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THE STREAM OF LIFE.

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THE

STREAM OF LIFE

ON OUR GLOBE.

ITS ARCHIVES, TRADITIONS, AND LAWS,

AS REVEALED BY

MODERN DISCOVERIES IN GEOLOGY AND PALÆONTOLOGY.

A SKETCH IN UNTECHNICAL LANGUAGE OF THE BEGINNING AND GROWTH OF LIFE, AND THE PHYSIOLOGICAL LAWS WHICH GOVERN ITS PROGRESS AND OPERATIONS.

By J. L. MILTON, M.R.C.S.

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A WORD OR TWO BEFOREHAND.

THE work now before the reader is an attempt to reproduce in the plainest language an outline of some few of the newest and most interesting discoveries in geology, language, and physiology, particularly those relating to the first appearance of man upon earth, and the gradual growth and laws of life. Throughout, one object has been to examine how far external causes, to which the power of affecting the life and destinies of man has been ascribed, really possess any such influence or not; for though the opinion may seem almost heretical, I am inclined to think that even in the most artificial state men remain, as a mass, totally unaffected by change of diet or climate, or the conquests of peace or war. But like the greek chorus I rather offer a commentary than pronounce an individual opinion; as the drama unfolds itself, I sum up the story and leave every man to judge for himself.

Perhaps the reader may think that the chapter on coloured stars, however interesting the topic may be, has not much to do with the subject of life on our globe. But I have to plead that some of the points discussed, such as the climate of the planets and the chance of their being inhabited, have a bearing upon possible changes in our atmosphere, involving the alteration and even the extinction of life as we see it; and that if little can be done now

by gathering materials, towards solving these questions, the task of future observers may still be made lighter. I might also plead the interest felt in all things connected with astronomy, an interest so wide-spread that the second edition of Sir John Herschel's astronomy was out of print within a few weeks of its appearance. Lastly I might urge the example offered by a long list of illustrious writers, who have treated of such subjects in the same work, without considering it necessary first of all to prove the existence of a common bond of structure or relation.

The first brief sketch of the work appeared in the shape of a few scattered papers in *All the Year Round*, and the editor of that deservedly favourite journal having kindly granted the fullest leave to reprint them, they are now offered to the public in a more extended and connected form than was possible in a periodical. Most of the views there put forward have only been confirmed by more recent discoveries, and though here and there some changes have been introduced, they rather enlarge than radically alter the positions first taken up.

A deep and increasing interest is evidently felt in the subjects treated of. Every day's experience confirms the shrewd remark made not long ago by Lord Palmerston, that "a general knowledge of the crusts of the earth is an essential accomplishment for every gentleman, and is useful in whatever pursuit a man is about to engage." Where interest fails to rouse, pride will step in. As men rise in the scale of society, they grow more ashamed of the ignorance about which they boast in an age of profligacy or violence. Besides I suppose there is in every mind and in the rudest nations, a desire to know the natural history of at least that speck of the globe they may happen to inhabit. Humboldt tells us that a "geological dream" is an essential part of every fixed form of worship, so that when history and religion first began, the law-givers and prophets of the dawning world had to still the craving for this kind of

knowledge, much as Owen and Lyell are expected to do in our day.

And there are worse things to crave and thirst after than geology,* worse things to gossip about than the chronicles of the earthquake and volcano, the flood and the geyser, the olden times of the mighty lizards and the mammoths; but people have been so long used to associate their history with alarming outbreaks of greek compounds and the prospect of having to struggle at the outset with a manual of some sort, that in general they wont read geology at all; in fact they look upon it as several stages worse than law and theology, which are not generally considered inviting studies.

It is a pity this feeling should exist. Not only is geology interesting, but it is immensely valuable viewed only as a means of making money. To the miner, speaking in the broadest sense of the word, it is a priceless acquisition. For long, sinking a pit was considered a lottery in which the experienced might be deceived, and the inexperienced might ruin themselves as easily as in gambling. The reason was that geology had not been studied sufficiently by the learned, and had been contemned by the practical men as a matter only fit for the closet and lecture room. Yet it alone can convert a reckless speculation into a certainty of success. Geology revealed coal beneath the permian beds of Worksop, a discovery of more real value than many a gold digging or diamond mine might prove in the end; and Mr. Jukes says he has known as much money thrown away in fruitless searches after coal, as the geological survey of the whole kingdom would have cost.

To the colonist again the value of geology can scarcely be overrated. A man thoroughly versed in it may see in a barren tract of scrub, or a rugged chain of mountain land,

* The division of the chapter on Geology into days is not, in the most remote way, intended to clash with those of Genesis. The term day is simply used to express a long and distinct period.

signs of every thing he could sigh for. Thus when the rocks of Australia were examined, it was soon noticed that there was a marked correspondence between them and certain rocks in the old country. In consequence a vigorous and systematic search was made, and the explorers were rewarded by discovering ample supplies of silver, lead, iron, copper, coal, and gold; so that the reader who is at all uneasy about our mines being worked out and half a dozen counties being made bankrupt, may console himself by reflecting that a fabulous supply of mining wealth is at hand in Australia.

It was geology and geology only that really discovered gold in this strange country. Long before it was found Sir Roderick Murchison foretold that it existed there; the Reverend Mr. Clarke did the same thing, and it was the pressure put upon government by the geologists that led to the matter being taken up and a reward being offered, the result of which was the discovery of gold.*

Geology will tell a settler other things even better worth knowing, for the value of gold-diggings has been quite overrated. Granite rocks and slates indicate that mountainous ridges are in close proximity, that when he sees them he may rely upon a good supply of fresh water and deep soil; that mineral wealth lies near and that good stone and timber can be had. A chalky coast, bringing back to memory the old familiar cliffs of England, will assure him that scenes like those on the Sussex downs are soon to break upon the view; little if any wood and not too much water, but long undulated plains where his sheep will fatten and multiply till he counts them by tens of thousands, or like Prince Esterhazy knows their number only by the number of his shepherds.

Hugh Miller, in his "Rambles of a Geologist," gives an

* Geological Observations in South Australia, by the Rev. Julian Edmond Woods.

admirable description of the difference he saw during his wanderings between the crops growing over different kinds of rock. "The harvest," he says, "had been early, and on to the village of Stonehaven and a mile or two beyond, where the fossiliferous deposits end and the primary begin, the country presented from the deck only a *wide expanse of stubble.* Every farmsteading we passed had its piled stack-yard and the fields were bare. But the line of demarcation between the old red sandstone and the granite districts, proved also a separating line between an earlier and a later harvest; the fields of *the less kindly subsoil derived from the primary rocks* were, I could see, *still speckled with sheaves,* and where the land lay high or the exposure was unfavourable, there were reapers at work. All along in the course of my journey northward from Aberdeen, I continued to find the country covered with shocks, and labourers employed among them; until crossing the Spey I entered on the *fossiliferous districts* of Moray; and *then, as in the South, the champaign again showed a bare breadth of stubble,* with here and there a ploughman engaged in turning it down." The same writer tells us that if we except the islands of the Inner Hebrides, the desolating famine of 1846, which cost this country over fifty millions sterling, was restricted in Scotland to the *primary districts,* so that only to know the difference between granite and roe-stone, might, to a farmer, make all the difference between ruin and prosperity.

Cliffs of marl and chalk also will tell the farmer that his cherry orchard may yet emulate the fame of the amber-hearts of Kent and the famous growths of Normandy. A large extent of limestone or calcareous strata will give fair promise of a fertile soil, where fruit trees will thrive as in Kent and Devonshire, where the myrtle and fuchsia, the geranium, the rose and the fig-tree will add their undisputed charms to the rude comforts and wild plenty of the settler's homestead, and mingle the memories of home, and the

emblems of english summer, with the more solid wants of life. This, too, is peculiarly the formation that yields those beautiful waterfalls, underground streams, natural bridges, and fine old sea-worn caverns, which have furnished the poet and painter with so many of their noblest images, and which speak to the best and most solemn feelings of every heart.

Geology does not war with such feelings, nor does the study of life. The one will elevate a latent passion for science into a thirst after truth, which will often weather those storms that crush out all enjoyment of grosser tastes; the other will throw an interest over the rudest calling, the work of the quarryman and the miner. The loftiest flights of the builder's art must depend for their stability upon the decisions of the geologist, and his opinions may, as in the case of Australia, regulate the wealth and even the fate of empires.

But for the colonist, the overtasked professional man, for thousands of other men, geology as it is usually written in the higher class of works is utterly incomprehensible; it might as well be penned in hebrew or sanscrit. I may therefore begin by assuring any timid reader, that I am neither going to discuss the chronology of the world nor to bewilder him with scientific terms. I really don't wonder at any person new to the subject being rather alarmed when he comes to such words as dolichocephalic and notochord, rhomboidal solids and diagonal lamination. He may well conclude that geologists are sometimes like other philosophers—"their discourses are as the stars which give little light because they are so high."

Or suppose the reader feels so far interested in the subject that he might like to know how to decide about the nature of a fossil. One of the first things he must learn is about the teeth; they are one of the grand distinctive marks that guide the breeder and horse-dealer, as much as they do the strictly scientific professor who would be shocked at the idea of alluding to them except under a greek name and in

an algebraical form. The most important and highly developed animals being the mammals, the reader who wishes to go to the fountain head, takes Owen's great work on Palæontology, and turns to the teeth of mammalian quadrupeds, which he finds represented by the following rather alarming figures :—

$$d.\,i\,\frac{1.1}{};\ i\,\frac{1.1}{1.1};\ c\,\frac{0.0}{0.0};\ d.\,m.\,\frac{3.3}{3.3}\ p.\,\frac{1.1}{1.1}\ m\,\frac{3\,3}{3.3}$$

This may be very well in an anatomical work, but really when I see it repeated in a manual or text-book, I feel sometimes inclined to compare the flood of learning shed upon so simple a subject, to the cloud which Zeus poured round the death scene of Sarpedon, which grows in splendour and awakens awe in the minds of us vulgar spectators, in exact proportion as it conceals its real events from our view ; and sometimes tempted to exclaim with Geronte, when borne down by the weight of Sganarelle's learning, "Ah, why didn't I study !" Possibly men think that by making their style unintelligible from the amount of learning it is seasoned with, they pay a compliment to the scholarship of their readers, as the Chinese in addressing their superiors make their writing smaller in proportion to their higher rank ; the superlative mark of respect being to form the characters so minute that they are illegible.

It is from no wish to appear original that this is said. The question I have to deal with narrows itself into this : most men are too busy to learn such subjects as geology and physiology through the medium of lectures and text-books ; they would gladly hear from time to time what is doing in these sciences ; they take a deep interest in them ; but if they are to master greek and algebra, anatomy and mineralogy, before they can understand what they are reading, they will look upon any attempt to learn as sheer waste of time. "Better" they will say, "keep to works which instruct because we can comprehend them, than face such a

phalanx of hard terms, which only bewilder one. We would gladly learn from you, but then we must in self defence

'Bar all latin and all greek,'

at least in such a shape as that in which you would serve them up. It may be very easy work for you to run over these mongrel terms, but we have had to fight the battle of life in other fields and we laid by the classics when we left school." I offer no opinion as to whether such a prejudice against scientific language is right or not. I only know that it exists and that a man who has only now and then an hour or two in the evening must make the most of it.

Many scientific men object to any compromise. There is no royal road to science they tell us; labour alone can scale the rugged path that leads to the enchanting domains of truth.

"Life gave nothing
Without great toil to mortals"

is the motto by which they are prepared to stand or fall. The Rev. Mr. Symonds, for instance, has denounced any pandering to the taste for having science made easy, and comments with no little asperity upon the lady who wants to read chemistry like a novel, and the horse-courser who wonders why the perigee should be more intricate than the pedigree of a racer. But the lady and the jockey will read sometimes, and they may be as well occupied in learning at least some of the simpler truths of astronomy and chemistry, as in depraving their minds with some wretched sensation tale or a bet. Let men of science say what they like, a fashionable novel and a horse race will always interest a certain class, and if they can only be weaned from such low tastes with manuals and text-books, the evil is not likely to yield in our time. It is therefore better such people should have a little insight into higher matters than none at all; there cannot be a more hurtful dogma preached than that "a little learning is a dangerous thing."

Even in purely scientific works I never could see the

necessity for using a jumble of double-jointed overgrown greek words, clumsily hammered into something supposed to be english, a species of jargon which for the time being I shall take the license of calling mysterious and useless, and which I hope to see as obsolete as the old practice of writing in latin, for which the pedants of former days battled so stoutly, which looked so very learned, and is now thought by some persons to be so very stupid.

It is a great pity the greek and latin ever took root in our language. They are quite unsuited to the english forms of speech, and incessant quarrying from them has done more towards making men neglect some of our finest old writers than any change of taste in the public. The worst of the matter is, that there is no mode of checking the manufacture of words from foreign materials; a novelty which would be absurd in english sounds respectable in latin and classic in greek; men get wearied of struggling against these fantastic creations and come at last to think that they are useful if not indispensable.

> "These rugged names to our like mouths grow sleek,
> That would have made Quintilian stare and gasp."

But for my part I am quite at a loss to know why the language of Bacon and Locke, of Brewster and Knox, the style of Newton and Franklin, would not serve at any rate most of the ordinary purposes of science.

Many of these monsters are only created to be displaced by another race, if possible more cumbrous and hideous, an evil which must gather force, so long as ever men seek to include so many qualities in a word, till a name will become a definition. The words adopted by one age are rejected by the next and lost in the third, till the language of our old age no more resembles that of our youth, "than two portraits of the same person drawn at long intervals of time." Those who are so fond of these compounds might do well to pause and enquire, if they have even no other

feeling in the matter, whether they are not thus consigning their names to oblivion, and whether the alchemy of another age will not, when it has extracted the gold from their works, throw their works themselves aside as dross which is no longer of use. The genius which can charm a future age in the language of science must be of a superlative cast. The names of Newton and Leibnitz are as familiar as those of Homer and Virgil, but who thinks now of the lesser stars? Even the names of Halley and Gataker, of Bradley and Flamsteed, sound strangely unfamiliar in the ears of many who have read every line of Milton and Pope. Let Science question Poetry, and Poetry will tell her to take warning. The english Shakspere lives in our hearts, while the classic Sidney is rarely opened. The homely english of De Foe is literally read at the pole and the equator, for Robinson Crusoe has travelled with an arctic expedition and Burckhardt heard the Arabs reading it as he sat by his tent door in the sublime solitude of the desert, while the far more learned Milton is more admired than sought after.

As to saying there are no words in english to supply scientific terms, it is absurd. Greek words simply express qualities—colours, plants, animals, &c.; they do not and never did express any more. Megalosaurus comes from two words meaning great and lizard, and ichthyosaurus from two signifying fish and lizard. They are perhaps more suited to a learned work because they had the same meaning in the days of Homer and Aristotle, but I am not aware that there is any thing more profound or comprehensive in the greek adjective and substantive than in the english equivalents, though from the veneration with which they are regarded, they may possibly possess some mysterious quality known only to the initiated. Perhaps the author of the Ingoldsby Legends or Horne Tooke could have thrown some light upon this recondite subject, but they are gone where we can get no help from them.

Nor when tried by any fair test do these compounds

always convey the meaning so adequately as might be supposed. The eocene of the geologist comes from two greek words signifying dawn and recent. Would any person from this suppose that it meant the beginning of the tertiary period, any more than he would if the words recent dawn had been used? The modern pliocene and pleistocene, with all their subdivisions, are formed in the same way. Coccosteus looks a very scientific name for a fish, but translated into "berry on bone" I see nothing wonderfully expressive in it. If greek words must be used these are perhaps the best that could be found, but do they in any way prove that it is necessary to use greek, for that is the real question?

If this kind of dialect possessed no other advantage it has that of being wisely manufactured. Memory will generally supply an ample stock of greek, and where that fails a lexicon is always at hand; whereas a clear readable style can only be produced by hard earnest labour. "A coarse stone," said that sterling english writer John Dryden, when defending Virgil for having spent three whole years in revising five or six hundred verses, "is presently fashioned, but a diamond of not many carats is many weeks in sawing, and in polishing many more."

Men are fond of quoting Mr. Locke; let us hear what he says upon the subject. If I have spoken strongly he is downright abusive. He has no faith in hard words and looks upon the use of them as a mere cloak for idleness and ignorance. "Hard and misapplied words," he says, "with little or no meaning, have, by prescription, such a right to be mistaken for deep learning, and height of speculation, that it will not be easy to persuade, either those who speak, or those who hear them, that they are but the covers of ignorance and hindrance of true knowledge," a piece of plain speaking which few authors of the present day would venture on.

Perhaps astronomy more than any other science awakens

interest from its long-drawn traditions and its ancient origin, while it appeals at once to the shepherd who watches the stars and the noblest intellects. "It has challenged the admiration of all ages. Poets, philosophers, and historians have all given it their highest encomiums, and kings themselves have enriched it with their labours." Yet this noble science is becoming year after year more obscure for those who cannot afford to abandon everything in order to master it, and this chiefly because it is overloaded with terms.

It will be said that I have been as sparing of stops and capitals as of greek and latin. I admit the charge and plead justification; I think authority and taste are on my side. Grimm in his noble work on grammar threw out capitals altogether except at the beginning of sentences, and some of the most elegant of the modern french writers have gone nearly as far. Except for proper names they are useless to readers who reflect at all, and are simply a relic of an ignorant age, when few men read and still fewer were familiar with the subjects they read of. Benjamin Franklin deplored the decline of the good old custom of writing all substantives with capitals, but I never could make out when this custom was followed; and a man who cannot tell a substantive from an adjective without such help as this, had better try whether he can't learn to do so. As to stops I believe men find that they can read modern works, though these contain far fewer commas and semicolons, quite as easily as older ones. Some of the german writers have very justly censured our unreasoning system of punctuation, and I could quote authority enough against the abuse of stops, did I not think that authority is hardly needed to decide a question of taste, or to justify an author in expunging what he thinks will only fatigue the eye and distract the attention.

I have often been asked if I could name a work which would enable a person not minutely acquainted with anatomy and physiology to understand something of the great

processes of life, without its being necessary to wade through the more obscure parts of physiology. I could only reply that for anything I knew to the contrary such works might exist, but that I never saw one. When searching authorities for my own purpose I found that books professedly devoted to such subjects, books written by the hands of Mayo, Wagner, Müller, and Hunter yielded less than I expected in the particular field I had chosen, and consequently I did not feel very sanguine that works compiled from them would supply the want any better. I have therefore essayed a sketch of physiology, but one drawn up with so little regard to established rules, that most of the scraps and gatherings which the reader will find in it, were gleaned rather from half-forgotten fields and hiding-places of learning, than from respectable authorities and well-arranged catalogues. With only such materials before me I do not profess to write scientifically. I took up the subject solely with a view of arranging a few stray facts and papers, which if they could throw no light upon it might give it something like a form and a name. From the very first I looked upon myself as a trespasser upon the hereditary estate of the philosopher, who if detected could only expect to be treated as a poacher. The reader therefore who is in search of profound learning had better seek it elsewhere, as I plainly warn him that he will not find it in these pages, and that if he looks for what I do not profess to offer, he will only lose his time.

Like a little and old-fashioned cabinet of curiosities, the sketch of the law of life must necessarily show incomplete in every part to the eye of those accustomed to delight in scientific-looking lexicons and well-arranged essays. This was however done designedly. The subject is rather apt to disgust in the most inviting form, and if over-freighted with ever so little dry learning and refractory terms, would have sunk a bettercraft than mine. If however I have made the leading outline clear, I shall pass by everything else with a good

conscience, as the old greek sculptors when they were satisfied with the figure, neglected the accessories.

That books do not teach physiology as the general reader would like to have it laid before him, is the sum and substance of what I hear. Men are here in the same position as with respect to geology. They want to know what physiology can teach them, without running the gauntlet of minute anatomy and organic chemistry through text books and manuals eight hundred pages thick; especially as those who are persevering enough to face such a formidable phalanx of learning, report that in these works, though replete with high class information, the living spirit of physiology is buried under an incubus of details, which it as vainly strives to throw off as a buried Titan does his mountain sepulchre. This is like describing every brick and pane of glass in a building but telling us nothing of its inmates and traditions, its old historical recollections and how it looked in bygone times. "There is," says Lord Bacon speaking of the abundant supply of this kind of learning and the dearth of real teaching, "a mere and deep silence touching the nature and operations of these common adjuncts of things *as in nature.*"

For these reasons then I have ventured to offer a sketch of the history of life and made an attempt to trace its laws. I do not profess to dive beneath the surface of the current but to point out its course. I have weighed the risk of endeavouring to follow in the path so ably trodden by Johnston and Wilson, Ansted and Miller, and have resolved to run it, taking both for my excuse and motto the pithy words of an old and half forgotten "maker:"

"Rude is my wyte,
And sympyl to put all in wryte."

19, Devonshire Street,
Portland Place.

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THE STREAM OF LIFE.

CHAPTER I.

THE BEGINNING OF LIFE; OR, ENGLAND LONG LONG AGO.

"This island is in a great measure a general epitome of the globe."
—*Fitton.*

THE FIRST GREAT DAY.—In the days when our little island was young she was not a beauty, she was merely grand and interesting. Unlike other belles she only began to charm the poet and novelist when she had long outlived the fire of youth, or rather when she was in the opinion of many fast sinking into a state of decrepitude, which unmistakably warned men of approaching death and dissolution. This strange consummation has required a long and wonderful series of metamorphoses, each as complete and mysterious as that which transforms the larva into the butterfly, and which it will be my task to picture forth as I best can.

The mind finds it difficult to realize the idea that a country so well tilled and drained as England, and subjected to the plough as far back as authentic history goes, was once a steaming morass covered with the rank tropical vegetation of the tree-fern groves its awful silence broken only by the hum of

the shardy beetle, the rush of the hideous flying lizards through lofty woods of ferns and reeds, or the tramp of the giant iguanodons over the plashy wolds. Imagination left to itself could scarcely have indulged in so wild a flight as to picture an era when palm-trees waved in Kent and Hampshire, and the plains of Cumnor were the coral reefs of some primæval lagoon; when the tiger and hyæna lurked in the thickets of Kirkdale and the trumpeting of the great northern elephant was heard on the moors of Yorkshire and the downs of Brighton; when the nautilus spread its sail to the breeze or plied its busy oars in the waters of the Effra; while the bison fed on Cromer plains, and the sullen river-horse and rhinoceros browsed by the Thames and the Avon, or lay down to die by the Ouse and the Aire.

Yet all these things were. The hammer of the geologist has conjured up many a picture of the farthest eld far more weird and wondrous than ever was fabled, and though of times far beyond the ken of history, yet supported on proofs for which we vainly hunt in tradition. The historian only seeks to trace back the annals of our island to the days when it was first peopled by painted savages, living in wigwams like the red Indian or beaver, and hunting with the rude bow and flint-headed arrow; the geologist recalls the times when it was the home of the dragon, the turtle, and the iguanodon.

What a strange picture the traveller who is whirled through the beautiful Weald of Kent or the Sussex Downs, the Wolds of Lincolnshire or the Valley of the Clyde, would see revealed if he could roll back the ponderous curtain of the past and recall to life the

grim denizens of these fine counties; a picture in which the foreground would be filled with forms so vast and strange of aspect that they must be seen to realize their imposing and spectral presence, seeking their food by ancient streams which have now for ages been dry green valleys, or amid forests of trees not one of which remains on earth.

The time of the woad-painted Britons fades far far away and the land is seen peopled by a strange and savage race, hunting the cave-bear and the giant bull with their flint-headed spears, or pursuing the whale with their rude harpoons. Many a stream where now the fisher is casting the fly, or which only echoes to the clack of the neighbouring mill, rings with the war-cry of a long-perished clan; and where now only a rivulet or a green dell marks the track of some ancient river, the canoe of the savage is seen gliding along, as he seeks the haunt of the beaver and salmon. The scene fades away and we hear only the roar of the ocean on the chalky cliffs, or the murmur of the waves on some coral reef fast silting up into a land-locked bay; beneath the green waves the busy chalk insects are toiling and fish are chasing their prey. The sea is gone and we are in the days of the dwarf-palms; the huge saurian is crunching his tough woody food or preying on some great lizard well-nigh as big, but not as strongly armed, as himself. The land is once more sea, and the fierce mailed and armed fishes engage in mortal conflict, dyeing the warm steaming waters with blood, and when they vanish we come to the time of the weedy, muddy, primæval seas, thick with fucoids, fitting abodes for the sea-worm and zoophyte.

How these dreams formed and faded away into the unwritten past, how the unnamed and stagnant oceans of the primæval world changed into clear seas and rivers, and how the monotonous vegetation of kelp-weeds, and still later the vast forests of ferns and club-mosses, with all the uncouth actors in the sombre drama of pre-adamite life, gave way to the beautiful fauna and flora of modern times, Geology, and Geology alone, has shown.

The curtain rises upon an interminable ocean of granite, seething and glowing like molten ore and heaving like the Atlantic in a gale, an impenetrable mist formed by the heat expelling every drop of water from the granite ocean, its sombre, awful stillness never stirred by a breeze and contrasting strangely with the infernal uproar beneath, overhangs the globe from pole to pole, offering a spectacle which in its gloomful majesty outstrips even the grand picture drawn by Milton of ancient Chaos:—

> "Behold the throne
> Of Chaos, and his dark pavilion spread
> Wide on the wasteful deep; with him enthroned
> Sat sable-vested Night, eldest of things."

As the great day wears on, the heat gradually passes out into space; and when we next look upon the scene, though the granite still seethes in every cleft and volcano, though every hill and table-land shakes and thunders as the raging flood beneath heaves and falls, and the waters which have fallen from the mists still boil like a pot, yet the fearful turmoil has greatly subsided; the granite is settling down into hills and valleys, and the Great Architect is laying the

strong foundations of the earth in the shape of the igneous rocks. Even before this part of the task was well completed and the seas had cooled down from boiling heat, the misty rivers were slowly wearing down the granite, and pouring it in the form of mud into every sea and lake, to form the first stratified rocks.

All through the morning and noon of this the first great day there was not a trace of life; not a weed floated on the waters; not an insect flitted through the hot and murky air; naked and lifeless, a vast region of gloom and smoke, of fire-scathed steppes and steaming lakes, the framework of our globe swept along in its appointed round. But as evening drew nigh, little fucoids, progenitors of the kelp-weed which the wretched inhabitants of the western Highlands have ever since the memory of man gathered for their cattle and sheep, began to line the iron-bound shores of these early seas. At first as might be supposed, they were few and feeble enough; but at last they grew so thick and rank that beds of anthracite are found in Dumfries composed solely of them, and flagstones are met with so full of bitumen from the same cause that they burn more brightly than cannel coal. About the same time * sea-worms and zoophytes—creatures like little bundles of twigs tied on a common stalk, without the sense of sight and smell—little by little were peopling the waters and with their arrival the day closes.

But still through its evening and night—if such words can be used of a time when neither sun nor

* See Appendix 1.

star could pierce the vast and turbid clouds which hung like a great pall over the earth—the fires of the granite and basalt though well-nigh stilled would burst forth here and there, and now and then a volcano would pour across the land a torrent of melted rock or launch the boiling lava over the mud of some inland sea and bake it into gneiss, and later on when the heat had lessened more, into mica-schists, until as the violence and frequency of these outbursts abated the clay-slates were formed with the aid of Nature's matchless hydraulic presses.* Nor was Nature even at this early hour unmindful of beauty, the same heat which made the rocks melt and seethe fed the alembic from which the garnet, the ruby, and topaz, with many other priceless stones and metals, were distilled by her wondrous alchemy.

The Second Great Day.—The first day is gone amidst impenetrable gloom and with the second come the earliest creatures of prey, the first tiny freebooters of the ocean,—corals of very simple pattern, stone lilies,† accompanied by crabs, and little creatures serrated like combs. Corals were perhaps in greater numbers in this Silurian age than at any time since; the Silurian limestone of Wenlock Edge is a coral reef thirty miles long. The ancient corals were formed upon a simpler pattern than the modern ones. They were four-rayed and those now living have six rays, or multiples of six. The stone lily was furnished

* Ansted considers that the slates are clays which have stood immense pressure.

† Encrinites or Crinoid Star-fishes. They belong to Province I. Radiata, Class I. Echinodermata, Order I. Crinoidea.

with long fingers to catch its prey, and was guarded from assault by an elaborately worked suit of armour, consisting of at least twenty-six thousand pieces so constructed and fitted together as to be proof at every point and yet allow of the freest movement—a feat which the most expert Milan armourers only executed in a very imperfect way. The famous beads of St. Cuthbert are made of the joints of these old stone lilies. Star-fishes and sea-urchins were now seen in these old Silurian seas, their strange radiate forms changing continually in pattern down to our day; they too, like ours, were given to committing suicide by explosion. Shell-fish of the oyster tribe soon appeared, and the crab had its representative—not in an animal of the commonly accepted form but in a creature called a trilobite, very much like an immense woodlouse being sometimes eighteen inches long. Along with remains of the trilobites have been found fragments of a lobster that must have been quite seven feet long.* Some of these trilobites were marked strangely enough with spots as if they had died of smallpox, others resembled tropical bugs, their tails being furnished with cruel-looking spines; they were more akin to our king-crab than most of his edible brethren; they flourished in great strength till the close of the coal epoch when they pass away, none of them being found in the upper beds of the coal. The beautifully jointed shells of this animal exhibit the most perfect contrivances ever yet seen for securing freedom of movement and protection at the same time. These animals like the molluscs could

* The Great Stone Book.

see, indeed the eye was so complex as to resemble that of some modern insects, and there are sound reasons for thinking they may also have been able to hear, so that already the grand work of variety of form and function, developed to such an extent in later ages, had begun. Fishes some writers say have no sense of taste, as if everything that sank into the waters to become their food must necessarily turn cold, watery, and insipid: I doubt the conclusion. The power of hearing has been denied them on equally weak grounds; Miller however gives strong reasons for believing that some of the most ancient fishes had, to judge from the comparative development of the organs, full power of smell, sound, and sight, so that they were as well off s those of later times.

As yet we have no sign of the enormous bulk which distinguished the reptiles and mammals of a later period. Beauty there was however of its kind both of form and hue, for the stone lilies were daintily sculptured with geometrical patterns resembling the style of the Early English. One variety has been compared to a baby's rattle, which it certainly resembled, its arms instead of expanding being netted together.

The second day was no longer marked by the palpable darkness which until then had shrouded everything; still the atmosphere was heavy and torpid, like that supposed to hang round Mercury and form the dark bands on the surface of Jupiter; it was so laden with carbon too that it must have proved fatal to any warm-blooded living being with sensitive lungs. There was no land on which anything could grow, for it had first of all to be irrigated by the muddy rivers,

or be built up bed after bed at the bottom of the lakes; but it was nigh at hand, and as the faint light sinks into evening it rises from the waters, bearing with it the earliest traces of land plants.

By some writers the Malvern Hills have been considered the first English land that rose from the bosom of our primæval ocean. Indeed not merely these but the east flank of the Wrekin are far far older than the Alps or Himalayas, and certainly they were well adapted to defy the tooth of time, the storm, and earthquake; Malvern indeed is of such adamantine strength that the engineers had hard work to get through it. Scotland too claims a proud pre-eminence in point of antiquity; as Miller says, it can call the towering Mont Blanc a mere upstart, and Dawalaghiri, more than five miles high and rising thousands of feet above the clouds, a heady fellow of yesterday. Even some more modern stones are of far greater age than much we are apt to ascribe great antiquity to; thus, our Portland stone is immeasurably older than the stone of the Pyramids. Agassiz however places America in advance of all. In one of his articles in the "Atlantic," entitled "America the Old World," he says "here was the first dry land lifted out of the waters; here was the first shore that was washed by the ocean that enveloped all the world beside; and while Europe was represented only by islands rising here and there above the sea, America already stretched an unbroken line of land from Novia Scotia to the far west."

The Third Great Day.—Again the curtain rises with returning light, and reveals the second great

epoch in the history of life—the laying down of the Old Red Sandstone, now made a household word by the genius of Miller, and bearing in its colour proof of the first appearance of that mighty metal iron, which was in time to bring everything under the rule of man.

The forming of this great geological production, in every country the home of the earliest land plants, appears to have been attended with an amount of violence unusual even in those stormy times. All the pomp and horror that the volcano and earthquake could lend, preluded the appearance of land destined to be tenanted by a more developed race of beings. And when it is recollected that a mountain* has been raised one thousand six hundred feet in the course of a single night, and the whole top of another mountain for six hundred feet down has been blown off at once by an eruption, as the funnel of a steamer is sometimes torn away in the explosion of a boiler; that there is a volcano at Piraunea eight miles in circumference at its crater, and that Cotopaxi glows at its lofty summit like molten glass and can project a mass a hundred cubic yards in volume between eight and nine miles; when we read how Etna has discharged a hundred and forty million cubic yards of lava at one eruption, and Skaptar Jokul has poured over the devoted plains of Iceland, at one and the same time, two streams of lava one seven and the other twelve miles wide, both some ninety feet deep and forty or fifty miles long; when we remember how Vesuvius†

* Jorullo.

† In 1822, Vesuvius launched a block of lava several tons in weight for three miles, it fell in the garden of Prince Ottajano.

has buried whole towns, and a convulsion of Papanda-yang* has engulfed forty villages at once, we may form some faint idea of the scene that must have presented itself when these forces were raging with primæval strength and unchecked fury,—when far and wide the land looked like the Iron Country on a winter's night, and every volcano showed in the gloom like a great forge chimney belching out torrents of melted stone and slag, while the scarred and shattered earth rocked beneath the resistless throes of the earthquake.

Hugh Miller dwells with his wonted eloquence on these strange scenes of destruction. After describing a platform near Cromarty, where as if suddenly overtaken by overwhelming destruction the ichthyolites lie in myriads grouped in every posture of terror and agony, he says, "we see the spiked wings of the pterichthys elevated to the full, as if they had been erected in the fatal moment of anger and alarm; and the bodies of the cheirolepis and cheiracanthus bent head to tail in the stiff posture into which they had curled when the last pang was over." In another ichthyolite bed he found "the thorny acanthidians twisted half round as if in the agony of dissolution, and the pterichthyses still extending their spear-like arms in the attitude of defence," the catastrophe having clearly overtaken them quite unawares. "In the Old Red Sandstone of Caithness," he says, "there are many such platforms, story rises over story and the floor of each bears its closely written record of disasters and sudden extinction. Pompeii, in this northern locality, lies over Herculaneum, and Angelo over both. We cease to

* The largest volcano in the island of Java.

wonder why the higher order of animals should not have been introduced into a scene of being that had so recently arisen out of chaos and over which the reign of death so frequently returned."*

The records of the earthquake and lava flood sound like a long history of the most terrible ills that can desolate the land and vex the human race. Cities are buried under floods of fused rock or showers of pumice stone; fields and gardens changed into useless stinking wastes of mud; for miles round the seas are covered with dead and dying fish, poisoning the very air far and wide till often more men are carried off by this cause than are destroyed by the earthquake; thousands of human beings are swallowed up bodily, or crushed beneath the falling towers and walls, or engulfed by the huge billows. But when we reflect that the lava is full of precious earths, that earthquakes have often been the sole means of bringing to the surface the evidence of the mineral treasures that lie so far below; that they lay bare our coal, salt, and limestone, nay, even cofferdam our mines, without which we could not possibly work them; we shall see in these fearful convulsions mighty agencies, without the aid of which man could never have been redeemed from the wretched and precarious life of a savage.

Large fishes now appear; they had begun with the second great day,† possibly with the first, but now they come in numbers; not the kingly salmon and the turbot of the dinner-table, but great voracious creatures armed with powerful means of destruction

* "Cruise of the Betsy," p. 173. See Appendix 2.

† With the Lower Silurian rocks, the Llandeilo flags, and it would seem even with the Cambrian in the Bala limestone.

and equally potent means of resistance, their skins being as hard as bone, or rather composed of plates, spines, and points of bone or horn, fitting in one class edge to edge like a tesselated pavement,* in another overlapping each other like the slates of a roof, and furnished with a hook in the upper margin to fit into a pit in the lower edge of the scale above, or bevilled and chamfered; indeed the mechanical contrivances in the shape of armour were never surpassed by any of Nature's later productions. One animal, called a holoptychius, was furnished with fluted pot armour, which ages afterwards Oliver Cromwell, a practical genius and capital judge, selected as the best kind for a helmet and the principle of which is now extensively adopted in our corrugated-iron houses. It was also constructed so as to give a dead shock to blows, having a firm outer and inner coat with a soft material between to act like sand-bags; finally its inner coat consisted of layers of fibres which crossed each other as in moleskin, so as scarcely to admit of being torn. As a bullet would have rebounded from its skin, it seems difficult to understand how any inhabitant of the deeps could well have hurt it. Furthermore the harness of some of these old ganoid fishes was hard enough to turn the edge of a graving tool. One species† had such a perfect outer case of bone from mouth to tail, that it has been likened to a fish carved out of ivory.‡ The light blue colour seen in the armour, particularly the shields of some, was probably due to the presence of phosphate of iron; of all the fishes now living, only two possess any-

* As in the osteolepis and diplopterus of the Old Red Sandstone and in the megalichthys of the coal measures.

† The osteolepis. ‡ Footprints of the Creator.

thing like a covering of the kind, namely the bony pike of America and a fish found in the Nile. The armour of a very old fish, the asterolepis, was very finely worked and carved; Hugh Miller says he has seen a richly inlaid coat of mail which was once worn by Charles V., and that the elaborate carvings on it, though belonging to the age of Benvenuto Cellini, were rude compared to those on the shell of this extinct giant. The armour on its head was immensely strong, far superior to that of any crocodile.

It has been supposed that this panoply was in some measure a defence against the great heat of the waters which prevailed in the old seas. But it has first of all to be shown that the waters were so hot, and it has been stated that some fishes bear a very high temperature without armour at all. It is more likely I submit that it served solely as a protection against friend or foe, the fish of that day being perfectly unscrupulous about attacking either when pressed by hunger. Besides Miller, who put forward this theory, has I think himself refuted it; he has described one fish armed in this way in front but which had the hinder part of its frame and tail unprotected, and he accounts for this singular arrangement by supposing that it buried those parts in the mud, and lay with its armed head and jaws protruded waiting for the passing prey. Now I suppose the mud in which it sought for shelter was quite as hot, if not a great deal hotter than the water.

Like the sharks of our day to which they were akin, these old fishes had the backbone prolonged into the tail which was unevenly fluked, enabling them to turn upon their backs with great quickness

when they wanted to seize their prey. Some of them were most strange-looking creatures; one called a pterichthys or flying fish,* must have shown like an immense tadpole furnished with clumsy wings or oars, its ugly head was protected by a helmet and half its body was covered with enamelled bone, the pieces being locked together by a mechanism which united the principles of the keystone and dovetail. Louis Agassiz in his "Memoir of Hugh Miller" compares it to the letter T, and describes it as "bearing less resemblance than any other fossil of the Old Red Sandstone to anything that now exists. When first brought to view by a single blow of a hammer, there appeared in a ground of light-coloured limestone the effigy of a creature, fashioned apparently out of jet, with a body covered with plates, two powerful-looking arms articulated at the shoulders, a head as entirely lost in the trunk as that of the ray or skate, and a long angular tail, equal in length to a third of the entire figure." This singular animal has only been met with in two places in England, a few specimens having been found at Farlow in Shropshire and near Crickhowel in Monmouthshire. One monster was shaped like a butcher's tray and another, the buckler-headed fish, was defended over its head by a shield of bone, shaped like a tulwar without a handle; Miller compares it to a saddler's knife. Others again wore the familiar forms of our sticklebacks and trigger-fishes.

* Discovered by Hugh Miller. It began with the lower deposits of the Old Red Sandstone, and becomes extinct at its close. The buckler-headed fish, or cephalaspis, begins as early as the Upper Ludlow rock.

When fleshy oily fishes die and are buried in mud the oil exudes slowly through, or the under parts melt away and leave it there. Once there it seems to bid defiance to time, becoming converted into a kind of pitch which preserves the skeleton parts for thousands of ages. In Scotland vast numbers have been found preserved in this way; "so thoroughly is every pore and hollow still occupied by this pitch, that when cast into the fire they flame like torches." This singular process has made the Devon flags of Caithness so tough that they will bear setting on their edges better than any other known stone.*

The flora of the early part of the Old Red Sandstone, our first garden, was poor, gloomy, sombre, and monotonous in the extreme. Club-mosses and ferns were well-nigh all it could boast of, even they are sparsely scattered and it is not till the Old Red is about to disappear that a fine irish fern and a pine tree appear on the stage. Hugh Miller speaks of a club-moss found in the grey tilestone, as distinct from these plants as the stiff fir of the coal measures is from the club-moss; again fragments of what seems to be a calamite have been traced to a very old stone bed.† For long it was maintained that the Old Red Sandstone of Caithness contained no land plants; it really contains nothing else, and is quite free from the small seaweeds. Nor was the sea then the great

* Owen tells us that they owe this peculiar denseness and tenacity "solely to the dead fishes that rotted in their primitive constituent mud. From no other part of the world, perhaps, can a large flagstone be got, which a builder can set on its edge with the assurance of its holding long together in that position."

† The micaceous red sandstone. See also Appendix 3.

seat of active life in aught like our seas in the beauty and variety of its beds ; some stone lilies of a very early period, now found in millions in the marbles of Derbyshire and the black rock of Bristol, were lovely enough, but the herbage of the deep was of the most same and wearying look.

With the old red sandstone begin also the first traces of air-breathing reptiles. Nearly twelve years ago Mr. Duff, of Elgin, sent Professor Owen the impressions of a small reptile found at Spynie, and in a fine-grained white sandstone, resting upon the old red and situate in the same neighbourhood, bony scales were found, which Agassiz at first took to be those of a fish, but which Owen showed to be of the crocodile nature.*

After the old red sandstone had been deposited a vegetation arose so rank that it has never been paralleled in the worst jungles of our tropical climates. From India and Australia to the lonely wastes of Baffin's Bay and Melville Island every foot of land was covered with the long-extinct marvellous plants of the coal measures. Every ancient wold and upland, every knoll and lea, was overspread with gloomy tangled woods of immense club-mosses and ferns, while by every stream and lake rose forests of lofty reeds.

The ferns it is well known are flowerless plants, and such were also the ferns of old ; but they were much more highly developed than the plants which came before them, the algæ, having stems and leaves. Some of these old ferns attained an immense size.

* Owen's Palæontology, p. 255.

The reeds, too, which resembled the mare's-tail now seen growing in our fens and ditches, were often twenty-four times as thick as those of the present day and several yards high, and the club mosses reached such dimensions that fragments of them have been found forty-five feet long and upwards of four feet in diameter, almost as large as the dark stiff firs* belonging to this epoch, for there were true trees along with all these reeds and club-mosses.

Under a sky the heat of which was never chilled by a cool breeze, or rather under a canopy of hot mist which wrapped the earth in a warm pall and kept in all the heat like the roof of a greenhouse, rooted in steaming, dank, bottomless morasses, heated by the scarcely subdued fires of the granite, these plants grew at an inconceivable rate; nothing even in the profuse growth of the coasts of Malabar and Chittagong in any way approached it. But they were thus admirably adapted for the purpose they were intended to serve, that of unloading the air of the carbon and storing up immense masses of vegetable matter in the shape of coal, into which, as they fell by myriads in the jungles, they were slowly changed.

The aspect of these old forests must have been inconceivably sombre. The geologist calls the flora of these days rich, but to an unscientific eye it must have looked hideous and repulsive. Gloomy immeasurable tracts of one sad whitish hue must have shown like groves of dead seaweeds, an appearance often noticed in a slight degree in some parts of America when the clouds have intercepted the rays

* Araucarias.

of the sun for days together. The sunbeams, the chemical rays of which change the soft fibre into hard woody substance and eliminate the colouring matter or chlorophyl, only reached them late in the day and clothed them with resplendent green.

Some of the club-mosses were beautifully marked with geometrical patterns and ornamented with exquisite diaper-work; one figured by Miller is carved like the stone-work of a church-window in the waving style. The sigillaria, of which twenty-two species are found in British coalfields alone, are remarkable for their sculptured stems. They are fluted vertically, or, as Miller designates it, like a Grecian Doric column, and each fluting is marked by a line of sculpture where the vessels passed out from the stem to the leaves, running down its centre. This sculpture varied according to the species; in one it resembled the bolt-heads used by ship carpenters; in another a pair of beans set side by side; in a third two rows of goggle eyes stare at the spectator. "In walking," says Miller, "among the ruins of this ancient flora, the palæontologist feels as if he had got among the broken fragments of Italian palaces erected long ages ago, when the architecture of Rome was most ornate, and every moulding was roughened with ornament; and in attempting to call up in fancy the old carboniferous forests, he has to dwell on this peculiar feature as one of the most prominent, and to see in the multitude of trunks darkened above by clouds of foliage that rise upon him in the prospect, columns of an older Alhambra, roughened with arabesque tracery and exquisite filigree work."*

* Testimony of the Rocks.

These strange plants had roots differing from any others, for they projected from the centre like rays, and ended abruptly in a circle like the spokes of a cart-wheel. One of the stigmaria, very beautifully marked like a meadow daisy, had roots or underground stems which ended abruptly like a cucumber. One rhododendron, brought from the iron shale of Leith, exhibits the peculiarity of bearing all its branches on one plane, like the tail of a peacock or the Madagascar tree called the "Traveller's Friend."

Plants of this class, without fruit or flower, were useless except to a few insects. Even to this day cattle will not crop the fern, although the root is eaten by persons who can get nothing better, and the horsetail weed is so distasteful on account of the silex it contains, that cattle will not touch it unless pressed by hunger. The reader will therefore be little surprised to learn that the chief inhabitants of the woods were hideous insects, such as cockroaches, scorpions, beetles, and the like, which seem to thrive very well upon things which offer no nourishment at all to other animals, and for which no food seems too dry and sapless. Reptiles also of different kinds grew numerous before half our coal-beds were deposited. Later on in this epoch however came two-winged flies, butterflies, and the dragon-fly. When the fly came one might expect the mortal enemy of this tribe, the spider race.*

The fishes of this era were armed with the most frightful means of destruction, and strong indeed

* In the shape of the fossil scorpion. A fine drawing of one found in the Bohemian coal measures is given by Miller.

must have been the armour that could resist teeth more sharp and trenchant than those of the crocodile, nay, in some of these ancient monsters,* four times as large as those of any crocodile, dorsal spines like huge beautifully-carved spear-heads, stings of immense strength above a foot long, as thick as a gun-barrel and furnished on each side with a thick-set row of barbs hooked backwards.† The fish of the present day, even dogfish and sharks, would have been delicate eating for those of ancient times. One monster found in the red clay of Suffolk, of very much later date however than the times we are now speaking of, called the carcharodon, is computed to have been quite sixty feet long, with enormous teeth sometimes quite six inches in length ;‡ teeth such as these would have broken through the armour of a crocodile as easily as we break through the shell of a hazel nut. The flesh-eating whale was even larger. A few of these vast creatures would have cleared out even the famous Rockall Bank, devouring with equal ease the codfish as big as calves said to be found there, and the sharks described as having bellies like casks and being as blue from age as though they were painted with the brush, which go there to eat the cod. As for the crocodile and sword-fish, instead of their scales and weapons offering any impediment to their being eaten they would only have facilitated digestion.

* As in the rhizodus, for instance.

† The sting of the pleuracanthus may be quoted as an example.

‡ The corresponding tooth in an existing shark is only two inches and a quarter in length.

Later on* came a swarm of hideous toad-like creatures, some of them as large as full-grown pigs. They were something between a toad and a salamander, with eye-teeth at least four inches long and one inch thick. The canine tooth of one species, named after Professor Jaeger, is quite an inch and a half thick at the root. As the inner structure of these teeth was of a singularly convoluted kind, they were named labyrinthodonts or labyrinth-toothed. Some of these repulsive-looking reptiles, the most revolting in appearance of all the strange creations of past ages, were as bulky as the largest modern crocodiles. At this era large tracts of the present counties of Warwick and Chester were covered with an inland sea, from which the new red sandstone of these parts was deposited, and by the shores of these waters these creatures crawled and squatted, having their day like other monsters. Five species of them have been found in England alone. Professor Huxley has now described one of these creatures from the Edinburgh coalfield.† The skull seems to have been quite fourteen inches long and ten and a quarter wide. It seems to have had a coating of plate armour, at any rate on the chest and belly, the plates on the breast being triangular and those on the abdomen somewhat like an oat in shape. Professor Huxley considers that it was an amphibian, of a fish-like form. A toad clad in plate armour, with a head as large as that of a small horse and these formidable teeth, must have been a strange-looking fish.

* The New Red Sandstone. The trias, permian, and magnesian limestone, come between this and the coal measures.

† The Quarterly Journal of the Geological Society, 1862, p. 29.

In the new red sandstone also of a neighbouring county lived a reptile almost as strange ;* its remains have been found at the Grinsill quarries near Shrewsbury. It seems to have had no teeth, and there are indications that its jaws were clad in a strong bony sheath as in birds and turtles.

As this day drew to a close, and the opaque roof of clouds which had so long brooded over earth and water had been purged off by the active chemistry of the vast forests of ferns and great mosses with their compeers, the sun shone forth in all his splendour, and when night gathered over the scene the stars set their first watch in the heavens and the moon assumed the regency of the sky :—

> "High in the hevynis figure circulare,
> The ruddy sterris twinkling as the fire,
> And in Aquary Cynthia the clear
> Rinsed her tresses, like the golden wire ;"

The stupendous clockwork of the heavens stood revealed, when for ages and ages there was no eye save that of the great saurian, or some equally strange thing of life, to gaze on its marvels. Nature donned her livery of green, and lake and ocean began to assume their deep azure hue; for the sun did not roll quite the same at creation's dawn as it does now.

These changes grew more marked and visible as the new red sandstone and limestone succeeded; climates and seasons began to appear, and animals seem more confined to particular regions. Tufted

* The rhyncosaurus.

plants like dwarf palms,* and nearly twenty different kinds of pine, the cypress, the yew, and the thuja, lily-like plants, plants allied to the screw-pines, and some which bore a fruit like the palm, only very elaborately sculptured, have usurped the place of many of the first land-plants; for though the ferns still prevail in legions and the horsetail reed still grows by many a swamp and pool, yet with the third great day itself the gigantic club-mosses and other monsters of the vegetable world are gone for ever.

The Fourth Great Day.—With this change of the flora came the great lizards, creatures of enormous strength and bulk, the "dragons of the prime;" and for a long series of ages supreme masters of air, earth, and ocean.

One, the fish-lizard† *par excellence*, with a head and teeth like those of a crocodile, was peculiarly distinguished by the immense size of its eye, which in some cases was quite as large as a dessert-plate. It was fitted with a strong hoop of bony plates, so that it could resist the great pressure exerted upon it, forming, as Dr. Buckland said, "an optical instrument of varied and prodigious power," so that this great lizard could descry its prey in the obscurity of night,

* The Cycadeæ, allied to ferns on one hand and conifers on the other, appear in the oolite for the first time. In this era begin our great forest, or dicotyledonous trees.

† Or Ichthyosaurus. It began with the lias, and continued through the times of the chalk. The lias will probably be known to some of my readers under its trade name of hydraulic cement, to form which it is simply burned and mixed with water.

or deep below the sea where we could not see for one foot before us. Its huge frame was mounted on four paddles, which, aided by the sweep of its tail, placed vertically as in swift-swimming fishes, must have enabled it to go like an express train through the waters over which it reigned in undisputed sovereignty, and also to seek the shores where it basked and slept when tired of depredation and slaughter. The reader may form some idea of its rate of travelling, by measuring the speed with which the seal cuts the water, and then comparing the seal with the model of the fish-lizard in the Crystal Palace gardens. It seems better adapted than the seal for rapid swimming, and calculating roughly must have had a speed of from sixty to eighty miles an hour, so that it could have swum from London Bridge to the Nore with ease in half an hour or forty minutes.

When it found its prey it must have been able not only to make short work of what it caught,—whether flesh or fish,—but to keep a pretty firm hold of its booty when assailed by any animal desirous of going shares in the spoil, for its mouth contained a perfect battalion of powerful curved teeth. More than thirty species of this formidable reptile, which far more than the shark merited the hard name of the tiger of the deep, ravaged the old estuaries and bays.

One of the earliest discoveries of this creature is due to a lady—Miss Anning. "It is to her," says the translator of Cuvier, "almost exclusively, that our scientific countrymen, whose names have been already mentioned, owe the materials on which their labours and their fame are grounded; nor, we are persuaded, will they be unwilling to admit that they are indebted

for some portion of their merited reputation to the labours of Mary Anning."

Coeval with it lived the plesiosaurus, or original sea-serpent—also a fish-lizard, but with more of the latter than the former part—often eighteen feet long, with its immense neck reared high above the waters which it inhabited. This singular animal had a short, compact trunk like a quadruped, fitted with paddles, and from the chest shot out his immense flexible neck which with the head formed half the animal's entire length. In a fine specimen in the British Museum the head and neck are even longer than the rest of the frame. The head must therefore have come down on any fish the animal wished to strike like a sledge-hammer, or a blow from the old spiked ball and chain called the morning star or holy water sprinkler, from the manner in which the blood spurted out of a part struck with it. In the seas where the chalk of Sussex was forming, there was also a marine lizard like the immense sea-lizard of Maestricht, or mosasaurus, but it did not nearly attain the dimensions of the Maestricht reptile, which was twenty-five feet long with a head four feet from end to end. It was while blasting the rock in a cavern in St. Peter's Mount, near Maestricht, that the remains of the mosasaurus were discovered; the jaws were attached to the roof of the cavern. The French considered these remains so precious, that when they were bombarding Maestricht in the time of the first revolution, they would not allow the artillery to be pointed against that part of the city where they were preserved.

One of the most startling facts in the physiology of the fish-lizards is their digestive power. Like the

shark and dog-fish they were furnished with a spiral intestine, somewhat resembling an immense corkscrew put into a small compass, and an enormous stomach; so that with an almost illimitable power of swallow they were not fettered by much bulk. This stomach was the most marvellous of all known stomachs and throws that of the shark, crocodile, or ostrich, quite into the shade. It is well known that the shark will swallow, for some reason only known to himself, such matters as bundles of shavings, large tin cases, and similar dainties; but the fish-lizard, or ichthyosaurus, was in the habit of gulping down the young of its own kin when they were several feet long! As this is equivalent to dining off a small crocodile or swallowing a slender gentleman of the dark ages in chain armour or buff-coat, it must be considered as the greatest feat of the kind on record; and the immense fish-lizard said to have been lately found in Italy—if the dimensions given of it were correct—would have despatched St. George himself, and his dragon after him, at one good meal. It is said indeed that a man in armour was taken out of the stomach of a shark caught near Nice. I should have liked to see the shark first of all before deciding on the truth of the narrative.

On the land lived an enormous flesh-eating lizard,* which very probably acted as a check on over-population of the country by the other land-lizards. This creature was often quite forty feet long, with legs almost two yards high. Its teeth were of the most formidable kind, being like pruning-knives with saw-

* The megalosaurus. Its teeth have been found in the cornbrash and oolite; the teeth and bones in the Wealden and Purbeck limestone.

tooth edges. However this provision was in no way superfluous, as it had to cut its way through the tough hides of other immense lizards. This huge brute was the terror of Chipping Norton, Selsby, Gloucester, Stonesfield, Bath, and many other parts of the west of England.

The iguanodon of those times—the monster of the wold—which so excited Cuvier's astonishment, was a herb-eating lizard which haunted the shores of the British Channel: its mighty remains in the sandstone of Tilgate and at Lewes, made classic ground by the genius of Gideon Mantell, were amongst the earliest treasures recovered from the stony depths of the earth in which they had so long lain concealed. Somewhat less of size, but still of ponderous bulk, was the wealden lizard,* twenty to thirty feet in length, with an enormous horny fringe, five to seventeen inches high, on its back.

While these creatures possessed the sea and land, huge flying lizards flitted through the tree-fern groves and pine forests. These great dragons were monstrous bats, with dusky wings stretching twenty feet across according to Owen, but according to some writers as much as nine yards, or twice the width of the condor of the Andes and the frigate-bird. Its great wings were covered with hair an inch long, undoubted traces of which have been found by Professor Goldfuss in the lithographic stone of Solenhofen.† Its powerful

* The hylæosaurus.

† Cosmos Entwurf, einer Physischen Weltbeschreibung, B. 1, S. 466. The largest belong to the green-sand from the middle chalk of Kent. However some have been procured little inferior to those of the green-sand. See Appendix 4.

muzzle was furnished with sixty teeth like those of a crocodile. Like the bird its bones were hollowed out, most of them having air-cells; the skull too was lightened by hollows, both to aid the purposes of flight. Its great spectral eyes must have enabled it to see by night, and though it could neither walk nor stand very steadily it could swim like the vampire-bat of Bonin, so that escape from it must have been almost impossible. This fiendish-looking vampire, sweeping past at full speed, must have been one of the most startling sights the old world could have offered. About four years ago a gentleman of the name of Dalton, then pupil with Professor Buckman but since dead, procured some fossil reptile eggs from the Three Bushes Quarry about a mile from Cirencester. This opening is in the great Oolite, and the bed from which it is taken is a very white or cream-coloured freestone in rough nodular blocks. They were extraordinarily perfect, as may be seen from the engraving in the "Proceedings of the Geological Society."* One got out of the bed was nearly two inches long and about three inches and a half round; it was full of transparent crystals of carbonate of lime. These eggs are not of the spherical form of the turtle's egg, and as they are apparently much too small for those of the great fish-lizard, they may possibly have belonged I think to the bat-lizard, the body of which was not very bulky.

How well nature has always arranged her measures for feeding her children may be seen in the care bestowed upon the teeth of the iguanodon. One

* 1860, p. 108.

might have thought that with its immense strength it could have cropped herbs and plants enough almost without teeth; but as it had to crush hard and tough plants, and as its vast bulk required a large supply of food, perhaps a ton a day, the teeth were kept in a state fitted for the task assigned to them. The cutting teeth wore away one after another till fresh ones were ready to come through; but each as it was ground down was converted into a grinding tooth, or molar, by the simple process of the central pulp being born harder than the other parts; so that as these decayed off or were rubbed down, the centre became a hard ridge which told upon everything it had to work through. The trenchant edge of the teeth was overlaid with a hard enamel which grew softer as it receded from the edge, so that the tooth would wear away quite evenly.

In the time of the lias there was also a long and slender-jawed crocodile, like the ghavial or gharrial of the Ganges. It is more than a hundred years since this reptile was first found in a fossil state at Whitby. It was most probably a keen fisher, being armed with long, slender, sharp teeth, well adapted for seizing the tenants of the rivers. Various kinds of crocodiles of those times* have been found at Chipping Norton, Sussex, and the Isle of Wight.

Many of these animals were like an enormous crocodile, but only far more bulky than any elephant; however, they were not quite so preposterous in size as has been represented. A few years ago one was stated to have been dug up at Rugby, a hundred and

* The Lias and Oolite.

fifty feet long; Dr. Buckland gravely described those which once lived in the neighbourhood of what is now the lake of Blenheim, as having tails as long and as large as the steeples of Kidlington and Long Hambro'. Now I don't know the length and breadth of these said eminences, but I can assure the reader that no fossil lizard yet found had a tail anything like the size of the smallest church steeple I ever saw. Even the iguanodon, though computed by Cuvier at sixty, and by others at seventy feet long, really did not measure much more than forty and often not so much, or less than half the size of the great northern whale when grown to its full size, which still remains the giant of the deeps. The author has been informed that some parts of an iguanodon, quite forty-two feet long, have been deposited in the museum at York; but as he has not met with any more detailed account of the matter, the reader must take the statement for what it professes to be. The model of the iguanodon at the Crystal Palace is, I believe, just thirty-five feet long, and at the time it was made was considered to be the size of life, the dimensions having been very carefully traced out by one of the most truthful anatomists living—Professor Owen. Since then however a high tide and violent sea having brought down a part of the sea-bank to the west of Sandown Fort, the thigh-bone of an iguanodon was found four feet ten inches in length, and consequently belonging to an animal very much bigger than any yet discovered; indeed I believe it is now generally admitted that this great reptile sometimes attained a length of more than forty feet.

These lizards seem to have been creatures of a

very low form of development in some respects. Thus the brain was of a very imperfect type, though even the sea-lizards breathed air like the whales, notwithstanding that they were cold-blooded animals; yet in all the breathing apparatus was far less complicated than in animals with warm blood, and the heart had only two cavities instead of four.

We have already seen that the seasons had begun, and now we find that so early as the times of which we are speaking great variety of the seasons prevailed at times. An examination of an old fossil tree, frequently spoken of as "the Eigg pine," has revealed the fact, that when these trees were living the springs were often late and cold and the summers cloudy and chilly. Sometimes too as in our day this severe inclement weather lasted four or five years together.*

In this age too tortoises and crocodiles were among the denizens of the old lakes and rivers, while the waters of Margate, Whitby, and other parts of the coast had their great ammonites and other gigantic shellfish. The true ammonites only lasted a short time in geology, namely, from the trias to the tertiary period. Small herb-eating mammals have been found of this age allied to opossums, †—Lyell speaks of two species; remains of a flesh-eating marsupial have also been brought to light. But not a trace has yet been found in England of those gigantic birds which about this time stalked over the muddy plains of Connecticut; creatures with a stride of from three to

* Cruise of the Betsy, p. 39.

† In the Stonesfield slate of the great oolite.

four feet, so that each leg must have moved over double that distance, or nearly if not quite seven feet. The feet of these great birds were often nearly half a yard long; some of them have even left marks twenty inches from end to end. These birds trod as do the most modern tribe, on the toes only, and the marks they had left on the sun-dried mud so many thousands of years ago were at once known to be those of birds by the inner toe being composed of three bones, the middle of four, and the outer of five.* It has been said lately that the footmarks of an immense bird have been found in the cliff at Hastings, but as yet I believe no full account of these fossil marks has been given. Most probably they had been made by a lizard.

As the names of these extinct giants have been framed and their nature decided upon, in many instances from such scanty evidence as their footmarks in mud so long since converted into rock, or a few scattered fragments of bones, the conclusions so arrived at have furnished an excellent theme for some of those who are fond of calling themselves practical men, and who look upon incredulity as a mark of wisdom and not of the most puerile vanity. Such an opportunity of sneering at the idea that a naturalist can tell from a scrap of bone the animal to which it had belonged was too good to be lost. Yet nothing is more certain than that it can be done. There are characters

* Birds make their appearance early in the oolitic system.—"Testimony of the Rocks." The marks found in Connecticut belong to a new red sandstone, not older than the lias. They have been made by a claw quite an inch longer than that of the largest wingless bird of New Zealand.

in each sub-kingdom of animals which never change, and are always accompanied by certain forms of teeth, or to use the words of Cuvier, "the form of the teeth gives the form of the condyle (of the jaw), of the blade-bone, and of the claw, just as the equation of a curve evolves all its properties." Thus no animals but those which are warm-blooded and suckle their young have teeth fixed by two or three roots. No animal leaves a mark like a bird; its footsteps may be known at any lapse of time, particularly in respect to the spreading of the toes, which diverge more widely than in other animals. The toes have always a different number of bones in each toe.

But the best proof of all is that it has been done over and over again. Huxley showed that a fragment of the neck-bone and the angle of the jaw of that strange animal the glyptodon, were enough to prove that the creature suckled its young and had warm blood with free red nuclei. Owen founded a genus of animals on the fragment of a jaw dredged up off the coast of Essex. Some anatomists shrewdly surmised that the professor had mistaken the fore for the back part of the jaw, but in sinking a well at Camberwell the workmen, when they had got down a hundred and sixty feet, found in the plastic clay * a fossil tooth of the same animal, the structure of which fully confirmed the view first maintained by Owen, and showed that the creature was a mammal twice the size of the American tapir, and was one of our most ancient tertiary mammals.

Owen informs us, and no one who is familiar with

* Beneath the London clay.

his writings will for a moment doubt what he says, that from a fragment of a skeleton he was enabled to say that it belonged to a bird deprived of the power of flight, and to predict that such a bird, but of less rapid course than the ostrich, would one day be found in New Zealand. Events proved that his reliance upon those laws which govern the relations of the contents of the cavities of bones to the flight and movements of birds had not misled him.

When Cuvier first wanted the scientific world to believe that the opossum had once lived where Montmartre now stands, the scientific world had an excellent opportunity again for incredulity. But Cuvier being apparently bent upon making the said world understand that truth was too strong for any amount of obstinacy, honoured it so far as to offer it a chance of seeing a crucial test. He took a fossil slab in which the upper-part of the frame of one of these animals was revealed, then with a graving tool, in the management of which he was very skilful, he cut away the stone from the hinder part till he revealed the outline of certain bones* peculiar to these strange creatures, lying in their natural position, and showed that the slab had simply been formed by mud gathering and crusting over an ancient opossum hardening into stone in the course of ages.

Hugh Miller was one day showing Sir Philip Egerton and Professor Owen his collection. Both were anxious to see a little plate of bone belonging to the head of an extinct fish.† Miller showed them

* The marsupial bones.

† The cranial buckler of the diplopterus.

the plate, and Owen at once said that it was as he thought; a prolongation of the brain, the part so long thought to be the seat of the soul and called the pineal gland, must have rested upon this little plate. Miller afterwards found an old bone with the very passage through which this little offshoot of the brain must have been sent out to rest upon the plate. "The reader," says Miller, "will of course see to what the evidence actually amounts. A witness of credit states that there once ran a certain prolongation of a certain organ, long since reduced to dust, from one indicated point to another, and this in a direction in which it had not been previously known that there existed a passage for its transmission. An opportunity of observation occurs . . . . and the required passage is found running in the indicated direction."

Although the footsteps of very ancient birds had been discovered so long ago, the skeleton of a bird had not been made out in any rocks before the last great series or tertiary times; they are not near so common, except in some very new parts of the earth, as the remains of mammals, reptiles, and fish, partly because they escape by flight many risks to which all kinds of quadrupeds are exposed, such as danger of drowning, partly because when carried away by water they float much longer and are more apt to be devoured by creatures of prey. But some six years ago, Dr. Emmons made known that six of the bones composing the rump-bone of a bird had been got out of the red sandstone in North Carolina. Dr. Mantell considered some fragments found in Tilgate Forest to be those of birds, though Professor Owen held a different opinion. I believe it was Mr. Denis, of Bury St. Edmunds, who

first proved by means of the microscope that the bones found in the Stonesfield slate were really those of birds, and shortly after the late Mr. Barrett, whose bright career was cut short so prematurely,* found in the upper green sand, near Cambridge, the thigh-bone and some other bones of a bird which he thought belonged to the gulls, a view also taken up by Owen. Quite recently a most singular-looking fossil, thought at first to be a feathered reptile, was found in the lithographic limestone of Solenhofen.† The first discovery of it was a fossil feather exquisitely preserved even to the minutest fibre. Soon after this the announcement was made that a collector at Pappenheim was in possession of a slab containing a more complete cast of this strange creature, and an officer of the British Museum was despatched to secure the prize, which he did at the cost of £750, it being a condition that he should take some other curiosities with it. This wise and noble munificence on the part of the authorities merits the highest praise.

The slab, when I saw it, was being drawn for the purpose of engraving. It is about two feet long, and presents the figure of a small bird, somewhat about the size of a partridge or grouse, crushed flat under immense pressure. When Professor Owen described it in a paper read before the Royal Society he said it must have been of strong flight, a view doubted by the Duke of Argyll who was present, and utterly scouted by an eminent observer of birds

* He lost his life in attempting to explore some coral reefs in deep water, by means of a diving apparatus.—Popular Science Review, No. VII., p. 430.

† Belonging to the upper oolite.

who declared that it never flew at all. Its tail consisted of twenty joints each of which supported a pair of plumes. It possessed a merrythought and the "perching foot" so characteristic of birds; the wing was clawed as in the spur-winged goose and the Syrian blackbird.

Amongst the most interesting colonists of these oolitic days were the ants, whose ceaseless toil now began to rear their galleried and buttressed hills in the glades of the old forests.

By the shores of the sea and in the pools left by the tide might also be seen signs that a great change was at hand. The hermit crab and lobster show themselves; little lobsters are found in the Speeton clay and greensand, larger ones in the oolite and chalk; almost with them come the limpet and those destructive pests, the ship-worm* and the pholas. There were also some beautiful forms of what we call the conch-shell, one the spinifera, engraved in Owen's work,† is of a very graceful and fantastic shape. Ammonites too abounded in the lias and oolite, and quite early in the latter cuttle-fish are found. In the British Museum there is a fossil of a ten-armed specimen, and a more consequential choleric-looking animal the museum does not afford.

But now the sea and estuary are to know new forms of existence. The teeming life of these waters had been so busy in forming the chalk, that this immense deposit, extending over many counties and often varying from six hundred to a thousand feet in

* The driftwood of the London clay also is usually perforated by the ship-worm.

† Palæontology.

thickness, was principally laid down by animals of such minuteness that a cubic inch will contain ten millions of their shells. It is indeed one of the greatest wonders of nature, for if it were piled up into a cone it would form a stupendous mountain. Long ages have rolled away since the last bed of it was laid down, yet for hundreds of square miles all that the birds of the air, the dust scattered by the winds, and the growth of weeds and plants have heaped upon it, are but a thin crust of mould, like the bark of a sapling on the bole of some ancient beech or the trunk of some mighty oak. In many places in Hampshire every furrow made by the plough lays bare the chalk.

We hear almost with incredulity of the labours of the coral insect. One can scarcely believe that such tiny creatures could build a mountain ten miles across as at Keeling Island. It seems like a fable to tell one that frail things, toiling deep below the roaring waters of the chafed sea, can rear from the ocean-bed vast craggy terraces hundreds of miles in length, which not only defy the force of seas that batter the granite into sand and sweep away the hard cliff with the regular speed of machinery, but which endure through stretches of time to which the history of man's works is but a span.

"Frail were their frames, ephemeral their lives;
Their masonry imperishable. All
Life's needful functions, food, exertion, rest,
By nice economy of Providence,
Were over-ruled to carry on the process
Which out of water brought forth rock.
. . . . .

What are the works of intellectual man—
Towers, temples, palaces, and sepulchres ?
Dust in the balance, atoms in the gale,
Compared with these achievements in the deep,
Were all the monuments of olden time.
Egypt's grey piles of hieroglyphic grandeur,
That have survived the language which they speak,
Preserving its dead emblems to the eye,
Yet hiding from the mind what these reveal—
Her pyramids would be mere pinnacles,
Her giant statues wrought from rocks of granite
But puny ornaments for such a pile,
As this stupendous mound of catacombs,
Filled with dry mummies of the builder worms ! "

Yet these vast structures are not more wonderful than the prodigious mounds of chalk heaped up by minute sea-insects beneath the green and sparkling waves of the old seas. It has been well remarked, that the labours of such insignificant-looking atoms as many of the insect nations are, have far more influence on the destinies of the world than the migrations and battles of the mammoth and whale. Not merely do they bar out the ocean and convert the breakers into a still lagoon or pastoral upland, not only do they pile up layers of immense commercial value, but they clear the earth of the dead organic matter, with which but for their aid it would be speedily encumbered, and they fix the oxygen which pervades plants and is the essence of life.*

From this time the sea lizards appear no more in the waters. Those of the air, the bat lizards, had gone as early as the times of the green sand and the middle chalk in Kent, and those of the land are henceforth to

* M. Pasteur, Comptes Rendus.

be represented only by a much smaller and feebler race; the bulkier forms had been missing since the lower chalk-beds began. The old forms of fishes, with the backbone prolonged into the tail, decrease in number till they come to be represented as in our day by the sturgeon, dog-fish, and the timid Port Jackson shark; and the modern class, the race to which belong the salmon and turbot, with the tail jointed on to the end of the backbone, is to have the mastery of the seas. No fish with this tail is found below the lias.* If man had lived at an earlier period he must have been either an excellent cook or had a good digestion to have enjoyed a fish dinner; at least if one may judge from the dry, sapless structure of the gar pike and Port Jackson shark, it must have been rather like eating a boiled door-mat.

While the green sand, the upper chalk, and the Kentish rag were forming, corals and sponges grew in every sea. One beautiful variety, shaped like a toadstool, is found in the upper chalk of Sussex. The Kentish rag is so full of them that the hands of the quarrymen are often fretted with their fossil flint splinters. At Warminster cup-shaped sponges swarmed in myriads, and a peculiarly fine pear-shaped sponge is found in the green sand of Blackdown. The Brighton pebbles and the Wiltshire flints are principally petrified sponges. At the first glance it seems as though it must have required ages on ages for the climate to have so changed from the times when the sponges of tropic seas grew in our blue lagoons,

* "The earth yields no indisputable evidence of Ctenoids and Cycloids (the modern class of fish) anterior to the cretaceous epoch."—Owen's Palæontology.

fringed with coral reefs; yet so brief is the space in the history of the crust of our earth, that "in the fields about Steeple Ashton every stone turned up by the plough is a coral, and the structure of coral banks may be studied in the lofty cliffs of Cheddar as well as in the upheaved islands of southern seas."*

In the secondary period the corals get fewer, only fourteen species being found in the coral rag, but again at a later period (Eocene) there are twenty-five, and towards the close of the tertiary times only four true corals are found in the coral crag.

THE FIFTH GREAT DAY.—*Morning.*†—Again a change comes o'er the spirit of our dream, and morning rises upon the hot blue skies, the sandy wastes, and parched foliage of a tropical land. Where of old the club-mosses mustered in dense and lofty jungles, where the tall ferns tossed their bright green arms about as the warm breeze swept over the uplands, and the arid reeds harshly rustled and clattered when the night wind stirred them, forests of palms rear their straight and slender shafts and spread forth their feathery crowns beneath the hot english sun. In the clay of Sheppey Mr. Bowerbank found no less than thirteen species of this now almost tropical tree, among which were the date-palm, the cocoa-nut, and the areca. One puzzling specimen of fruit found at Swanage Bay, Isle of Purbeck, speaks as if there had been a very mixed order of fruits there, for it is rather like a hickory nut, or the fruit of the Australian plant known by the very intelligible name

* Milne-Edwards. † The eocene.

of petalo-stigma. Beneath the lofty palms grew creeping plants of the melon order, while over the fields spread cotton and pepper plants in such plenty that there must have been something like a group of spice islands at the mouth of the Thames and off the coast of Kent.*

Cowries too and other tropical shells clung to the rocks, and fed in the pools of the Channel and Thames, on which also floated the beautiful english nautilus:—

"The sea-born sailor of the shell canoe."

The sepia fish crept stealthily by the stone or darkened the pools to escape from its enemies. Rayfish,† whose jaws were armed with a perfect pavement of crushing teeth, watched and basked lazily in the depths, while through the blue waters shot formidable sharks, and swordfishes armed with longer and far more trenchant weapons than the present race.

The eocene seagull sailed overhead or plunged and floated on the waters, the kingfisher chased the dragonfly by the stream, and by marsh and tarn watched the stiff, ungainly heron, while lost in the deep blue of the unclouded tropic sky, hung the keen-eyed vulture, ready to swoop down on some young snake or unwary opossum. Quite in the dawn of this epoch, the toiling bee—not, as now, the companion of man, whose haunts it rarely leaves for any distance—built its galleried fortalice in the

* Possibly further. Leaves of a tree like the sweet cinnamon have been found in the brown coal of the Rhine.

† Rayfish begin with the secondary period.

hollows of the old trees or on the grassy banks, and sallied forth—

> "To spoil the saffron flowers, and sip the blues
> Of vi'lets, wilding blooms, and willow dews."

It is often found, like the ant, buried in the amber:—"locked up hermetically in its gem-like tomb; an embalmed corpse in a crystal coffin." Along with it came the moth, butterfly, and the bombyx, an insect which may be seen in summer poised on its restless wings, sipping deep of the juice of the flowers above which it hovers.

> "The winged nation wanders through the skies,
> And o'er the plains and shady forests flies."

In the south of England the river banks were the favourite abode of a singular race of pig-like animals. They were something of a cross between—or at any rate they stood between (if such terms can be used) the horse, tapir, rhinoceros, and hog, varying in size from the bulk of a hedgehog to that of a river-horse. They seem to have been peaceful animals of aquatic tastes; some had fleshy trunks like the tapirs, others thick, strong tails almost like the otter or kangaroo; in one species* this appendage was as long as the body and very thick. Remains of a very large herb-eating animal of this time have been dredged up off the coast of Essex † and dug out of the plastic clay near Camberwell; also a small-hoofed herb-eater in

* The anoplotherium. "It was the only mammal that had all its teeth level, without a break, like man."—HUXLEY.

† The coryphodon.—Owen's Palæontology, p. 322.

the London clay,* which seems to have been intermediate between the tapir and the pig or pachyderm. Indeed, many of these animals had features in common with two or three existing genera, and yet with so much diversity, that it is often difficult to describe them by their resemblance to animals now living.

As this part of the day draws to a close, a hoofed quadruped appeared,† forming a link between some of these strange animals and the cud-chewing beasts of the field, along with a few of the aquatic pachyderms first spoken of, and by this time fast verging to extinction. Indeed they do not seem to have ever been very numerous in the south of England; their favourite haunt was the Paris basin, where they swarmed in herds for ages, and where their remains are often found in a very fine state of preservation.‡

In those days, as in all others since life began on the globe, the weak and peaceful tribes were the prey of the powerful and destructive. The crocodile and alligator warred upon these herb-eating animals in the rivers and lakes, snakes struck and coiled round them in the jungle, and ferocious carnivorous beasts chased them on the plains. The strata in which they are found yield to the geologist ample proof that there existed at the same time flesh-eating beasts, of the most savage class to judge from their flesh-cutting teeth. "They were," says Owen, "more fell and deadly in their destructive task than modern wolves or tigers." A species of one of these crea-

* The pliolophus. † The dichodon.

‡ See Appendix 5.

tures,* about the size of a leopard, has left its remains in the upper eocene of Hordwell, in Hampshire. Of the crocodile two varieties have been discovered in the London clay of Sheppey Island, and later on there was a ghavial-like crocodile at Bracklesham. There was also the Hastings crocodile, with short, broad jaws, found in the Hordle beds, and a true alligator. There were snakes in Sheppey† twelve feet long; at Bracklesham there were some of the boa-constrictor kind twenty feet in length.

The oldest bats belong to this era, making their appearance on the stage of life in Paris, possibly also in a few woodland glades in the most southern part of England, about the coast of Hampshire for instance or the Isles of Wight or Sheppey. Most likely they were rare, as great part of the English deposits of this date belong to the sea, while those of Paris were large fresh-water lakes, the banks of which might have been well wooded, and more affected by the bat.

If primeval man lived in those times, he must have had delicate eating of one kind in abundance; for there are more species of turtle left in the London clay than are now known to exist in the whole world. Even the crocodile-eating turtle is represented at Hordwell in the upper eocene. Besides there were all the pork-like animals, if he liked them; or if his tastes leaned to those of the noble savage, there were the great tapir-like beast and all the crocodiles—not

* The hyæonodon.

† The earliest remains of serpents in England belong to the London clay.

bad eating in their way according to Du Chaillu's account of them. To get at the opossums and monkeys* he had only to make a trip into Suffolk, or go by the Thames to Oxford, while a visit to Bracklesham would enable him to take the fine snakes there. True there were such drawbacks as alligators, crocodiles, and beasts of prey of the most ferocious kind; but with all deference I submit these were trifling matters compared with the dangers he had to face in those times when he really lived, and when his attaining old age must have been something very like a miracle; for if he essayed to travel by the rivers, he had to run the risk of being swamped in his canoe by herds of huge river-horses; or if he went by land, there was the danger of being trampled to death by immense elephants, gored by rhinoceroses, tossed by bulls two or three times the size of any prize ox, with the contingency of having at the end of his journey to take up his quarters in the lair of some monstrous hyæna or cave-bear.

Mid-day.†—The noon of this great day is almost entirely wanting in England and we must seek in other parts of Europe for a picture of the age which it represented.

The air is still hot, but the denizens of warm climates are fewer; the tropic shells are growing rarer, though one‡, now only found in hot countries

* Owen says that remains of the monkey have been disinterred from the eocene sand of Suffolk; but I believe later examinations of more fragments have decided him to refer the remains to a pachyderm. In the pliocene brick-earth of Essex he detected parts of the fossil teeth of a macacus.

† The miocene era. ‡ The cardita ajax.

like Senegal, still abounded, and those belonging to temperate regions and modern times are increasing in numbers. The European ape belongs to this epoch. A long-armed variety is known to have existed at Sansan, near the foot of the Pyrenees. Sir Charles Lyell speaks of it as being about equal to a man in stature, which would mean that it was much taller than the gorilla, for this savage brute is not so tall as man. The king of the gorillas, now in the British Museum, is said I believe to measure six feet two inches, but in this calculation the length of the foot is included. Standing upright, it cannot be more than about five feet seven. Owen speaks of two species of ape having been found at Sansan along with remains of a very large toothless animal.* The large ape alluded to by Lyell is also stated to have been made out at Eppelsheim.

Coming events cast their shadows before, deeper and more defined when we turn to the mammals, for those of a later date are now distinctly heralded in by the great water-mole,† which lived by the Rhine, and has been traced in France, Switzerland, Germany, and even in Perim Island; by the mastodon, and a score of other quadrupeds with names as ponderous as themselves. This huge brute, which was perhaps all in all the bulkiest of the mammals, seems to have been quite eighteen feet long, its head was three feet across, and the under jaw was provided with two immense tusks bent down-

* Of a genus between the manis and orycteropus. These toothless animals (Edentata of the naturalist) comprise both those which are toothless altogether, and those which have no teeth in the front part of the mouth.

† The dinotherium.

wards. It very likely lived almost entirely in the water; when it anchored itself firmly and drove these tusks into the ground it must have been able to uproot the strongest water-plants on which it fed. There was also the narrow-toothed mastodon, another species of which in later days flourished in America, and according to Indian tradition so desolated the "old dominion." The mastodons were really elephants * with grinders adapted for very coarse food. They were of immense size being quite as tall as the biggest modern elephant, infinitely more massive, and quite twenty-five feet long. If the reader will compare the skeleton of one now in the British Museum with that of an elephant, he will see what a puny creature this looks beside the other; some of the grinders of this animal weigh from seventeen to twenty pounds. The narrow-toothed species seems to have rarely visited our shores; Owen says it once roamed over part of the earth now forming England, France, &c., and gives an engraving of a tooth of one from the Norfolk crag. The mastodon was accompanied in France, Italy, &c., by the river-horse and rhinoceros, the mammoth and tapir, the miocene boar, horse, ox, beaver, hare, &c.†

The fossil skull of a species of flamingo has been found in the fresh-water beds of this age near Clermonte-Ferrand, also remains of a kind of eagle or osprey at Chaptusal, and of a bird as large as and allied to the albatross, in a soft sea-shell bed at Armagne. The vulture also has been traced at Cantal;

* Owen's Palæontology.

† Lyell's Principles of Geology, vol. iv. p. 136.

indeed, except the great running birds, traces of all the orders of birds have been made out in deposits belonging to this noontide age.

The great flesh-eating whale of America, which has been found in Alabama, measuring seventy feet in length, is represented in France by a smaller species, teeth of which have been found in miocene beds of the Gironde and Herault.

At this time the Alps were rising and assuming their present form, for those great and beautiful fabrics are so modern that as yet no stratum has been detected so old as our crag.

From this time forth through long long ages the different forms of life begin to depart more and more from a common type, and assume features peculiar to each great division. The huge four-horned deer of India and the strange marsupials of Australia, the mammals of Europe, the armadillos and sloths of America, the immense struthious birds of New Zealand, are henceforth to characterize those great divisions of the globe. Indeed it is quite possible that this operation began much earlier, and that the continents and seas where a marked likeness prevailed were then connected and arranged after a fashion of which we have now only a very obscure idea. For instance, the trilobites of Bohemia are not at all like those of Scandinavia; few of the fossils found in North Devon are met with in the southern part of this county; whereas American fossils are found in the north-west of Scotland, and Wiltshire ammonites are found in the heart of Russia and at the mouth of the Indus.*

* Quarterly Journal of the Geological Society, 1860.—Address of the president.

This age is, I think, in a manner represented by the sea deposits in the red crag, referred by some to a later date.* This red crag, which extends in patches from Walton-on-Naze, Essex, to Aldborough, reaches five to fifteen miles inland and is sometimes forty feet thick, contains acres and acres of ear-bones and teeth of extinct dolphins and whales of this age. For nineteen years it has yielded every year thousands of pounds' worth of these bones, though I believe that Professor Henslow, who pointed out this source of wealth, never even received the thanks of those whom he enriched.

Evening.†—Another fragment of the fifth great day rolls by, the shades of evening gather over the scene, the glory of the tropic scenery has faded, and old England begins to look like a northern county in the United States, for the face of the land is covered with the pine and plane, the willow and buckthorn. When we pierce through the boulder clay, which was soon to flood the land, we find that at this time the oak and birch, the hazel and fir overspread the fields, where in the glory of the morning the palm-crowns stirred heavily in the sultry breeze, and the melon ripened its golden fruit beneath a blazing sun. They, too, are soon to be followed by the fruit-trees of our day, and before many ages are over the wild crab and almond will unfold their lovely blossoms to the spring breeze.

At this time flourished the old European elephant,‡

* For the age and position of the crag, see Appendix 6.

† The pliocene.

‡ The elephas priscus of the pliocene.

the leptorrhine rhinoceros * went trooping through the woods and jungles, and the great river-horse, quite as bulky as that of Africa,† gambolled and wallowed in the rivers and ponds. The bison ‡ and the huge ox § fed on the plains.

NIGHT.||—The fifth great day is fading into the shadowy past, and the last faint and dying light reveals a scene of ever-gathering gloom and desolation. For years and years the cold has been growing more and more bitter, the lingering chilly springs are followed by shorter summers and longer and more unbroken winters. There is an Arctic look about everything; and in every wood and valley, in every stream and bay, creatures fitted to brave the perishing cold of Siberia and Spitzbergen have usurped the domains of the less hardy tropic races. The woolly-haired mammoth has displaced the old elephant and the elephant of the south, the rhinoceros is clothed like the mammoth in wool, the beaver builds by the icy stream, and the Siberian hare squats beside the willow-bush or the stunted hazel. The horse and hog, the elk and reindeer, have succeeded to the pachyderm and crocodile, the woods ring with the roar of the northern lion and hyæna, and in the seas arctic shells and narwhals ¶ have followed the cowrie and nautilus.

* See Appendix 7.

† "The hippopotamus is first met with in pliocene strata."—Owen.

‡ The Bison priscus.

§ The Bos antiquus. See Appendix 8.

|| The pleistocene.

¶ A narwhal was stranded on the beach near Boston so late as 1800. When the shell and sand banks of Norfolk and Suffolk anterior

The mammoth or gigantic northern elephant,* which now fed on the young pines and willows or plunged through the tangled woods of birch and hazel, sojourned so long in the land that from a bank off the little village of Happisburgh in Norfolk, upwards of two thousand of its grinders have been dredged up by the fishermen within thirteen years; and even this is not the richest locality, as the coast from Essex to Norfolk swarms with them. It was of colossal size, the skeleton having been made out as long in some cases as thirty-two feet and fifteen feet high. It had enormous curved tusks which turned upwards and then backwards till they came nearly to its brow; they were quite ten feet long and rooted fifteen inches in its head. One belonging to a male mammoth was found in Essex, nine feet along the outer curve and two feet nine inches round at the thickest part, another dredged up off Dungeness was eleven feet long. The ivory is often so little altered that it can be used for carving and turning. The mammoth was clothed with long red hair, and still more to protect it against the cold, there was an undergrowth of crisp wool about an inch long. That found in 1803 had besides, a covering of black bristles twelve to sixteen inches long, a provision which very likely obtained with those in England.

Of all the old English elephants the mammoth was the most numerous, had the longest career, and extended its range over the largest territory. It has been

to the Norwich crag are cut through, a regular change from the tropic shells to arctic forms of shell life is revealed.

* The elephas primigenius, or latest form of the elephant found in temperate latitudes.

met with not only in England and northern Europe but even in Italy. The reader has most probably heard how frequently the tusks of this animal are found in Siberia, and that several carcases have been discovered preserved in ice with the flesh and hair almost intact—so fresh indeed, that when the ice melted away the wolves fed on the bodies; most probably when the country became quite arctic it migrated in winter, but it certainly returned after the great glacial time, for remains are found in the gravel and even in caves of a time after the ice deluge.

All the three species of elephant we have spoken of have been found at Cromer. Only one kind does not appear in England at all, namely, the dwarf elephants of Malta, about the size of a pony, found in a cave in that island along with remains of immense swans, said to be three or four times larger than any living swan, and of an equally immense dormouse. Could the little elephants, covered with shaggy hair, seen by Bishop Heber on the lower range of the Himalayas, and which seem from that time forth to have vanished out of human ken, have been the last lingerers and pilgrims of the species?

What has been said of the dimensions of the mammoth and some other monsters of the eld must seem so marvellous, that an incredulous reader might well ask if Science had not borrowed Fancy's painted wings. How then will he receive the intimation that, vast as are the proportions spoken of, they do not impress the mind half so much as one single glance at the skeletons themselves? For so bulky were many of the pre-Adamite creatures, that they were far thicker in proportion to their height and length than any

modern elephant. If the reader will pay a visit to the British Museum and inspect the skull of the great extinct armadillo, as big as a small clumsy boat, or the skeletons of the great sloth and the American elephant, he will feel no incredulity as to this statement. At the Crystal Palace the impression of the great size of the saurians is lost in the space; they should be seen in a room. Yet to build the model of the iguanodon there, even according to Professsor Owen's cautious estimate of its size, which is now known to be too low, took six hundred bricks, six hundred and fifty two-inch half-round drain-tiles, thirty-eight casks of cement, and ninety casks of broken stone. When the mould of the monster's carcase was ready, Mr. Hawkins entertained Professors Owen and Forbes and twenty scientific friends to dinner in it. The limbs of these creatures were thick in proportion. The leg of the water-mole must have been nearly as large round as the body of a small pony; the arm-bone of the mastodon was quite three feet in girth at its thickest part; the thigh-bone of one great sloth is larger, being also nearly half as thick through as it is long.

Along with the mammoth there was also, as has been said, a great wool-clad two-horned rhinoceros, which, besides prevailing in many other places, swarmed about the site of London, and an enormous tiger-like animal—indeed, by some writers it has been named the British tiger,* and has often been stated to be as large again as the largest Asiatic species of tiger; if coloured like that of Bengal, it

* See Appendix 9.

must have been the most magnificent creature that ever trod the earth. By other writers it is now called the sabre-tooth.* No doubt, I believe, is felt that this sabre-tooth, for such is its name, was not a tiger: it was a most savage brute, somewhat akin to the cat tribe, but of even a fiercer nature, and really belonging to a genus now altogether lost. It was provided with weapons which rendered it, if possible, more formidable than any modern savage of the jungle or the desert, its teeth being perfect sabres. This destructive beast varied in size from that of a leopard to the bigness of a lion. It was a native of Devonshire, possibly of many other parts; but wherever it appeared it must have been the terror of every living thing, except perhaps the great elephant.

At Banwell in Somersetshire, not very far from the haunts of this savage of the forest and plain, have been found the remains of a very fine kind of lion.† Those of our day must therefore have fallen off in more respects than one; for the strongest african lion could not endure the cold of the Baltic, unprotected, for a single winter; yet the Somerset lion seems to have tolerated the same climate as the reindeer, remains of which have been found in the same deposit in East Dereham.

Hyænas too, many of them bigger than the largest tigers of our day, rent the night air with their hideous yells. Owen thinks that the great english hyæna was

* The machairodus. It is found in the miocene in France and Germany, in the pliocene in Italy, and in the cave breccia in Devonshire.

† See Appendix 10.

very probably a spotted one, like the fierce crocuta of the Cape. There was also an immense cave-bear, quite the size of a horse which I suppose went prowling about, plundering the bees of their savings in autumn and getting fat on their honey, snapping up weak and injured reindeer and horses, sleeping away his fat in winter in the caves, and turning out in spring, lean and haggard and sleepy.* The giant elk† too now browsed on the plains, along with the bison and great deer. It was a magnificent creature, ten feet four inches high with stupendous antlers; but though generally called the irish elk, it was not an elk at all, but a true deer between the fallow and reindeer; neither is it purely irish, for its remains are found in England in pond-beds, brick-earth, red crag, and bone caves. The reindeer also was common to many parts of England; Owen gives an engraving of the skull of one found at Bilney Moor, East Dereham. There seems also to have been at this time a gigantic red deer in Ireland, which rivalled in bulk the so-called irish elk.

The beaver was possibly one of the few inhabitants of the island which survived the great winter now looming darkly in the future. There were two kinds, the great beaver and a smaller one. Owen thinks the great beaver was extinct in England long before

* "Britain, during the times of the boulder clay, and for ages previous, had its native elephant, its two species of rhinoceros, its hippopotamus, its hyæna, its tiger, its *three* species of bears, its two species of beaver, its great elk and its gigantic deer."—Testimony of the Rocks. The bear has been found in Kirkdale, near Torquay, &c.

† The megaceros hibernicus of the pleistocene.

historic times began, but the other species seems to have lived here till quite a recent period, as the jaw-bone has been dug up, not fossilized, in Lincolnshire and in the Thames clay of Oxfordshire;* and it is even said that this fine intelligent animal was killed in England so late as the time of Oliver Cromwell. Lyell says it had become scarce at the close of the ninth century, and by the twelfth was only to be met with in one river in Wales† and another in Scotland. The modern bear only perished in Scotland in 1057. It was a brown bear.

It might be as well to state here that, as a general rule, the reader may know whether or not bones have been long buried, by applying them to his tongue. Bone which has been very long buried loses its gelatine or organic part, and cleaves to the tongue like a piece of chalk. "Bones and teeth in this state quickly absorb a solution of gelatine, and thus their original tenacity may be restored."

Birds now began to show in greater numbers. In the brick-earth of Essex remains of a swan have been found. They belonged to a bird quite as large as the modern swan, from which this fossil bird cannot be distinguished. At Lawford an arm-bone like that of a wild goose has been found in the clay, while in the bone caves remains of birds resembling the falcon, wood-pigeon, lark, thrush, teal, &c., have been met with.

All through this, as through preceding ages, we find no traces of the gigantic birds which left their foot-marks on the sandstones of Connecticut, though some

* Old Bones, by the Rev. W. S. Symonds.

† See Appendix 11.

monarchs of the feathered tribe represented them till quite a recent period in other lands, and even lingered so long that men have almost come to believe in the stories of these great birds appearing by camp-fires, like huge ghosts, as if to tell the sad tale of their decay, or leaving their footprints in as mysterious a manner as the savage in Robinson Crusoe. Australia and New Zealand, with their strange plants and animals, seem to have been their last strongholds, and there certainly they existed till within a very recent period, if they are not alive now. Some of the smaller species are living in Middle Island,* and Professor Owen has been informed that the elephant-like species of these great wingless birds † was used as food by the natives there but a very few years ago. It was stated in a Nelson paper that explorers had seen early in the morning the fresh footprints of a bird of this order, ‡ in a spot where nothing of the kind had been seen the night before; but then it was thought strange that the Maori knew nothing about it, and when two miners reported through an Otago paper that they had been disturbed at their camp-fire by the apparition of a monstrous bird, which without its head and neck was quite seven feet high, and when some writers said this could be no other than the great moa, supposed to be extinct though only very recently, the tale was put down as an imposture; indeed it does seem incredible that birds ten or eleven feet high should never have been seen by the natives. But there are many circumstances which have not been taken into account which

* A division of New Zealand.
† The dinornis elephantophus.
‡ The struthious, or ostrich order.

might help to clear the matter up. According to the Melbourne correspondent of the *Times*, Middle Island, the great haunt of the New Zealand birds, was never thickly peopled, and some thirty years ago the few people who lived in it were nearly exterminated by a hostile tribe, of whom however and their reasons for this feat, I profess myself unable to give any further account. Again the natives never sought the wastes where the Moa is thought to live, they dreaded to pass the mountains of the east coast, for tradition told that they were haunted by the great taniwa or man-eating lizard, and by savages almost as dreadful as this monster. Certain it is that the moa was living but a few years ago, and so far as food is concerned, might be still living in those parts unvisited by man, according to the belief of the natives.

Moreover, it is very possible that the habits of this great bird may have prevented it from being seen. It was wingless, so that it never appeared in air, and may like the apteryx have fed principally if not altogether at night. It was of the same order as the apteryx, or kiwi-kiwi as it ought to be called, an order distinguished by loose plumage, a breastbone without any keel for cleaving the air in flight, and enormously strong limbs. The toe-bones of the elephantine species are nearly as large as those of an elephant, and the leg-bones of the gigantic species* which though much taller is less robust than the other, are still as thick as those of a horse.

Mr. H. J. Webber, who has recently been amidst its haunts, thinks the moa may have been exter-

* The Dinornis giganteus.

minated by the fires which are constantly happening in the dense bush of New Zealand, and states that all the bones of the bird whch he has examined show distinct traces of fire.

Coincidences, too, are greatly in favour of its being still alive. Two kinds of kiwi-kiwi not distinguishable from the living kind were contemporary with the moa. A large coot discovered fossil by Mantell was subsequently found to be existing in Middle Island, and in all probability exists there still. Other wingless birds, the apteryx itself for instance, and the night-parrot * have eluded destruction, though hunted by the native dog which would have had no chance against the formidable moa. Enemies, except the bush fires, it had none, for, as has been said, the natives never went near it, and there are no beasts of prey in New Zealand.

Again it has been several times stated that the natives of Australia had spoken of a gigantic bird, a kind of ostrich now rarely seen even by them and unknown to the white man,—a creature which like the moa seldom quitted the untrodden wastes of the interior. The tale was generally as much credited as those of Sinbad's great roc, the giant eagle of West Africa, and the ash-begotten phœnix. Yet in Captain's Cook's voyages it is narrated that they found on Eagle Island "the nest of a bird of enormous size; it was made of sticks upon the ground, and was no less than twenty-six feet in circumference (!) † and

* The kakapo.

† Voyages of Captain James Cook,—London, 1834, in two volumes, vol. i. p. 113. Eagle Island is on the north-east coast of Australia, about half a degree south-east of Torres Straits.

two feet eight inches high." Now I confess to the most implicit faith in Cook's narratives; besides Banks and Solander accompanied the expedition, *and therefore I believe that a little more than a century ago this great bird inhabited these parts.*

These extinct fossil birds seem to have been gifted with the same indiscriminate appetite as the ostrich. This bird has been known to swallow a large clasp-knife without any difficulty, and even to get down a carpenter's augur with an effort. A gentleman tendered one at the Zoological Gardens a penny, which it immediately appropriated and took like a pill. Directly after, the coin not having satisfied its appetite for this kind of food, it snatched his wife's parasol out of her hand, breaking it short off by the silk which remained in the lady's grasp, and swallowed his booty at one gulp with an air of the most contemptuous defiance. The New Zealand birds, not being able to get parasols and clasp-knives, contented themselves with swallowing stones as big as marbles, heaps of which have been found in positions which showed that they had lain in the gizzards of these great bipeds.

The strength of these great birds must have been enormous, as their bones are so much bigger than those of the ostrich that the skeleton of the one looks quite a fragile insignificant thing beside the other. It is said, with what amount of truth I don't know, that the ostrich can break the leg of a horse with a kick, and I have seen one bend a tolerably thick iron bar in its cage door on which it was pleased to make an attack. In fact its muscular power must be very

great to enable it to traverse with such quickness as it does the vast African wastes over which it

"Speeds like a horseman who travels in haste."

The great extinct birds, if anything like as fleet in proportion as our ostriches, must have been as swift of foot as a race-horse, and as to strength they could have broken the leg of an elephant, I should fancy, without any great effort.

Amongst the most singular relics of birds, more singular even than the nest found by Cook, are the immense eggs brought from Madagascar. They are entire and measure from thirteen to fourteen inches in length, with a proportionate bulk, that is to say they were about as thick and nearly twice as long as a man's head. The contents are calculated to equal six ostrich or a hundred and forty-eight hen's eggs. The reader may see one in the British Museum which looks quite this size; there is also an immense one in the Museum of the College of Surgeons. Mr. Martin says one of these eggs will hold two gallons of water; I should have put down the amount much lower. These eggs were the offspring of a gigantic bird* quite as large as the great moa, but of a different genus.

Before the last ray of light has departed, it may interest the reader to point out a few of the wonders of this age in one or two other lands.

In South America, the land of the sloth and armadillo, there was an immense armadillo, now extinct,† and two enormous sloths. One was remarkably

* The epiornis.

† The glyptodon.

strong * the other † was distinguished for its prodigious bulk. The reader may see a skeleton in the British Museum, showing what a truly enormous animal it was. It had, to judge from the model in the grounds of the Crystal Palace, a thatch on its back like that on the roof of an old weather-beaten cottage, and must have looked like the top of a small pease-stack, mounted on thick dumpy legs. It could not, however, have been a very formidable enemy except in appearance, as its structure was such that it could scarcely have run under any circumstances. It was fortunate indeed for other animals that this immense brute was not made for assault, as one blow of its paw, nearly a yard long, would have been fatal to any living thing.

It seems this animal gained its livelihood in as dangerous a manner as the modern tree-sloth, which is said, when it has miscalculated the height to which it can climb on a tree and eaten up all the food it can find, to drop off at the imminent risk of breaking its neck. Some years ago, Professor Owen excited no little astonishment by saying that the great fossil sloth used to work away at the root of a tree till it came down, and then devour all the leaves and young branches. Dr. Buckland said if he did it would be with the result of breaking his own neck with the falling trees. Strange to say both proved to be right, as Professor Owen found the skull of one of these animals which had been broken at two different times. Of course he had survived the first, but the second proved fatal. The healing and the new bone showed that it had been done at one single blow, and

* The mylodon robustus.

† The megatherium. Both were of the pleistocene.

that an accidental one. Now a wild beast if it had inflicted such a wound would have despatched its victim. But it is doubtful if any animal, even the great aurochs, charging like an avalanche, could have broken the skull of this great sloth. Most singular of all it had two skulls, one within the other, so that in a general way it could break its head with impunity.* It had a very powerful muscular tongue like the giraffe, so that it could soon strip a tree when it had got it down. The mylodon gained its food in the same way as the other.

While these creatures were playing the parts assigned to them, the theatre of life in Australia represented scenes as strange and full of interest. The singular pouched animals or marsupials were, as ever, in the ascendant; one great flesh-eating marsupial was the size of a lion. There was then † a wombat about the size of a tapir, so large that its bones have been taken for those of a river-horse; also an extinct opossum of proportionate size, and an immense thick-skinned kangaroo with a skull nearly three feet long. If this monster could have jumped as high in proportion to its size as the modern kangaroo, it is impossible that anything now living could have caught it in flight. A herd of these great kangaroos traversing the wastes with leaps fifty feet long and twenty or thirty feet high, quite enough to clear a moderate sized house or a large haystack,

* See an abstract of Owen's lecture on this subject at the Collegiate Institution, Liverpool, in "Preadamite Man," 1860, p. 292.

† The pleistocene.

must have been a sight worth going to Australia for.*

This complete extinction of animals in so recent a period, and so resembling in their proportions extinct monsters in other parts of the globe, shows that Australia, like New Zealand, though in some features like very ancient pictures of the globe, has really grown old in its particular way. Both lands seem to be remnants of a secondary period.† In Australia we still find cycadaceous plants, and prickly firs akin to those which covered the land in England when coal was forming, and in New Zealand a flora like that of the days of the oolite here; in both we see the undisputed traces of the great birds. The marsupials, akin to those of old times, are now almost solely found in Australia, and in her distant seas is found one of the last representatives of old fishes, the Port Jackson shark.‡

Midnight.—I suppose most of my readers have heard of the drift and of boulders, but they are not, I presume, all of them aware that their history is connected with a tale of such awful destruction that the human mind at first cannot realize its horrors. They belong to those things which, like the distance of the planets, the speed of light, the idea of space, the myriad swarms of insect life, are not adequately expressed by words or numbers; the mind only acquires an idea of their vastness by dwelling on them.

* "The kangaroo bones found in the Wellington Valley caves are at least three times the size of any now living." The wombat's skull found by Sir Thomas Mitchell was fully as large as the skull of an elephant.

† The triassic period.

‡ Appendix 12.

I have already endeavoured to show that for ages there had been a gradual change from the times of hot, misty air and steaming jungles extending to the arctic circle, first to a tropic climate and then to a very cold one, and that this was always accompanied by a corresponding change in all the tenants of air, earth, and water. But as the fifth day closed the cold grew more and more intense both on sea and land, and while the reindeer and Siberian hare showed by their presence that for some time the rigour of an arctic winter had set in, the ice floes that drifted past Hampshire and Sussex bore the cold-loving narwhal, and shell-fish appeared in our seas which now are only found on the shores of Iceland, or amid the fearful solitudes of Spitzbergen.

Far and wide over old Britain from the banks of the Thames to Ronaldsay and Cape Wrath, winter extended his gloomy reign. The old hills were all covered with glaciers, or, to use the expression of Mr. Jamieson respecting the Grampians, "they were wrapped in one great winding-sheet of snow and ice;" a state of matters which does not harmonize very well with the supposed decline of our climate from that golden age before the Flood, when "spring greened all the year."* Mr. Jamieson has gone into this subject with great care, and he considers that the part of Scotland then above water was far loftier than at present. There is little doubt that this holds good with respect to England, and that while

* "The seasons since have, with severer sway,
Oppressed a broken world . . . . Great spring before
Greened all the year; and fruits and blossoms blush'd
In several sweetness on the self-same bough."

some parts of it, as for instance the chalky lands, had hardly if at all risen above the waves, the mountainous parts were much higher and the coast in some places, as at Cromer, quite five hundred feet above the sea and forming part of a country extending over to France, Belgium, and Holland. In fact nothing but a rise of land could have produced this intense cold, and that there was intense cold is proved beyond all question.

The great northern elephant was so peculiarly fitted for enduring any inclemency of weather, that this increased severity of the climate could have made no difference to it so long as ever dwarf trees and bushes survived for it to feed upon. The reindeer it is known seeks its food beneath the snow in winter. The tiger has been killed by the Lena, and the panther has been found north of the Celestial Mountains. The native horse now faces the intense cold of the winter nights in Finland; and as to man, if he was really now to appear, if he really did not exist in the times of the eocene, we may assume that he was as well able to bear cold as the natives of Tierra del Fuego. Lyell thinks it not impossible that while this intense cold in Scotland and England lasted there may still have been sheltered nooks where there was an ample vegetation, as in the Danish settlements in Baffin's Bay on the west coast of Greenland, where hundreds of plants flower close to immense, wide-spread, perfect mountains or table-lands of ice; and that towards the close of this era man probably existed only in such parts as the valley of the Thames, the Somme, the Seine, &c., where the famous flint remains have been found, along with the bones of great extinct animals of this

date. England at this time must under such circumstances have resembled "Tierra del Fuego, which with its innumerable islands and rocky islets, like mountain ranges half sunk in ocean, combines every variety of aspect—storm-beaten rocky summits several thousand feet above the sea—glaciers so extensive that the eye cannot trace their limits—densely wooded hill-sides—grand cascades and sheltered sandy coves,—altogether such a combination of Swiss, Norwegian, and Greenland scenery as can hardly be realized or believed to exist near Cape Horn."

This wintry solitude extended over a great part of northern Europe, Asia, and America. Mr. Darwin even argues on very strong grounds, that it pervaded all the surface of the globe, and lasted through what I think we may very well call the night of the fifth day; but towards the dawn of the sixth day immense areas of the land settled down very much lower, till at last the air became in consequence so much warmer that a vast part of the ice melted and poured down into the valleys with resistless fury, bearing huge torrents of drift and sometimes icebergs, carrying immense blocks of granite, syenite or gneiss, which the frost had split or the glaciers had torn away, stranding them now by the road on hill sides, then on plains, again by river banks, then by lakes, as the land sank and the weather grew milder and milder, till at last it was left much in the same state as when the night was drawing on, being still perhaps several degrees more severe than now.

The tourist may trace the path of the great boulders and crags, and the glaciers on which they

were hurled and forced along, by the deep scratches and grindings on the rocks well nigh wherever there has been a mountain and a gorge. He may see them on the rocks of Llanberis in North Wales, and on those of the mountain region which overlooks Windermere, in Westmoreland; in the Isle of Anglesea and the Isle of Man. In Ireland he may note them in the gorge near Killarney and at Bray Head; in Scotland in so many places that I must refer the reader to Mr. Jamieson's valuable papers published in the Proceedings of the Geological Society. This gentleman mentions, that so enormous was the pressure that had been exerted, that at one spot in Scotland which he visited the boulders have been carried upwards, and the rocks against which they ground have been worn down into "rounded flowing outlines like those of a feather bed."

Over Europe we find marks quite as palpable of the great carrying power of the glaciers which must have passed over the land. On the flanks of Mount Jura, not far from Neufchatel, are seen prodigious boulders of protogine (a peculiar kind of granite), the nearest site of which is the valley of the Rhone above its embouchure, where it falls into the Lake of Geneva, seventy miles from the spot where these boulders are found. M. Escher showed Sir Charles Lyell, at Troyen in Appenzell, fragments of a kind of rock known as the granite of Pontelyas, the natural site of which is known to be near Trons, quite a hundred miles off. The plains of Lombardy and Piedmont were also overrun with this flood, which can be traced into Sicily.

As to the boulders themselves, they are everywhere. "We find them," says Miller, "in every conceivable situation; high on hill-sides, where the shepherd crouches beside them for shelter; deep in the open sea, where they entangle the nets of the fisherman; on inland moors, where in some remote age they were painfully rolled together to form the Druidical circle or Pict's house; or on some margin of the coast where they had been piled over one another, at a later time, as protecting bulwarks against the encroachments of the waves." * Had some of the writers who speculated so profoundly as to the means by which these valuable monuments of past times were reared, been acquainted with this simple fact, what a great deal of trouble they might have spared themselves and their readers too!

But the strangest of all places to find these boulders is at the bottom of mines. Many have been discovered deep below ground, but lately Mr. Salmon gave an account of some found at seventy-four fathoms, or four hundred and forty-four feet below the surface. They were in a level of the West Rosewarne mine at Gwinear, and were of great size, two being about six feet wide and deep and about four and a half long. These seem to have been much the largest yet found.

Again in Sweden they lie in countless thousands, and in the long winter nights the Skåne peasants tell how in former times the giants, wearied by the ringing of the Christian bells, hurled these great stones at the churches, and how the vengeful Trolls hold their infernal rites beneath them, drinking and dancing in

* Rambles of a Geologist.

their shadows, from whence they issue to tempt the unwary boor with the horn filled with liquid fire and the ivory pipe. North Germany is strewn with boulders torn from the Scandinavian mountains, and Russia has its share; the great boulder-stone on which stands the statue of that wonderful savage, Peter the Great, is one of the specimens.

Many of these boulders in Europe came from Sweden or the Scandinavian mountains, which seem to have afforded almost inexhaustible supplies and to have poured them forth in all directions and towards all parts of the compass. The Alps yielded another supply, many of them however only travelling very short distances; one line of wanderers came sailing, possibly on icebergs, over Holland to England and stranded in vast numbers at Cromer, while another line passed over from Normandy to Pagham,* where there are also great numbers of them. Those at Cromer are principally syenite, porphyry, and trap. Many of them are six and eight feet in diameter. Those at Pagham are masses of granite, syenite, and greenstone. The force by which they were moved is almost incredible. In Hone's "Table Book," one is described lying on the highest part of Sutton Common, in Craven, of about fifty yards in circumference and about ten yards in height.

This glacial flood has also left its traces over a great part of the north of Asia, so that we can only suppose that all the valleys and plains, with the mountain sides to a considerable distance south of the arctic circle, passed through a similar crisis. "Along

* Fifteen miles south of Chichester.

the Himalaya, at points nine hundred miles apart, glaciers have left marks of their former low descent; and in Sikkim Dr. Hooker saw maize growing on gigantic ancient moraines;" the remains of extinct glaciers have been made out in Syria four thousand feet below the highest part of the Lebanon mountains, where even on the loftiest heights there is now no perpetual snow.

The straits of Belleisle, the barren coast of Labrador, the banks of the St. Lawrence, and many other parts of North America, bear undoubted marks of the wintry streams which carried the great boulders now strewed in such numbers by the sides of the Hudson and Staaten Island, and which poured such torrents of mud over Canada, that when the ice retired it left a bed of drift five to eight hundred feet deep. From the rapids of Sault St. Marie to the virgin forest of Lake Superior, the boulders lie strewed like the wreck of some mighty city of old, and the Sioux Indian still humbly offers his mite of tobacco to the guardian spirits of the famous pipestone quarry, when he reaches the huge granite boulders that lie near its base. It is rarely that in Canada the deepest railway cuttings reach the rocks, and I expect a very great portion of Sweden will be found in the same state, as in many parts no stone but the boulder is met with.

Erratic boulders have been seen on the Rocky Mountains and glaciers have left their traces on the Cordilleras of equatorial South America. Mr. Darwin saw a vast mound of detritus in Central Chili, due most probably to deposit from glaciers, and Mr. D. Forbes has seen in the Cordilleras furrowed rocks like

those of Norway. Direct evidence is found in New Zealand of the same mighty agent.

The immense size and weight of some of these blocks, such as the boulder-stone of Borrowdale and that at St. Petersburg, have excited some incredulity as to their being ever carried by ice. But the objection scarcely deserves notice. Glaciers would bear platinum; and as to icebergs, solid packs of ice nine and twelve hundred feet high and miles long could have borne any number of these rocks; besides the strain on the carrying powers of the ice was not so great as might be supposed; granite is only a fraction more than two and a half times as heavy as water, so that ice even heavily laden with it was in no danger of sinking.* Very few rocks indeed are three times the weight of water—most of them are only twice as heavy.†

But there is nothing in all this that explains why many of the smaller boulders are so round and smooth. We can understand why their exposed sides were worn down by the grinding of the glaciers squeezed against them; but some of the fragments seem to be worn away on all sides. A tour on an iceberg would at the utmost only scratch them here and there, or rub off a few chance asperities of surface which might happen to come in contact with substances as hard as themselves. Mr. Marryat says, that at Marstrand in Sweden there are a number of wells or pits on the shore, where nature is constantly polishing the stones found in Sweden. These wells are circular, a fathom

* Cosmos, B. iv., S. 163.

† Lyell's Principles of Geology, 1837, vol. 1.

or more deep and three to seven feet round. They occur in threes, the largest lowest down in the group, and are made each by the wearing of the stone from the action of the water; in fact it seems that the waves and currents, unable to dislodge the stone, are yet strong enough to disturb it on its base, and that this rolling forms the pit while the friction polishes the stone. "In a tan-yard near Götaborg several were lately discovered with the stones still in their places, polished and round, as large as cannon balls." "The owner of the land affirms that the stones when first removed were light, but after exposure to the air became heavy, — so heavy are they now I could not lift them."

Hugh Miller has given a most spirited description of what I will venture to call the life and adventures of a boulder, to which I gladly refer the reader, for there is always something solemn in the history of a great stone. The wanderings of a boulder may be supposed to begin by its being torn away by an avalanche and stranded on the bleak and wintry shore of some old island, still as the grave and covered with glaciers; it lies there through the long long winter and the gloomy, fitful, inclement spring, while day by day the field ice floats by, "now grey in shadow, now bright in sun." At length the short late summer comes, and the humble struggling flowers of an arctic land bloom for a while. "A few dwarf birches unfold their leaves amid the rocks, a few sub-arctic willows hang out their catkins beside the swampy runnels, the golden potentilla opens its bright flowers on slopes, the evergreen *Empetrum nigrum* slowly ripens its glossy crowberries, and from where the sea spray

dashes at full tide along the beach to where the snow gleams at midsummer on the mountain summits, the thin short sward is dotted by the minute cruciform stars of the scurvy-grass and the crimson blossoms of the sea-pink."

Then the scene shifts. We come upon a bare treeless landscape; all around the eye falls upon the mossy moor and lifeless hill, and the old stone is weather-grey now or stained with polar lichens. The sea which at no very distant date will dash over it, is slowly gathering round and rising nearer with each revolving age. "The low green island of one century forms the half-tide skerry darkened with algæ of another, and in a third exists but as a deep-sea rock." By-and-by the old stone lies deep at the bottom of the ocean. Strange shell-fish crawl round it, deep purple encrusts it where once the grey lichens grew, sea shells fasten on its sides from which waves the sea tangle, and all round the solemn-looking underwood of the ocean forest gathers thickly and steadily over it.

And now the time of the boulder clay is over and once more through long, dreary, perishing winters and a few fitful attempts at summer, the seasons grow milder and the land that was beneath the sea rises higher. The brave old stone which lay in Cimmerian darkness at the bottom of the ancient sea, is now seen at low water and at last on the shore. Dark forests of pines grow on the hill sides and by the river banks, and, sheltered from the bitter winds, the oak, elm, and ash rise bright and green amid the savage scenery. Man has not yet come but his hour is nigh, and the brutes he was to subdue are on the

wolds and moors. "The cream-coloured coat of the wild bull,—a speck of white relieved against a ground of dingy green—may be seen far amid the pines, and the long howl of the wolf heard from the nearer thickets. The gigantic elk raises himself from his lair and tosses his ponderous horns at the sound, while the beaver in some sequestered dell traversed by a streamlet plunges alarmed into his deep coffer-dam."

Ages have followed upon ages and now the great stone lies dry at neap-tides; it is only a high spring-tide driven by a hard wind that dashes over it; still it is a "nameless stone, on which the tall grey heron rested moveless and ghost-like in the evening, and the seal at mid-day basked lazily in the sun." Then came an awful wreck; a boat was shattered on it, and amid the curses of those who wept over the drowned men the old stone was baptized and henceforth had a name.

Utterly destructive as were these floods to life in every form, in the guise of tree and grass, of bird and beast, their value in fertilizing the land was incalculable. It was not the sun which lent splendour to the tropic scenery and made the muddy banks of our once mighty rivers like steaming jungles, that rendered the land fit for the ploughshare and the rude harrow. It was the upheaval of the earth, the grinding of the glaciers, and the rush of the great drift floods. These mighty forces crushed and broke up the hard rocks which would for countless ages have defied the effects of mere weather; these rocks were rubbed down till they fell in silent waters in the form of soft fertile mud over the barren soil, while the same process set free the valuable salts contained in this

impregnable matrix. Without this process, man in most parts of the northern hemisphere, instead of founding arts and sciences, would in all probability have been a savage, seeking his food with the snare and flint javelin, or gathering berries, acorns, and roots when his hunting failed him. At the best he might have learned to till rudely some narrow slip of land by some old lake or river, where he saw that the floods of winter and spring made the grass and flowers richer and greener in summer. Those only who have noticed the unchanged aspect of old rocks after years and years, and marked how thin is the stratum that time has heaped upon them in the course of ages, can appreciate the sterility, the lifelessness for man of lands which could only be fertilized in this way. Such land "might," as Miller remarks, "possess a few gardens for the spade, but not fields for the plough. We owe our arable land to that comparatively modern agent, whatever its character, that crushed as in a mill the upper parts of the surface rocks of the kingdom and then overlaid them with their own débris and rubbish to the depth of one to forty yards. This débris, existing in one locality as a boulder clay more or less comminuted, in another as a grossly-pounded gravel, forms, with few exceptions, that subsoil of the country on which the existing vegetation first found root, and being composed mainly of the formations on which it more immediately rests, it partakes of their character—bearing a comparatively lean and hungry aspect over the primary rocks, and a greatly more fertile one over those deposits in which the organic matter of earlier creations lies diffused." Our fire and building bricks too and tiles are got from

the washed boulder clay, most probably formed where streams which had flowed over this spread out into great tranquil reaches and lakes, in the centre of which, from the stream having lost so much of its strength, the fine silt was thrown down.

This clay is full of alum, of such immense value in the arts as a mordant, and of aluminum which bids fair to rival gold and silver for many purposes. The ruby, sapphire, topaz, and emerald are crystallized alumina coloured with oxide of iron.

Mr. Ramsay* has suggested that those peerless ornaments of mountainous lands, the lakes, may have been due to the action of glaciers scooping out holes in the rock by means of their prodigious weight and restless irresistible force. These holes may have easily filled by natural drainage. He considers that we cannot account for lakes by supposing water to have scooped out basins for them. No torrent of water would ever have the power to scoop out holes twenty or thirty miles long; he remarks that lakes do not lie in the line of gaping fractures, and therefore were not formed by fissures in the earth, and that they are found more frequently as we go further north, where we may suppose there was once a greater supply of huge glaciers.

It is singular that the discovery of this great frost, and that of the existence of man so soon after it, or rather towards its close, should have been made independently of each other, and so nearly at the same time. Like the discovery of the flint weapons in the gravel to which it adapts itself like the counterpart in

* The Quarterly Journal of the Geological Society, 1862, p. 185.

a puzzle, it was rejected by the scientific world until, as Agassiz said, "the power of truth constrained a recognition of the justness of what used to produce only a compassionate smile as the lamentable aberration of an overstrained fancy."

A great deal of the merit of having, at any rate, compelled men to attend to the marks of glaciers in this country is due to Agassiz. Twenty years ago he made a long and careful survey of many parts of Britain and Ireland, where he everywhere remarked the scorings on the rocks he was so familiar with in his native country (Switzerland), leading him to the conviction that in former times great part of our country was overspread with glaciers.*

Near Cromer the sea has laid bare so complete a panorama of this part of the globe before and during the times of the great winter, that I feel tempted to describe it somewhat at length, in order to give in one picture a summary of those great events. "Long before the ages of the boulder clay and drift," says a writer in the *Popular Science Review*,† "when the climate of England was much as it is now, and about the time when the newer crag was deposited, the Norfolk shires were skirted with dense forests. From Happisburg to Cromer, and much further, they are to be seen along the level of a deposit marked by fossil shells, which indicate the sediment of old contemporary lakes and rivers of which there is now not a trace. After a series of changes, the drift period supervened, the forests were thrown down, and a dark brown clay,

* Quarterly Journal of the Geological Society, 1862, p. 166.

† No. VII.

with boulders as big as cottages, was piled sixty feet high over lake and forest, as the country sank under the sea." It is to a period even before this that I wish to carry the reader back. He is, however, requested to bear in mind that the order hitherto adopted is now reversed, and that for a particular purpose he is going backwards from modern times to the days of the mammoth and narwhal.

On cutting, then, through the soil we come to sand and then to drift, a layer of *débris* which overlies the boulder clay and formed as the icy floods were gradually declining; then we arrive at the boulder clay thickly sown with fragments of old rocks or boulders. Beneath this lie layers, sometimes of sea remains, sometimes of fresh-water leavings, possibly from high tides and storms having now and then forced the sea into an inland lake or high up a river; still lower we discover on one side the bed of an ancient forest, the stumps of many of the trees standing as they decayed; on the other side, sloping down to meet it, the Norwich crag. Both these stand upon the upper chalk and flints, or the last of the beds formed during the secondary periods of the geologist.

The dawn of the fifth day does not seem to be represented, so that if we suppose the middle part of it to correspond with the Norwich crag, we come at once to the evening when the great winter was approaching, and this brings us to the forest. Now there are reasons for believing that when this forest grew, the land was at least five hundred feet higher than now and that already extreme cold had set in. The old wood, which has been traced for more than forty miles extending from Cromer to Kissingland,

was just such a wood as we meet with in a northern wintry land. Cones of the scotch and the spruce or Norway fir are found there, some of which had been gnawed as if by squirrels. Alongside of the firs grew the oak and the yew, the alder and sloe, the buckbean, hornwort, and water-lily.

By the gloomy slopes and marshy brooks and pools where these forms of vegetation throve, most of the animals of this epoch sought their food. Three species of elephant—the old elephant, the mammoth, and the elephant of the south—the river-horse, the rhinoceros, the hog, horse, cow, stag, and the two beavers have all been found here.

Coming backwards again to daylight we find, as has been said, above the forest and the Norwich crag, layers of sea and fresh-water remains. In these beds have been discovered two large whales, one of which Owen calculated to have been sixty feet long. The tusk of a narwhal and the remains of a walrus have also been found, stranded there most probably during the time of the greatest cold and when these animals lived in our seas and bays as they now do around Spitzbergen and Baffin's Bay. At that time Cromer Wood, already buried, very probably stood on one of those wintry islands of which Britain was then composed, and on a few sheltered tracts of which grew straggling swedish and norwegian plants. Then over all rushed like a tropic night the boulder flood, bearing down from Sweden and Norway huge angry torrents charged with icebergs and rocks, sailing over Germany, Holland, and Denmark. And thus the Fifth Night passed as if Nature had resolved to herald in the coming of man, the destroyer and murderer,

with a scene of gloom and death which he alone in his workings could seek to parallel, and to which the globe had been a stranger since the days of the fire-formed rocks.

The Sixth Great Day.

> "Winter passes off
> Far to the north, and calls his ruffian blasts;
> His blasts obey, and quit the howling hill,
> The shatter'd forests, and the ravaged vale."

"Good times and bad times and all times get over;" the long wintry night rolls away and the morning dawns upon a more cheerful scene, though all is still rugged and barren, for the land is too lofty for a temperate climate, being quite eighty feet higher than now. But the vast packs of field-ice come more seldom, the crash of the avalanche is heard more rarely. Age after age the green land is seen more and more, till at last "creation's heir" appears upon the scene—not in England in a paradise of fruits and flowers, but still in a land which despite the inclemency of the seasons gave manifest tokens that it was one day to be a garden.

Almost about the same time as the old english savage himself, or but little before him, came the roses, grasses, lavenders, &c. Of the immense difference this was to make to man we may judge from the fact that the Rosaceæ comprise the apple, pear, and quince; the cherry, plum, peach, and apricot; the strawberry and bramble. As to the grasses far more than half the human race subsist upon them, and what the other half would do without them passes under-

standing; for rice, wheat, oats and hay-grass are things of which we could only rightly compute the value by missing them. Then also came the labiate family including the mint, thyme, lavender and hyssop; the tufted basil and fragrant sage. With this epoch too came the more beautiful forms of insect life and of flowers. For long, changes destined to culminate in these gorgeous forms of life had been shadowed out, faintly at first as the breathing shell whispers of the distant ocean, then more and more clearly, till at last on the morning of the sixth great age Nature loudly proclaimed that man was coming—man who was to subdue the wild beast of the wood and field, to rear the altar and pierce the tough earth, to know the tides and to name the stars; the earth must be made ready for the orchard and grain field; the seed must be sown for the rose and lily, the violet and woodbine; the stream and lake, the sea-coast and the bay must be peopled with delicate fish for this pampered child of heaven; the face of Nature must be changed to welcome Nature's adopted son. Alas! when the mists of this morning roll away they disclose him already doomed and loaded with crimes, a murderer and outcast: the breeze which chased the morning dews bore with it the roar of battle and the groans of slaughtered men, never it would seem to cease while earth should be the seat of life.

And now, save where here and there a stray shark has lost its way, all the bulkiest among the ravenous tyrants of our estuaries and coast are replaced by the codfish and herring, the salmon and haddock, the ling and pollock, and the other immensely valuable fishes which tenant the "barren

ocean."* The forefathers of our periwinkle and mussel appear in the red crag, those of the whelk and oyster in the coralline crag.†

The foumart and weasel, the badger and hare, the wild-cat and the fox are in the woods and on the moors; and though the great wool-clad mammoth still lingers, and the cave-bear and hyæna still have their dens in Yorkshire and Devon; though the great beaver still builds by the woodland stream, and the musk buffalo ranges over the wintry pastures;—yet their hours are numbered, and before another age has gone they will be seen no more in England, and their places will be given up to the dun cattle and the fallow deer, the wild sheep and goat, the boar and the native horse.‡

It has been already said that there were good grounds for believing that Cromer once stood many hundred feet higher than now, and also that it formed part of a wintry island. Either about this time or soon after, when the drift passed away and the land was laid bare, man—contemporary with the mammoth, the great woolly rhinoceros and the river-horse—roamed or settled over England, France, Germany and Flanders, then all joined together. Subsequently to this Professor Forbes supposes that Ireland was separated from England, and then England from

* See Appendix 13.

† Both these crags are later than the London clay.

‡ "Wolves, foxes, badgers, otters, wolverines, martin-cats, foumarts and weasels, have left their remains in the newer tertiary deposits and bone-caves. Bats, moles, and shrews were then as now the forms that preyed upon the insect world in Europe."—Owen's Palæontology. The majority of these are not distinguishable from existing species.

France. One of his principal reasons is that some animals clearly passed over from the continent to England and Ireland, and this colonization was cut short much sooner in Ireland than here. Thus, for instance, certain reptiles are common to Belgium, England and Ireland, but the number of these is twice as great in Belgium as in England, and four times as numerous as in the sister country. Many writers, M. Archiac among the number, lean to the belief that this disruption of Britain only took place after the times of the gravel, a modern deposit belonging certainly to the age of man.

If the reader should wish to investigate these matters more minutely I should advise him to refer to Sir Charles Lyell's fine work on the antiquity of man, and to the writings of Mr. Jamieson, of whose labours I have already had occasion to speak in the highest terms. This gentleman's opinion is that a series of changes took place in Scotland very similar to those in Cromer, that is to say, at the beginning of this epoch the land was higher than now, and that in a great convulsion parts of it were torn up, sunk and overflowed by the sea and icebergs; these are now covered with marine drift. Then the gravel poured over the hollows and formed the gravel bed, the water getting shallower till it entirely receded, and the land was laid bare once more.

We have now brought the reader to that time when the German Ocean forced its way through the Straits, and when Ireland was torn away from Britain. In order, therefore, not to break the thread of the narrative more than necessary I shall proceed to sketch out as well as I can the changes which have ensued

in the land of Britain itself since that time, and then take up the subject of man's appearance here.

For long geologists had believed that from the epoch of the disruptions just spoken of the height of the coast had remained quite unaltered. The great argument was that the Wall of Antoninus from the Frith of Forth to that of Clyde had been built to meet the present, not the "old coast line,"* and that St. Michael's Mount in Cornwall had been even two hundred years previously connected as now with the main land, thus pointing to an absence of any change of relative level of the land and sea since those days.

But many geologists are leaning more and more to a different opinion, and are quite disposed to admit that the restless corrosion of the sea and the slow upheaval of the land, the silting up of rivers and the washing up of pebbly and sandy banks, are changing the outline and level of the land as incessantly and as rapidly as ever.

The changes of level seem to have taken place in Scotland more than in any other part, and a great part of that country has been materially altered in this respect since man first came there. Some few years ago Mr. Buchanan made the interesting statement that within a period of eighty years seventeen canoes had been dug out of the silt that lies along the sides of the Clyde, five of them from under the streets of Glasgow; one seemed to have gone down stern foremost in a storm.

Almost all these canoes Lyell tells us had been

* A flat terrace of unequal breadth running all round our coasts. Most of the seaport towns are built upon it.

made out of a single oak stem. Most probably the hardest part of the work, that of hollowing them out, was done by means of fire, the shape of the sides being afterwards given with the flint or stone axe. A few were very well finished, and to complete these metal adzes had clearly been employed; indeed a regular ascent could be traced from the times of the flint to those of iron. In two an advanced state of art is manifest; they are built of planks, and one found about ten years ago was eighteen feet long and very elaborately constructed. In one canoe was found a beautifully polished celt or axe of greenstone; in another a plug of cork, which must have come from Spain or some such distant part, where alone the cork-tree is found. Thus the Clyde must have been a great deal wider than at present, and its bed must have risen greatly since man was here. Indeed Mr. Geikie in a paper read before the Geological Society, gave what he held to be proofs, that since the first century of our era the central parts of Scotland from the Clyde to the Forth and Tay had risen quite twenty feet.

Again, Lyell also contends that certain facts relating to the wall of Antonine, instead of supporting the view that the land has not changed its level, point just the other way: "The old Roman quays," he says, "built along what must then have been the sea, have been found on what is now dry land." Whales also have been brought to light in the peat and loam of the Carse of Stirling; one eighty-five feet long was discovered at Dunmore, a little distance from Stirling; it was about twenty feet above high-water mark, as was also one found at Airthrie. Pointed instruments made out

of deer-horn were found near two of these whales; one still retained part of the wooden handle to which it had once been fixed; this preservation Lyell thinks may have been due to its having lain in peat, the power of which in warding off decay is well known. This weapon is now in the Museum at Edinburgh.

"The Roman," says Professor Daniel Wilson, "only saw a very modern generation compared with that primæval Caledonian fisherman," "the allophylian savage," as he calls him, "who pursued there the gigantic cetacean monsters of the deep, armed with his rude lance of deer-horn and his harpoon tipped with flint."

Lastly, such distinct marks of great upheaval have been made out in Fife, in Ayrshire, and many other parts, that Sir Charles Lyell has computed the rise since man first peopled these parts at twenty-five feet.

This movement has been noticed only to a very limited extent in England. The coast of Cornwall however has undergone considerable changes. De la Beche mentions several instances of human skulls found forty or fifty feet deep, overlaid with marine strata. But were this elevation in England ever so slight, the rise in Scotland must in time produce such a degree of cold that both countries will be visited by a very severe climate quite as cold as that of Norway or Lapland. As to the destruction of the coast-line by invasion of the sea from its wearing through headlands, or its retirement from the coast in consequence of great sandbanks being washed up, they are quite different matters and will be spoken of elsewhere.

Mr. John Algernon Clarke, of Long Sutton, has

drawn a picture* of the great level of the Fens which we heartily commend to the reader's attention, especially if he is fond of antiquity, for Mr. Clarke describes the great tract in question as being of far more interest than the danish peat bogs or the french gravel cuttings. Indeed it may be said to connect perhaps more closely than any other part of England could do, historical times with those of the great dynasty of winter.

Here in old times in history but in very recent ones in geology there was once a noble forest. It stood on a clayey surface now sunk down so low, that "were the clay bared of its peaty covering it would be drowned by salt water ten or twenty feet in depth." Remains of this forest stretch under the peat or rather imbedded in the peat for miles along the coast of Lincolnshire, and sixty years ago reached a mile out to sea. "It is evident," says Mr. Clarke, "that the ruined forest with its thick covering of tidal warp once extended far out into what is now the German Ocean."

It seems to have been a forest of very fine timber; "in some localities the oaks and firs attained an altitude now unknown in England," in other parts only marsh wood is found, such as the alder, birch, willow, and sallow. Some of the trees look as if they had been prostrated by a storm or violent flood.

The forest grew on a soft alluvial clay, here a few inches there as much as twenty feet thick. Beneath this are found the Oxford clay or beds of boulder clay, sand, or gravel. But in other and very large parts the soft clay reposes upon a *second subterranean forest*

* *Times*, April 16, 1863.

of oak, yew, and other timber rooted in drift clay as at Boston eighteen feet from the surface. Some of the trees in it are of immense magnitude.

"There was plainly a depression of the country before this earliest forest was submerged for the deposition of the blue clay" on which the upper forest grew. "The age of this forest is fixed after the dispersion of the boulder clay, but before the accumulation of the yellow drift gravel of Deeping, which has been found overlying the lower peat and its imbedded trees. A remarkable circumstance is that this forest may be seen far out in the Wash Bay in particular states of the tide; and a stone axe has been discovered in the cleft of a broken trunk, two miles from high-water mark off Hunstanton."

The timber of the forest first spoken of is sometimes found bearing marks of man's handiwork and stone celts have been discovered near them. "In Downham Fen were found under the peat, and resting upon the subjacent *clay*, pieces of wood *piled for making a fire* with the embers still left in the centre. In Deeping Fen was exhumed a canoe forty-six feet in length and nearly six feet in width, hollowed out of a single log; it lay *below the peat* and *above the clay*, resting upon cross timbers, which had been broken by its weight.

By the time the Romans were masters of England great part of the level had become a fen. As usual they built a road which was marked by that thoroughness of purpose which distinguished all the undertakings of this great people. This road went right across the Fens from Downham in Norfolk to Whittlesea and Peterborough. It was a gravel causeway three feet

thick and forty to sixty feet broad in some places; it rests upon a foundation of oak timber and ragstone bearing upon the peat. In the time of the Saxons and Normans again the level had become a large stretch of tarns and pools, "with immense bogs and turf moors, while some portions were clad with moisture-loving trees and vert afforested by royalty."

Now if the forest were, as Mr. Clarke thinks, apparently for most solid grounds, frequented by the old people for the sake of firing and shelter, a vast lapse of time must have taken place between their epoch and that of the Romans, for over the peat in which are buried the remains of the forest lies in the marsh district a sea-bed sometimes *twenty feet* in thickness; and yet that *this old sea-bed or marsh land had been deposited before the time of the Romans*, Mr. Clarke thinks is quite clear.

"Two centuries ago the outermost sea barrier was what is called the 'Old Roman Bank.' A document of the reign of Henry II. speaks of this immense engineering work as 'the Old Sea Bank.' It is certain from the low level of the land that the many towns and villages contiguous to the bank could not have existed before it had barred out the ocean; and most of them are named in 'Domesday Book' as having existed (many with their salt-pans) in the days of Edward the Confessor. Wisbeach could not have been out of the salt water had there been no embankments; yet Wisbeach and its river embouchure are distinctly spoken of in a Saxon charter of A.D. 664. Still further, some of the towns guarded by this bank have roman names and roman remains; the embankment communicates with several undoubted

roman sites, and while many roman relics are discovered on the the inland side, none have ever been found on the sea side of the bank. The level of the country and the position of the bank show that no subsidence has occurred since the roman age; while the fact of the bank standing upon the thick stratum of marine warp which overlies the peat forests confirms the inference from the roman road, that the subsidence and flooding of the woodland terrain happened long before the Romans visited the scene."

CHAPTER II.

THE FIRST DWELLERS UPON EARTH.

"There went a fame in heaven, that he ere long
Intended to create, and therein plant
A generation, whom his choice regard
Should favour equal to the sons of Heaven."

After the land had been made a garden for his use, and earth, sea, and river had begun to bear food for him, came Man in his appointed time—

"A creature, who, not prone
And brute as other creatures, but endued
With sanctity of reason, might erect
His stature, and upright with front serene
Govern the rest"—

to dwell for a season in the cave and wigwam and seek a precarious existence with his rude canoe and clumsy implements of chase, preying on animals weaker or more stupid than himself, and dying like the beast of prey till he succeeded to the dignity of the cromlech and barrow. One might have thought that had he lived in the time of the gigantic beasts of prey and the great pachyderms which once dwelt in England his lot must have been mournful indeed. The inspired writer who likened him to the grass of the field, the poet who drew him calamitous by birth,

frantic and doomed, a thing of earth unfit for the strife of gods,* of a race like the

> "Yearly leaves that now with beauty crown'd
> Smile on the sun, now wither on the ground,"

might have borrowed even a deeper tone of sadness for their theme, had they seen him as history and geology have since revealed man in his earliest state.

It puzzles one to understand how he managed at all, for it seems beyond dispute that some of the earliest races at least instead of being giants and warriors were puny and feeble, possibly also degraded and stupid. Furnished even with such terrible appliances as the Armstrong gun and Enfield rifle, man would have had enough to do to hold his own; but when his means of defence were the bow and sling, the snare and pitfall, it seems at first sight almost incredible that he could for a moment have entered the lists against animals from which the lion and rhinoceros would have fled in dismay. With one blow of its trunk the mammoth would have levelled to the earth the largest african elephant; one stamp of his mighty foot and the contest was at an end. The Bengal tiger would have encountered the old english tiger or swordtooth on the same terms as the puma or jaguar would meet the lion; indeed this peerless brute need not have stooped to contest

* *Ἐννοσίγαι', οὐχ ἄν με σαόφρονα μυθήσαιο*
Ἔμμεναι, εἰ δὴ σοί γε, βροτῶν ἕνεχα πτολεμίζω
Δειλῶν, οἵ, φύλλοισιν ἐοικότες, ἄλλοτε μέν τε
Ζαφλεγέες τελέθουσιν, ἀρούρης καρπὸν ἔδοντες,
Ἄλλοτε δ' αὖ φθινύθουσιν ἀκήριοι·

matters with such puny antagonists. A modern lion would not, if he could avoid it, have given him the chance; brutes are wiser than man and avoid an unequal strife. The fiercest hyæna of the Cape, the dreaded grizzly bear, would have had equally little chance with those of England in the old wintry times.

The reader might well ask how then could man cope with these monsters? Yet nothing is more certain than that for ages he warred upon them with the flint arrow and spear, leading the wretched precarious life of the savage till he passed away like the lizards of the wold and stream; that he lived with the beast as an equal and companion till in due time he became master, and the heaven-born breath of reason slowly ripened and fashioned him into the powerful and highly-gifted creature he now is.

A quarter of a century ago nothing of the kind would have been believed. It was known "as a fact" that man was a *parvenu*, a thing of yesterday, and perhaps in the whole range of knowledge there was no point on which scientific minds were more thoroughly made up than about human fossils. It was decided once for all that they did not exist, and that any facts in favour of such a doctrine which tended to upset a very satisfactory state of credence, would require a troublesome explanation and were to be ignored. If that proved ineffectual they were to be assigned to hasty generalization, jumping at conclusions, &c. It is true that some few of those most favourably placed for hearing the first ground swell of any little storm brewing were not altogether satisfied, but the scientific world was quite at its ease;

it had formed its decision and was not in the least disposed to bother its scientific head further about the matter. Indeed, as has been most pertinently remarked, it is very disagreeable to have one's conclusions overturned. "The first impulse of human nature," says Ansted, "is to put the unlucky discovery on one side—say nothing about it. Most likely it will not bear investigating, and therefore don't let's have the trouble of investigating it."

What a pity that such a comfortable state of things cannot always endure! The plan of pooh-poohing anything is so extremely convenient, so satisfactory to one side at least, so warranted by precedent and authority, is always supported by such very respectable persons and requires so little exertion of the intellect, that only a very troublesome person, a sort of atheist in fact, would be guilty of trying to disturb it. What Mr. Locke said nearly two hundred years ago, that "novelty is a terrible charge among those who judge of men's heads as they do of their perukes, by the fashion, and can allow none to be right but the received doctrines," and that "new opinions are always suspected and usually opposed, without any other reason but because they are not already common," has clearly lost none of its force.

This is precisely what the scientific world felt when a very troublesome person indeed, M. Boucher de Perthès, wanted it to believe that certain remains of man were to be found in the gravel. Scientific World frowned, shook its learned *caput*, and then having made itself quite comfortable, said it was impossible—that the long interval of time between the deposition of this stratum and that in which it is certain man

existed, coupled with the destruction of so many races of animals in the intervening period without a trace of man, were quite opposed to it. All the human relics as yet found were clearly of modern origin, and the greatest thinkers were quite of opinion that the gravel had been deposited ages before man was created. Sir Isaac Newton believed man to be a very recent creation, because all arts and science, all authentic history and discovery were so very modern. Cuvier and Lyell had shown how near the surface lay all that had been found of man. Professor Oolite laughed at the idea, and Sir Protogin Felspar couldn't see how the author was to make his theory out. M. de Perthès replied that he had positive proofs that remains left by man had been found in the gravel; he figured some hundreds of them very carefully and published the figures in an octavo volume; nay, he offered to show his specimens to the geological pundits of Paris, but like the rest of the Scientific World they had made up their minds beforehand, which is after all the shortest and simplest plan, and a man whose name ought to endure while science exists could not even obtain a hearing! Scientific World not being able to confute this obstinate heretic, and not being in a position to burn him alive or to break him on the wheel, took the only course that remained: it refused to read his book, and a translation of part of it which appeared at Liverpool fell still-born from the press.

It seems after all that the merit of this discovery is due to Englishmen. When curiosity had been sufficiently stirred up both here and across the Channel, men all at once called to mind a number of facts which

had long pointed to the same conclusion. They remembered that as far back as 1797 a gentleman of the name of Frere had found, in a fresh-water formation in Suffolk, flint weapons of the same type as those of Amiens, along with some remains of the ancient elephant, and that eighty-two years previously an implement of the same kind had been dug out of the gravel of London, together with the bones of an elephant. The existence of flint-headed arrows had long been known, they had been found in great numbers, but the supposition that they had belonged to another race of men would most probably have been considered as idle as the superstition which assigned them to the fairies so long believed in the highlands.*

Long before M. Boucher de Perthès made public his discoveries, for it was about the very time Schmerling was painfully and manfully toiling away in the Belgian caves, a gentleman of the name of McEnery, residing near Torquay, found in a cave not far from this town, called "Kent's Hole," not only bones of the mammoth, tichorhine rhinoceros, cave-bear and others, but several remarkable flint tools, some of which he supposed to be of great antiquity, while there were also remains of man in the same cave of a later date. In a "Memoir on the Geology of South Devon" published by the Geological Society of London in 1842, a gentleman of the name of Austen communicated the fact, that in this same cave where McEnery had found the flint tools and bones, he had discovered marks of

* "There every herd by sad experience knows
How wing'd with fate their elf-shot arrows fly."

These elf-shot arrows have flint heads.

man in undisturbed loam or clay under stalagmite mingled with the remains of extinct animals; all these lay under a perfect floor of stalagmite and must have accumulated in the cave before the concretion began to form. Mr. Austen thought such facts could not be explained away by supposing that the cave had been anciently used as a burying-ground, as in Dr. Buckland's well-known case of the human skeleton of Paviland, because in the Devon cave the flint implements were widely distributed through the loam and lay beneath the stalagmite.

A considerable time since the Rev. John Cumming in his Geological Description of the Isle of Man noticed the occurrence of the remains of the great stag imbedded in mud with "implements of human art and industry, though of an uncouth and ancient character," and in another passage, after alluding to a submarine forest to which he was disposed to assign a more ancient date, he observes, "It is singular that the trunk of an oak-tree which has been removed from the submerged forest at Strandhall, exhibits upon its surface the marks of a hatchet."*

Again, thirteen years prior to M. Boucher de Perthès, Dr. Schmerling had published an account of his having been engaged in searching for the traces of man, and with about the same encouragement from the scientific world.†

He discovered in the cave of Chokier, two and a half miles south-west from Liège, a polished needle-shaped bone, having a hole pierced obliquely through it at the

* Quarterly Journal of the Geological Society, 1860, p. 472.

† Recherches sur les Ossements Fossiles découverts dans les Cavernes de la province de Liège, 1833-4.

base—such a cavity he observed as had never given passage to an artery. This instrument was embedded in the same deposit with the remains of a rhinoceros.

In the third edition of his Principles of Geology and again in the fourth and succeeding editions of this valuable work, Sir Charles Lyell gave a brief account of Schmerling's researches, "without," as he says, "pretending to call in question their trustworthiness, but at the same time without giving them the weight which I now consider they were entitled to." He now admits that Schmerling had really discovered that man had appeared much sooner upon the earth than geologists were then willing to believe—an act of noble candour quite in keeping with what one might expect from him. It must have been no trifle to be let down into the Engis cave, as Schmerling was day after day and week after week, by means of a rope fastened to a tree so as to slide to the foot of the first opening where the best preserved human relics were found, and when he had thus gained access to the first subterranean gallery, "to creep on all-fours through a contracted passage leading to larger chambers, there to superintend by torch-light" for so many months and even years "the workmen who were breaking through the stalagmite crust as hard as marble in order to remove piece by piece the underlying bone breccia." It must have been nearly as hard to stand, as Schmerling was obliged to do, for hours with one's feet in the mud, with water dripping from the roof on one's head, in order to mark the position and guard against the loss of each single bone of a skeleton.

Besides, when he had toiled for so many long years with all this heroic devotion to the pursuit he had

begun, there was still the possible chance that the fruits of his labours would be at once snatched from him. Sir Charles Lyell says, "when these circumstances are taken into account we need scarcely wonder, not only that a passing traveller failed to stop and scrutinize the evidence, but that a quarter of a century should have elapsed before even the neighbouring professors of the university of Liège came forth to vindicate the truthfulness of their indefatigable and clear-sighted countryman." With all possible deference to Sir Charles, I am disposed to think that the Liège professors ought to have been as capable of judging from the first few discoveries of bones as from any number.

M. Boucher de Perthès was now rapidly getting the upper hand, and not satisfied with alarming Scientific World, he had it put upon its trial; Scientific World did not like this, and endeavoured to show that the flints might have been formed by "violent and long-continued gyration in water," which is about as possible as that they might have been shot at the earth by the man in the moon or the inhabitants of Saturn, or that they had been made by steam in antediluvian times and buried in the gravel in order to mystify the learned. M. Boucher de Perthès found the worn handles of wood and horn formerly attached to these spear and arrow heads; Scientific World winced, and would have persuaded people that it had been all along convinced of the truth of these interesting discoveries, but it was too late. The investigations of Dr. Rigollot, Mr. Flower, and still more of Mr. Prestwich, who went an unwilling observer, and was convinced when he saw the flint beds of St. Acheul; of

MM. Gaudry and George Pouchet, entirely confirmed M. de Perthès' view. M. Gosse, of Geneva, found a flint hatchet in the sand of the suburb of Grenelle; M. de Verneuil showed the Geological Society of France a worked flint hatchet and an elephant's tusk found in a gravel-pit at Précy, near Creil, in the valley of the Oise. "Thus," as a french author says, "these worked flints have been found in the diluvium of three of our valleys—of the Somme, the Seine, and the Oise."

But it was particularly in 1858 and 1859 that opinion changed so suddenly and widely here, when a new cave being discovered at Brixham, a short distance to the west of Torquay, the Royal Society came forward and made two grants for the purpose of having it thoroughly searched. This was done by several geologists under the superintendence of Mr. Pengelly. They first came to a coating of stalagmite, in which they found a reindeer's horn and the fore-arm of the cave-bear, then to a thick layer of bone-earth, and lastly to gravel.

The bone-earth contained fossils of the mammoth, rhinoceros, cave-bear, cave-hyæna, cave-lion, a kind of horse, and some other animals. They found no human bones, but about fifteen flint knives, generally *near the bottom of this layer*—one very perfect specimen lying very near the hind-leg of a cave-bear, which had clearly been laid there whole and with the ligaments on it, so that it seems certain that in this very part of England man lived as far back (if not farther) as the time of the hyæna, lion, bear, and rhinoceros.

From this time forth it was no longer scientific to

doubt that weapons made by the rude warriors of primeval days are to be found in strata containing remains of the mammoth and cave-bear, and analogy might well tempt us to believe that they may yet be traced to the very dawn of the time in which the giant mammals first appeared. Scientific World was forthwith found guilty and condemned to death. Before execution it confessed to having perpetrated the same crime on several other occasions. Last dying speech and confession of Scientific World was published by Professors Owen and Ansted, and Sir Charles Lyell, who assisted at the mournful ceremony.

All honour then to Schmerling, Agassiz, and Boucher de Perthès, for the heroic resolution with which they held on their way through many long years, disregarding alike cold indifference and active hostility, studied sneers and timeserving criticism. Mr. Horner, in his address to the Geological Society (Proceedings, 1861), might well say that the conclusions of M. Boucher de Perthès "had been suffered to be neglected by a strange unreasoning credulity, not very creditable to the scientific men of all countries."

Now, as this system of hunting down and worrying has gone on since the days of Prometheus, who suffered unheard-of woes because he was the friend of man, and of Socrates who was poisoned for wanting men to be virtuous and to believe in a Supreme Being, and as the unfounded persecution of Du Chaillu proves that the spirit is just as strong as ever, the author benevolently offers the *soi-disant* scientific world a plan which he hopes may relieve it of the

duty it appears to think it owes the world. It is that all those persons who cannot go to a scientific meeting without insinuating something to the detriment of every great discovery, should form themselves into a society for the suppression of knowledge and mutual stupefaction, every member of which would have full liberty to contradict everything he chose, from the "Principia" of Newton downwards; and in order not to cut them off from all connection with science, they might be permitted as heretofore to subscribe to any scientific societies so long as they stopped away from the meetings.

I would also suggest a club-house on the model of the temple in the "Dunciad," ornamented with busts of the Rev. Julius Bate who called Newton the Dagon of modern philosophers, the divine who preached against vaccination, the tormentors of Hutton, Knox, Bell, Marshall Hall, and a host of others (there will be no want of choice), and write over the doorway of their asylum the following lines from the "Dunciad," slightly altered to save these excellent people any trouble:—

> "Beneath our footstool Science groans in chains,
> And Wit dreads exile, penalties, and pains.
> Here foams rebellious Logic gagged and bound,
> And there fair Rhetoric stretch'd upon the ground.
> Whate'er the talents, or howe'er design'd,
> We hang one jingling padlock on the mind."

Mr. Horner was quite right. The incredulity shown in this case was no great credit to the age, and if justifiable at the beginning, still the position taken up ought to have been abandoned much sooner than it was.

Long ago Professor Owen said that the flint weapons found in the gravel were "unquestionably fashioned by human hands" (alas! poor Scientific World!) Professor Ramsay, than whom no one could be a more competent judge, observes, "For more than twenty years, like others of my craft, I have daily handled stones, whether fashioned by nature or art, and the flint hatchets of Amiens and Abbeville seem to me as clearly works of art as any Sheffield whittle." The conclusion therefore which was legitimately come to from all the facts, was that the flint tools and their fabricators were coeval with the extinct mammalia embedded in the same strata. In truth such pains were taken to examine into the fact of the implements being really in the gravel at St. Acheul, that the most incredulous might have been convinced if arguments could ever convince those predetermined not to believe. On one occasion Mr. George Pouchet, acting on a suggestion given by Lyell, went to St. Acheul commissioned by the municipality of Rouen, and did not leave the pits till he had seen one of the hatchets extracted from the gravel. M. Gaudry also gave the following account of his researches in the same year to the Royal Academy of Sciences at Paris:—"The great point was not to leave the workmen for a single instant, and to satisfy oneself by actual inspection whether the hatchets were found *in situ*. I caused a deep excavation to be made, and found nine hatchets most distinctly *in situ* in the diluvium. I also remarked during each of my three visits to Amiens that there were some extensive gravel-pits, such as those of Montiers and St. Roch, agreeing in their geological character with those of

St. Acheul, and only a mile or two distant, where the workmen, although familiar with the forms, and knowing the marketable value of the articles above described, assured me that they had never been able to find a single implement."

In a most ably written article in the *Times*,* it is remarked with great truth, that "It is difficult to conceive anything more satisfactory than the evidence, collected with so much caution and tested with so much skill, which these (the Brixham) caves have supplied," for "besides the implements themselves, there was also discovered, deep in the bone-earth, one of the flint cores from which flakes had been struck off in the course of forming such tools. The presence of flint knives by themselves would of course prove nothing, for they might belong to any age in which the use of metal was unknown. But the fabricators of those in the Brixham caverns must have lived antecedently to the time when the work of their hands was being covered with stalagmite; and *contemporaneous with the stalagmite* must have been the cave-bear to which the entire humerus enveloped by it belonged. So that, if there is any priority to be assigned, it must in this district be given to man rather than to the *ursus spelæus*."

At the risk of being charged with tedious repetition I give the summary of this lucid writer in his own words:—"Dr. Falconer and Mr. Prestwich, two of the most distinguished among the geological committee which had superintended the excavations at Brixham, visited the deposits in the valley of the Somme, and

* April 9, 1863.

the latter had the satisfaction of extracting *with his own hands* a well-shaped flint hatchet from a bed of undisturbed gravel at St. Acheul. The tool was lying, at a depth of seventeen feet, *on its flat side*, and neither in the matrix which contained it nor in the overlying beds of sand and loam, containing many land and fresh-water shells, was there the least sign of any vertical rents. A report of this to the Royal Society, accompanied by *a photograph showing the position of the tool in situ*, satisfied many sceptics and induced others themselves to visit Abbeville and Amiens. One who did so, Mr. Flower, disinterred at the depth of twenty-two feet, *from strata which were observed by many witnesses to be perfectly undisturbed*, a fine oval-shaped symmetrical flint weapon. This was in June, 1859. In the same year Sir Charles Lyell himself visited the same pits, and obtained several other tools of the same kind. Unable to resist the accumulation of evidence, he formally expressed his opinion of the antiquity of the fossil tools at the meeting of the British Association in the following autumn."

It is hard to see how any subject could well undergo a more searching examination than the human relics found lately in the gravel-pit of Moulin-Quignon, near Abbeville, and about which such a flood of letters poured into the papers.

The world having been informed through the medium of an Abbeville journal,* that M. Boucher de Perthès had found in the gravel-pits of Moulin-Quignon a human jaw and tooth, and that a gentleman who

* *L'Abbevillois*, Avril, 1863.

accompanied him had been so lucky as also to make prize of a flint hatchet, a more than ordinary interest was at once shown. The bones were said to be clearly fossil, and to have been found about sixteen feet from the surface, close to the chalk. The time had long passed since men could ignore M. Boucher de Perthès' discoveries without running the risk of being ignored themselves; but here some reaction seemed to have set in, or else the case was very doubtful, for scarcely had Sir Charles Lyell (not a member of the scientific world) mentioned the discovery at the Ethnological Society, than it was stated that Mr. Prestwich (who also does not belong to the scientific world, and who nevertheless is quite capable of giving an opinion) was not by any means satisfied that the fossils were genuine.

Such statements soon made these relics a most exciting topic of discussion. Some writers were in such a hurry to give their opinion, that without more ado they pronounced the bones to be deceptive. Mr. Evans and Mr. Prestwich went to Abbeville; what they saw and heard there made them very suspicious. It turned out that the discovery was not made by M. de Perthès, but that he had been summoned to see the relics when they were found there. He saw a bone projecting from the cliff; this he took out and found it to be the half of a lower jaw quite perfect and containing one tooth, the last but one. This tooth had been hollow in life from decay, so that toothache pretty clearly began at a very early time. There was a solitary molar tooth found loose at the same time. He made out that one tooth had been lost from the jaw during life, and that the socket had worn away;

the sockets of the others were filled with the substance in which the bone was buried, a fact due I presume to its saturation for ages with water which had trickled through the bed, and to its having been subjected to immense pressure. The bed itself is a flint-gravel called "black seam," from being dyed bluish-black with iron and manganese.

As this rests immediately upon the chalk, being before the high-level gravels of the Somme Valley, and therefore one of the most ancient beds since the boulder clay, the bare possibility of the immense age of the bone was alone enough to make men doubt. There was only a thin layer of an iron clay between this very gravel and the chalk of secondary times. Mr. Evans and Mr. Prestwich pronounced the flint hatchets got from the same bed to be "modern fabrications."* Dr. Falconer then went to Abbeville and got three of these flint hatchets out of the black-seam gravel; they looked thorough antiques, but on "severely testing them" on his return to London, Dr. Falconer came to the conclusion that they were spurious, for when they were washed they lost their metallic bronze-like look and took on a dingy white colour. M. Quatrefages, a distinguished french *savant*, got two of them out of the same place in Dr. Falconer's presence. But a very great number of flint implements were found all at once in this seam, and in proportion as the workmen were better paid, the number of hatchets increased. Of course all this was enough to make men feel in doubt.

As to the jawbone, it was light in weight, not infil-

* *Times*, April 25, 1863.

trated with metallic matter, part of it was of a dirty white colour, and it did not seem as if it had been crushed or rolled by the flints from which it was said to have been taken. It was of a very peculiar form, suggesting something of the jaw of the Australian or Esquimaux.

M. Quatrefages started with the jaw for Paris and Dr. Falconer returned to London, bearing with him the molar, which was soon submitted along with the history of the jaw to the sharp scrutiny of Mr. Busk and Mr. Somes. They all decided that the whole affair was an imposture. First, Mr. Somes, from a number of old jawbones got out of a London churchyard, found several which collectively furnished all the peculiar features of the poor fossil, but not one which had them all. Then they sawed up the tooth, found it full of gelatine, white, glistening, and fresh-looking—this showed it was not an ancient fossil; the flint hatchets had already been pronounced fabrications, so that there was an end of the case and Dr. Falconer came to the conclusion that a very clever imposture had been practised, "so cunningly clever that it could not have been surpassed by a committee of anthropologists enacting a practical joke."

Nevertheless M. Quatrefages was not at all satisfied; the more he looked at the matter the more assured he felt that the jawbone and flint hatchets were genuine; several french gentlemen of very high standing did the same. The gelatine in the tooth proved nothing; this substance had been found in fossil teeth of much greater antiquity; the whiteness of the section might easily be due to the soil in which the tooth lay; the hatchets were tested with boiling water and found

genuine. Mr. Busk had also found that the "black-seam band did not permanently colour his penknife." Still the english *savants* remained incredulous, and many people were not a little startled when Dr. Falconer said in the *Times* * that the human relic was authentic, that no imposition had been practised, and that as an opinion to the contrary had been started, this was given up without any reserve whatever!

This must have been rather unpleasant news to those who were in such in a hurry to pronounce the discovery an imposture, especially as a conclave of English *savants*, including Drs. Falconer and Carpenter and Messrs. Prestwich and Evans, was forthwith invited to a conference with MM. Lartet, Quatrefages, Delesse, and others. The question was discussed at two meetings, one of which lasted six hours. At the end of this time they had not got much nearer, when luckily the president, M. Milne-Edwards, proposed the very sensible plan of going to the gravel-pit and judging for themselves.

This idea was at once adopted; the whole party set off with sixteen workmen furnished with pickaxes, an *undisturbed part of the cutting was then chosen*, and during the course of the day *five flint hatchets were dug up* "under circumstances which made it impossible to doubt the authenticity of their natural position in the cliff." Indeed, it seems difficult to conceive that deception could well be practised under the eyes of so many men together and under such circumstances. "I was," says Dr. Falconer, "an eyewitness, *with many others*, to the disengagement

* May 21, 1863.

of two." Dr. Falconer adds too a few words which may well make one hesitate about adopting hasty conclusions on such matters, and putting down as imposture anything we do not feel very sure about. "What," he says, "struck the english members with especial force, was that of these five (hatchets) only *one* presented the characters which they held to as distinctive of *genuine* specimens of great antiquity; *the other four were identical* in their general appearance with those which in the previous meetings of the conference they had considered to be *unauthentic.*" The evidence regarding the jaw was then reconsidered, and it was unanimously admitted by the commission to be genuine. Dr. Falconer however still doubted whether the jawbone could be of great antiquity, though it was clearly settled at the last meeting that it had been deposited in its resting-place when the gravelly clay was forming, and that this rests upon the chalk.

The authenticity of the stray molar seems much more doubtful. It is to be borne in mind that some of the evidence generally relied upon as to the antiquity of bones has been more than once disputed. Years ago, Professor von Meyer stated that the markings like minute shrubs on bones, and the adhesion of bones to the tongue, are of no great value in determining the age of osseous relics, though great weight has been attached to such tests. He stated that he had in his possession a dog's skull brought from the Roman colony of Heddersheim and decidedly of great antiquity, which could not be distinguished from fossil bones taken out of Frankish caves, for it presented the same

colour and adhered to the tongue in the same way.*

The spirit in which this controversy was carried out and concluded reflects the highest credit upon both sides. The French acted throughout with a genial kindly feeling; while the Englishmen, having seen that there were grounds for altering their opinion, did so and avowed it in a manly straightforward way which contrasts strongly with the miserable shifts adopted towards M. de Perthès in earlier days, Du Chaillu, and other discoverers.

That so few undoubted fragments of man have been met with in the gravel is no argument whatever. The discoveries are too recent, and the strata of this class have been too insufficiently examined, to justify any one in founding any line of argument on negative proofs. Perhaps the reader is old enough to remember the time when so few remains of the great mammals had been found, and when the public mind was so completely wrapped in Cimmerian darkness on the subject of animal remains generally, that a writer in one great journal pronounced the views of geologists to be disgusting nonsense unsupported by a shadow of proof. If the person who ventured upon this sagacious conclusion be now living, he must frequently have occasion to plume himself upon his wonderful acumen.

"It is naturally," says Lyell, "a matter of no small surprise that after we have collected many hundred flint implements, not a single human bone has yet been met with in the alluvial sand and gravel of

* Verhandl. des Naturhist. Vereins in Bonn, xiv. 1857; also Huxley's Man's Place in Nature, p. 135.

the Somme; but we must not forget that Dr. Schmerling, after finding extinct mammalia and *flint tools in forty-two belgian caverns,* was only rewarded by the discovery of human bones in three or four of those rich repositories of osseous remains."

The number of places where these weapons have been traced in England is constantly being increased. Instead of its being affirmed now that the flint arrow-head and axe of the savage are myths, we are told that they are an every-day affair.

They have been found in Rampart Hill near Bury St. Edmunds, at Swalecliff near Whitstable and in the gravel pits of Peasemouth near Godalming, at Croyde Bay, Harrowden, Cardington and Kempston.* Messrs. Prestwich and Evans have found several in the shingle between Herne Bay and Reculvers, at the base of a wasting cliff which consists of sandy eocene strata. A flint instrument, with some fragments of Roman pottery and teeth and horns of animals, has been dug up from the gravelly site of an ancient ferry over the river Itchen, near St. Denys' Priory, about two miles from Southampton. Some have also been detected in the valley of the Ouse near Bedford. "Mr. James Wyatt having returned in 1860 from France, resolved to watch carefully the excavation of the gravel-pits at Biddenham, two miles W.N.W. of Bedford, in the hope of finding there similar works of art. With this view he paid almost daily visits for months in succession to these pits, and was at last rewarded by the discovery of two well-formed implements, one of the spear-head and the other of the oval shape."

* Quarterly Journal of Geological Society, 1862, p. 113.

It has already been mentioned that Mr. Frere found some at Hoxne in Suffolk; he supposed there had been a manufactory of them at this place, an opinion which Lyell says is very probable as their cutting edges are so much sharper than those found in the valley of the Somme, as if they had not been used either in war or for building. "In another part of Suffolk, at Icklingham, in the valley of the Lark below Bury St. Edmunds, there is a bed of gravel in which two flints of a lance-head form have been found."

Very recently a hyæna den at Wookey Hole has been explored with great care by Mr. Dawkins, B.A.* This Wookey Hole is a long cavern on the south flank of the Mendip Hills, about three yards high and twelve wide. It is about two miles from Wells. A cutting stretching some thirty-four feet inwards through the *débris* with which the cave was filled to the roof, brought to light bones and teeth of the woolly rhinoceros,† the irish elk, mammoth, hyæna, cave-bear, wolf, fox, horse and frog. The hollow bones were all broken and splintered, being also very much marked by teeth. In this cave the remains of the horse were found in greater numbers than any other, whereas in Kirkdale cave those of the ox predominate. No remains of the water-rat or river-horse were found in this cave. Along with these Mr. Dawkins and his fellow-labourer Mr. Williamson found a white flint spear-head, a chert arrow-head, a roughly chipped piece of chert, a round flattened piece of chert, some splinters of flint, and two rudely fashioned horn arrow-

* Quarterly Journal of Geological Society, 1862, p. 115.

† Rhinoceros tichorinus.

heads. The spear-head is described as being of white flint, and as resembling "in outline, size, and workmanship, a beautiful semi-transparent quartz rock specimen from the burial mounds of North America in the possession of Dr. Acland."

Mr. Dawkins argues that if man was contemporary with the animals, remains of which were found in the caves, he must have existed in England, not six or seven thousand years ago but before the great frost, "a period that we cannot sum up in years." There is every possible reason for believing that he was contemporary with these creatures. The remains found there were not in any degree waterworn; a delicate process of bone from the jaw of a wolf was found quite uninjured. These implements were found twenty feet from the original mouth of the cave; and, as Mr. Dawkins says, the motive that could induce a savage to dig out a trench in the cliff twenty-four feet long and of such width and height, and with his miserable implements, only to fill it with bones, spear-heads, and rubbish, has yet to be found out. His own opinion seems to be pretty well made up; the facts he thinks lead but to one conclusion, namely, that "these implements were deposited in the cave during the pre-glacial period," a conclusion which I certainly share.

The most important of these discoveries in Wales is that made by Colonel Wood in the year 1861. This gentleman found in a cave called Long Hole, in South Wales, some well-made flint knives in the undisturbed part of a bed containing the remains of two kinds of rhinoceros.

In Sicily Dr. Falconer found a great quantity of flint and agate knives in a bone-breccia deposit.

Mr. Keating, whose long stay in Upper Canada in the neighbourhood of Lakes Superior and Huron gave him ample means of acquiring information, says that it is quite a common thing to disinter such ancient weapons in that part of the world. Professor Wilson has an imperfect flint knife, found at a depth of upwards of fourteen feet in the rolled gravel and gold-bearing quartz of the Grinell Leads in Kansas by a person digging for gold. The reader will find this part of the subject much more fully discussed in Wilson's "Prehistoric Man" than I can attempt here. I may remark, however, that apart from the finding of flint weapons, evidence of man's great antiquity has been brought to light in other parts of America. Lyell says that while excavating for some gas-works near New Orleans, the workmen found some charcoal and a human cranium sixteen feet below the surface and beneath four buried forests one upon the other. Count Pourtalès also found some human relics consisting of jaws and teeth, with certain bones of the foot, in a calcareous bed in the coral reefs of Florida computed by Agassiz to be about ten thousand years old.

These old lords of the soil seem to have abode by the lakes and the streams, dwelling possibly, much like the beaver monkey or the Orinoko savages, in the trees. The weapons found at Hoxne are in a fresh-water deposit; on following up one of the fresh-water deposits westward of the Reculvers, near to the site of the flint weapons spoken of, Mr. Prestwich found in it at Chislet near Grove Ferry, the river cyrena among other shells and more than a dozen flint weapons of the Amiens type have already been found in the basin of the Thames.

The shells from the Harrowden pit where flint implements have been discovered, showed that most probably the bed of gravel there formed part of a large lake or pond, but not very far from an estuary or the sea shore. Biddenham pit also seems to have formed part of a similar lake, but of smaller size and more encumbered with mud.

As to the old english troglodyte, the man of the caves, he must have lived in a state equally as savage, hardly a stage above the beasts of the field and much as the african earthman now lives; for not a scrap of clothing, not the poorest domestic utensil has been found. The cave was his lair at night, his workshop and kitchen by day. There he hammered away at his flint-weapons, or shaped his bone-tipped javelins ere he sallied out to seek his prey, and when he returned with what he had trapped or slain, the cave was the scene of the savage family supper. When all—sire, dam, and cubs—had stilled their hunger, the shells of the oysters and periwinkles and the bones and horns of the bear and deer were thrown aside, while what was left of some huge beast was stored rudely away, after which all herded together to pass the time in sleep and listlessness till hunger once more called them forth to the chase. As he grew more advanced he probably took to cooking, for some recent discoveries show that at an early period he was very likely as far advanced as the South Sea Islanders, and had some ideas of fortification which almost connect his era with the times of the old pictish forts; an improvement which seems happily to have been diffused through the neighbouring countries.

At the meeting of the Archæological Institute, on

the 3rd of July, 1863, Sir J. Clarke Jervoise, M.P., gave an account of extensive vestiges of the ancient forest of Bere, near his property in Hampshire. He exhibited a plan of a remarkable fortified site—a camp, surrounded by concentric circular trenches, evidently of a very early period; and described certain singular beds of burnt flints, locally known as *milk stones*, from the colour of the calcined surface. They lay in large quantities in the clay. Sir J. Jervoise thought it possible that these flints might have been used, when heated, for some purposes of cookery, in like manner as the South Sea Islanders are said to have heated water in gourds, or wooden vessels, by means of heated stones thrown into them. Mr. Albert Way described the traces of a similar culinary expedient in very primitive times, noticed by him in the excavation of certain singular dwellings on the estates of the Hon. W. O. Stanley, near Holyhead. Lord Talbot said the agency of fire had doubtless been made available for purposes now difficult to demonstrate. He adverted to the extraordinary remains known as vitrified forts, of which examples, although less familiar to the antiquary than those in Scotland, exist in Ireland; and he had lately received from an antiquary of note in France, Captain Prevost, a very curious memoir on certain similar fortresses existing in that country.

Again in Germany proofs of man's antiquity, beyond all cavil or doubt except to those who will not see, have been met with. Of these few have excited so much interest or are calculated thus far to throw so much light upon the natural question of what sort of men these were, as the remains found in the

Neander Valley Cave, near Dusseldorf, described by Dr. Schaffhausen and Dr. Fuhlrott. The skeleton seems to have been nearly perfect when first discovered, but the workmen ignorantly shattered and lost most of the bones, only a few of the largest escaping. It was lying in loam, in a hollow of a rent which passed through a limestone cliff obliquely from the top to the face of the cliff. The bones were quite in a fossil state, adhering to the tongue, but it is very doubtful if they are so old as those found at Engis; the thickness of the bones was very extraordinary and the elevations and hollows for the attachment of muscles were developed in an unusual degree. Dr. Schaffhausen came to the conclusion that the human remains in the Neander Valley Cave belonged to the time before Celts and Germans, and probably to one of the wild races spoken of by the latin writers, and whom the german immigrants encountered as autochthones.

Equally interesting in their way are the famous Danish settlements of which Lyell has given so graphic an account in his "Antiquity of Man." He tells us that "at certain points along the shores of nearly all the Danish islands, are seen mounds consisting chiefly of thousands of cast-away shells of the oyster, cockle, and other shell fish of the same kind as those which are now eaten by man." They are known by the name of kitchen-heaps and are simply heaps or middens of the refuse left after eating by savages, without the inclination or means to remove them from the neighbourhood of their cabins.

In these heaps lie weapons of flint, horn, wood, and bone, pieces of coarse pottery, charcoal, and cinders,

and some weapons of stone which had been whetted and sharpened in a manner which showed an advance in this rude art beyond the men of the flint weapons. There were no relics of bronze or iron, so that the heaps belong to the ages of flint and stone. These mounds are low in point of height, being from one to three or four yards high, but they are of great size in other respects, being sometimes a thousand feet long and a hundred and fifty wide.

In them are found shells of the common oyster of a much greater size than they are now seen near the Baltic. Indeed this inland sea has lost so much of its salt that the oyster cannot live except near its mouth, where every now and then a strong wind drives in a large supply of salt water from the North Sea. The cockles, mussels, and periwinkles found in these middens are from the same cause three times the size of those found in the Baltic nowadays.

No trace of the mammoth, rhinoceros, or aurochs* has as yet been found in these heaps. Lyell however thinks that there is every prospect of finding the aurochs, as it has been met with in the Danish peat. The bones of the wild bull† have been disinterred, as also of the beaver, long extinct in Denmark, and of the seal, now very rare on those coasts.

The bones of the larger animals had been split, most probably with flint hatchets, to get out the marrow. All the gristle had been gnawed off; this Lyell supposes had been the work of the dogs. There were very few bones of birds, and these almost always large bones and had belonged to old animals. Sir

* The lithuanian aurochs or bison.

† The bos urus of Linnæus ; the bos primigenius of Bojanus.

Charles Lyell attributes the absence of the bones of young birds also to the indiscriminate appetites of dogs, which though of a small race were most likely as well endowed in this way as those of our day. The dogs of the age of bronze which followed these were larger, and those of the iron age larger still.

No remains seem to have been found of the cat, horse, ox, goat, or sheep. Like the Red Indian, the Dane's only dumb friend was his dog.

"Among the bones of birds," says Lyell, "scarcely any are more frequent in the mounds than those of the auk or penguin, now extinct in Europe, having but lately died out in Iceland, but said still to survive in Greenland, where, however, its numbers are fast diminishing."

The ancient people ventured out to deep-sea fishing in rude canoes hollowed from the trunk of a tree, doubtless by means of fire and rude flint axes. These canoes are constantly found in the peat, and, as the reader is very likely aware, were in use in England and Scotland also. The bones of the herring, cod, and flounder, which could only be caught by fishermen who stood out far from shore, are found in these ancient dust middens.

But it is gratifying to learn that they were not in the habit of eating either foes or aged parents, as some modern savages do, despite of all that has been said to the contrary.

Their skulls are small and round, with a prominent ridge over the orbits of the eyes, showing that the people were small, with rounded heads and over-hanging eyebrows; very possibly they were much like the modern Laplanders. The human skulls of the

bronze age found in the Danish peat, and those of the iron period, are of a much longer shape and are larger. There appear to be very few well authenticated examples of crania which can positively be referred to the age of bronze.

As no traces of grain of any kind have been found it is most probable that they had no idea of tilling the ground. In fact, to sow and reap, though we are apt to associate them with the most primitive state possible, really indicate a vast advance beyond that of the rude fisher savage.

In their days the scotch fir prevailed in Denmark, and amid the sombre depths of these ancient pine forests they possibly sought for game or trapped the beaver and the gigantic aurochs, no slight feat with their puny dogs and rude implements of chase. This tree has long perished out of Denmark, indeed it has not been known to exist within historic times, and all attempts to make it flourish there have entirely failed; yet it was evidently indigenous in the human period, for M. Steenstrup with his own hands dug out a flint instrument from below the buried trunk of one of these trees. It seems proved that this scotch fir was afterwards supplanted by the sessile variety of the common oak. The oak has now in its turn been almost superseded in Demark by the common beech.

"The Danish and Swedish antiquaries and naturalists, MM. Nillson, Steenstrup, Forchhammer, Thomsen, Worsae, and others, have succeeded in establishing a chronological succession of periods which they have called the ages of stone, of bronze, and of iron—named from the materials which have each in their turn served for the fabrication of implements." But so far as I am

able to judge in the matter, the age of stone ought to be separated from that of the flint weapons and stand between it and the bronze where we always find it. Those weapons, the use of which was so very prevalent just before the age of bronze, and to which the name of *celts* is given, were polished and made with much more skill than the rude flint implements.

"The age of stone in Denmark coincided with the period of the first vegetation, or that of the scotch fir, and in part, at least, with the second vegetation, or that of the oak." How long it lasted we cannot say. Future investigations may clear up the point or give us a clue to something like a certain conclusion; but at present we only know that it was of vast duration. The shell mounds correspond in date with the earliest part of the age of stone. When it passed away, the scotch fir vanished with it and was succeeded by the oak, and when the age of bronze came there were either no such trees or at most but a few stragglers. A considerable portion of the oak epoch coincided with the age of bronze, for swords and shields of that metal, now in the museum of Copenhagen, have been taken out of peat in which oaks abound. The age of iron corresponded more nearly with that of the beech tree.

The kitchen-middens of the Danes have been found in Scotland, principally, I believe, as yet, about the Moray Firth and the north-east of Scotland. In one is a sort of promontory formed of those raised shingle beaches. "This mound, or rather these two mounds (for there is an intervening portion of the ground that has no shells), must have been of considerable extent. A rough measurement gives eighty by thirty yards for

the larger, and twenty-six by thirty for the smaller portion. The most abundant shell is the periwinkle. . . . . Next in order as to frequency is the oyster, which, as well as those who had it as a large item in their bill of fare, has passed away from our coasts. Save in some of the nooks of our firth, as at Cromarty, Altirlie, and Avoch, we know not where a small dish of them could be procured. As third in order in this mound is the mussel, and then the cockle. Each of these species, however, bears but a small proportion to either of the former two. Similar refuse heaps, found all round the shores of the Moray Firth, are being gradually carted away by the farmers to serve as manure. It is hoped that the scotch antiquaries will promptly examine those which remain."

These mounds have been visited by Mr. John Lubbock, F.R.S., who records his experience in the *Natural History Review*. The remains explored by him are in Elgin, and he derived much assistance from the Rev. George Gordon, of Birnie, who drew attention to the subject in April last. The first shell-mound examined was at Bannat Hill, near Burghead, near the railway. It was a small, nearly circular heap, about six yards in diameter, resting on a nucleus of sand. Periwinkles are most abundant. It also contained limpets, mussels, fragments of crabs' claws, and numerous pieces of bones, only those of oxen, sheep, and pigs being determined. There were numerous traces of fire. No pottery or stone implements were found; but three small bone implements were discovered: an engraving of one resembling an awl is given. At a large shell-mound between Burghead and Findhorn, Mr. Lubbock picked up a small fragment of a bronze ring.

He also gives an engraving of a bronze pin found by a labourer while carting away for manure some of the shell-mound at Brigzes. It is four and a half inches in length, and rather thick in proportion. From its similarity to pins found in irish crannoges, it has been considered by a competent judge (Mr. Franks) to have been in use probably about 800 or 900 A.D.

"If this pin really belonged to the shell-mound," says Mr. Lubbock, "we get an approximate date for the accumulation; and the presence of bronze establishes a great distinction between this mound and the much more ancient kjökkenmöddings of Denmark." That these shell-mounds (actually called "shelly-meddings" by the fishermen in the Moray Firth, as Mr. Lubbock states) were not unknown to Hugh Miller, is proved by an extract from the "Sketchbook of Popular Geology" of that accurate observer. For many other interesting details we must refer our readers to Mr. Lubbock's paper.

Admiral Fitzroy tells us that there are now just such heaps in Tierra del Fuego. In his letter on the subject he observes that in "1830 four of those aborigines were brought to England. In 1833, three of them were restored to their native places (one having died). They had then acquired enough of our language to talk about common things. From their information and our own sight are the following facts:—The natives of Tierra del Fuego use stone tools, flint knives, arrow and spear heads of flint or volcanic glass, for cutting bark for canoes, flesh, blubber, sinews, and spears, knocking shellfish off rocks, breaking large shells, killing guanacoes (in time of deep snow), and for weapons. In every sheltered

cove where wigwams are placed, heaps of refuse—shells and stones, offal and bones — are invariably found. Often they appear very old, being covered deeply with wind-driven sand, or water-washed soil, on which there is a growth of vegetation. These are like the 'kitchen middens' of the so-called 'stone age' in Scandinavia.

"No human bones would be found in them (unless dogs had dragged some there), because the dead bodies are sunk in deep water with large stones, or burnt. These heaps are from six to ten feet high, and from ten or twenty to more than fifty yards in length."

A most interesting account is given by M. Lartet of the burying-ground of an ancient race found at Aurignac, in the south of France, and who were probably in a more advanced state of civilization than the men of the flint age. The discovery was made in a most singular way by a workman, who observing that the rabbits took to a hole when pursued, put in his hand and pulled out, to his astonishment, a large human bone. The mayor, who was a "médecin," ordered the bones to be taken up and transferred to the parish burying-ground. He counted seventeen skeletons, and "remarked that the size of the adults was such as to imply *a race of small stature*. Unfortunately the skulls were injured in the transfer, and what is worse, after the lapse of eight years, when M. Lartet visited Aurignac, the village sexton was unable to tell him in what exact place the trench was dug." M. Lartet having examined the vault, found that it was very low in the interior which had been cut off from the outer world by a large stone. So low was it,

as to lead the explorer to conclude that the bodies were placed in a squatting or sitting posture, so much used in primitive interments. Quite inside, below where the remains had been found, bones of the cave-lion and wild boar, and in some "made ground" were found human remains, works of art, bones of animals; and in a substratum in the interior the tusk of a young cave-bear, which has been carved probably to imitate the head of a bird. Outside were found bones of the cave-bear, hyæna, woolly rhinoceros, gigantic Irish deer,* aurochs,† &c.

"If," says Lyell, in that grand and simple style which so peculiarly marks his writings, "the fossil memorials have been correctly interpreted; if we have here before us at the northern base of the Pyrenees a sepulchral vault with skeletons of human beings, consigned by friends and relatives to their last resting-place; if we have also at the portal of the tomb the relics of funeral feasts, and within it indications of viands destined for the use of the departed on their way to a land of spirits; while among the funeral gifts are weapons wherewith in other fields to chase the gigantic deer, the cave-lion, the cave-bear, and woolly rhinoceros, we have at last succeeded in tracing back the sacred rites of burial, and, more interesting still, a belief in a future state, to times long anterior to those of history and tradition. Rude and superstitious as may have been the savage of that remote era, he still deserved, by cherishing hopes of a hereafter, the epithet of 'noble,' which Dryden gave to what he seems to have pictured to himself as the primitive condition of our race:"—

* Megaceros hibernicus. † Bison europæus.

" As Nature first made man,
When wild in woods the noble savage ran."

Again, at Savigné, near Civray, in the department of Vienne, there is a cave in which there are no extinct mammalia, but where remains of the reindeer abound. The works of art of the stone period found there indicate considerable progress in skill beyond that attested by the objects found in the Aurignac grotto. Among the Savigné articles there is a stag's horn on which figures of two animals, apparently meant for deer, are engraved in outline, as if by a sharp-pointed flint. In another cave, that of Massat, in the department of Arriège, which M. Lartet ascribes to the period of the aurochs, a quadruped which survived the reindeer in the South of France, there are bone instruments of a still more advanced state of the arts; as, for example, barbed arrows with a small canal in each, believed to have served for the insertion of poison; also a needle of bird's bone, finely shaped with an eye or perforation at one end; and a stag's horn, on which is carved a representation of a bear's head, and a hole at one end as if for suspending it. "In this figure we see," says M. Lartet, "what may perhaps *be the earliest known example of lines used to express shading!*"

Lyell threw out long ago "the hypothesis that in the basin of the Thames there are indications" of a meeting "of a northern and southern fauna" at the very period to which we trace man back. "To the northern group," he thinks, "may have belonged the mammoth * and the tichorine rhinoceros, both of

* Elephas primigenius.

which Pallas found in Siberia, preserved with their flesh, in the ice. With these are occasionally associated the reindeer." Fossil bones of both these and the river-horse have been dug up where now stand Waterloo Place, St. James's Square, Bethnal Green, Gray's Inn Lane, and London Docks. In 1855, the skull of the musk ox was also found in the ochreous gravel of Maidenhead by the Rev. C. Kingsley and Mr. Lubbock—the identification of this fossil with the living species being made by Professor Owen. A second fossil skull of the same arctic animal was afterwards found by Mr. Lubbock near Bromley, in the valley of a small tributary of the Thames, and two others were dug up at Bath Easton from the gravel of the valley of the Avon. Professor Owen has truly said that "as this quadruped has a constitution fitting it at present to inhabit the high northern regions of America, we can hardly doubt that its former companions, the warmly-clad mammoth and the two-horned woolly rhinoceros,* were in like manner capable of supporting life in a cold climate." Some of these animals, it is surmised, may have wandered over wide districts, as the Bengal tiger now does; passing as far north as the fifty-second degree of latitude to prey on the reindeer, and even two hundred and fifty miles farther, where it comes in contact with the polar or tail-less hare.

But though this explanation may satisfy us with respect to the presence of the mammoth and buffalo, it by no means does so as to the presence of the river-horse, a brute which naturally lives by the African

* Rhinoceros tichorinus.

rivers, and is so accustomed to an almost tropical heat that it is only reared in our climate under shelter, and with great difficulty. Lyell thinks "they may have resembled, in this respect, the musk buffalo, herds of which pass for hundreds of miles over the ice to the rich pastures of Melville Island, and then return again to southern latitudes before the ice breaks up." Dr. Falconer called Sir Charles's attention "to the account given by an experienced zoologist, Dr. Andrew Smith, of the migratory habits of the living hippopotamus of Southern Africa." This huge clumsy brute is really very wary, travels with great speed, and makes its way indifferently by land, sea, or river. He accordingly thinks there may have been a time when they went north in the summer for change of air to the Mediterranean, crossed it to Spain and France, and made their way to the Thames, the Severn, and the Somme. But they show little disposition to seek such cold climates now, and I am inclined to think that the river-horse never travelled so far.

Mr. Horner thinks that ever since man existed in Europe there must have been a continent, now all under water except a few spots such as Sicily, Malta, and Gozo, and that through this flowed a great river (much as the Niger does now), in the waters of which these great river-horses sought their food and by the marshy banks of which they lived. In fact the horns and teeth of the river-horse were found in such quantities in Sicily that for a time they were carried to France by the ship-load for manure, till it was observed that they were so fossilized as to have lost their gelatine.

The reindeer seems to have been very common in

England, and to have swarmed in Wales. Colonel Wood succeeded in getting more than a thousand antlers "of species and varieties allied to the reindeer" from a fissure called Bosco's Den in Glamorgan, and even then he computed that several hundreds more still remained in the bone-earth of this cavern.* Lastly, the discoveries made by Mr. Dawkins prove, I think, as clearly as anything can be proved, that to the south of the Mendip Hills at least man was contemporary with the hyæna, rhinoceros, the Irish elk, mammoth, cave-bear, wolf, fox, and ancient horse.

In a cave in Languedoc the remains of an immense stag have been found along with barbed arrow-heads of bone, some having indented grooves probably for the application of poison; so soon did the deadly work begin. Along with these were found needles and a "flute-bevilled" tool of bone, a splinter or knife of flint and the horn of an antelope (?) hacked at the base, probably when the animal had been flayed.†

Fragments of bones of the aurochs, bearing marks seemingly made with an implement having a curved edge, were found on cutting the Canal de l'Ourcy, near Paris,‡ and as fossil remains of the same aurochs have been found in England, France, and Italy in preglacial deposits§ we have here one more reason which should make us hesitate about fixing man's era after the great winter.

M. Christol described some human bones as occurring in the cavern of Pondres, near Nismes, in the

* Quarterly Journal of Geological Society, 1860, p. 491.
† Ibid. p. 488. ‡ Ibid. p. 471. § Ibid. p. 473.

same mud with the bones of an extinct hyæna and rhinoceros. The cavern was in this instance filled up to the roof with mud and gravel, in which fragments of two kinds of pottery were detected, the lowest and rudest near the bottom of the cave below the level of the extinct mammalia.

The now famous gravel beds by the side of the Somme in Picardy contain bones of the elephant, rhinoceros, river-horse, stag, ox, and horse. Mr. Flower found two very fine tusks of the river-horse in the flint gravel of St. Roch, about half a mile from St. Acheul. Indeed of late so many proofs have been brought forward that the mammoth and many other extinct mammalian species very common in caves occur also in undisturbed alluvium, embedded in such a manner with works of art as to leave no room for doubt that the once favourite surmise that they had been washed into the caves must in most instances if not in all be given up.

When these remains were made known men hesitated to believe that they were genuine because it was quite clear from associated circumstances that man had here been contemporary with a still older group of animals, the fauna of the southern elephant.* This fauna is found in a fossil state in a layer of tuff covering the slope of Denise opposite to that from which the human relics were obtained. In this tuff are discovered remains of the great river-horse, the southern elephant, the older rhinoceros, antelope, short-snouted hyæna, "and twelve others of the genera horse, ox, stag, goat, tiger, &c., all supposed to be of extinct

* Elephas meridionalis.

species," while the human remains most probably belong to the era of the northern elephant and woolly rhinoceros.

Despite the incredulity expressed there seems little reason to doubt that the relics at Denise were genuine. M. l'Abbé Croizet who had great experience in collecting fossil bones in volcanic parts such as this specimen was taken from, and Laurillard who assisted Cuvier, gave an opinion to this effect. It was suspected that the different parts had been put together and plaster of Paris poured over them to bind them into a firm mass, but as there were fifty-four fragments in the exact position they ought to assume, this could only have been done by an expert anatomist, and no such person seems to have been mixed up in the affair.

Of course it is absolutely necessary to doubt at first in all cases even where the evidence is given with all good faith. In a determined raid made many years ago by some settlers in Australia against the natives the latter were hunted down with the most unrelenting fury, the settlers being roused to the highest pitch of vengeance by several murders and acts of violence which the natives had committed. But though they offered the most desperate resistance they had to succumb, poor wretches, before the deadly fire-tube of the white man. In one of these encounters a native fell mortally wounded by a rifle ball. Like the wild beast when hurt to death the savage crept to a cave which was near, and there unseen and uncared for he lay down to die. When years after his remains were found they were completely petrified; a tiny stream of water had fallen from the limestone roof of his tomb

and had carried with it enough lime to encase him in an indestructible shroud bidding defiance to decay. An enterprising showman stole the body looking upon it I suppose as public property, and though it was recovered he again got possession of it and what was more kept it.

Many such examples might be found, in fact petrifactions are often quite recent affairs. Of course geologists would not be deceived in such matters but others might. Not very long ago a letter appeared in the *Melbourne Argus* detailing the finding of three bodies turned into stone. They were petrified natives and were found in a stony creek fifteen miles from Castlemaine. "They are quite whole," says the writer, "and not wanting in the smallest details. When I saw them I thought they were actually alive, until on going closer I noticed the eyes. They are in a sitting posture, and the veins, muscles, &c., may be distinctly traced through what is now a group of stone blocks; they are in a splendid state of preservation; even the finger-nails, teeth, &c., *are as perfect as they were five hundred years ago*. One of them has a stone axe by his side without any haft." Here it is assumed that the petrified bodies may have been in their present position five hundred years because they are turned to marble, but so far as the facts go they do not prove that the bodies had been there five years.

In 1811 a bull which was lost in 1809 near Truro was found at the bottom of an old coal-pit, standing as if in the act of drinking, and perfectly petrified, and except that the hair looked like moss it was not much altered in appearance. Several attempts were made to remove this strange petrifaction, but the moss

always broke off, so that it was thought it would only be lost labour, and very probably the poor bull is still there.

As to the animals of Switzerland, we have told nearly all there is to say in the chapter on the First Builders. They belong to a later era and may be briefly said to be mostly contemporaries of the european bison or aurochs. The reindeer has not as yet been found among them; but this animal existed in Switzerland at a period which M. Lartet thinks much older than the time of the lake dwellings. But times had much changed even in their day, since the days when the old britons had to guard themselves against the ferocious tigers and the stealthy hyænas of England.

The honour of the discovery that man really waged war against the great pachyderms is due (under correction) to a name which, so far as I can discover, has not been mentioned by any of the writers who have entered upon the controversy, with the exception of Professor Wilson of Toronto. It is that of Albert Koch, who in 1841 published at Louisville an account of the finding of the missourium or mastodon of the Missouri, the skeleton of which creature now forms such a noble and imposing object in the British Museum, and furnishes certain proofs that this huge brute had been assailed by hunters. "Dr. Klipstein,* who then lived near Charleston, dug up in a comparatively undisturbed bed near that city the tusk of a mastodon lying alongside of a fragment of pottery. They were both buried in a deposit of peat and sand, but the value of

* Proceedings of the Academy of Natural Sciences, July, 1859.

the discovery is somewhat doubtful, and the date of the deposit far later.

"There was embedded," says Mr. Koch, speaking of his discovery in his quaint half-German half-Yankee style, "immediately under the femur or hind-leg bone of this animal, an arrow-head of rose-coloured flint resembling those used by the American Indians, but of larger size. This was the only arrow-head immediately with the skeleton, but in the same *strata*, at a distance of five or six feet in a horizontal direction, four more arrow-heads were found; three of these were of the same formation as the preceding; the fourth was of a very rude workmanship; one of the last-mentioned three was of agate, the others of blue flint. These arrow-heads are indisputably the work of human hands. I examined the 'deposit' in which they were embedded, and raised them out of the 'embedment' with my own hands."

Mr. Koch distinctly expresses his belief that there was a human race "existing contemporary" with the mastodon, and that the fact of their remains not having been found was owing to these "relicts" of the ancient world having been generally investigated by persons not aware of the necessity for a minute examination—a view which he supports by the following narrative:—

A farmer living on the banks of the Burbois river in the Gasconade country, Missouri, remarked a very disagreeable taste in the water used for household purposes. It was taken from a spring near the house, and in order to get rid of this nuisance he dug round the spring with the view of making it into a well. While doing so he brought to light several bones

belonging to an animal of unusual size, and along with them a stone knife and an Indian axe. The affair was talked of throughout the whole neighbourhood, and Mr. Koch hearing of it started off to see the remains.

On his arrival he found that most of the bones had been destroyed, having been dug out carelessly and exposed to the air. Some had been broken to see if they contained any marrow! An intelligent gentleman however of the name of Baily had collected others which he gave to Mr. Koch. They appear to have belonged to one of the gigantic extinct sloths. On making further search Mr. Koch found nine feet below the surface close to the site of the remains a layer of ashes mixed with charcoal, large pieces of wood partly burnt, together with Indian implements of war as stone arrow-heads, tomahawks, &c., and above a hundred and fifty pieces of rock which had evidently been brought from the river three hundred yards off and thrown at the animal. Some of the animal's teeth had been broken by the blows and had escaped the fire with which the hunters had sought to finish their work.

Whether the animal Mr. Koch found lost its life by hunters or had perished in a tornado as might be inferred from the circumstance he mentions of some of the trees, the fragments of which were found near the animal, "having been torn up by the roots and twisted and split into a thousand pieces apparently by lightning combined with a tremendous tempest," it is certain that the finding of the arrow-heads in both cases so near the bones of these monsters coincides far too strongly with modern discoveries to have been

mere chance. It is also to be remarked that along with the skeleton were found leaves of the cypress, great part of a huge flower and several stems of the palmetto, in themselves evidence that if man had not yet appeared on the scene his hour was at hand.

Mr. Koch has endeavoured to prove that his missourium was the leviathan of Job. The strength of jaw, the faculty of trumpeting, the toughness of skin, the ferocious and formidable appearance, the teeth "terrible round about," the strength of the neck (showing that the leviathan was not a crocodile which has no neck), are to a certain extent in favour of the view; but the present writer must express his conviction that so far as ascertained proofs go the animal meant in Job was the mammoth or river-horse.

If science and religion can alike appeal to rude tradition for confirmation of such mighty events as the Deluge, if both can find in the concurring legends of tribes scattered far apart proofs which even the most sceptical dare not refuse, the writer may be pardoned for seeking to rescue from oblivion a fragment of the hoary eld singularly in keeping with the views now so generally adopted.

In far distant ages the Indian steered his canoe over what are now the vast prairies of Missouri. At a certain epoch an army of gigantic brutes (the mastodons, &c.) came from the east and mounting the Mississippi and Missouri rivers, a furious battle began between them and the native monsters of those rivers. Great numbers fell on both sides, but after several desperate combats the intruders seem to have prevailed and resumed their march towards the setting sun. The greatest of all these fights took place near the

bluffs now known as the Rocky Bridge; and, as soon as the fight was over, the Indians gathered together many of the slaughtered animals (strangely confirming the burning of the great sloth by the Burbois river) and burned them as a sacrifice to the Great Spirit, who, according to their traditions, himself buried the rest in the Bigbone river. Thither in the happy days of old the Indians went yearly to offer up near the spot their thanksgivings for deliverance from these formidable creatures. But as years rolled by the pale-faces came, and a settler sought to build his homestead on this fertile part of the land. The Indians lighted the council-fire and smoked the red calumet of war, and the white man was glad to fly. He came again; but some old chiefs returned and expelled him, and from that day until the strong hand of government removed them, no bribe could induce them to give up this hallowed ground. When they had quitted it the settler came again, and one of the first things he did was like the patriarchs of old to dig a well. Here he found several bones of young mastodons and might have found more but that he had to give up digging. Soon after this the place was sold, and then a young man employed to clean the spring found a mastodon's tooth. Others came and found more bones, until at last in March 1840 the matter reaching Mr. Koch's ears he repaired to the spot and disinterred the remains of the mastodon, which he afterwards exhibited at the Egyptian Hall.

Every land that has a history can tell how its first kings and giant warriors conquered and ruled the earth. In the East perhaps more than in any other clime these dreams have not only maintained their

vitality, but in some cases have been invested with a splendour and reality denied to the tales of more sober Europe.

A good half century ago the son of a London alderman reproduced one of these dreams in a work (Vathek) which the author loves to class among the grandest productions of the human mind. One of the finest pictures in it is that of the pre-Adamite kings, their fleshless forms stretched upon beds of incorruptible cedar. How strange if the dream should prove the echo of a true legend,—if those whom they called their pre-Adamite kings were the chieftains and lords of races before the historic times—if the hammer of the geologist should forge a chain to bind together the dim traditions of the land of Firdousee and Zoroaster, of Haroun al Raschid and Zobeyde—the brilliant and awful imagery of Job—the gorgeous dreams of Beckford—the long-forgotten legends of the hapless Ottawa Indians—and the discoveries of a Frenchman in the valley of the Somme!

We have now done with most of the questions immediately belonging to the finding of primæval man. It only remains to see what were the food and weapons, the habits and tastes of the ancient briton, the real old english gentleman.

Those who are inclined to feel a deep interest in our forefathers will be gratified to learn that there must have been plenty of food for them and that most likely they were able to take very good care both of themselves and their households. The bison, musk buffalo, mammoth, and great stag must have been valuable articles of commissariat, and from his very first appearance he seems to have known how to overcome

them with his rude weapons. It does not look much as if ever—

> "Man walked with beast joint tenant of the shade,
> The same his table and the same his bed:
> No murder clothed him and no murder fed."

If the ancient britons had the appetites of Laplanders, two of whom it is said can eat half a reindeer without bread or salt,—of the Yakouti or Tongousi who devour forty pounds of meat a day, tossing in such matters as a few pounds of frozen butter and candles as side dishes or pastry, one of whom ate before the eyes of Saritchoff twenty-eight pounds of rice porridge for breakfast,—or of Du Chaillu's Africans who got through crocodiles, leopards, gorillas, and elephants at such a rate that fifty pounds of meat for a few days was looked upon as short commons—it must still have taken hard work to struggle through an elephant weighing as much as ten prize bulls or an aurochs four or five times as big as a dray-horse. Nor were they without luxuries. Cod, mullet, carp, salmon, herring, &c., peopled the ancient seas and rivers, quite distinct it is true from the fish of our day, but most likely very good eating if our forefathers knew how to cook them, which is rather doubtful. They are all gone now; the rude hunters and fishers of that time sleep like their prey in tombs of monumental clay, no more to hunt by wold and stream.

"We learn," says Lyell, "from the Danish peat and shell mounds and from the older Swiss lake settlements, that the first inhabitants were hunters who fed almost entirely on game, but their food in after ages consisted more and more of tamed animals, and

still later a more complete change took place to a pastoral state accompanied, as population increased, by the cultivation of some cereals."

To judge by the drawings and descriptions of their weapons, taken from those found in the valley of the Somme, the hyæna cave in the Mendip Hills, &c., these were principally of two kinds, one having a spear-headed form varying in length from six to eight inches, the second the oval form which is not unlike some stone implements used to this day as hatchets and tomahawks by natives of Australia, but with this difference that the edge in the australian weapons (as in the case of those called celts in Europe) has been produced by friction, whereas the cutting edge in the old tools of the valley of the Somme was always gained by the simple fracture of the flint and by repetition of many dexterous blows. The implement found by Mr. Horner* in a gravel-pit near Amiens is shaped like a wedge, and may have been used as such.

"The oval-shaped australian weapons however differ in being sharpened at one end only. The other, though reduced by fracture to the same general form, is left rough, in which state it is fixed into a cleft stick which serves as a handle. To this it is firmly bound by thin straps of opossum's hide. One of these tools now in my possession was given me by Mr. Farquharson of Haughton, who saw a native using it in 1854 on the Auburn river in Burnet district, North Australia."†

Some of these in England and France were pro-

* Quarterly Journal of Geological Society, 1860, p. 190.

† Lyell, "The Antiquity of Man."

bably made like some of the hammers in use in primitive districts, in which a stone or piece of iron, rudely shaped, is fixed in a cleft in the middle of a long piece of ozier or hazel; the ends are then plaited into the form of a coarse thong: with this weapon a terrific blow can be given. Flint knives are often spoken of, but I see nothing that can be with propriety classed under this head.

"In the gravel-pits of St. Acheul, and in some others near Amiens, small round bodies having a tubular cavity in the centre occur. They are well known as fossils of the white chalk. Dr. Rigollot suggested that they might have been strung together as beads, and he supposed the hole in the middle to have been artificial." Till we know more of their use we can scarcely include them among the weapons of the flint age.

With these rude weapons then the ancient savages sought their prey, made war upon each other—man against man and tribe against tribe. The spear-heads of flint were most likely bound tightly to a shaft, equally rude, shaped by their rustic dexterity with the cumbrous flint axe. Mr. Prestwich supposes that during the long winters of the climate in which they lived, and during which the rivers were often frozen over for months together, their flint weapons may have served for breaking through the ice in order to trap the fish as is now done in Canada.

The surface of many of the tools is encrusted with a film of carbonate of lime, while others are adorned with beautiful delicate little crystals, called dendrites, composed for the most part of oxides of iron and manganese, forming extremely delicate, blackish-

brown sprigs, very like the smaller kinds of seaweed. "They are a useful test of antiquity when suspicions are entertained of the workmen having forged the hatchets which they offer for sale. The most general test however of the genuineness of the implements obtained by purchase is their superficial varnish-like or vitreous gloss as contrasted with the dull aspect of freshly fractured flints." But it is rather doubtful if either test can be implicitly relied upon.*

In the chase the flint-headed spear was most probably their chief reliance—no trace of the bow has been found, and the sword only appears with the age of bronze—ages after these old times. Nor is the savage who knows how to handle the spear so despicable a foe or so helpless as might be supposed. Colonel Mundy saw a little Australian hurl his spear into the very centre of a target with such force that, though the weapon flew quite sixty yards, the warrior had to exert all his strength with his foot fixed against the tree to withdraw it. Captain Cook always thought the doings of Homer's warriors were a little, just a thought, overdrawn till he saw the feats of these savages, and nothing struck him more than the clang of their spears as they marched with one in either hand, shaking them with all the air of Jove-born Sarpedon, or beauteous Paris himself:—

> "Two pointed spears he shook with gallant grace,
> And dared the bravest of the grecian race."

The white, unless armed with a first-rate rifle, has no chance against the Tasmanian, who, if clever at his

* Lyell. The Antiquity of Man.

calling, will, even when unarmed, soon hunt down the bushranger. Hovering just out of range of the fowling-piece the black glides like a snake through the tough scrub and underwood, tracks him over the grass like a bloodhound, and when at last hunger drives the bushranger to fire off his charge at some bird or opossum, closes in upon him and brings him down with a running fire of stones hurled with such aim and fury that the white man is certain to fall. If he tries to return the fire the other eludes him with the ease of a deer. An old chief allowed Colonel Mundy to pelt him with stones at twenty yards off, but, though the Englishman was no contemptible shot, he might as well have aimed at a will-o'-the-wisp. These men can throw the boomerang almost twice as far as the most athletic cricketer can fling a ball, and with the throwing-stick they launch a dart through the skin of the deer or kangaroo quite a hundred yards off.

I could cite many other instances even amongst those savages who cannot in any way have been supposed to have derived assistance from more civilized nations, but I will limit myself to one. The Laplanders, travellers tell us, soon acquire such speed in travelling on their singular snow-shoes, which are "two ells long and half a foot broad,"* that they outstrip every animal they go in chase of, and when pursuing divers they launch or hurl a rod at them with such wonderful accuracy of aim as very frequently to kill the bird, and thus in a single foray to obtain great numbers of them.

* Regnard's Journey to Lapland, 1681.

As there is always a superfluity of those persons who can explain everything in the same off-hand style from an astronomical problem to the reasons why a prime minister cut his friend in the park, and who are far more ready than is necessary with their

"Wise saws and modern instances,"

I quite expected before this that we should have been enlightened about these flint instruments and the material connection between necessity and invention. It is almost a pity no one of them has as yet done so, as some person bent on discomfiting him might have put him down, and what is still more, have put down the wretched hollow old saying at the same time, and thus we should have got rid of two nuisances at once.

What a miserable deception it all is about necessity being the mother of invention.* The grandest triumphs of inventive art—steam, gunpowder, the clock, the telegraph, printing, gas, &c., were not the work of necessity,—for that matter men could have fought, travelled, sailed, and written without them, not so well as now, but still without them for ages to come. So little necessary were they that it was hard work to get men to use them at first. They were all the offspring of chance-work—it was genius that converted them into necessaries, that made them fit for every-day life. No invention ever sprang up among starving men; and as to savages, they will hunt for refuse and offal, grub up roots, tear away the coarsest shell-fish from the rocks to devour it raw, and at last lie down to die of hunger without once discovering

* "Inventrix consiliorum omnium necessitas."

such a simple thing as a net or snare. As the man is in nature, such will he be in these things. It is his original constitution of mind which teaches him how to forge arms, erect forts, build ships, and enact laws, that makes one race polished in arts and letters, and the other savages till the end of their time on earth.

It does not seem very easy to understand how they made these flint weapons. The process appears to have been effected in every instance by chipping off pieces till they attained their present form—indeed those found in England and France have most evident marks of having been made in this way. It certainly must have required an apprenticeship to learn the light firm touch which alone could break off the required thickness without cracking or splitting the flint so as to spoil it. If the reader will take a dozen or two flints and amuse himself for an hour or two, as I have often done in sea-sidey hours, with trying to make a flint axe or arrow-head, he will see that it is by no means easy to get even an effigy of the old english weapon. Mr. Tylor says he has heard, on good authority, that somewhere in Peru, the Indians make their obsidian knives by laying a bone wedge on the surface of a pica of obsidian and tapping it till the stone cracks. The Aztec obsidian knives are certainly much better finished than those of flint and agate; but once the great difficulty of getting a straight strip out of the mass is overcome, the forming such tools out of obsidian, I should say, is easier work. Mr. Tylor however thinks that even the artist who now makes the flint arrow-heads for english antiquarians would be rather puzzled to manage with obsidian.

Torquemada says the Mexicans made obsidian knives in this manner. "One of these Indian workmen sits down upon the ground and takes a piece of this black stone, which is like jet and as hard as flint. The piece they take is about eight inches long or rather more and as thick as one's leg or rather less, and cylindrical—they have a stick as large as the shaft of a lance and three cubits or rather more in length; and at the end of it they fasten firmly another piece of wood eight inches long to give more weight to this part (so as to make a T-shaped wooden plane); then pressing their naked feet together they hold the stone as with a pair of pincers or the vice of a carpenter's bench. They take the stick (which is cut off smooth at the end) with both hands and set it well home against the edge of the front of the stone, which also is cut smooth in that part, and then they press it against their breast, and with the force of the pressure there flies off a knife (meaning I suppose a sliver or strip) with its point and edge on each side as neatly shaped as if one was to make them of a turnip (!) with a sharp knife, or of iron in the fire. Then they sharpen it on a stone, using a hone to give it a very fine edge, and in a very short time their workmen will make more than twenty knives in the aforesaid manner. They will cut and shave the hair the first time they are used, at the first cut nearly as well as a steel razor, but they lose their edge at the second cut." * Mr. Tylor says it is clear that the workman held the cross piece with his two hands against his breast while the end of the straight stick rested on the stone. The art of working obsidian is now lost.

* Torquemada. Monarchia Indiana, quoted in Tylor's Anahuac.

From Lyell's work we learn that among "other articles outside the entrance of the burial-place at Aurignac in the south of France was found a stone of a circular form and flattened on two sides with a central depression, composed of a tough rock which does not belong to that region of the Pyrenees. This instrument is supposed by the Danish antiquarians to have been used for removing by skilful blows the edges of flint knives, the fingers and thumbs being placed in the two opposite depressions during the operation."

"It has often been asked," says the same writer, "how without the use of metallic hammers so many of these oval and spear-headed tools could have been wrought into so uniform a shape." Mr. Evans in order experimentally to illustrate the process constructed a stone hammer by mounting a pebble in a wooden handle, and with this tool struck off flakes from the edge on both sides of a chalk flint till it acquired precisely the same shape as the oval tool which Sir Charles has figured in his work.*

In the *Gentleman's Magazine* (July, 1863) there is a letter on "The Fraudulent Manufacture of Flint Implements" recently detected at Winchester. They were offered for sale by a poor labouring man, who stated that he had found them in a barrow about eight miles from Winchester. Upon being much pressed, however, the man confessed the forgery, and for a small consideration showed the correspondent the art and mystery. "Pulling out of his pocket a small, dirty bag, he took from it a common carpenter's

* Antiquity of Man, p. 115.

awl and the hasp which goes over the staple of a padlock, and then taking from another pocket some pieces of flint, he sat down, and holding the flint dexterously between his thumb and finger, and resting his hand upon his knee, he soon formed a beautiful specimen (which is engraved with others in the *Gentleman's Magazine*). The awl he used for making the angles at the base and rounding the barbs. The man's skill and quickness were remarkable, *being,* as he stated, *the effect of several years' practice in this art.* It should be added that the long portion of the hasp formed the handle, and the circular part the hammer on which he broke the flints." Professor Daniel Wilson has figured some flint implements from Honduras which far surpass in the skill they must have required any of the weapons discovered in Europe. One of them with five points springing from a crescent is seventeen inches long.

Hugh Miller says that the yellow chalk flints found in Banff and Aberdeen have only been known of late to the modern Scotch, but that before the age of iron their value for making weapons was quite understood. "I have never yet," he says, "seen a stone arrow-head that had not been fashioned out of this hard and splintery substance. These old Scotch warriors were mineralogists enough too, as their stone battle-axes testify, to know that the best tool-making stone is the axe-stone of Werner."

Mr. Dawkins in a paper read to the British Association said that the flint weapons in the Wookey-Hole hyæna-den had been made from flints brought from the chalk downs of Wiltshire, the least fragile chert of the green sand of the Blackdown hills.

The ancient Scots had moreover a rude knowledge of the chemistry of fire. Long before they knew the use of mortar or to dress a stone they were aware that by the aid of fluxes they could melt the surface of stones into one solid mass. "I have been informed," says the same writer, "by Mr. Patrick Duff of Elgin that he found, in breaking open a petrified fragment detached from an ancient hill-fort, distinct impressions of the serrated kelp-weed of our shores"—the very same flux once used so extensively in our glass-houses.

As to the character of the earliest inhabitants of our isle one can judge so far almost solely by the weapons. Far too few human remains have been found to enable us to form any sweeping conclusions, and it would be premature to judge of the ancient english skull by those of the ancient danes, flemings, or teutons, who very possibly belonged to a very different race.

The conclusion arrived at by Professor Schaffhausen respecting the Neander Valley skull was that it belonged to a creature with a very small brain, and Huxley told Sir Charles Lyell that it was the most apelike head he had ever seen. He agrees with Schaffhausen and Busk in considering it as the most brutal of all known skulls, resembling that of the ape in the projecting lowering eyebrow and flattened form of the front and top of the head. In fact there is little more room for brains in it than in that of a chimpanzee. Indeed when it was first shown doubts were raised as to whether it belonged to a man or not. The forehead is extremely flattened and the bones of the lower part of the forehead overhang the eyes to such

an extent as must have given this beetle-browed race when living a look of the greatest and most repulsive ferocity. But for all this Professor Huxley says that in no sense can the Neanderthal bones be considered as the remains of a being intermediate between man and apes.* What the creature wanted in wit he made up for in strength, the bones of the thigh, arm, and forearm, though not larger than those of a European, being of such thickness and marked with such ridges and hollows for the attachment of muscles as leave no doubt of his being a creature of the most formidable character—a human gorilla in fact, but an armed one. Huxley however, though he allows the bones to be larger than those of the European, with the muscular ridges greatly developed, does not appear to consider them entitled to the character of being enormous, and he remarks that the Patagonians who possibly live now in much such a climate as the Neander Valley man, are remarkable for the stoutness of their bones.

The skulls taken from the tumuli at Borreby in Denmark, one in particular, approach in character that of the Neanderthal, but the other skulls taken from these Danish mounds are of a higher class, having better foreheads. These Borreby skulls belong to the stone age of Denmark, and this race was either contemporary with or most likely later than the races who left behind them such enduring marks of their abode in the heaps of shells.

The Engis skull, though its character cannot be so well decyphered, seems also to have belonged to quite

* Man's Place in Nature, p. 157.

a low type. When first looked at what little could be made out of it pointed to the conclusion that this ancient flemish race was somewhat like the Ethiop or negro. Some more fragments have been added to those on which Schmerling's observations were first made, a cast of the whole was submitted to Huxley who made a full report thereon quoted by Lyell. We will not if you please follow the professor through his admirable report. He pronounces the form to be dolicho-cephalic or longheaded, gives the measurements of the glabello-occipital line, longitudinal arc, &c., with all the care and accuracy one might expect from such a distinguished observer. My principal matter is with the fact that though the older it apparently belongs to a much higher class of head than either the men of the Neander Valley or the Danes of the Borreby mounds. It is as far in development above the australian skull as the Neander skull is below it. All this it may be observed is based upon the assumption that in these relics we have before us fair average samples of the people of that day, and not merely accidental departure from the ordinary type, such as we see daily in the very same race, who often differ as widely one from another as the Engis head from the german, a point on which I lay little stress myself, believing that the savage race and ape class differ much less from each other, in this way, than civilized races.

We then conclude that so far as evidence before us goes that a higher class of men was succeeded by a race scarcely above the brutes, and Lyell warns us against "the expectation of always meeting with a lower type of human skull the older the formation in which it occurs," a view which is based on the theory

of progressive development and may prove to be sound; "nevertheless we must remember that as yet we have no distinct geological evidence that the appearance of what are called the inferior races of mankind has always preceded in chronological order that of the higher races."

But is there any reason even in this low formation of skull for concluding that this race of men were a stage between the ape and man? We are told that "it is now admitted that the differences between the brain of the highest races of men and that of the lowest, though less in degree are of the same order as those which separate the human from the simian brain, and the same rule holds good in regard to the shape of the skull." But if geology teaches such facts it simply leads men into a quicksand. No ape shapes a spear-head, or forms the rudest axe, spreads a pit-fall, kindles a fire, or weaves a garment. Still with these marks of greater craft it is only too doubtful if in many respects man stands as high as the ape in the scale of created beings. The name of savage but too often means the union of the worst features of the human race; the noble savage is a creature who maims and beats women, leaves the old to perish of hunger or strangles or drowns them, feeds on his fellow men, and looks upon murder, theft, treachery, and lies as feats worthy of a chief and a brave; a wretched gloomy thriftless and hopeless creature living like the wolf, dying like the worn-out beasts of prey, and if he believes in anything beyond this world, a prey to the most abject superstition.

It is a most singular and interesting fact that these powerful races should have been succeeded by such a

feeble little people as the lake dwarfs seem to have been, apparently a gentle inoffensive race, even below the little men of the age of bronze who succeeded and perhaps exterminated them. As we shall soon have to enter upon the history of the lake dwarfs I leave this part of the subject for the present.

What is the age of the man of the flint weapon, the first dweller upon earth so far as we yet know?

Sir Charles Lyell's opinion is most decidedly that man, notwithstanding the great distance of time at which he lived, has only been traced back to a period after the great winter. "One step at least," he says, "we gain by the Bedford sections which those of Amiens and Abbeville had not enabled us to make. They teach us that the fabrication of the antique tools and the extinct mammalia coeval with them were all post-glacial, or in other words posterior to the grand submergence of Central England beneath the waters of the glacial sea." In general we only track man to the boulder clay. Certainly had he been here when the great winter came, when the hour drew nigh which was to wrap the earth in one vast winding-sheet of snow and bury it beneath the thick-ribbed ice, when life in the beast and bird, in the tree and grass, was struck down as though a lava flood had swept over it, and every mound was crusted with the pale blue glaciers and every stream iron-bound in ice, his lot must have been most dreadful. Nothing now on earth could compare with it, not even the state of the hapless savages of Tierra del Fuego, who everlastingly starved with the cold of their horrible climate, shivering even in summer in the raw chilly breeze, covered with filth and vermin, "live in one of the most inhospit-

able climates in the world, without having sagacity enough to provide themselves with such conveniences as might mitigate its severities, and render life in some measure more comfortable." "The very outcasts of humanity, amidst eternal fog and ice they gain their scanty and precarious living almost solely by preying on the raw shell-fish of those wintry coasts." How like the poet's dream of man in his native state.

> "To their supper fruits they fell,
> Nectarine fruits! which the compliant boughs
> Yielded them, sidelong as they sat recline,
> On the soft downy bank damask'd with flowers."

With the comfortable prospect of sleeping afterwards on the flowery couch,—

> "Pansies, and violets, and asphodel,
> And hyacinths; earth's freshest softest lap."

Lyell however is extremely cautious about drawing the conclusion that because we cannot trace man back beyond the great glacial period, he therefore did not exist. This mighty catastrophe, he justly argues, might have so utterly destroyed every trace of him that we might long seek for them in vain. He says, if there were a few wanderers over lands covered with glaciers, or over seas infested with icebergs, and if a few of them left their bones or weapons in moraines or in marine drift, the chances after the lapse of thousands of years of a geologist meeting with one of them must be infinitesimally small. Mr. Dawkins, in a paper read to the British Association, speaks of the bones of the lion and rhinoceros hemitæchus being found in Wookey-Hole den along with flint and chert implements; both these creatures are pre-glacial.

It would be indeed very premature to judge at present. Could we even carry man back to the days before the great winter, his time upon earth would be as yet but a span. But an attempt has been made to refer the appearance of man in one part of the globe, geologically speaking, at least much further back; and perhaps the strangest thing yet told of Australia is that she is now in a state much resembling that of parts of the secondary period, and that man is living there. "I believe," says the Reverend Julian E. Woods,* "that the present state of this part of Australia (the south) is very similar to what Europe was *immediately after the second period*, and that really in regard to the development of its fauna and flora this continent is far behind the rest of the world." I think if the author had compared it to England during part of the secondary period instead of after it, he would not in any way have strained the analogy. In the flora the correspondence to the secondary period is well marked. There are represented the Araucariæ, so common to this great era in Norfolk Island and Australia. There are found the Zamiæ, closely allied to species met with in secondary deposits.†

Now, we know that man exists in Australia in a sad rude benighted state certainly, leading a precarious life at times, and never having too much to eat and drink, but still living pretty well upon the whole; and the very fact, says Mr. Woods, that man finds an easy and very comfortable subsistence in Australia which, whether my principle be admitted or not, is behind

* Geological Observations in South Australia.

† See Appendix 14.

other countries in natural development, proves the perfect adaptability of the earth as a residence for man at other periods. We also know that the Australian heaps up the shells of shell-fish in mounds which represent the "refuse-heaps" or "Kjokken-möddings" of Denmark, and finally, that on the other side of Torres Straits, a race akin to the Australians are among the few people who now build their dwellings like the extinct lake people who lived at so remote a date from our earliest traditions.

In the time of the ancient people the country was so totally dissimilar from what it is now—broad stretches of land running across the channel, and perhaps quite a hundred miles into the Atlantic, with much that is now land of Norfolk and Kent, then under water and islands,—that without a map I should despair of conveying an idea of it. As to the climate, I believe it must suffice to say, that it appears to have been cold and wintry; the soil bearing chiefly the alder, willow, oak, hazel, and similar trees, adapted to endure a low temperature and little genial weather.

CHAPTER III.

THE FIRST BUILDERS.

"Maestro mio, or mi dimostra,
Che gente è questa."

THE LAKE DWARFS OF SWITZERLAND.—The singular settlements of the lake people of old Switzerland which have recently attracted so much attention, were, as is now pretty generally known, first brought to light about ten years ago, during the dry winter of 1853 and 1854, when the waters of the lake of Zurich having fallen much lower than usual, the townspeople of Meilen, on the borders of the lake, decided upon taking advantage of such an excellent opportunity to reclaim some part of the bed of the lake. This was done by dredging up the mud from the nearest part and heaping it upon the part to be reclaimed, and it was during this process that they discovered, that deep in the ground there were ranged a quantity of small wooden piles, among which lay scattered ancient hammers, axes, celts, and such like implements. Except an amulet or bracelet of brass wire and a small bronze hatchet, they all belonged to what geologists call the stone age.

We are indebted to Dr. Ferdinand Keller for an excellent account * of some of these invaluable relics which he has illustrated. This gentleman has also

* Antiquarische Geschschaft in Zürich, b. 12, u. 13, 1858 u. 1861.

figured an ideal picture of what these quaint old villages must have been in far-off times when they were the homes of a long-lost race, and ere

> "The waves had roll'd
> Above the cities of a world gone by."

M. Troyon has also given a most lucid and valuable description of the lake buildings in his recent work,* also accompanied with illustrations not only of the buildings, but also of the weapons belonging respectively to the age of stone, bronze, and iron. The reader who is desirous of going thoroughly into the subject will find it very carefully treated in Lyell's "Antiquity of Man" and in the writings of Lubbock and Wylie.† Here my limits as well as the nature of the subject compel me to restrict myself almost entirely to a notice of those discoveries relating to the age of stone, confessed by all writers to be the first age in the life of man.

It seems according to Dr. Keller that even as recently as the eighteenth century there were several fishing-huts on the river Limmat, near Zurich, constructed on much the same plan as those of the old lake people. In this there is nothing improbable. Similar abodes are made by the Papoos of New Guinea, in the Bay of Dorei, and by some of the people of Borneo; there seems also little doubt that the crannoges of Ireland, alike in purpose if not in structure, were continued in Ireland in the lakes till a comparatively recent period; and even now the fishers by the Volga raise their reed cabins in the middle of the streams.

* Habitations Lacustres par Fred. Troyon, 1860.

† Archæologia, vol. xxxvii. 1859.

In the lakes of Switzerland these dwellings seem to have been very numerous. M. Troyon and others give facts which can only lead to the conclusion that these old waters were once thickly peopled. The settlements are found in the large lakes of Constance, Zurich, Geneva, and Neufchatel, besides several of the smaller ones. According to Mr. Lubbock, who explored them in company with MM. Morlot and Sutor, twenty-four have been found in the Geneva lake and twenty-six on lake Neufchatel. Some belong to the age of stone and flint, others to the bronze age. Amongst the oldest may be reckoned the towns of Meilen, Wangen, Moosseedorf, and Wauwyl.

The reader will find in the second volume of "All the Year Round" a capitally written account of the discoveries made at Moosseedorf. When this small lake was drained the long-deserted habitation of a colony of the lake people was brought to light. From the account there given and others we find that a vast advance had been already made beyond the life of the gravel-buried races, for fragments of pottery were found, chisels, hatchets, poniards, needles, a wooden saw or hatchet, with holes to let in flint-teeth,* &c. There were also flint implements, arrow-heads of rock-crystal, bone, &c. The most striking feature is the extreme smallness of the people, they were the tiniest, nattiest folks ever yet heard of. Their quaint little saws are three inches long, the hatchets still smaller; a pretty baby-hatchet one is called. It is portrayed as "a piece of serpentine not two inches long, very well sharpened however, and inserted with wonderful firm-

* Troyon. Habitations Lacustres.

ness into a detached portion of stag's horn;" "a dandy poniard" was found, consisting of a polished piece of horn about four inches in length fixed in a piece of antler. A bracelet was picked up on the skeleton of a full-grown person; a child could scarcely have put its hand through it. Professor Troyon told the author of this communication that the only person he ever saw who could slip on one of these bracelets was a Peruvian lady, the last descendant of Montezuma! Even a bronze sword, belonging apparently to a later and bigger race, was so small that Professor Troyon, whose hand was by no means large, could only get three fingers on the handle.

They were heavy swells in their way and stuck up their hair with pins of bone, covered their fingers with rings and adorned their wrists with weighty bracelets; on their necks they wore collars of deer antlers, and on their breasts were teeth of the great bear, doubtless to impart to their hearts the courage of that redoubtable brute. They had also their sports, for large stone quoits or disks have been dug up, and pierced nuts have been found which are supposed to have served as rattles to still the infantile turbulence of early days. The first discoveries made at Moosseedorf showed only knotted garments made something like a very fine fisher's net, but some excavations in the old bed of the lake Pfäffikon, near Zurich, proved that the lake-dwellers on this site at least were well acquainted with weaving and tanning. "Woven linen stuffs," says Mr. Wylie in a letter to the *Times*, "and flax in every stage of preparation were found. Leather also was found in a condition which permits the inference that the art of tanning was also known there." This

Moosseedorf like some other places seems to have been a great manufacturing site, division of labour having been carefully carried out; in fact it was a Geneva or Birmingham.

They must then have dwelt in a little Venice with a causeway, and have spent their domestic hours of life in little cabins on foundations of tiny piles not thicker than hop-poles, much as the Aztecs seem to have done who first began by settling in a few swampy islands in the lake of Tezcuco; for the first beginnings of Mexico were a cluster of huts built upon wooden piles, though it afterwards grew into a huge city, with canals running through the streets. To this day the Mexican women spin with just such a spindle as the lake women used. "They are very simple," says Tylor, "like very huge button-moulds and a thin skewer stuck in a hole in the middle makes them ready for use."*

It is generally asserted that the earliest historical accounts of such habitations are those given by the father of history, old Herodotus, in his description of the Pæonians, who dwelt in just such settlements in a small mountain lake called Prasias in Pæonia, now a portion of Roumelia. This was in the sixth century before Christ. They were a race of rude fishers who fixed their abode in the lake for the sake of the fish which the lake yielded in plenty, and dwelt there in great numbers. Their dwellings were reared in the middle of the lake for the sake of safety,† and must have been strongly constructed as they kept their horses there. The old swiss lake people on the con-

* Anahuac, 201.

† Wylie. Archæologia, vol. xxxvii. 1859.

trary were compelled by the constantly increasing depth to build near the shore. A still more primitive form of dwelling than even that of the Pæonians is shown in some of the Assyrian bas-reliefs, representing people living on artificial islands formed of interlaced boughs, probably either anchored to the ground by large stones or tethered to the shore.

It has been calculated that some of these swiss settlements contained as many as three hundred little houses. Allowing three or four people to each hut they must often have held as many as a thousand souls. The huts have been estimated at ten to fifteen feet in diameter, so that there was a fair supply of sleeping room for a rude age of fishers. Some of these villages rested upon many thousand piles.* "At Wangen, M. Lohle has calculated that forty thousand piles were used, probably not all planted at one time, nor by one generation."

The little Swiss fed on wood raspberries, wild plums, and corn. Carbonized apples and pears of small size, such as still grow in the swiss forests, stones of the wild plum, seeds of the raspberry and blackberry, fir apples and beech nuts also occur in the mud, and hazel nuts in great plenty. In fact, the flowers and plants which existed then exist now ; the only difference yet revealed is that the water-chestnut and the dwarf lake rose or *nymphæa*, which are now no longer found in the lakes of Switzerland, then grew abundantly in them. The resemblance thus shown between the climate of this and that of four thousand years ago may be considered a fatal blow to the

* Revue des deux Mondes, Février 15, 1862.

theory of polar deluges, propounded by Adhemar and afterwards embraced by MM. Le Hon and Jouvencel.

They fed also on the elk and stag, the wild boar, the ox and goat, and possibly on other animals, as the bones of the fox, bear, beaver, the badger, the common martin, the polecat, the ermine, the weasel, the otter, fox, wolf, wild cat, hedgehog, squirrel, field-mouse, hare, two kinds of pig, the wild boar, and the swamp hog, the great stag (cervus elephas), the roe deer and fallow deer, the steinbock, the chamois, the lithuanian bison, or aurochs,* and the wild bull, tortoise and cat were found. There were also found "eighteen species of birds, the wild swan, goose, and two species of ducks being among them, also three reptiles including the eatable frog and freshwater tortoise, and lastly nine species of fresh-water fish;" so that after all these little people did not fare so very badly. The watch-dog guarded their stores at night and bayed by their dwellings; they cultivated fruit-trees and made a kind of cheese in vessels pierced with holes. Traces of barley and bread have been found. In fact, except that they had no eggs and poultry, they seem to have lived on the fat of the land and kept house like a jolly old baron at Yuletide.

Nearly all these animals are still living in Europe if not in Switzerland. The wild bull, which as before stated survived in historical times, and the great stag have long been gone. The bones of the bison and wild bull are always split. The rein-

* Lyell; Antiquity of Man. Lartet; Quarterly Journal of the Geological Society, 1860, p. 475.

deer has not yet been found in the swiss settlements, indeed all the animals are far more recent than those with which man was contemporary when he abode in the caves of the Mendip and Brixham. Although they ate the fox they seem to have abstained altogether from the hare, only a fragment of bone of this animal having been found at Moosseedorf; possibly they had the same superstition about eating it as the old britons had and as the laplanders now have. A great deal of importance has been attached to this discovery, though I do not myself lay much stress upon it. In such matters tastes sometimes change suddenly, and from causes which often cannot be known. Foxes and seals were eaten at the table of Charles the Fifth, perhaps much later. In a bill of fare for 1800 at an inn in Bristol, the land tortoise, sea pheasant, mew, curlew, swan, quist, peahen, sea magpie, and cuckoo! are mentioned among the eatables. As a boy I can remember an old man who used to go out to get the snake and adder for dinner, and from whom I learned that they were in his youth commonly used for food.

Lyell says they had succeeded in taming the ferocious ox* of that day which Cæsar saw and described as a most redoubtable brute, almost the size of an elephant, fierce, swift, and strong. That they may have trapped or slain these formidable creatures I can quite believe, for a bull will plunge into a pitfall with the most utter recklessness and stupidity, and with their puny frames and rude weapons that was no slight feat, but that they tamed them I doubt. To have

* The bos primigenius.

assailed wild cattle so fierce and powerful and take from them their young, for the old ones would be wellnigh as unapproachable as gorillas, is almost beyond our belief; besides he tells us that its bones and horns had dwarfed under their regime, which is not a common result of domestication.

Of fish bones for a long time not a trace was met with, and it was surmised that they never ate any, either because the lake contained no fish, or because they abstained out of superstitious motives from using it, or out of pure distaste such as seems to have often prevailed among certain tribes. But this view has now been given up, further search having revealed ample evidence of fishing gear, consisting of pieces of cord, hooks, and stones used as weights. Canoes also have been found; one made of the trunk of a single tree, fifty feet long and three feet and a half wide, was found capsized at the bottom of the lake of Bienne. It appears to have been laden with stones such as were used to raise the foundations of some of the artificial islands.

"Amidst all this profusion of animal remains extremely few bones of man have been discovered, and only one skull dredged up from Meilen on the Lake of Zurich, of the early stone period, seems as yet to have been carefully examined. Respecting this specimen Professor His observes, that it exhibits instead of the small and rounded form proper to the danish peat mosses, a type much more like that now prevailing in Switzerland, which is intermediate between the long-headed and short-headed form.

Tradition tells of few scenes more interesting than those called up by thinking of this simple fisher-

people in their little wave-girt homes; a scene on which the genius of Homer might have dwelt with fondness. Little dwarf children taken out in times of peace to gather wild berries and weave flower chains in meadows buried for ages, watching the jumpy squirrel and the bright-eyed fieldmouse, while the little goat-horned sheep clambered up the rocks or browzed in the ancient fields, or listening with awe to the growling of the great bears or the lowing of the huge dun oxen. By-and-by the babies are grown to dwarf darlings in quaintly-fashioned robes, and sit demurely ranged at work under the eye of their elders,

> "The spinsters and the knitters in the sun,
> And the free maids that weave their thread with bones,"—

knotting their curious flax garments, first with their fingers, then with quaint bone needles and bodkins, and as arts improved with the rude spindle; while the men fashioned their deadly fireballs or simple pottery, shaping the coarse dark clay into jars as large as the old roman wine vases, such as the hindoo has used from remotest time, or chipped their arrow-heads of flint and crystal, or edged their bone daggers and their serpentine hatchets, or sallied out to hunt or fish. By-and-by they are dwarf matrons, grave with household cares—"on hospitable thoughts intent," or thinking about getting off their young folks; and dwarf men of business and warriors, changing by-and-by into little elders solemnly meting out justice, and then little old men and women bent with pains and aches, sitting in the sunshine and chirping like grasshoppers, "τεττίγεσσιν ἐοικότες," thinking often as

little as the children sprawling about them, how soon they are to be little corpses lying in the depths of the old lakes. Or when some mighty warrior or virtuous father of the state passed away to the land of spirits, the honoured remains were solemnly borne with all the mournful pomp of their simple faith, to the rude but vast stone tomb and buried, for the people of the stone age had a great respect for the dead ;* and when they were laid in their last resting-place, the arms were crossed upon the breast and the chin bent down upon the knees: as man lies ere he enters upon this scene so he should lie, they thought, when he re-entered the great womb of nature. Then they laid his arms and the offerings for the dead, food and trinkets, beside him, and that done, the great stones were raised like a chamber over the body and above all was piled the vast funereal mound of earth.

And thus they acted their parts in the pilgrimage of life till the strong hand of the spoiler wasted their strength, and internal decay proclaimed to their era that their hour had come, and their numbers began to thin and their star to wane by a process as sure and steady as that which changes the man into the lean pantaloon. As they passed away the wheel of time with each silent turn blotted out some trace that former years had spared, till all slept beneath the waters of the swiss lakes in one common oblivion.

> "Expunged each name, the mighty and the mean,
> From being's page as though they ne'er had been."

* The more ancient of the stone buildings in Switzerland called Druids' stones, are now supposed to have been reared by them, as no traces of any metal are found in these erections.

If such a scene as these colonies must have represented had been described in Herodotus and all traces of the little people had perished, what food would it not have furnished to those who are always so very moderate in their tone when they praise and such excellent hands at detecting inventions. What little he did say seems to have been hardly credited. But the grand old historian bides his time; the age of the Greek, the Roman, and the Gaul rolls by; the draining trench invades the long-kept sanctity of the depths of an old lake, and in its mud the stranger finds embalmed the trophies of the chase, the antlers of the great deer and the head of the wild bull; the arms with which the ancient hunter slew these great creatures, the clay vase from which he drank, and the piles of moss and dry leaves on which he rested when the chase and feast were over. Man is revealed living ages and ages ago as Herodotus drew him.

Where the lake people got the materials for some of their tools is rather a puzzle. Some of the hatchets and wedges found at Moosseedorf are of a jadestone not found in Switzerland or anywhere near. The amber too must either have come from the shores of the Baltic or German Ocean. A kind of flint also which they used for arrow-heads is thought to have been imported from England where it is found in large quantities, as it is not met with in Switzerland and though found in France, yet only in very small amounts. They also used coral from the Mediterranean and a precious stone from the East.* There is, however, nothing improbable in this, nothing more strange than

* Revue des deux Mondes.

in the mound people of central America being familiar with the toucan of the tropics and copper from Lake Superior. As to crossing the German Ocean it was probably, from the land being higher, much narrower than now, and the feat was no greater than the savages of the Pacific constantly undertake, often in craft of the frailest kind.

The history of what has been found at Moosseedorf is almost exactly that of every very old settlement of the stone age such as Meilen, on Lake Zurich, Wangen near Stein on Lake Constance, and Wauwyl. Serpentine hatchets were found at Wangen, and at Wauwyl were discovered sling-stones, corn-crushers, and whetstones. The wolf was found at Wauwyl, which was not the case at Moosseedorf. The settlements of the stone age alone are found in the eastern parts of Switzerland, those of the bronze age are confined to the western side. As they bear marks of a decided advance in the arts, this movement from the west towards the east, so different to the path which men have long assigned to civilization, becomes of interest. I must refer the reader to the writings of Sir Charles Lyell, Lubbock, and Troyon for an account of the settlements of the bronze age and that of iron, upon which I cannot enter here.

As time went on the pile works of Switzerland appear to have become gradually less numerous. In the stone age they were spread over the whole country, during the bronze era they were confined to the lakes of western Switzerland, and during the last, the iron age, they are only found in the lakes of Bienne and Neufchatel. In the last appear copies of the bronze axes made in iron, just as the early

bronze celts were copies of the earlier stone axe. A field of battle at Tiefnau near Berne is remarkable for the number of iron weapons and implements found in it, accompanied by pieces of gaulish and Massaliote money anterior to our era. After this period no more evidences of lake habitations are found on a large scale. A few fishermen may have lingered on the half-destroyed platforms, but the wants and habits of the people were utterly changed and the time for such works was gone.

The whole city of Moosseedorf seems to have perished by the most awful of deaths—fire. The half-burnt corn and wood tell their own tale; the workman and the matron stayed in their toil as though the angel of death had swept over them on the wings of the choking simoom; the unfinished axes—the half-polished daggers—like the figure of the wretched woman stricken down at Pompeii and the track of the chariot on its dust, proclaim the tale of death under circumstances of fearful indelible horror—not of flight from the foe—not of going forth to a happier and more fruitful land—or of peaceful parting of brother from brother, one wending to the right and one to the left as in the days of Abraham and Lot.

Indeed the lake warriors seem to have been quite at home in the art of destruction. They had invented fireballs of charcoal hardened with clay; these were pierced with a hole that they might be thrown more easily, and after being made red hot were launched on to the roofs; once there we may imagine how soon dry roofs of reeds were in a blaze.

There is nothing strange or new in this part of the story. Like the dog man is naturally a destroyer;

since his race began he has never fairly rested from bloodshed, and it is idle to suppose that he ever will. The era of peace, when the goddess with her myrtle sceptre hushed the savage passions of man and won him over to arts and letters, and when—

> "The hooked chariot stood
> Unstain'd by hostile blood,"

has only existed in the dreams of the poet and the philanthropist.

Most of the very ancient settlements seem to have suffered in this way, the men of the age of bronze, who are conjectured to have been a more powerful and warlike race, having most probably massacred them with that brutal indiscriminate carnage of which the history of savage races gives only too many instances. In the east of Switzerland not one tribe seems to have been spared, but in the western part they fortified themselves more strongly than before, and gradually adopted the habits of the conquering race, or perhaps gradually decayed like the red Indian before the more peaceable encroachments of a people glutted with slaughter, and growing more fond of peace and luxury. We therefore need not wonder to find the settlements of the age of bronze larger and more numerous than those of preceding times.

Both in the age of bronze and in that of stone we find these ancient races were quite as well aware as ourselves of the importance of a good site for their towns; this they always selected with rare sagacity, and their choice has been ratified by the unknowing races which followed. Zurich covers an ancient settlement

of the age of stone; Geneva stands now where in the old times of bronze a city stood on piles.

Attempts have been made with great care and impartiality to calculate the antiquity of some of the lake dwellings. Thus there is a settlement of this kind at the Pont de Thièle, between the Lake of Neufchatel and that of Bienne. Near the shore of Lake Bienne stands an old convent called St. Jean, known to have been founded seven hundred and fifty years ago. When it was built it stood at the edge of the lake, but now it is some distance from it; and if the change went on at the same rate from the time of the pile buildings till the erection of the convent, as it has done from the building of the convent till now, we must, if we are to place any reliance upon such data, assign to the little lake town of the Pont de Thièle an antiquity of nearly seven thousand years; a period almost equal to the age of the world as computed eighty years ago by the great historian Johannes von Müller.*

Again nearly a hundred settlements of the bronze age have now been discovered, showing such an increase of population as must have required a great lapse of time to effect; many of the bronze objects lie so deep that a long time must have passed away before such a thick bed could have formed over them. Now on a very moderate calculation the age of bronze carries us back quite three thousand years, probably more, and when we remember that there is every proof of the stone age having endured for long before

* Saemmtliche Werke, B. i. S. 26. According to his computation the world would now be 7,585 years old.

that of bronze, we cannot resist the conclusion that these settlements were the seat of life five hundred or a thousand years before the fall of Troy; possibly much longer.

Even on the most moderate computation the period at which these ancient dwellings were constructed must be placed at an immense interval from ours. In the marshy valley of the Orbe, just where it flows into the south-western end of the Lake of Neufchatel, is a small strip of land on which, mouldering to decay, lie the ruins of the once strongly fortified city of Eborodunum. Between this strip and the lake, on ground partly occupied by the town of Iverdun, no trace of roman antiquities has been found, and as Eborodunum belongs to the period of the Gauls and Romans it is concluded that this ground (between it and the lake) was at the beginning of our era covered with the water. This ground is about two thousand six hundred feet wide, and it has therefore taken eighteen hundred years for the waters to subside thus far,—probably much more, for the old city, there are reasons for believing, existed before the Romans came. Now more than three thousand feet from this strip of ground lie the piles of a lake settlement which must thus have been abandoned, adopting the same computation, at least fifteen hundred, more likely quite two thousand, years before the times of Eborodunum. Add to all this the lapse of time between the abandonment of those lake dwellings and the date at which they began as a few scattered huts, and we see what a waste of years lies between us and them, who hunted, tilled the ground, and trafficked with the Baltic people centuries and centuries before the fall of Troy.

Lyell ascribes an immense age to the earliest known American race. He says, "If I was right in calculating that the present delta of the Mississippi has required as a minimum of time more than one hundred thousand years for its growth, it would follow, if the claims of the Natchez man (found by Dr. Dickeson in a rent made by an earthquake in 1811 and 1812) to have co-existed with the mastodon, are admitted, that North America was peopled more than a thousand centuries ago by the human race. But even were that true we could not presume, reasoning from ascertained geological data, that the Natchez bone was anterior in date to the antique flint hatchets of St. Acheul."

M. Martillet has reported the discovery in Italy of piles belonging to a class of dwellings such as those found in Switzerland. They were met with in the peat filling up the moraine of an ancient glacier.

Similar forms of dwelling to those found in Switzerland have been discovered in many parts of Ireland, where indeed the march of discovery outstripped the revelations of the old swiss lakes. These buildings consist of artificial islands called crannoges. Lyell says that as many as forty-six have been found. They are scattered over the more central parts of Ireland, King's County, Cavan, Roscommon, Meath, &c., though it is not improbable that every lake in Ireland may contain them.

Sir Charles, with his usual felicity and clearness of style, describes one found at Ardekillin Lake. It was an islet of an oval form, consisting of a layer of stones lying upon logs of timber; around the islet there stood a stone wall based on piles of oak. Captain

Mudge has described a log cabin which may be referred to the same class of buildings, and which was discovered in Drumkellin bog in the county of Donegal, fourteen feet below the surface. It was a small flat-roofed structure twelve feet square and nine feet high. Low as it was it was divided into two stories. The planks had been split with a stone wedge, and the mortises had been made with a blunt stone chisel, seemingly with one which actually lay on the floor of the hut, for when it was compared with the marks on the mortises the two were found to correspond exactly, "even to the slight curved exterior of the chisel." There were found some round shingle stones, and on the floor lay a slab of stone a yard long and fourteen inches wide; there was a little hollow in it which had been made by art, and it is conjectured that this was intended to hold nuts which were to be cracked by a blow of a shingle stone.

The foundations of the house were of fine sand, and rested on a layer of bog or peat quite fifteen feet thick; the sand was very probably brought from the seashore which is about two miles off. When the cottage was inhabited it was most likely surrounded by trees, as some of the trunks and roots of these are still preserved in the peat in their natural position.

The reader will find in the Archæologia, Journal of the Kilkenny Archæological Society, &c., descriptions and engravings of numerous articles got out of these old crannoges; among them are pieces of pottery marked with a waved pattern, paddles, wooden scoops, iron and brass pins, a crucible, bone comb, &c., a plough sock of iron, &c., showing an advance through the age of bronze to that of iron.

"We have been favoured," says the *Illustrated London News* in a recent number, "by Mr. George Morant, jun., of Shirley House, Carrickmacross, Ireland, with an account of the finding of a beautiful neck ornament in an artificial island, or 'crannoge,' in a lake near the above place. The ornament is a locket of crystal, set in silver; the cable and other parts, much corroded, are supposed to be mediæval work (fourteenth or fifteenth century). Near it was found a smaller ornament of gold, like a modern watchkey. On another of the 'crannoges,' or fortified islands, were recently found a very perfect bronze pin, several coins of Mary's reign run together by the action of fire, a stone celt, and a spearhead. The islands are surrounded by posts, some above and others below the water-line of this day: quantities of the bones and teeth of animals, charcoal, and ashes are found in them. Upon this communication we may remark: in the Archæological Journal for March, 1846, is a very interesting paper, 'On Crannoges, and Remains discovered in them.' It was the practice of the northern chieftains of Ireland to intrust their defence rather to water than to stone walls: in other words, they ensconced themselves rather in islands than in castles; to the latter indeed they appear to have had a particular prejudice. At a comparatively late period we find, in reply to an inquiry, in 1567, from the Lords of Queen Elizabeth's Council, as to 'what castles or forts O'Neil hath, and of what strength they be?' that he only depended upon '*sartin ffreshwater loghe's* in his country, which from the sea there come neither ship nor boat to approach them; it is thought that there, in ye said *fortified*

islands, lyeth all his plate, which is much, and money, prisoners, and gages.' These fortified islands were generally artificial, and upon them were constructed wooden huts or cabins, called in Irish *crannoges*. Then follow notices of crannoges, commencing with A.D. 1246 and terminating with 1844, when a *crannog* was discovered on the lake of Monalty, about half a mile from Carrickmacross. A canoe, or boat, formed of one piece of oak, was then brought to light close to a low island on the south side of the lake; and relics were also found on an island on the adjoining Lake of Lough-na-Glack. The objects of greatest antiquity found on these islands are stone celts of the common type; a rough piece of flint, apparently intended for an arrow-head; and stones with indentations, evidently made for slings. Of bronze weapons and ornaments there were numerous specimens, of which a javelin and bronze pin are engraved. Amber and blue glass beads, and a comb, apparently ivory, are mentioned; with iron instruments, bullets of lead, earthenware, small Dutch tobacco-pipes, a pair of quern stones, &c." The paper concludes thus:—

"From the great variety of these remains, extending from the remote period when weapons of stone and bronze were used, to the firearms of the seventeenth century, it cannot be doubted that these islands, or *crannoges*, were, for many ages, the resorts of petty chieftains, probably of the MacMahon sept: and afterwards, perhaps, of gangs of freebooters, or *Tories*, although the traditions of the neighbourhood have not preserved the memory of the fact."

At the last meeting of the British Association a paper was communicated by Lord Lovaine on some

lake dwellings recently discovered in Wigtonshire. They were found in Dowalton Loch, a sheet of water about two miles long and half a mile broad, lying between Wigton and Fort William. This lake was surrounded by a moss, and was recently drained by Sir William Maxwell, of Monteith, who was fortunate enough to obtain possession of a bronze vessel found near the south bank of the tarn. Lord Lovaine having heard that some person who had visited an island in this lake had found some bones, a small granite quern, and sundry piles, and that at the end (of the lake I presume, for the description is rather obscure at this part) and at one of the little promontories, similar piles were still visible, resolved to make a search. Some labourers who were despatched for this purpose stated that they could not reach the islet spoken of, but that they could get at a smaller one and that a canoe lay near it. This Lord Lovaine visited and found that it was a small islet about a hundred feet round. On the north side of it was a bed of oak, twenty-four feet long, four feet two inches broad, and seven inches deep in the middle; on each side of this was a small artificial stone bed. A trench was now cut round the islet, and on digging they found at the south end teeth, human bones, a piece of a fine yellow earthenware armlet, a large broken earthenware bead striped blue and white, a small metal armlet apparently gilt, and two other pieces of armlet, one striped with blue and white. From the description the structure of the islet seems to have been wholly artificial, the woodwork resting on brushwood, and this on branches of trees weighted with stones, while below the branches were layers of

heather and brushwood also weighted with stones and soil, all reposing upon a bed of fern two feet thick. "The whole mass was pinned together by piles and stakes of oak and willow, some of these driven two and a half feet into the bottom of the loch, similar to those above mentioned. The islet was surrounded by an immense number of these, extending to the distance of twenty yards outward of it, and masses of stone, which apparently were meant to act as break-waters, were laid amongst them. The next examined stood about sixty yards off, at the extremity of a rocky projection into the loch, but separated from it by the now hardened mud. It was smaller and the layers were not so distinctly marked, and some of the timbers inserted in it under the first layer of brush-wood were larger, and either split or cut to a face. A stake with two holes bored in it about the size of a finger, a thin piece of wood in which mortises had been cut, and a sort of box, the interior of which was about six inches cube, with a ledge to receive the cover, very rudely cut out of the block of wood, were found. Lord Lovaine succeeded two days afterwards in reaching the largest islet in a boat, about three feet below the level of the other islets, but it was much larger, and several depressions on its surface showed that it had sunk wherever the soil was not covered with stones and silt. Teeth were scattered all over it; quantities of bones were found at different depths in the moss, but always below the upper layer of faggots, and towards the outside. The excavation was stopped by the oozing in of the water, but a workman plunged his arm up to the shoulder into the soft material, brought up

handfuls of the fern layers, mingled with sticks and hazel-nuts and large bones, believed to be those of oxen. Near the spot, lumps of sand and stones fixed together were picked up. On the south side of the island extraordinary pains had been taken to secure the structure, and heavy slabs of oak, five feet long, two feet wide, and two inches thick, were laid one upon another in a sloping direction, bolted together by stakes inserted in mortises eight inches by ten in size, and connected by squared pieces of timber three feet eight inches in length. It extended to the length of twenty-three yards, and its base, about five yards beyond the surface of the mud, was formed of stems of trees laid horizontally and secured by stakes. In other respects the formation resembled that of the other islet, but it was far larger, measuring one hundred yards round by about thirty-six yards across. No building of any sort was discovered, but a large plank or pole, twelve feet long, fourteen inches broad, and seven inches thick, lay covered with stones on the north side. The sinking of the mud had by this time laid bare a second canoe, between the islet first examined and the shore; it was eighteen and a half feet long, two feet seven inches wide, and barely two inches (?) deep. The next day, being unable to reach the last-mentioned island, Lord Lovaine found upon the spot which had been indicated to him on his first inquiry, no less than six structures similar to those before described, in a semicircle; they were however much smaller, apparently single dwellings. Though upon some of them charred wood was found, nothing else was discovered except a mortised piece of timber which might have drifted there; and in one, inserted

under the upper layer of brushwood, a large oak timber, measuring eight feet long by three feet in circumference. Throughout these investigations no tool or weapon of any sort had come to light. In the layers the leaves and nuts were perfectly fresh and distinct, and the bark was as plainly distinguishable on the stems and timbers as on the day they were laid down, as were also the heather and the fern. The great number of teeth scattered over the surface of the larger island, and even on the mud surrounding, and the immense expenditure and labour indicated in the shaping and hewing of the large timbers with tools, which must have been, from the work produced, of the rudest description, betoken apparently a considerable population. The finding of the large bones in the lower layer of fern might lead to the belief that the edifices were gradually raised as the waters of the loch increased, and the necessity of strengthening them by breakwaters would seem to prove that the loch must have risen considerably before they were abandoned. The loch must have remained for a considerable period at each of the different levels: at one time six or seven feet above its last level (*i.e.*, before its drainage was effected), to which it was reduced by three cuts made to feed neighbouring mills, one certainly of great antiquity. At three feet and a half below the ordinary level there were unmistakeable appearances of a former beach with which the top of the first-mentioned islet almost exactly coincides. It was remarkable that though there were many rocky eminences in the bed of the loch, none bore token of their ever having been used for the erection of those dwellings, which seemed to have invariably been based

upon the soft bottom of the loch, where the intervening mud and water might have afforded the inhabitants a greater security from attacks from the shore. Since writing his paper, Lord Lovaine had been informed by a very old man in Sir W. Maxwell's service, that in clearing out a channel between a small wooded island in Ryston Loch (close to Monteith House) and the beach, he remembered there being found layers of timbers, piles, and flat stones laid in circles. His lordship had also obtained from a farmer living near Ravenstone Moss a paddle of black oak, three feet long, fourteen inches broad, and one inch thick, which with four or five others he had found in that moss, lying close to a mass of timbers about six feet from the surface. This his lordship had every reason to believe formed part of a structure similar to those described. The timber found in the islets in the loch, though retaining its shape, was for the most part decayed, except where it had been protected from the action of the mud."

"Professor Wilson, of Toronto, who was present, said that Joseph Robertson of Edinburgh he knew had accumulated a good deal of valuable and important information on this subject, showing that a considerable number of those locomotive constructions (!) existed in Scotland. One of these, Kincardineshire, had this peculiar interest about it—that the notes about it are of old dates, and in that respect it has this value in reference to present inquiries, that the notices of it were altogether free from the difficulties or doubts of more modern speculation, and were therefore of special importance in the present state of the argument. In the records of the Society

of Antiquaries of Scotland he found a letter from a clergyman of a parish in Kincardineshire addressed to the Earl of Buchan, then president of the Society of Antiquaries, in which he described the draining of a loch in that district going on at that time, and he described these lacustrine remains as having been found there:—piles, bones of animals, and relics of various kinds. The clergyman states in the letter that he forwarded to the Earl of Buchan several specimens of bones and fossil ornaments which he calls brooches. Two of these were still preserved in the museum of the Society of Antiquaries of Edinburgh. He had not the least doubt that the ornaments thus preserved had been originally employed for playing at some game of chance or skill, such as chess or draughts.

What are called the Picts' Houses belong to the very beginning of building in Scotland, and bind together strangely the old camps spoken of, found in Hampshire, &c., and the kitchen-middings. Dr. Daniel Wilson * describes one found at Skara, near the house of Skaill, in the west mainland of Orkney. It is a rude stone structure, and around it are heaps of ashes, several feet thick, mixed with shells, horns, and bones of deer and other animals. Several circular discs of slate were found. They were just like some discovered in Kent's Hole cave. The most singular thing in it was a box constructed of stones, and containing about two dozen oyster-shells, each pierced in the middle with a hole large enough to admit the finger. Oysters are rare in Orkney now, being found

* Prehistoric Man, vol. i. p. 103.

only in two places, Deersound and Frith, the nearest of these being eight miles from Skaill.

In a letter to the *Medical Times*,* Dr. Henry Bird describes two kinds of tumuli found on the Cotteswold hills, which contain remains of man, flint and bone implements, &c., and which may, I think, be safely counted among the earliest traces of building in England: the first soarings of the old troglodyte towards a higher style of life.

The tumuli of one class are round, and formed of loose stones heaped over human bones and flints. Sometimes they bear marks of fire; at others these structures are shown to be graves, built of dry walling and then covered with rough and unhewn stones, like the roof of a house, over which loose stones and then earth were piled. These have clearly been used as burying-vaults, for they contain the remains of several individuals of both sexes and of all ages. Some of these tumuli have been ploughed over and cultivated; they are called giants' graves from the large size of the persons buried there. "Sometimes," says Dr. Bird, "they are found lengthways with the face towards the rising sun; in other instances doubled up as if they had been placed in a sitting posture." These tumuli are sometimes twenty feet across: the skulls found in them indicate a low order of mental development.

The other tumuli are long, and contain chambers which communicate with each other like pigs' cots. These chambers are formed of walls or uprights of rough stone, such as may be seen in the stone stiles

* May 20, 1863.

of Derbyshire, partly sunk in the earth for the sake of support, and roofed with large flat stones; the spaces between the uprights are neatly walled up and packed with stones. Some of these tumuli are as much as sixty yards long, thirty yards wide, and seven to fifteen feet high. They contain several chambers, and also stone graves with burned animal and human bones, rude pottery, &c.

"The human bones (I presume those found in these tumuli) belonged to people of ordinary stature, rather above the average height; the skulls are of superior development."

Dr. Bird thinks these tumuli may have been the burying-places of the higher classes. From his description no coins seem to have been found in them, and no mortar to have been employed in their construction, contrary to the practice of the Romans who invariably used it. Dr. Bird concludes that these rude buildings all belong to the earlier part of the stone period; I believe if we were to refer them back three thousand years we should not err, on one side at least, and it is gratifying to think that they reveal, in a period long supposed to be one of utter desolation or heathen darkness, a love of the sanctity of family ties, a hope of a future life, and a belief in a Supreme Being.

The reader has I suppose heard of the Mound Builders of America, first revealed to any extent at least by Messrs. Squier and Davis, who have given a most valuable account of the old monuments of this people in the Mississippi Valley. Till then no one seems to have dreamed that ages before the spanish savages went over under Columbus to begin their work of

death and misery, the vast plains through which the Mississippi and Ohio roll their turbulent waters, were peopled by a nation of older date and more advanced in the arts than the red indians whom the Europeans found there.

The unknown people Lyell tells us by whom these mound cities were constructed, judging by the form of several skulls dug out of the burial-places, were of the Mexican or Toltecan race. I must take the liberty of doubting whether this view can be upheld. It seems pretty clear that the Toltecs, particularly if they were the same people who built Palenque, were of a different race from the Aztecs. They were of the same class as the early peruvians, more humane, accomplished, and intellectual; whereas the Aztecs were fierce and bloody, addicted to the most horrible superstitions. The heads carved on the pipes of the Mound Builders have a solemn look, far more intellectual than the red indian, to whom the Aztecs are closely allied. The mouth is small, as is the lower jaw, the chin and upper lip are short, the cheek bones not so high as in the red man. A skull found at Scioto, known as the Scioto mound skull and unquestionably belonging to these ancient people, in its character bears out the view that in these pipe-heads they represent their own race; the frontal bone is finely arched, the forehead broad and intellectual, the skull wide, and in its dimensions much resembles the old peruvian head. To the Palenque race then the Mound Builders were very likely allied, and if the Toltec race was the same as the Palenque people, to them also—but in that case the Toltecs differed necessarily from the ferocious Aztecs, who

professed a ritual only fit for the devil, and cooked their prisoners with chili to make them pleasanter eating.

Some of the earthworks left by the Mound Builders are on a magnificent scale. They are of various character—forts, sacred enclosures, symbolic mounds, beacon-hills, &c. Fort Hill, Ohio, is surrounded by a wall six to fifteen feet high, and upwards of a mile and a half long; within the enclosure are large ponds or cisterns. Fort Ancient, by the little Miami River, Ohio, is walled by a range of embankments little short of four miles long, besides detached mounds, parallels, and overlapping curtain walls.

The sacred enclosures of the mounds were on as large a plan as the forts. The so-called Newark works are of this class: they are earthworks, and consist of an enclosure twelve hundred and fifty feet long and eleven hundred and fifty wide; the earthen bank which runs round them is about twelve feet high and fifty feet thick at the base. The opening to this enclosure is at the east side; in the centre is an altar with a remarkable structure apparently designed to represent a gigantic bird with outstretched wings. From this great enclosure, which is an ellipse, a wide avenue leads to a square of twenty acres, with seven mounds symmetrically arranged within the enclosing walls. The avenue is continued beyond this till it joins another group of works with embankments, avenues, mounds, &c. A full description however of these remarkable works would lead me far beyond my limits, and would only embarrass the reader if it were not accompanied by a map. The reader will find them explained at length in Professor Wilson's Prehistoric

Man.* I can here only allude to one or two points, showing the scale on which these structures were laid out, and the exactness with which they were executed. The parallel walls of two of the avenues are upwards of a mile long and two hundred feet apart; they end in an eight-sided earthwork of more than fifty acres in extent, and beautifully level. From one of the gateways of this octagon extends an avenue enclosed by parallel walls; the avenue is sixty feet wide and three hundred feet long, and it ends in an enclosure which is a true circle, more than half a mile in circumference. The walls of the avenue are prolonged for a short distance at the opposite side to that where they enter; they are then cut transversely by a mound seventy feet long, which rises about eight feet above the walls of the circle, and is called the observatory.

In another group of works five or six of the enclosures are exact squares, each measuring a thousand and eighty feet on every side. To make such works as these the Mound Builders must have had instruments; such means must also have been necessary for making the exact circles they formed, some of them more than a mile round. A curious oblong tablet found in an old sepulchral mound in Cincinnati has been supposed to be an instrument for measuring curves. Both the ends are hollowed out, and form arcs of circles of different dimensions. It is scored also at each end with a series of minute lines, having different spaces between them, just as some of our measuring rules are scored on one edge for tenths and on the other for twentieths of an inch.

* Vol. i. p. 333.

There are also found sacrificial mounds containing each a large basin of fine clay, quite eight feet broad, which served as an altar. On these altars a vast number of articles seem to have been burnt as a sacrifice: they include elaborate carvings in stone, ornaments of mica, copper implements, pearl, shell and silver beads, cloth, ivory and bone needles, calcined bones, fragments of human bones, quantities of pottery, spear-heads of quartz and manganese garnet. The human bones were probably the last sacrifice offered before the consummation of the work, for traces of repeated vitrification have been found, and the altars seem to have been repeatedly used for burning the smaller articles, and their surface to have been occasionally renewed; but when the human bones were laid on the altar the fire was applied, and when it had nearly done its work the earth was heaped over the altar, and the fire was quenched by piling up the earth into the huge sepulchral mound of which the people have left so many. It is therefore probable that only great chiefs or priests were buried in these tombs. They may however have been used for human sacrifices.

The earthy covering of the mound itself was constructed with as much care as any part of their earthworks: in one mound the explorers observed that after the sacrifice had been burned the basin or altar was filled up evenly with fine dry ashes, with which were mixed a few scraps of pottery and some copper bosses. Over these again was spread a layer of silvery mica in sheets, and on the mica a pile of burnt human bones. Above these fragments of humanity lay a thin sheet of earth showing in miniature the shape of the mound; this

was encased in half a dozen layers of earth and sand alternating with each other; then came two layers of gravel and pebbles quite three feet thick. In one of these structures the mica layer was arranged in the form of a crescent, twenty feet from horn to horn and five feet broad at the widest part. Some of the altars are as much as fifty or sixty feet long and twelve to fifteen wide, and some of the mounds eight hundred to a thousand feet in circumference at the base and seventy feet high.

Both in the Ohio and Scioto valleys animal or symbolic mounds, that is to say huge mounds of earth made so as to represent an animal, are met with; but there is an area lying between the Mississippi and Michigan where they occur in much greater numbers. In this district "gigantic basso-relievos of men, birds, beasts, and reptiles, all wrought with persevering labour on the surface of the soil," are found in thousands. Those in Wisconsin include forms of the lizard and turtle, the elk, buffalo, bear, fox, otter, racoon, &c. The largest of these symbolic mounds found in the Mound Builders' land is the great serpent in Adam's county, Ohio. It lies on a spur of land where Bush Creek enters the Ohio. The body of the serpent stretches out seven hundred feet in graceful windings, and its huge jaws are opened wide to swallow an egg formed by an oval earthwork a hundred and sixty feet long and eighty feet thick. In Wisconsin some of these objects are cut out on the surface, that is to say the outline is dug out of the soil and then the earth is heaped about the edges. They thus more resemble the White Horse of Berkshire and that of Braddon Hill in Wiltshire. Pro-

fessor Wilson speaks of a colossal human figure, armed with a club, at Cerne in Dorsetshire, as being "a curious counterpart to those scattered over the prairie lands beyond the western shores of Lake Michigan."

Respecting the mound beacons there is not much to be said. The Mound Builders simply adopted a principle which has continued down to the time when the electric telegraph supplanted the semaphore, itself only an improvement on the old fire beacon, motion being substituted for fire. They selected prominent spots on which mounds were formed; on these it is conjectured they lighted the beacon fires, as the stones on them are nearly vitrified. It is needless to say that this primitive beacon is still in use among some nations.

In many of the earthworks, especially in the sacrificial mounds, have been found as I have already said numbers of relics showing the state of the arts among these people. They consist of articles of pottery, silver and copper, beautiful pieces of carving, stone weapons, some made of hornstone, and described by Lyell as bearing a resemblance to the old flint implements found in Amiens and other places. Those who have seen the carvings of this mysterious people concur in speaking most highly of the skill they manifest. Professor Wilson, after justly observing that the mere size of a statue or basso-relievo is no evidence of taste (he might have gone further and said that it is generally a sign of barbarity), expatiates and with justice on the variety and beauty of these sculptures and the delicacy of their execution; and Dr. Davies speaking of one carving representing a

tufted heron striking a fish, remarks that nothing can surpass the truthfulness and delicacy of the sculpture. The figures too on their pottery are executed in a bold free style; they are finely finished and tastefully ornamented with scrolls, figures of birds, &c.

These Mound Builders seem to have been confirmed smokers, which of course right-minded people would at once set down as the cause of their extinction, especially as they lavished on the carvings of their pipes all the exuberance of an active fancy and an exquisite taste.

The sea-cow of the tropics is found very well designed on some of these pipes, carved a thousand miles away from the home of these strange animals; a fact which shows that either very correct likenesses of them must have passed from hand to hand till they reached these far-off valleys, or else that these old mound people must have visited the tropics. Mr. Fairholt, in his most amusing work on smoking, gives a capital engraving of a beaver figured on one of these pipes. Another pipe represents a wild cat looking as ferocious and watchful as need be; a third bears a toucan only found in the southern counties of North America: the nearest place where it is met with is a thousand miles off, on the coast of Florida; its home is in the tropic regions of South America. These ancient pipes are of materials so hard that immense labour must have been expended in carving them, granite, porphyry, and basalt being favourite materials. In everything, carving, taste, design, relief, they are far superior to anything executed by the modern red man, for though some of these are elaborately enough carved, they exhibit

nothing like such notions of art in the true sense of the term; one might as well compare the flourishes of an engraver or cabinet-maker with the work of a sculptor.

Besides having intercourse in some way or other with the tropic regions of America, their communications extended as far as the Gulf of Mexico, from which they procured sea shells; they also obtained obsidian from the Mexican mountains and mica from the Alleghany districts. Copper they got from Lake Superior, where it is procured pure in fabulous quantities. Professor Wilson, in his "Prehistoric Man," gives an admirable description of the old mining settlements at Lake Superior and of the people who worked in them.

Again, in Virginia clay pipes are found; they are of rude workmanship and perhaps filled the same relative position that the modern clay pipe does to the beautifully carved meerschaums of our day. One is given by Messrs. Squier and Davis in their work on the Mound Cities, on which is a head strongly dissimilar to that of the Indian, and perhaps more like those seen on the idols of Mexico than any other kind. The distinctive characters of race are strongly shown in the curls falling like lappets as we see them in egyptian figures, in the bold hooked nose, the large oval eye, the square mouth, and the receding chin. Another, also figured by Wilson,* though not near so fine a head, is equally distinct from that of the american savage. The face has the look of a person who has known and felt consuming care, the nose is curved

* Prehistoric Man, vol. i. p. 466.

with the bridge depressed and nearly vertical, long and with a projecting tip; the lips are delicate and the mouth is small. Although there is a wide distinction between these heads and those of the wily voluptuous-looking Assyrian, the gloomy Copt, the clever merciless greedy face of the Jew, and the feeble dreamy Aztec, yet the face is more akin to this group than to any living race I have ever seen the likeness of.

I suppose any one who has seen the extraordinary Aztec children and the red man, would give up any idea he might have heard that these singular creatures were the cretin indians, and admit how they brought back to the mind those wonderful carvings on the ancient egyptian and assyrian temples and friezes, where shadowed forth as on a vast magic mirror stand what men long thought were caricatures of the human race, with their fish-like eyes and lean limbs, but which we now know to be faithful portraits of races as utterly gone as the dodo and mammoth.

If there is some great fact lying at the bottom of all this, if the ancient races sprang up in groups having a particular type of features in common yet distinctly separate among themselves, as we know the jews to have been united by a common band of features and character and yet separating distinctly into tribes, and as the phœnicians seem to have been united though separate, the discovery when made will I think possess the highest interest for the historian and philosopher.

It is very doubtful if the mound people had a written language of any kind. An oval disc of white sandstone with some very mysterious characters en-

graved upon it, was dug up at the Gravo Creek Mound on the Ohio; but the characters are awfully suspicious; some correspond with the ancient greek, others with the runic, some with the anglo-saxon (!), and others with the phœnician. Professor Wilson thinks these facts fatal, and the introduction of anglo-saxon characters on an Ohio tablet is certainly a staggerer; but the most suspicious feature in the case is that the tablet was not discovered till the proprietor had fitted up the excavated vault where it was found, as a show.

Respecting the people themselves who once dwelt in these long-deserted mound cities, I think there can be little doubt that they were not red indians at all. Only one skull incontrovertibly belonging to the race has as yet I believe been found; it is called the Scioto Mound cranium, and was procured from one of these mounds, in which it had been preserved by lying in the charcoal over which large stones bedded in tough clay had been piled. This one skull however is such as is never seen among the red men.

The utter disappearance of this people from the face of the earth without vestige of tradition or history, without one word of their language being known among the savage races who usurped their lands, without even their name being rescued, is one of the most mysterious things in the history of mankind, and so far as I know without parallel. Unless we can suppose that they were utterly exterminated by some plague, it seems almost impossible to account for the mystery which enshrouds their fate. Had they been overrun by some of the savage races who at the coming of the white men possessed their land, one

might have thought their conquerors would either have left some traces of the devastation they had made, or have borrowed, as is more commonly the case, something of their arts, laws, and language. But here nothing of the kind is found.

Indian tribes and even great races have often been destroyed and vast tracts of land left without a human being. The savage Mohawks and Shorikowani utterly extirpated the Attiwendaronks, and the Delawares and Iroquois blotted out the name of the Alleghans, but these men were mere tribes compared to which the Mound Builders must have been a perfect nation. A gloom deeper than that which so long brooded over the cities of the plain and of the old assyrian empire rests on the days of the Mound Builders, and we know them solely by the earthworks which have given them their only name, and the secrets which the earthworks have yielded up.

Sir Charles Lyell says that when he was at Marietta Dr. Hildreth showed him a mound whereon he had seen a tree growing, which when cut down had eight hundred yearly rings. General Harrison, President in 1841 of the United States, and well skilled in woodcraft, states however, that even this age affords very insufficient evidence as to the antiquity of the mounds. In the first place he assumes that no trees would have been allowed to grow so long as the earthworks were in use. When in Ohio land is newly cleared it is for some time monopolized by one or two trees, such as the yellow locust and the black or white walnut, and when these die out they are replaced, not by trees of the same but of other kinds, till in course of many years the variety of forest trees, so remark-

able in North America, is fully established. Now the mounds when forsaken would be like newly-cleared land, and as they are overgrown by this variety of trees, General Harrison infers that perhaps several thousand years may have been required to effect this.

The Chippewa Indians have a custom of expiating by fire, into which they throw all their pipes, ornaments, kettles, skins, hatchets, &c. Wilson too gives a fine description of the burial of a renowned indian chief which took place about forty years ago, and presents some resemblance to some of the rites which appear to have been practised by the Mound Builders. The dead warrior was dressed in his most sumptuous robes with his scalp and plumes, and seated on his war-steed on a lofty bluff by the Missouri. His bow was in his hand; his shield and quiver, pipe and medicine-bag hung by his side. Pemmican and tobacco were added to solace the chief on his path to the hunting-grounds. Then after the charms were said and each warrior had stamped a red mark on the side of the steed, the turf and soil were piled over the horse and rider till a lofty mound was formed, on which rose a cedar column to tell where the mighty chief rested amid the honours of death—

"Τύμβω τὲ στήλη τὲ· τὸ γὰρ γέρας ἐστι θανόντων."

The Babeen or big-lipped Indians found along the northern Pacific coast, extending from the borders of Russia nearly to the Frazer River, possess pipes quite as extraordinary as those of the Mound Builders. They are carved most elaborately out of soft blue clay-stone or slate, but the most interesting thing about

them in reference to our subject is the exact resemblance of some of the heads to those of the Assyrians, or rather to the group altogether spoken of at page 198. If the reader will compare the head at the smallest end of the pipe figured in Mr. Fairholt's work on Smoking with some of those given by Layard and Forster, he can I think scarcely fail to trace a strong resemblance. Wilson figures a Chippewa pipe, which for the bold execution and striking attitudes of the figures, carved out in full relief, is a perfect marvel of art and far beyond the ordinary work of the red men. The writing, if such it be, on the Dighton rock may be another trace of the old people. Among these tribes there may perchance linger arts and customs derived from the Mound Builders, but of which the history has long been lost: at the same time however they may have come from a totally different source.

As I have already spoken of the copper which the Mound Builders procured from the neighbourhood of Lake Superior, it may perhaps be as well to introduce here what little has to be said respecting these vestiges of an extinct race, as they seem to have been connected, commercially at least, with the Mound Builders.

They seem to have been a very inferior people, and have left little behind them but spears and arrow-heads of copper; in some places these are found ornamented with silver. They were miners it would appear, and the hand of the destroyer, whether plague or war, seems to have come upon them with the same appalling suddenness as on the people of Moosseedorf or Pompeii. The Minnesota mine gives evidence that

the working was abandoned by men who had no time to prepare for flight; a mass of copper lies on its cradle, and around it are strewn valuable copper chisels, as though thrown away or left on the approach of some powerful enemy, or to escape from a flood or earthquake. These implements are found over a large district of this part of America. Near the Galops Rapides on the St. Lawrence were found a copper chisel, a spearhead, and one or two small daggers, a miniature mask of terra cotta, and finally a score of skeletons of gigantic size buried in a circular space with their feet towards the centre. Large trees grew above the site at Keweenaw Point, where some of these implements were disinterred.

As the subject of particular types being perpetuated is scarcely less interesting than that of the antiquity of man, I will conclude this chapter with the briefest possible notice of a few other building races, observing, in order to explain any anomaly or incompleteness, that I professedly limit myself to those lands now inhabited by savages, or peopled by savages when wrested from them by the white man, or gradually overrun by white people who believed they were simply encroaching on a deserted land. Of course no one would marvel to find evidences of vast antiquity in Egypt and Assyria.

In Europe I may point out the people who carved the Hällristningar or the hieroglyphs of ancient Sweden; the cromlech builders of ancient Britain, of whom we have certainly lost all positive evidence; and the round-tower builders of Scotland and Ireland. As to the immense stone* which M. Maupertius went to

* Pinkerton's Voyages, vol. i. p. 254. See Appendix 15.

the extremity of Lapland to see, I scarcely know what to say about it. It may be only a curiously fissured stone, Nature's writing with dark grey letters on a ground of cream-coloured felspar, or it may be writing like the first rude arrow-headed marks. Again, in Northern Asia, in Siberia, we find towers of which the present people, though their possession of the land is very ancient, have lost any vestige of tradition. Mr. Atkinson communicated to the Geological Society that fragments of worked metal (bronze) had been found at a gold-mine on the river Shurgan in Siberia; they were discovered in presence of one of the officers of the mine, and were seen by Mr. Atkinson within half an hour after. The sand in which they were found is said to contain remains of the mammoth. They seem to have belonged to a bracelet. "The country," says Mr. Atkinson, "was covered with a dense forest of cedars, pines, poplars, and birches, extending for several hundred miles, but few parts of which have yet been penetrated."* "In all North Australia," says the Reverend Julian E. Woods, "caves have been discovered which have evidently been formerly tenanted by the aborigines. The walls around are covered with rude *frescoes* in red ochre, containing emblems as curious for their antiquity as (for their) *showing some remote connection with Hindoo designs.*" Now the Australian found by the early voyagers ere he could have learned anything from the white man, was in a state of the lowest possible barbarism. As for drawing, it is very doubtful if such an idea ever entered his head.

* Quarterly Journal of Geological Society, 1862, p. 42.

In America, besides the Mound Builders, we have copious remains of other races who seem to have perished off almost as mysteriously. Wilson describes a regularly walled but uncemented stone vault found in Pontiac County, Lower Canada. The walls measured eight feet long by six wide and five high: like the old buildings of this kind in France, Switzerland, on the Cotteswold hills, &c., they were only sunk about halfway in the ground, rising in this case two feet from the surface. Over them had been laid a huge stone slab above which the earth was piled. In the vault was found a well-made specimen of gourd-shaped pottery, which is now preserved in the Museum of the Natural History Society of Montreal; it is marked outside with lines which seem to have been given by revolving it against a tool of some kind. Over this vault had grown a maple-tree, which had decayed and fallen. When Cortes marched from Mexico to Honduras he must have passed quite close to the once mighty city of Palenque. It was then as now in ruins, and these ruins cover a space much larger than most of the capitals of Europe; the remains of palaces and temples on a scale of size and magnificence without parallel in modern times, hieroglyphic tablets, paintings, and low reliefs lie strewn about in the wildest confusion. The people of this great empire seem to have been gone and forgotten when the Mexico of the Aztecs was still a powerful kingdom. The heads engraved on the sculptures of Palenque are a good deal different from those of the Aztec race, and more akin to those of the Mound Builders and the older Peruvians. Mr. Stephens saw among the natives one, and only one, person whose

face bore a striking resemblance to those delineated on the walls of Palenque, just as in some dirty neglected ruinous garret at Rome, the traveller may now and then by some strange chance see the genuine old roman face and square head.

While from the Rocky Mountains to the Atlantic there is scarcely a trace of stone building of an age prior to that of Columbus, in the country between these mountains and the Pacific the footsteps of great races meet us on every side. On the Rio Colorado and its tributaries numerous ruins of great extent have been found; they are described as being built with large stones accurately wrought and neatly squared. They are large and plain, without ornament, thus differing widely from the ruins of Mexico and Yucatan. The Moqui Indians, a supposed remnant of the ancient builders, still construct their houses with remarkable skill; their villages are all large square stone structures, with solid walls, not pierced either for door or window, and accessible only by means of a ladder; they are generally seated on lofty plains or tablelands. The people are of small stature, with *fine* black hair, in which they differ from the red man, and resemble the old Peruvian; they are gentle, intelligent, and possessed of great taste. They now survive only in the form of a small remnant occupying seven villages on the Rio del Norte. In California ruined structures of stone are found; Captain Johnston describes one forty feet by fifty, and four stories high.

With the glories of the Incas and their sad fate, with the startling accounts of their terraced declivities, military roads, causeways, and aqueducts, their

bracelets and collars of gold, their mirrors of silver and polished stone, and their finely adjusted silver balances, I suppose the reader to be familiar. The strange thing in their history is that they seem to have also succeeded to an earlier race.

In Tahiti, where the best houses are built of bamboo, is a pyramid about two hundred and forty feet long, about ninety feet broad, and from forty to fifty feet high; the foundation is stated to consist of "rock stones," and the steps of coral, squared with extreme neatness and laid with great ingenuity; in fact, all looks as if it had been made by experienced architects. Yet though some of the blocks employed in the construction of this mysterious edifice are of considerable size, they have no marks of the chisel, nor is it at all easy to understand how such vast masses were transported from the seashore to their present resting-place. "*It is scarcely possible,*" says the writer of the article* from which this information is taken, "*that the present race of islanders, or even their ancestors, could have performed such a task. They are unacquainted with mechanics or the use of iron tools to shape the stones with.* From all that could be gleaned from the guide and from other natives afterwards, I felt convinced that they knew nothing of its history, for, as it was beyond their comprehension, they naturally said it was built by the gods, and was as old as the world."

In Tonga Tabù and Easter Island, at Tinian Ualan, and other parts of the Carolina islands, are seen remains of massive stone buildings, the origin and use

* Colburn's United Service Magazine.

of which are equally unknown to the natives, whose ideas of building are bounded to a rude hut. In the easternmost of the Polynesian islands Captain Beechy observed colossal statues or platforms of hewn stone, many of them fallen and mutilated; the natives could gives no account of them at all.

Such are the Archives of Life. They tell us that four great classes of creatures lived before man; and that of all the great needs of life—for them as for man himself—air, food, room on earth and the continuance of race, means of defence and means of prey—not one was wanting at the proper time. If then the probabilities against three stars being drawn into the same sphere are so enormous, even when such a case depends upon so simple and widespread a power as that of gravity, how immeasurably greater must be the probabilities that six conditions, each of which required vast and complex details, appearing together, could only have been part of a mighty and fully matured plan in which secondary causes must have played a very subordinate part.

CHAPTER IV.

THE FIRST WANDERERS ON EARTH.

"Behold
The first-born brood of chaos and the eld,
The rugged sires of rude unskilful tribes."

Of all traditions, those which tell of the first peopling of earth by the human kind have ever been the most fondly cherished, and where history rejects the evidence it still preserves the legend, as though it were one of those relics which must not be too rudely dealt with even when they can no longer be believed. The spectacle of the first couple when they were alone in the land, in whatever language it may be told, has still an irresistible charm; and faint as are the outlines of their story, dim as is the ideal picture of their isolation and dangers, their joys and sorrows, their plans for the future and regrets for the past, we never grow weary of dwelling upon the theme. I doubt if, in all the grand narratives of the Bible, any have more stirred the heart than those of the first couple issuing forth from Eden to share in the common lot of humanity, and the re-peopling of the world by the children of Noah; or if amid all the fascinations of eastern travel, there is one which exerts a deeper power over the mind than that of treading in the footsteps of the patriarchs.

The reader has now seen that beyond all question parts of England and Ireland, Scotland, Germany,

Flanders and Switzerland, Denmark and America, had been inhabited by rude savages at a period immensely remote if compared with written history; that in some parts of these countries, at a later period, but still long before even the dawn of authentic tradition, there were people who built forts, erected settlements, and gathered together into cities; that they had some knowledge of the arts and sciences, of commerce and religion; and that they believed in a future state. It is at this later period that I propose to take up one or two threads in the dim and tangled history of the first peopling of our island, and trace them out as far as possible by the light which geology is slowly shedding upon this obscure and distant time.

And first, I may observe, that the wandering nations of the earth from whom our earliest colonists are said to have come have been but very few. I do not speak of those who as they grew in strength possessed themselves of lands near them, settled in them, and amalgamated all into one empire, like the Roman and Assyrian races, but of the genuine wanderers who left their fatherland behind them for ever and wandered forth to people the earth, rolling away past stationary tribes as rivers sweep past the wood and the mountain. They have been so few in number that their names lie strewn over the dark sea of tradition, like the scattered ships of the Trojans over the immense waste of boiling waves. When we have named the jew, phœnician, scythian, and Tuath-de-danaan, and possibly an old peruvian and a mongol race, we have embraced nearly all that tradition, supported by modern research, can really call up to life.

But if they have been few and restless as the mighty rivers, they have almost rivalled them in their power of surviving change and destruction. We see in history that nations have risen, become famous and strong, and yet have perished so utterly that scarcely their names have been preserved from the common grave of all human things, leaving the ruins of their strongholds and their histories heaped before us like the leaves heaped by successive autumns :—

"As is the life of the leaves, such is that of mortals ;
Some leaves the winds strew on earth, others the forest
Fruitful brings forth, to bloom in the spring time.
Like these are the races of mortals, this beginning, that ending."*

Yet the offspring of some of these wanderers, the jews, for instance, survive and bid fair to survive as long as the most powerful people now on earth.

The cause of their migrations is to me, in the majority of instances, quite incomprehensible ; at any rate general principles seem inadequate to explain it. It is not a mere want of the luxuries which foreign countries afford that induces emigration, for the larger proportion of the human kind have almost uniformly resisted the introduction of such things from abroad, till within a very recent period at least. It was not in the present instance the principle of moving forwards where there was the least resistance, which we are told is the mainspring of all human movements, for these early rovers made their way

* "Οἵη περ φύλλων γενεὴ, τοιήδε καὶ ἀνδρῶν.
Φύλλα τὰ μέν τ' ἄμενος χαμάδις χέει, ἄλλα δε θ' ὕλη
Τηλεθόωσα φύει, ἔαρος δ' ἐπιγίγνεται ὥρη·
Ὡς ανδρῶν γενεή, ἡ μὲν φύει, ἡ δ' ἀπολήγει."

into populous parts, gave battle to the rightful owners, robbed and murdered them when strong enough to do so, and cheated them when they were not powerful enough to trust to force. Yet while all this was happening there were millions of acres of fine meadow-land and river-bank, of mines and forests, lying ready for the axe and plough. It was not mere pressure at home, for in many cases they never rested long enough in any spot to over-people it; and how little this must actuate people indisposed to wander we may see in such lands as China and Japan, Russia and Hindostan, where scarcely any motive has for centuries proved powerful enough to induce the people to leave. In China the most appalling poverty has till lately found no better outlet than crime; nothing but eviction has driven the starving Celt from the highlands and Ireland; the strong and ruthless policy of conquest and force has alone expelled the red indian from the hunting grounds of his ancestors.

Take for example the case of the phœnicians. They came away from the land of gold-dust and ivory, of the myrrh and the gum-tree, the home of the camel and antelope, with which all their grand traditions were bound up, to seek tin in Cornwall and amber in the cold and distant Baltic. They could have done perfectly well without these things, but even supposing they were necessary, the motive that prompted them, strangers from almost tropic lands, to settle in distant parts of Ireland and England, when both Tyre and Carthage viewed emigration of their subjects with the same cold and sullen distrust as Japan or Russia do, seems utterly inexplicable. I can only

assume that it was some extraordinary instinct which impelled them to this step; indeed, if we look at the vast extent over which the four great wandering races spread, if we remember that in many parts of their journeys not a road existed, nor a landmark or object of any kind except the stars and the sun, that hunger and thirst, cold and danger were ever before them, I think it must be admitted that nothing in the history of the world equals these undertakings.

However my object here is not so much to ask what reasons impelled them to these migrations, as to inquire how far these migrations themselves may have affected the battle of life among men. There is a very prevalent belief that many lands now thickly peopled were entirely colonized by roaming tribes, and that their offspring exist in a mixed form of some kind or other. For instance it seems to be quite taken for granted that some of these people, scythians and phœnicians, landed in Britain, and that their blood still survives mixed with that of danes and frisians, celts and anglo-saxons. My own belief is that such a thing is simply impossible, that a mixed race cannot long survive, and that even a pure race, except in the circle or area for which it was originally adapted or created, is not more likely to stand its ground; that colonies from it, unless they be supplied with fresh blood from the mother country, so soon as they are left to themselves sink into anarchy and decay; arts and sciences flourish no more, language and blood become mongrel, all principles of morality are lost, and in the end the people exterminate or so weaken each other, that

often the original holders of the soil recover possession of it.

Now that he is gone men are beginning to see that Knox was right. He pointed to the swift and sure decay in *physique* of the anglo-saxon in America.* He showed that two opposite races will never bow to the same rule, and that sooner or later they will part, as Belgium has done from Holland and Lombardy from Austria; that race is eternal, blood unalterable. He might almost as well have lectured to the winds, but that his bold predictions and strong original views were based on truth, will be seen when men trust more to nature and less to the tales of old chroniclers.

The mestizos of Lima, born of a white father and an indian mother, and the canadian half-breeds, are scarcely ever found possessed of the least independence or resolution of character.† Sometimes the mestizos are endowed with strength and endurance, but the canadian half-breeds often lose even this. The mulattoes bear fatigue worse than either the whites or the blacks "and are the shortest-lived of the human race (!), the women are very delicate and subject to a variety of chronic disorders; they are liable to abortions and their children die young." One race soon overpowers the other. If the child of a black father and white mother marry a black, in two generations the form and features of the mother are lost.‡ Humboldt says that when a mestizo marries a white man, the second generation differs hardly

* The Races of Man.

† Wilson's Prehistoric Man, Vol. II., p. 344.

‡ Lectures on Physiology, by Mr. Lawrence.

anything from the European race. Speedy and inevitable decay attends the union of the dutchman with the caffir, and the englishman with the east indian.

This I believe would always be found the case could we trace history closely and accurately enough. The warlike tribes which have from time to time poured over parts of Europe have often appeared in numbers enough to overwhelm any force the invaded people could bring against them; they have held the country with a strong hand and have used all the merciless defences of tyranny; yet they have no more been able to abide than the clouds; they have no more swept away or permanently altered the people they oppressed and kept under, than a storm destroys the elements amid which it rages. They have stirred the face of things and passed away again. The croat is only encamped in Italy, as the turk is in Turkey, and the savage russian in Poland, and as the moor once was in Spain and the roman in England. Withdraw them, give the original race room to spring up again and they will cover the soil as fast as a garden or park left to lie waste will be covered by indigenous plants.

I know that the very opposite opinion has been long held and that it more naturally suggests itself. When a tribe of danes glutted with blood and plunder had settled in the land, what more likely than that their descendants should endure in it as well as those of the people they vanquished? When peace succeeded to the war of invasion, what more natural than marriages between families seated near each other? The young who loved, even if of opposite nations, would care little for the strife of their fathers. Then what holds good of

the dane must of the roman, the phœnician, and the scythian. I answer, it does not; the evidence of history cannot decide a question of natural science; the testimony of names of families and customs, of language and worship, though a great historian * has told us it is the best we can have, is a mere nothing in the scale against the exact teachings of zoology. Customs are things of a day, and names and language perish in a century; the celt speaks the tongue of the hated saxon; the netherlander is weaning himself from low dutch in favour of french; the blond-haired briton worshipped the same god† on Cadder-Idris as the red indian on the table lands of Mexico, and the dusky indian at Bhaugulpore. No doubt mixed races would be prolific for a time, the question is whether the indigenous race does not incessantly tend to regain the ascendant. In a century after the romans were gone England was purely english again. The third generation of english after the norman invasion was almost wholly english except in those families who maintained the race pure by marrying only with fresh blood from Normandy, and they soon died out. We hear of our being a mixed race, but when is the roman head, or the norman face seen in really english families?

The englishman is not the saxon, he lived here ages before the saxon was known, and is just as likely as the saxon to have had a language of his own. The whole tale of the saxon invasion is such a monstrous absurdity that one can only rank it with the old wars of Rome taken bodily from the histories

* Hume. † Belus, the god of the sun.

of the still older wars of Greece. All positive evidence points to the conclusion that we are the descendants only of the old english people and painted savages, as they were of the offspring of the old english troglodyte, and as the celt of Ireland is of the old firbolg or indigenous celt of Ireland and the scotchman of the canoe-building people of the Clyde and Forth.

Even in Cæsar's day the south of England was thickly peopled, letters were taught, arts were in high esteem, and the people were not only well clothed and armed, but well mounted in war. The gauls sent their young priests into Britain to learn the sacred mysteries of the order from the english druids; a fact which has so puzzled some of those historians who could by no possibility believe that arts and letters can spread but in one direction, namely, from east to west, that they gave up trying to explain it.* What is still more extraordinary, they must, at least very soon after this, if not quite as early, have made ornaments, the execution of which ripened apace till it closed in a stage of excellence which has never been surpassed. The earlier barrows of Beach Downs, near Canterbury, contain spear-heads, knives, and iron bosses for shields, beads of various shapes and colours, and simple earrings; in the later ones, which Mr. Fairholt ascribes to the time between 582 and 742, are found fibulæ of a most beautiful character, with brooches and ladies' ornaments in a very refined and elegant taste.†

* Burke's Works, 1818, Vol. X., p. 187.

† Costume in England, by F. W. Fairholt.

Now who taught the old briton to fashion such beautiful objects? The phœnicians, it may be replied. But Carthage seems to have had very little that was beautiful; the relics which escaped destruction leave scanty room to regret that so much perished. Dr. Davies has figured some of the choicest scraps of art which he discovered at Carthage, and some remains may be seen in the British Museum. Miserable things they are too, and little calculated to give one a very high idea of carthaginian art; in fact, the phœnicians, like the jews, had no taste but for tawdry show; the glass beads may have come from them; phœnician pedlars may have sold them to the wondering blue-eyed savage girl of those times for her fair hair, or have bartered them for skins; but as to the brooches it is of no use trying to believe it. Perhaps it will be said that the first lessons in the art came from Rome or Italy, as of course it would have been rank heresy to admit that they could have been invented here. But neither Greece nor Italy ever produced anything of this kind in such exquisite taste as the shell of a fibula figured by Fairholt, found at Sutton, near Woodbridge, and now in the possession of Mr. Fitch of Ipswich. Besides, it is in the purest geometric design.

The old english people had communication with the mainland. They imported brass, and had done so for long before Cæsar arrived. In the rudest barrows of Wiltshire, known by the zigzag lines in the arms and the flint weapons to have been formed before the time of the roman invasion, articles of glass, jet, and amber are found. The amber itself was probably imported, and if it be admitted that the plug of cork

discovered in the Clyde canoe proves that Scotland in those times had some intercourse with the south of Europe, then we rest assured that England, by reason of its close proximity, certainly had.

The other parts of England seem to have been inhabited by savages. They are described by Cæsar as very different; perfectly wild, such as they had been since the time when they hunted the flat-footed bear and the giant bull, and such as they continued to be long after. Herodian, considerably later,* says that many parts of Britain were become fenny by the frequent inundations of the sea, and that the natives swam through these fens, or ran through them up to the waist in water, being in fact quite as much at home in such damp quarters as if they had been beavers and swamp hogs; a taste they showed in common with one tribe of the scythians at least, the Finns, who are said to have taken their name from their living in the fens. They are described as almost naked and very warlike, using small swords, which hung on their naked bodies, and shields. It does not appear that they borrowed the idea of arming themselves in this way from either phœnicians or romans, amongst whom, indeed, they saw nothing of the kind. Widely unlike the agricultural people of the south and trading people of the Scilly Isles, the precarious chase afforded them a scanty living; they hunted and fought with flint-headed arrows; their spear-head was a long bone fixed to an oaken shaft; their battle-axe was formed of a ground stone fastened to the handle with twigs and fibres; and they sheltered themselves in

* A.D. 207.

huts made of a few boughs laid down and plaited in with twigs. Already, then, the english savage was armed in a far more effective way than his sires, who had but a poor flint splinter for a javelin head; the ground stone of the battle-axe and the sword show that the age of flint had passed away to return no more.

Then comes the question of who these people were. For many reasons I believe them to have been the same people, or at least not more different than the englishman of the south is from the north countryman. As to all those dreadful histories and derivations about the old Britanni, Cymbri, &c., about which no two authorities can agree, and upon which each successive writer considers it his duty to improve, I trust the reader will agree with me that they are worse than useless in their present form. It will be enough to remember that the land was all one with the mainland, or scarcely broken up long after man was in England, and hence there is no occasion to cross the German Ocean in search of invaders; also, that on the Cotswold Hills, the remains of two distinct classes of people, buried there ages before the days of Cæsar, have been found. As to the old britons being driven by belgians and saxons to the fastnesses of Wales, we may leave the theory to take care of itself. Now and then it has been said, distinct features of a different race from the present English, possibly of some lingerer of one tribe of the ancient people, may be seen among the kentish hop-pickers and the Cornwall miners; but whether there were really two ancient people, as there seems reason to believe from the skulls found in the Cotswold Hills, or there was only the same distinction between them as might now be

seen between the skull of the rude labourer and that of the upper classes, it is difficult to say.*

Then we have the people in the Scilly Isles, described by Strabo as wearing black garments or cloaks, reaching down to their heels, and bound round their breasts, walking with sticks, and wearing long beards. That these were a trading people, carrying on an active commerce with ports in the Mediterranean, possibly also with France, Flanders, &c., there can be little doubt. So far as the description goes they might very well pass for a colony of jews, who were at this time flourishing in Spain, and very possibly traded by means of phœnician ships and sailors. The jews certainly were in England soon after this, if not by this time; in fact, they appear to have been almost the same people with the phœnicians; they used much the same dialect, particularly in commercial matters; and certainly it must be admitted that they suited each other exactly, being equally greedy, ruthless, mean, and suspicious.

We now come to the scythians, of whom men have heard till they have got to believe that the story of their arrival and stay here means the same thing as their forming a great part of the people. If these vagrants came at all, they were here long before Cæsar's time. Generally the scythians are described as a savage predatory race, wandering in large bodies with their wives and children, in tilted carts and carrying their herds with them. Arts they utterly despised, war and theft were their occupation; and it is difficult to suppose that such a people ever fabricated the beautiful ornaments spoken of; they may

* See Appendix 16.

have occasionally come into possession of them as plunder or spoil after a battle, but such races do not work in precious metals.

Tradition, through her younger born sister history, had long told the story of these roving shepherds reaching England from the wilds of Asia. History also says, that in the early days of the roman republic, while Carthage was the proud and merciless queen of the great inland sea, her bold and skilful mariners had formed settlements in England and Ireland, and many writers have asserted that their descendants still exist in Ireland as a distinct people. In England the potent chemistry of the sword and battle-axe soon fused them into a state of greater unity. The tradition is disfigured by many absurd additions, many accounts which are very difficult to believe ; but that there is a substratum of truth, I think there can be no doubt.

The story of the migration of the scythians is mentioned by the old writers, as a saga of undisputed truth. Bede speaks of it thus, and so does Nennius in the ninth century. Villanueva, who finds phœnician names by every mound and valley in Ireland, and Mr. O'Brien, would laugh to scorn any one who doubted either that the phœnicians made their way into Erin, or that they established there a flourishing empire. Even Mr. Higgins, who profanely says, that it is not a matter of the slightest consequence who the celts and scythians were, who looks upon our authorities, the roman writers, as downright liars and plagiarists, and the romans themselves as low plundering vagabonds, admits that there must have been a migration from Spain.

If we now cross the border we find the old legends of Scotland agreed upon two points; that scythians

lived there, and that a great people came thither from the East. When Alexander the Third was crowned king, a venerable highland sennachy, with silver beard and scarlet mantle, stood up and sang how the scottish kings sprang from the son of Neol, king of the Athenians, and Scota, daughter of Pharaoh, king of Egypt.* The idea may seem rather far-fetched, the names and even the royal personages themselves are most probably apocryphal, but there may be some small germ of truth in all this.

The next place we find them in is Ireland, but as a long interval of tradition exists between their appearance in that country and the period of the earliest known inhabitants, it may be as well first of all to introduce one link in the chain of evidence as to the inhabitants of Scotland, and then take that respecting Ireland up to the time when the scythians arrived.

Frequent mention is made in the history of the earliest times in Scotland of the picts. They are said to have been a small people, skilled in carving and building. Now it seems that at an immensely early period there was an old race in Europe akin to the old small-made peruvian race. It was thought that the relics on which this supposition was founded might have been brought to Europe by the followers of Pizarro, but the peruvian skull has been found at Jerusalem, whither it is not all likely the spaniards of that day ever went.† When these accounts are connected with what has been discovered respecting the small size of the early lake-dwellers of Switzerland, and their taste for carving and making imple-

* Tytler's "Lives of Scottish Worthies."

† Wilson's "Prehistoric Man."

ments, and with the accounts of the people whose remains have been found in the ancient burying-grounds of Aurignac and Savigné, their small size and the excellence of their carvings, the fact of lake dwellings being found in Ireland and in Scotland as I have shown; the reader will I think be inclined to admit that tradition and geology directly point to the possibility of a very large portion of these countries having been peopled by a race, of whom the picts were prehaps the last living representatives. It would be interesting if we could class all these little people as tribes united into one common group or type, like the phœnician, jewish, and assyrian groups.

That ornaments were made in Scotland long before the times usually assigned to the beginning of a taste for such things, ages and ages before the days of the blue-shielded warriors of Fingal, seems pretty certain. At one of those places in Ayrshire where sea-shells have been found at a height of forty feet above the sea, a rude ornament of cannel-coal was discovered lying upon the boulder clay, or till, as it is called. Sir Charles Lyell, calculating its antiquity from its position, considers that we may assume for it an age of thirty-four hundred years, or about the time when the Israelites went forth from Egypt. If he had added another five hundred years, it is probable he would not have overrated the antiquity of the deposit. Various circumstances, too, render it probable that the ancient scotch, either themselves maintained some intercourse with the people of the mainland and the shores of the Mediterranean, or else occasionally met with persons who had come from these parts of the world.

The reader will remember that a short notice of the lake dwellings of Ireland has been given earlier on, and I suppose he is familiar with the famous tradition that long, long ago the waters of Lough Neagh buried a city of the round tower people, and that still, when the lake is clear and the air bright overhead, the fisherman may see the ruins of the ancient city deep beneath the waves.* But here science, instead of striving to destroy the bright illusions of legend and poetry, steps forth to offer them her guiding hand, geology reveals lake dwellings in Ireland; geology tells that the builders of such dwellings in Switzerland had clearly been compelled to retreat from the sites first chosen by the encroachments of the waters. But it will be said these were not the mysterious highly cultivated round tower builders; very possibly not; but geology says that these lake dwellers selected their sites with such a strong instinctive feeling of what man requires, that up to the present time successive races have been unable to choose better; and if the Swiss of our day still dwell near the old towns buried under their lakes, why should not the round tower builders have chosen the sites of the old irish lake dwellers, for it seems very probable that they came in direct contact with them.

For a large mass of valuable information about the earliest colonies of Ireland we are indebted to the

* "On Lough Neagh's banks as the fisherman strays,
When the clear cold eve's declining,
He sees the round towers of other days
In the waves beneath him shining."

labours of Villanueva, O'Brien,* and Higgins. Many of the earlier writers, Vallancey and others, adopted and expounded the text that Ireland was peopled from the land of the sun, and was for many centuries a pure fire worshipping land, with far more zeal than prudence. Even Moore, partial as he evidently was to the legend, felt compelled to put it forward as the opinion of antiquarians, and Mr. Petrie, in his prize essay on the ecclesiastical architecture of Ireland, all but overthrew the belief that the round towers were built by these fire worshippers, and that they were at all like the fire temples seen at Bhaugulpore and other places in Asia. Whichever way the question be decided, it will not affect the fact of traces of these great building people being now found in Ireland. Mr. Petrie, sceptical as he is, does not deny the presence of the Firbolgs and Tuath-de-danaans, whom it is quite time to bring upon the stage. I have tried to condense into a short sketch the views of Villanueva and O'Brien, but they are so at discord with each other that it has not been an easy matter to steer wide of no little confusion.

According to O'Brien, the first colonists of Ireland were not phœnicians, but the expelled bhudhists of Persia or the Tuath-de-danaans, whom the intolerance of the brahmins and rajahs had driven into exile, and they were the people who brought with them the art of making those beautiful lunettes, fibulæ, gold crowns and pateræ, of which Ireland contains such vast quantities. They arrived in Ireland quite twelve

* O'Brien's History of the Round Towers; Phœnician Ireland, translated by Henry O'Brien, Esq., 1833.

centuries before Christ under the leadership of three brothers, and at once gave battle to the then possessors of the island, the firbolgs or celts, near Lake Masgin, in the county of Mayo, defeating them so utterly that the latter were compelled to seek a hiding place in some island in "the north." In this action, Nuada Airgiod-lamh, or Nuada-of-the-silver-hand, the general of the persians, lost his hand, and was obliged afterwards to wear one of silver. This account was long looked upon as a tale; but the invaluable relic it seems has been recovered, and is now in the museum of the Society of Antiquaries, who, Mr. O'Brien says, when it was shown to them, "knew nothing about it" (!) and but for this gentleman's restless industry, its use and origin might long have remained a secret. A fac-simile of the legend engraved on it is given in Mr. O'Brien's translation of Villanueva's Phœnician Ireland.

The people whom these Tuath-de-danaans conquered and drove to their northern fastnesses are spoken of as the firbolgs or celts; no other people are mentioned as having at that time shared the dominion of Erin with them. If they were the forefathers of the present celts of Ireland, they must have then been in small number, or the Tuath-de-danaans must have possessed a great superiority of arms and discipline, unless indeed there was some treachery at work; for my confidence in the prowess of the irish is such, that I believe were equal numbers of them turned loose, unarmed, against a mere predatory horde of armed persian infantry, they would just charge them as the wild highlanders did the disciplined english at Culloden, wrest their weapons from them, and either

worst them, or give battle in the most desperate style.

However, it seems they never made any successful attempt to recover their country, and from this time till the days of the scythians the invaders remained lords of some of the fairest portions of old Erin. It was they who founded the famous milesian dynasty of which the irish are so justly proud, and the heads of which are still represented by the noble family of Thomond. They gave the country the name of Iran, or the Sacred Isle, the charms of which were sung of by Orpheus, the swan of Thrace, and doubted of by Diodorus as too good for man.

It was the phœnicians who brought them hither. They were already settled here in small numbers; the grasping, unsated, insatiable phœnicians, ever on the wing, carrying friend or foe so long as they were paid, ready to sail to any climate under heaven if they could only make money by the venture; the jews of the high seas, and just as sanguinary, mean, and inexorable, with a dash of the yankee slave-owning skipper in their character.

These Tuath-de-danaans, says Mr. O'Brien, were the people who built the round towers in honour of Budha, where the purest worship of ancient days, the very counterpart of Christianity, was solemnized. They were a humane and gentle people, and never practised the bloody rites of those wretches the phœnicians. From this time till long after the beginning of the Christian era, Ireland was very far in advance of any part of western Europe. The arts were cultivated, cities were built, the people lived under a mild and wise government, and learning took

so deep a root that it required ages of intestine feuds and barbaric invasion to destroy it. Ptolemy speaks of several illustrious cities as existing in Ireland in his time, a hundred and thirty years after Christ, and many, many centuries later, Spenser could still remark with justice upon their great and early superiority. "For where you say," he observes, "the Irish have always bin without letters, you are therein much deceived; for it is certaine that Ireland hath had the use of letters very aunciently, and long before England." Another proof of Ireland's great superiority is the beauty of her music, if it be true that her exquisite airs are so very old, and that the welsh borrowed so much of their music from the irish as Sir John Carr and Selden say they did. Selden says the welsh music came out of Ireland as early as King Stephen's time.

These people beyond all doubt passed into Scotland, and sent a colony there who built the round towers of Abernethy and Brechin, ascribed on such very insufficient grounds to the builders of the monkish times. I visited both Brechin and Abernethy on purpose to examine these towers thoroughly, and having carefully inspected a tolerable number of the so-called gothic buildings in several different countries, over a tract of quite sixteen hundred miles, I have no hesitation in expressing my belief that they are not of gothic origin at all.

The extraordinary suggestions made by many learned men as to the use of those round towers, as given by Mr. O'Brien, and the versatility which which his opponents suggested a new theory so soon as ever he had demolished an old one, are among the most

curious instances on record of an unalterable resolution not to admit any proof of having made a mistake.

Over the door of one at Donoghmore in Ireland and another at Brechin in Scotland is the bas relief of a crucifix, which was at once accepted as proof that these towers had been built by monkish architects. This was too much for Mr. O'Brien, he called the whole thing a superstructure of historical imposture, and promised them that it should soon crumble about their ears "before the indignant effulgence of regenerated veracity." What was more to the purpose, he shewed that Budha also suffered death by crucifixion, and gave an effigy of the god in the attitude of this punishment, along with two others representing different stages of the incarnation, *dug up from the bogs of Ireland.* Mr. Petrie sought to prove that the crucifixion was an image of Christ, and Mr. O'Brien retorted that this was nothing but rank blasphemy and ignorance. Mr. O'Brien's enthusiasm may be considered amusing, but at any rate it springs from a high motive, which is more than can be said of culpable neglect or coldness in respect to such matters as decaying relics of former ages.

When the Jesuits settled on the coasts of Guinea, Madagascar, Socotra, "and the countries thereabout," (!) they found all the natives wearing crosses, and celebrating their divine service in chaldee, which Mr. O'Brien says is "a dialect of our native irish," meaning, I suppose, of the language from which the old irish sprang. As this utterly mystified them, they could not deny that Budhism existed in those distant parts; but they said this religion

was an adaptation of Christianity, which was rather a mistake, as it was certainly taught ages before Christ.

Many of my readers must have seen the famous stone brought by Edward the First from Scone to Westminster Abbey, where this able and merciless sovereign thought to complete his task of breaking the noble spirit of the scotch by destroying and carrying off all their monuments and archives. It is well known that this stone was used for the crowning of the scotch kings, and was first fastened in a wooden chair by King Kenneth, but Ware says it was brought by those very Tuath-de-danaans to Ireland, and that it groaned when their kings were seated in it to be crowned—not a very cheerful omen certainly. Perhaps this lugubrious disposition was what procured it the name of Liafail, or fatal stone.

The Tuath-de-danaans were in their turn defeated by the scythians, who came thither from Spain, and after subjugating them, founded the scytho-milesian dynasty. The struggle seems to have been short enough, as the first battle is said to have decided the campaign; probably the Tuath-de-danaans were dying out. That they came from Spain seems quite agreed upon, but Mr. O'Brien asserts that they only touched at that country on their way to Ireland. Villanueva, however, in opposition to Mr. O'Brien, tells us that they were carthaginians, and that they founded the milesian dynasty. This is much more probable than that this dynasty sprang either from the scythians, described by some authors as light-haired, blue-eyed, and of large frame, or from the small, wiry, lithe, dark-eyed swarthy race then numerous in western

Europe, whom I believe to be the true scythians now represented by the gipsies. The oval face, tall figure, long hands and feet, lank black hair, dark complexion, and mournful look of the Milesian, seem to me in no way to correspond to the description of any scythian race. Both writers, however, seem agreed upon points, that they just as utterly overthrew the Tuath-de-danaans as these had the celts, and that the Tuath-de-danaans never recovered their former power; in fact they seem to have quite lost all their spirit. These scythians are described as a fierce, warlike people, caring for nothing but war and plunder, despising letters, and standing in much the same light to the Tuath-de-danaans as the early romans did to the highly lettered but far feebler greeks, or the huns and croats to the italians. They too spread over Scotland, but the evidence here is rather confused. The irish, who claim them as ancestors, say that they went out of Ireland and subdued Scotland; the scotch, who claim descent from them, say that they subdued and peopled Ireland; while the welsh, who sprang from the same stock, maintain that they conquered both scotch and irish.

Who then were the scythians for that is more than I can make out? Their cradle has been assigned to central Asia and western Asia; according to Villanueva they inhabited the north of that vast continent. O'Brien fixes them by the shores of the Red Sea, where they were residing when Moses passed over. Gillies tells us that they dwelt in great numbers to the north of the Danube whither Darius set out on an expedition to attack them. Herodotus says

they scalped their foes, and Plutarch describes them as cannibals, adding that Alexander first taught them not to eat their dead, which does not tally with the accounts given of their living on the flesh and milk of their herds, neither does it accord with what little we know of any other race of cannibals, for they are certainly not given to wander about in tilted waggons. Professor Max Muller calls the term Scythian convenient and comprehensive, and says that probably finns, mongolians and turks were known to the greeks under that name. But convenient and comprehensive terms are apt to be vague, and if the scythians inhabited northern, western and central Asia with the countries to the north of the Danube, we may include great part of the human race under that name.

Certainly these scythians were the most extraordinary people ever heard of. Muller has described the Colchians as almost the only people who traded with them. Of these strange colchian people, the dutch of their day, he gives from Hippocrates a most excellent picture. "Their *little* land," he says, "lay on the east coast of the Black Sea; it was principally marsh and the air damp; they were exposed to frequent heavy rains; the plains were cut by numerous canals and their dwellings were reared on the shores *principally on piles*. They, the country people, *were fat* and at least of middle height. Their language was heavy and without charm. They were the Dutch of this very ancient time. Even their great stream the Phasis lost itself partly in the sand."*

* Sämmtliche Werke, vol. i. p. 33.

Now Colchis which was on the east coast of the Black Sea was an immensely ancient egyptian colony, and from them may possibly have come the great lessons taught by Thoth, the god of letters and science, and which the scythians were thought to have carried into Britain.

The scythians followed the worship of Zoroaster, that is, they worshipped fire under some form or other, as did all the most potent nations—Syria, Chaldea and Assyria—of that part of the world. What language they spoke is now difficult to make out, but it seems almost certainly to have been one of the greek dialects. Even as late as the eighth century after Christ they are said to have known greek thoroughly, a fact supported by the use of greek numerals by the gauls.

Traces if not of eastern origin yet at least of close and frequent intercourse with the eastern races there are beyond all doubt all over Ireland, though now so confounded together that it is only with great care we can even attempt to separate one people from the other. Spenser speaks of the belief that the scythians of Ireland came from the east as a thing of which no one had ever doubted. He says they made use of the same war-cry as their kinsfolk the scythians, that like them they live in herds, feeding on "the milk and white meats" of their cattle. Like the scythians, whose very name Villanueva tells us comes from a phœnician word signifying to wander, they were continually roving to fresh pastures. One great difficulty in the way of our giving unhesitating credence to this account is that the scythians moved in such large tribes together, and are described as living in covered

carts, carrying their wives and children with them; and it puzzles me to understand how, if they were numerous enough to subjugate the Tuath-de-danaans and overrun England and Scotland, which the romans found it such hard work to do, sometimes with a hundred thousand of the first soldiers in the world, they could procure food, as they only wasted the land; they produced nothing.

Even in Spenser's time the mantle was considered a distinguishing mark of the irish scythians, an idea this great writer sets himself to dispute. "For the jewes used it, as yee may read of Elya's mantle. The Chaldees also used it as yee may read in Diodorus. The Egyptians likewise used it. The Greeks also used it aunciently" and "the auncient Latins," &c. But nowhere does he deny that the scythians used it almost universally. Spenser describes them in his time as using "Scottish bowes not past three-quarters of a yard long," and "arrows not much above halfe an ell long" as "comely on horseback though hee lacke stirruppes" and deft at mounting, for "in his getting up his horse is still going, whereby hee gayneth way."

My own belief is that they are the gipsies. I know of no people in Europe except the gipsies who have an inextinguishable love of wandering and living in covered waggons. True they no longer drive their herds with them, for stronger men have taken these away and with them the pastures. They cling to their ancient customs, worship and laws with all the tenacity of the patriarchal people. They will steal from the stranger, him they will spoil in their petty vexatious way, but it is rarely they rob largely; what

they pilfer is to keep up life. They claim a right to take the fowls and game of those who took from them their pastures; they think God gave to every being to live on the fruits of the earth. Among themselves they are said to be honourable, and their rule of right and wrong towards each other might put to shame those who look upon themselves as made of better flesh and blood. Perhaps few people figure less frequently in the police reports than the despised gipsy. But I must say I lean entirely to the belief that they are a pure original european race, having nothing in common with the ugly mongols and huns. They are not the least like any of the wandering asian races; neither are they at all like the copts or any people I have seen in egyptian paintings. They may have belonged to that great group of short dusky skinned and dark-haired races who have so long dwelt by the Moldau, Theiss, Danube, and Rhine, known as croats, goths, bavarians, &c.

Villanueva says the scythians mixed with the phœnicians, and overran Palestine; but I should sooner think fire and water could mingle; he also says they spread into Wales and settled in the south part of it—which then comprised Monmouthshire and Herefordshire—where they were called Silures from Zil, worshippers of the sun and fire, fire being with them not only the god of all good but also the emblem of justice and vengeance, and the workings of whose wrath the accused criminals called down upon their heads if they were guilty. Nothing could be more natural than that men who had not been taught a purer and nobler religion should

worship the sun. His fierce, resistless heat, his unparalleled splendour, especially in the pure air of the East, his power of evoking life when after winter had passed away he resumed his empire, must have made him like the lion, the very type of strength and majesty.

But where were the phœnicians all this time? Villanueva says busy in Ireland settling, building temples, colonizing, trading like the jews, steadily pushing on their way, leaving others to fight, sow and plant while they had the trade. As to the proofs that they were in Ireland in vast numbers and from a very early date, they are ample enough; the difficulty is not to find them, but to arrange them without overloading the page. Throughout a large part of Ireland there is hardly a valley or plain, a moor or hill, but has some spot or some clan or sept that bears a phœnician title, often hardly changed in all these years. In the plain of Fermoy, called in the Annals of Innisfallen, the "Plain of the Phœnicians," are a number of stone pillars erected *phœnician fashion* upon little hillocks. Some of them are of vast age. The phœnician people worshipped Baal, the Bel of Babylon and Chaldea, and the first day of May in irish was called La Baalteinne, that is the day of the fire of Baal. The old irish name for a year meant the circle of Baal, and several irish mountains still retain the name of Clocgreine, that is mountain of the sun; "in numbers of which you may yet see the ruins of heathenish altars and chapels." A great number of words in the ancient irish were phœnician, itself a hebrew dialect, and the antiquarians who in Byron's day had, after settling time, settled that

the sublime old Erse was punic * still retain the field.

In Ireland we may trace very distinctly several different kinds of altars or religious monuments. First, the cromlechs raised by the people who possessed the land before the Tuath-de-danaans more than three thousand years ago. These cromlechs, or flags of the Deity, are immense flat stones, supported on secure stone pedestals. Next come the round towers of which we have spoken. Then small stone fabrics called Druids' houses, many of which may be seen at Kerry, Cashel, Dundrum, &c.; after them, or along with them, great underground vaults, of which the most surprising yet discovered is that at New Grange, the very name of which is corrupted from phœnician words meaning the cave of the sun. Near Sligo stands on the "isle of the sun," a conical shaft of stone, surrounded at the base by a wall that it might remain holy. O'Brien considers the stone chambers "coeval almost with the round towers." They seem allied to the dolmens.

Near Drogheda stand, or rather lie, the ruins of a singular monument, or species of pyramid which covers two acres of ground, and has an elevation of about seventy feet. The original height was not less than a hundred feet. It is formed of *small* stones

* "What Erin calls in her sublime
Old Erse or Irish, or it may be Punic,
The antiquarians who can settle time,
Which settles all things, Roman, Greek, or Runic,
Swear that Pat's language sprang from the same clime
With Hannibal, and wears the Tyrian tunic
Of Dido's alphabet."

covered with earth, and at the base was encircled by a line of stones of enormous size, upright, and rising ten to eleven feet above the ground. About a century ago there was a large pillar or stone on the top, but it has been destroyed. "Those stones," says O'Brien, "as well as those of which the grand interior chamber is built, are not found in the neighbourhood of the pyramid, but have been brought to them from the mouth of the river Boyne, a distance of seven or eight miles." This was a common practice among the druidical builders, and is repeated at Abury in Wiltshire. The stones of which the entire structure consists are of *great size*;* those which form the lintels, or roof of the gallery, are but six in number; and of these the first is twelve feet four inches long, the third eighteen feet, and the fifth about twelve feet: the breadth of these stones is not less than six feet. The tallest of the upright ones forming the entrance to the recess is seven feet six inches in height, and its companion seven feet. Within this chamber is an urn three feet eight inches in diameter; in the opposite chamber is another, but displaced from its supporter: these urns are of granite. On the first examination of the interior a pyramidal, or obeliscal stone, six or seven feet in height, is said to have stood in the centre, near which the skeletons of two human beings were found; and about the same period two gold coins were discovered on the top of the mount.

* Mr. Petrie considers that there is a great identity between the cyclopean remains of Greece and Italy and those of Ireland (Ecclesiastical Architecture of Ireland, vol. i.). There is an equally great identity between this placing of stones on mounds and those on the Tothills of England.

Now with respect to this chamber, it seems to have no marks of fire, and probably was not used for such a purpose. From what has been discovered in similar buildings on the Cotswold Hills and in France, it seems clear that these were burying chambers for the chiefs, as the cromlech was for the high priest or king. In proof that the cromlech was really used for a burying place for persons of distinction, I may mention that, in 1838, a knoll in Phœnix Park, Dublin, was levelled, when it was found to consist of an artificial sepulchral mound, a hundred and twenty feet in diameter, which had been formed by heaping earth *over a cromlech*. Within this cromlech were found two male skeletons which had been interred in the early sepulchral or sitting fashion. The remains of an animal, supposed to be a dog, were also found, and four stone cists, each containing a sepulchral vase with burnt bones. There were, likewise, an arrow-head of flint, a double-headed bone pin, and the remains of a shell necklace; but many of the cromlechs again were never used in this way. Whether they served as the sanctuary of the high priest, typifying the throne and palace, it is quite consistent with what we know of savage uses to believe that when some great arch-priest or warrior died, they buried him, temple, weapons, ornaments, and all, just as in Cæsar's time the gauls buried their warriors with their arms and favourite retainers, their dogs and horses, and as the Huron and Chinook warriors are still buried with their pipes and spears, their paddles and the scalps they took in battle. Similar great-stone or megalithic buildings have

been found underground in other parts of Ireland and in France. "While," says a writer in the *Revue des deux Mondes,** "the more historical regions of our country scarcely offer a few fragments before the times of the gauls and romans, the heaths of Brittany and the woody valleys of Poitou have kept their dolmens (rude altars of unhewn stone), and their *rangées de menhirs,* the plains of the centre of France show their *fosses-à-loups,* their *marges* or *mardelles,*† which formed the under story of the gaulish houses, and when we penetrate the profound pine forests of the Landes, we are astonished to see the enormous enclosures (*clôtes*) cut in the ground, and which have remained deserted since the time when the Celts or the Vascons drove the old people away. Solitude has preserved these remains of a people who no longer exist."

In England and Scotland, while we discover the Cromlech and the Clocks of the sun or Druidical above-ground temples, the chambers, so far as I know, have not been traced except on the Cotswold Hills, although I imagine the question of whether an eastern *form of worship* was used or not in England may be as safely answered in the affirmative as any question of antiquty.

Many years ago a gentleman of the name of Todd found in a churchyard, in the little town of Corbridge, in Northumberland, an ancient altar erected to the Tyrian Hercules, bearing an inscription in the old

* Fevrier 15, 1862.

† "Des traces d'habitations à moitié souterraines: elles consistent en cercles du 20 à 100 pieds de diamètre, qui contiennent les restes d'une industrie peu developpée." (Troyon.)

greek letters, with bulls' heads and sacrificing knives of the rudest form carved on it. Now it is not at all likely that the romans would erect an altar to a phœnician deity, or inscribe greek letters upon it. The only possible solution of the enigma seems to lie in the fact of the old druids using greek characters.

Major Cunningham* tells us there can be no doubt that the budhist form of worship existed at some time and under some form in England, but there seems more reason to think the old english worship was egyptian.

Long before the time of Cæsar the god called Thoth by the Egyptians was worshipped in England.† In a map published little more than a century ago, the hill erected in Westminster to the worship of this god, and from which comes the name of Tothill fields, is shown just at a bend in that ancient causeway, the Horse-ferry Road. There are several places in England where similar hills either exist or did so. They are scattered all over from Devonshire to Northumberland. Most of the hills on the seacoast of Dorsetshire are called teuts by country people. One of these hills stood lately, and perhaps stands now, near Wilts. It is a lofty conical mound *with a vast stone on the top.* This was the form under which the early english worshipped this god. There is or was lately another on the east side of Worcester, and the Toot, near Tewkesbury, is well known. The singular stones at

* British Quarterly Review, 1859, vol. ii.

† Hermes Britannicus, by the Rev. W. L. Bowles.

Penrith known as the giant's thumbs were very likely erected to this god.*

It is not mere coincidence then that this god is called the Thoth of the egyptians, the god Tot of the gauls, the Taute of the phœnicians, the Teut of the teutons, and the Teutates of the celts; that Mercury or Hermes should be worshipped in Phœnicia and Egypt under this name, and that Cæsar should say *he found the worship of Mercury established on his arrival in England;* that the ethiopians should have worshipped the dog-star under the name of Tot, and that the Druids should have cut the sacred vervain at the rising of the Dog-star.

Baal, quite a different god from Mercury or Toth, was worshipped in England as well as in Scotland and Ireland. Mr. Bowles mentions a well at Tottenham sacred to Belenus, or the Sun, and another at Sulgrave. The Druids made fires on May eve, Midsummer eve, and the first of November in honour of Baal, and all over Scotland, Wales, the Isle of Man, &c., lie cairns or heaps of stones, like the *Mercurial* heaps of the Greeks. May day is still known as La Beal tine, or Day of Baal's Fire, by the highlanders.

Easter day was the Astarte day of the ancients. The Christian festival seems only to have been grafted on the old ceremony, as the feast of St. John was grafted in Ireland and Norway on the old Baal worship of the same day.

It is well known that those savages, the phœnicians, would sacrifice their own children to Moloch. This

* The reader may see them in Jefferson's History of Cumberland.

was practised by the israelites occasionally, and by the assyrians and syrians. In the Valley of Tophet, too, a fire was always kept for burning the flesh and bones of sons sacrificed by their own parents, who dragged them through the flames in honour of Moloch, but nowhere did this far worse than fiendish custom flourish, nowhere was it so thoroughly cherished and enjoyed as among those atrocious devils the phœnicians. While the wretched victims were shrieking in agony, they used to dance round the fire striking the timbrels. The horrible rite generally ended with a scene of most bestial drunkenness. It makes one's blood run cold to read of the extent to which these creatures carried their infatuation. When Agathocles was pressing Carthage two hundred children of the best families in Carthage were sacrificed, and no less than three hundred of the citizens burnt themselves of their own free will. These brutalities are said to have been practised in Ireland, but, according to Mr. O'Brien, not by the phœnicians so much as by the celts. The Tuath-de-danaans, he says, never observed these horrid rites, they were indulged in only by the firbolgs, who were celts, and who contrived the cromlechs for the occasion. "The *Scythian Druids* would fain re-establish the usage until repressed by the humanizing precepts of the enlightened Danaans. So they immolated only criminals." *

* This old phœnician practice of passing pregnant women and children through the fire has not been long extinct in the Highlands, and a correspondent sent Mr. Hone a transcript from a journal kept by a member of his family, in which it was said that the sister of the queen of the gipsies having died (1769), the other gipsies burnt all her wearing apparel, "including silk gowns,

O'Brien, speaking of the actual fire temples or vaults, of which there are several in Ireland—the very vaults or fire temples described by Hanway as not exceeding ten or fifteen feet in height—says that in 1820, meaning I presume 1280, Henry de Loundres put out a fire of this kind called "inextinguishable," which had been preserved, though a remnant of the pagan idolatry of Baal, from the earliest times by the nuns of St. Brigit at Kildare. It was re-lighted and continued to burn until the total suppression of the nunneries; the ruins of the fire-house and nunnery still remain. We may be pretty certain that between the first coming of Tuath-de-danaans and the first preaching of the Christian religion three forms of worship held sway in Ireland; the early persian, phœnician, and later persian or scythian. Mr. O'Brien ignores the phœnician faith. He says, "We observe mouldering in decay beside each of the three species of ancient worship, the celtic, the budhist, and the druidical, the first and last of which became ultimately identified, and of which the cromlechs and Mithratic caves are the memorials; while the round towers represent the purer, the bloodless, and the inoffensive budhist faith. Christian ruins of more modern structures yet venerable in antiquity, and composed by architects who could not vie in skill of either design or ornament with their pagan predecessors."

We always hear of the Druids as priests practising a cruel and bloody religion, professing an immense reverence for the sacred groves, resolutely refusing to give up any of their horrible practices, hated by all

rich laces, silver buckles, gold earrings, trinkets, &c., for such is their custom."

the races near them,—a description which agrees so well with that of the phœnician priests at Carthage that I doubt if accounts of any two classes of a community more completely in accordance could be found in history. But from what the well-spent labours of Mr. Higgins, Mr. Bowles, and others have brought to light, it seems far from improbable that at any rate some of them taught the lofty simple fire-worship of Thoth, the ibis-headed god of the reed-pen and papyrus roll, who ages before the first Pharaoh ruled in Egypt taught men letters, told them that the soul was immortal, and bequeathed them the germ of the solar system and the great doctrines of Pythagoras, while other druids or other priests taught the fiercer religion of Baal, thus giving us two forms of fire-worship in England; that, as Strabo says, they had a rude but imposing system of geology, the essence of which was that the universe was immortal and destined to survive fire and water. From the fire-worship of Thoth which adored the Creator under the form of the sun, sprang all the divinities of Greece and Rome, and when it is remembered that the peculiar old peruvian skull has been found in Europe and at Jerusalem, and that the sun-worship has been found in Peru and Mexico, it would seem as if there was behind all this an unwritten and undreamed of history, yet perhaps to be unfolded.

The priests of druidical times are said to have made amulets or rings of glass, some of which are described as very beautiful, being composed of blue, red and green, with spots of white so arranged as to form an emblem of the lives or future states of the wearers.

Villanueva mentions that a tribe of armenians came

with the phœnicians into Ireland, and the reader is referred to his work for the proofs. It may be a mere coincidence that in the earliest drawings of the norman invasion we find the peaked armenian cap as it is drawn by Layard. Mr. Rokewode engraved two figures from the norman church at Kilpeck in Herefordshire, one of which wears this cap, or as Mr. Fairholt* calls it, "a cap of *the Phrygian* form, and exceedingly similar to those worn by the ancient Britons and Gauls."

There are certainly some very striking points of resemblance between the customs of the old britons and those of some eastern nations. The priests of ancient Egypt wore breastplates very similar in form to those used by the chief priest among the druids, "and it is perhaps equally singular that others of the precise form but made of feathers, were worn by the people of the Sandwich Islands.† The phrygian shield, the mooned shield of Lodbroc, is among the earliest of known saxon shields. Among the symbols found at Hermantis near Thebes is one exactly representing the circle and serpent as at Abury. The druids constantly employed the figure of the serpent as an emblem of immortality.‡ The colossal series of stones in Normandy, about four thousand in number, and possibly intended to mark the year of the world according to the reckoning in old celtic times, is called Carnac, which in Egypt was sacred to Thoth.§ The elephant is carved on the west side of Brechin round tower, just

* Fairholt's Costume in England, p. 90. † Ibid.
‡ Hutchinson's History of Durham, vol. i. p. 4.
§ The Celtic Druids, by Godfry Higgins.

as it stands on the side of the doorway of the temple of Calane in Ceylon, and in the old nubian temple of Kalabelu sit three figures, each with a cross in its hand.

Just as various tribes of jews went forth and settled, sometimes from choice and as often on compulsion, and lived age after age in the same spot, side by side and yet with some distinctive marks, for instance the black and white jews of whom I have elsewhere spoken; and as some of them are warlike such as the afghan jews, some learned and musical as the german jews, some utterly degraded and filthily dirty, like the polish, Frankfort, and Prague jews, some purely trading, yet all united by one common bond of strong family features, habits, passion for wealth and singular virtues, so in this immensely populous phœnician race there may have been numerous tribes distinct from each other but still more distinct from common races, equally united by one great tie of origin, worship, and similarity of feelings.

Some of the more adventurous of these races seem to have spread even further than Ireland, and to have reached the other side of the Atlantic. This has been stoutly denied by some writers and as strongly asserted by others. If correct it would appear that they soon passed away again, for no proof of their actual existence, or of their ever having possessed colonies in these distant parts has been preserved.

The mexicans used to relate that long before the invasion of the fiendish spaniards, white men wearing long beards came to their land from the East. I own that at one time I was quite as incredulous about this as about many idle legends, but I think differently

now. In the first place red men, with scarcely any hair on their faces, were not likely to have invented such a fable unless they had either seen such men or heard of them, for there are no natives like this in America. If they had seen or heard of them, there must have been greater communication between America and Europe before the time of Columbus than has been generally thought. The mexicans built vast pyramids, called their temples by a word which sounds marvellously like Greek or Latin.* They called their priests papa-hu (the last syllable being an ending), which sounds very like the papa or pape of Europe. In their ancient carvings mexican chiefs often wear helmets with a serpent starting out from the forehead after the fashion of the egyptian kings, and to this day the mexican indians hang hair, teeth and rags upon the great cypress tree of Mexico, just as the breton peasant still hangs votive locks of hair in chapels, and as the rude fisher people of Ardoilen† offered nails, shells and fish-hooks on the altar of their little church. A great similarity exists between the cruel sacrifices of the mexicans and those of the phœnicians, and of all the ancient people on the western mainland the mexicans alone imitated the phœnicians in the character of their worship, which Wilson justly says was a ritual only fit for the devil. The peruvians, still further off again, ornamented pottery with maltese crosses and shaped heads on them which would have been no disgrace to the palmiest times of grecian art.

* Teocalli, mexican; dei cella (probably pronounced kella) latin; *θεου καλια*, greek.

† A small island about six miles from the coast of Connemara.

If these vikings from the east reached Mexico, how did they get there? What little tradition tells us is, that they went by Iceland, and from thence passed to the east coast of North America. There is great reason to believe that the phœnicians first gave the name of Thule to Iceland; they called it Gezirat Thule, the island of darkness or evening. The tales of the old Icelanders that their adventurous rovers* discovered America in the ninth century have been long dismissed with little more than a passing notice in a foot-note or an appendix; even now when they are admitted by many writers, they excite little interest, though to me they seem calculated to throw light upon one of the most profound enigmas of past ages, the state of the globe and of navigation at such a remote historic era. The early scandinavian writers made the white man's land extend to Florida, close to the borders of the Mexican Gulf, and an old norse chronicle which treats of the first colonization of Iceland by the northmen, mentions that the old vikings found there christian men whom the northmen called papa. Now from Iceland to Newfoundland is not so much longer or more difficult a voyage than from Norway and Sweden to Normandy, a voyage often made in those rude times, and is certainly not in any way more arduous than some of the voyages of the phœnician sailors, to disbelieve in which altogether would be simply to discredit ancient history once for all. Besides, in our time such voyages have been performed in craft more frail than that of the phœnicians or northmen. In 1833, a japanese junk was

* Van Troil's Letters on Iceland.

wrecked on the coast of Oregon, and little more than a century ago a poor Esquimaux drifted in his canoe to the coast of Aberdeen, where he was picked up by a ship.

In the Landnama written by various authors, the first of whom was Are Frode, born in 1068, it is said that Iceland was settled by the norwegians in the days of Alfred the Great, and that when they reached Iceland, they found books, bells, and croziers. In fact, it appears to have been well known long before that time. Bede also speaks of Iceland under the name of Thyle (the ultima Thule), a century before the norwegians went there, and Alfred the Great gives it almost the same name. Nay if we are to credit the grand old tale of the Nibelungen, and if it were the island where Sivgfrid subdued the haughty Brunhilde, it must have been, in the days of Attila, a rich and noble country.*

The Iroquois Indians long sacrificed with much solemnity a white dog as a burnt offering to the Great Spirit, and when William Penn concluded his famous treaty with the sachems beneath the great elm-tree of Schackamaxon, the chief sachem, before confirming the bond of agreement, put on his head a chaplet in which appeared a *small horn*, which with them, as with the eastern people of scripture, was the emblem of power and sanctity. It was understood that this act made the place sacred, and so soon as

* " Ich hab' in meinen Tagen, die Wahrheit will ich gestehen,
So wohl erbaute Burgen nie so viel geschen
In irgend einem Lande als wir da vor uns schaun ;
Der mag wohl reich heissen, der alle sie vermocht zu baun."

the sachem assumed the chaplet, the Indians threw down their bows and arrows and seated themselves round their chiefs in the form of a half-moon.

Mr. O'Brien is not troubled with any misgivings as to whether or not the phœnicians spread into America. He simply asserts that they did, and seems to consider any objection to his view as utterly unworthy of serious argument. "The Algankinese," he says,* "are the most influential and commanding people in the whole of North America. Their name in IRISH indicates as much — viz., *algan-kine,* or *kine-algan,* a noble community, corresponding to the phœnician words *alga* and *gens,* which mean the same thing. The language of this people *is the master language of the whole country,* and what is truly remarkable, *understood,* as Baron de Humboldt asserts, *by all the indian nations except two.* What, then, are we to infer from this obvious affinity? Why unmistakeably that a colony of that same people who *first inhabited* Ireland, and assigned to it those characteristic names which so disconcerted the harmony of Mr. O'Flaherty's acoustic organs, had fixed themselves at an early date in what has been miscalled the New World." Mr. O'Flaherty had described the ancient irish names as no less outlandish than "the names of the savages in the american forests," and thus, according to Mr. O'Brien, had blundered into the truth. One difficulty stands in the way. Mr. O'Brien has himself represented the celts as being the first people who inhabited Ireland, not the phœnicians. On the whole, then, I think we may conclude that

* Phœnician Ireland.

voyagers from Ireland really reached Iceland, and very likely America, at an extremely early date, possibly long before the Christian era. It is not improbable that the phœnicians of Ireland, gradually succumbing before the growing strength of other races in that country, led the way, and were followed by the irish christians, unless we can suppose that some of the phœnicians themselves had become converted to Christianity.

Where did the mound builders and the old canadian copper miners, the ancient peruvians and pretoltec builders of Palenque come from? Did they grow up on the land where they lived and died, or did they swarm forth from that great cradle, the vast mysterious steppes of Asia? Men seem quite unwilling to believe that they could by any possibility be indigenous, and it has been supposed that some of the first wanderers from Asia passed by Behring's Straits to America, and thence spread over this vast continent. Professor Wilson seems rather to lean to the opinion that they may have crossed the Pacific at once to the western coast of America. The great preponderance of stone buildings between the Rocky Mountains and the Pacific, the nearness of those of old Peru to this great sea, and the numerous traces of similar architecture in the islands of the Pacific, are considered as proofs of a common settlement. But as it seems difficult to imagine that they sought a few scattered islands, it is surmised that at a comparatively modern period large tracts of lands in the Pacific sank down, and left only those little specks of islands which now dot its vast expanse. Professor Dana, geologist to an expedition sent out by the United States Government, adopted

this conclusion, and Mr. Hall, who also accompanied the expedition, gathered such data as satisfied him that the singular stone structures of Ualan and Bonabe were built when the sites on which they stand were much higher than now; in fact, they are at present sunk so much that what were once paths are now passages for canoes. Again, the remarkable traces of the great stone or megalithic carving observed by the celebrated Captain Beechey on some of the islands near the coasts of Peru and Chili, are now found repeated at Bonabe and other islands near the asiatic coast.

CHAPTER V.

THE FIRST COLONISTS OF SACRED HISTORY; OR THE LOST TRIBES.

"Tribes of the wandering foot and weary breast."

Did any person ever come to a satisfactory conclusion as to what had become of the ten tribes? I can scarcely believe in the existence of such a philosophical mind, and can safely say that I never heard or read till now of anything that looked really like a solution of the enigma.

"When the Spaniards," says Mr. Tylor,* "came to these countries (Yucatan and Mexico), as soon as they had leisure to ask themselves what could be the origin of the people they found there, of course the answer at once was 'the lost tribes of Israel.' Indeed the nose of the mexican Indian is said to be very jewish. And as we looked at these grave taciturn men, with their brown complexions, bright eyes, and strikingly aquiline noses, it did not seem strange that this belief should have been generally held, considering the state of knowledge on such matters in these days. We English find the ten tribes in the red men of the North: jews have written books in Hebrew for their own people, to make known to them that the rest of their race had been found in the mountains of Chili, retaining unmistakeable traces of their origin and conversing fluently in Hebrew: and

* Anahuac, p. 17.

but lately they turned up, collected together and converted to Christianity, on the shores of the Caspian. The last two theories have their supporters at the present day. Crude as most of these ideas are, one feels a good deal of interest in the first inquiry that set men thinking seriously about the origin of races, and laid the foundation of the science of ethnology."

Again, other observers have quite satisfied themselves that these tribes existed on the coast of China; but this is overthrown by its being proved that they lived in Kurdistan under the name of Nestorians, who do not resemble the jew in face and never practise circumcision. Eldad the Danite had ages before found them in Tartary. Sir William Jones gave his consideration to the question of their being the Afghans, and this view seems now positively to be settled in the affirmative.

One of the most original theories ever yet broached was that by the late celebrated Robert Knox in his noble work the "Races of Man." This keen observer proposes the hypothesis that these people, whose mysterious disappearance has long caused philosophers so much toil and perplexity, had gone into the interior of the earth, by the hole which Captain Symonds discovered near the North Pole; a very satisfactory solution indeed if it could be proved; but as it would have been rather difficult to follow them far below the surface, the theory must pass for what it is worth.

Whether they ever made this trial trip into the bowels of the land or not, they must have found it an unsuitable abode, as they are at last shown to be living in Afghanistan. They call themselves Ben

Israel or Children of Israel, also Bunnie Israel, meaning sons (of Israel), as Fitz and Mac do, though they repudiate with scorn the name of Yahoudi or jew, for they utterly hate and detest the people we call jews, just as much as the turks or indeed any other mahometans do, despising him more than any living creature. One warlike tribe call themselves the tribe of Joseph. They possess a strongly marked jewish style of face and seem very sensitive about the bantering tone with which the subject of their origin has generally been treated. The younger brother marries the widow of the elder according to the law of Moses.

This fact about their physiognomy ought to be decisive. Notwithstanding what has been said about the gradual change of type and race, the influence of food and climate, manners and marriage, we may rest certain that no abiding change was ever yet effected in the features of any tribe on the face of the earth. For a time indeed some distinctive mark may fall into abeyance, the first offspring of a mixed marriage may not be exactly like either father or mother, climate may change each successive race more and more till they sink as in the case of the yankee or Anglo-Australian, but these departures from the original type endure no longer than the exposure to the cause which gave them birth. Reunite to their distinctive nations the offspring of a mixed marriage between the english and the austrian or belgian races, and the children of these return to the type of the nation with which they are amalgamated. The austrian or belgian becomes croat and fleming, those which remain in England become anglo-saxon. Transplant the

family of the yankee or anglo-australian to the land of their fathers, and in one generation more you will scarcely distinguish their children from the parent stock. I do not believe there is any class of people in whom this disposition is more strongly marked than in the jew. After three or four generations of conversion to Christianity, of continued marriage with Christians, english customs, food and climate, the jew comes out as strong as ever, the glib oily tongue, the nose, the same shifty tricky spirit of remorseless greed, which has made them abhorred, and in spite of all their hoarding, sparing and grinding, wretchedly poor in the mass.

Dr. Wolff, himself a jew, and who travelled through great part of Afghanistan, thought the general physiognomy of the afghans was not jewish, but that two of the tribes, the Joussouf Szye and the Khyberra, were very jewish-looking; and the late Mr. Moorcroft says that they have a singularly jewish cast of features.

The account given by the afghans themselves is that Nebuchadnazar, when he overthrew the temple of Jerusalem, transplanted them to the town of Ghore, and that they were called Afghans from their chief Afghana, the son of the uncle (cousin?) of Azof,* the vizier of Solomon, and that they lived as jews till Kaleed called them to the wars of the infidels, when they distinguished themselves and their leader got the title of Abdulrascheed, or son of the mighty, and was named "the mast" of his tribe. Then they went back to Afghanistan, which they have never quitted,

* He was the son of Berkia and the grandson of Saul.

often as the fortunes of their land have changed rulers.

An officer on the staff of the Commissioner-in-Chief in India wrote to Sir George Rose in 1852 that he had just been through Afghanistan and had been much struck with the jewish look of all the people he saw the moment they crossed the Indus, that one of the tribes who were just then giving them so much trouble called themselves the tribe of Joseph and another the tribe of Isaac. Mr. Elphinstone, speaking of the upper classes at Rajpoutana, says, "The upper classes are Rahore Rajpoots (who are of the afghan race). They are stout and handsome, with hooked noses and jewish features." At the rajah's court, held at the same place, he was also struck by the fair complexions and jewish features of the natives present, and on crossing the Indus he again found the same phenomenon.

Again the prevalence of Israelitish names is a remarkably strong proof. One of the earliest parts of which they took possession in Afghanistan, is called the mountains of Soliman or Solomon, one part of which is called Solomon's throne, while a mountain range is known by the name of "the lord Amram," being the same with Amram the father of Moses, and the Arabs, who may have taken the name for the legend from the jews settled in Arabia, call them the people of Solomon. Further, besides the names of the tribes we have spoken of are found the tribe of David, the tribe of Esau, Solomon, and Moses, that of Ishmael and Saul, from whom they claim to have sprung.

In such a land names do not change as they do

amongst busy bustling commercial people. At all times men have only penetrated with much difficulty into the great mountain districts of Afghanistan. The vast mountains towering into the clouds and crowned with eternal snow, the tremendous precipices and defiles make it almost impregnable. Great part of the tract first occupied by the afghans is inaccessible for beasts of burden, and presents extreme difficulty to men. It is therefore hardly wonderful if, as is said, they were residing here in the time of Ptolemy the geographer, and if the most wasting and overwhelming invasion have swept over them in vain, with the force of the whirlwind it is true, but leaving as little abiding impression behind.

"This group of Hebrew patronymics," says the Rev. Mr. Forster,* "giving names to the tribes or classes of a great eastern nation, in a way without example in other Mahometan populations, might alone justly awaken interest and inquiry. But when avowedly originating in union with a universal national tradition, and taken in connection with the claim of Israelitish descent, it assumes the character and weight of substantive internal evidence."

This gentleman has traced with great care the close connection between the evidence given by the Scriptures and the traditions of the Afghans themselves; he has also carefully collected and compared the geography of Ptolemy with the descriptions of Mr. Elphinstone, and deduced from them the conclusion that the evidence in favour of the view of the afghans

* The Monuments of Assyria, &c., with a New Key for the recovery of the lost Ten Tribes : p. 258.

being a jewish tribe, and of the mountains of Solomon and other parts having borne these names from very ancient times, is not to be refuted.

Besides observing the old patriarchal form of government and the law of Moses "that if a man die leaving no children, his brother shall marry his wife," they keep to the severe Mosaic law of life for life, eye for eye, and tooth for tooth, &c., the dreadful *lex talionis*. Mr. Elphinstone says, "The injured party is considered to be entitled to *strict retaliation* on the aggressor: an eye for an eye, a tooth for a tooth, and so on."

If there be one passion more than another in the jew which has made him abhorred, it is his inborn vile love of gain. To gratify his rabid thirst for money he will overcome everything men hold dear, and submit to be detested by the whole human race. Of all creditors he is the most cruel, insatiate, shameless, and importunate. Now see what those who know the afghans well say of them. Avarice, writes Sir George Rose, is their ruling passion, and Mr. Elphinstone tells us that the desire of gain seems to be almost a disease with them. "Most of the Douranee chiefs prefer hoarding up their great but useless treasures to the *power, reputation, and esteem* which the circumstances of the times would enable them to command by a moderate liberality. The influence of money on the whole nation is spoken of by those who know them best as boundless, and it is not denied by themselves."

Among these savage grasping caterans, as fierce and lawless as the winds that tempest round their desolate ghauts and snow-capped mountain-tops, endowed

with all the craft of the savage and the forethought of civilized man, and ever at feud among themselves or warring one upon another like the clans of the highlanders or the milesian septs, we find one tribe still more impracticable and unruly than the others. It is the tribe of Joseph, which means the tribe of Ephraim or of Ephraim and Manasseh ; proud, restless, insolent, and spurning all authority, as in the far-off days when they are first spoken of, warrior shepherds now dwelling in strife by the Caubul and Indus as once by Horeb and Sinai.

All around lie the footprints of those who went forth at the bidding of the great conqueror and colonizer Nebuchadnazar, and the enthusiast might almost be excused for seeking in the minstrelsy of this wild region to recover the melodies of Judah's broken shell. Close by the home of the tameless tribe of Ephraim lies Ashnagar, where the Behat joins the Indus, now said to be the Isagooros or Isaxaros of Ptolemy, and east of the Indus lies the so-called mountain of the Jews. This mountain bounds the vale of Cashmere on the west, and the Hebrew rolls of books of the Old Testament still extant among the Black Jews of Malabar, written on sheets of red goat-skin, came to them from Cashmere.* On the west side of the country of the tribe of Joseph lies Zablestan, a region of Afghanistan, and south of Khorassan, known if not for its geography at least for its veiled prophet. This Zablestan or Zabulon-estan is also thought to be the land of Zebulon; the people like all the afghans call them-

* Forster.

selves Beni Israel. But one of the most singular points of all is that Ptolemy called one or more of the tribes living here the Aristophuloi or noble people. The old geographer would never have thought of ennobling, of signalizing them by such a lofty epithet; he took simply that which they had given themselves. "Its appropriation by the Lost Ten Tribes of Israel was at once scriptural and natural, while its application to them by the heathen geographer was only the natural and necessary consequence of its prior adoption by themselves as their rightful ethnomymic."* Ptolemy also puts them along with the Kabolites, a name simply derived from the arabic Kabilat, from which Cabul and Cabulistan (the city and country of the tribes) may very likely be offshoots.

We have spoken of the Afghans as the kings of the East, a title claimed for them by others not themselves, and I believe first advanced by Sir George Rose. Mr. Elphinstone says "that their government has been obeyed from the neighbourhood of the Caspian Sea to that of the Ganges," and their power been felt over Persia and Tartary, nay even as far as the capital of the Mahrattas. One tribe alone, the Ghilgies, single-handed overran the whole of Persia and defeated the armies of the Ottoman Porte, and it was only after a most severe struggle that Nadir Shah expelled the third of these Ghilgie beings from Persia; even now it is more than doubtful if they are subdued.

Amongst the most singular settlements of this

* The same source has been assigned to the Aryan name (Max Müller's Science of Language, 1862, p. 237).

strange people are those of Cochin and Malabar, where dwell the black and white jews, one claiming descent from those who fled thither when Titus destroyed the city and temple, while the black jews say their forefathers were driven thither by Nebuchadnazar who was as fond of colonizing as ever were the old romans. Far off as they are they keep up a constant communication with the other jews, all through the east, and have always done so. The black jews of Cochin say that they have the records of their people from the time when they sat down a captive race by the Euphrates and wept when they thought of their glory and their fall. At least one cannot think they were ever likely to weep much for anything else. Like most of the ancients they were ready enough to shed tears when the fit was upon them; but it was for their inheritance, for the departed glory of their house, for the gold and jewels, the flocks and herds which the spoiler had taken. The tender beauties of home and nature, the mournful strains of poetry, the song of the bird, the lovely flower, the evening star, and the night wind had no charms for them; their hearts yearned to more lucrative objects of attachment, shekels and ephods, milk and honey.

Dr. Buchanan, who went twice to Cochin to inquire about these records, and was allowed to see some of them, found that the white jews had only a bible in parchment and of quite a modern cut, but in the synagogue of the black jews there was an old record-chest, into which decayed copies of the Scriptures had been thrown. He accordingly went to the synagogue with a few of the chief men to examine the contents: *which some of them said they had never looked at before,*

and did not seem greatly to value. The MSS. were of various kinds, on parchment, red goat-skins, and cotton paper. This writing on red goat-skins is supposed to be peculiar to the black jews; the art of dyeing skins red was practised by the jews as far back as the time of Moses, who coloured the skins of rams in this way.

The white jews, who look upon the black jews as an inferior race, showed Dr. Buchanan an ancient brass plate on which was engraved the charter of freedom given them by a king of Malabar in the year of the world 4250 or A.D. 490, also a narrative in Hebrew telling how their forefathers fled from before Titus; how other jews followed them from Judea, bringing with them the silver trumpets saved when the second temple was destroyed; how strife sprang up among them and one side called in the aid of an indian king, who came upon them with a great army, destroyed their houses, palaces, and strongholds, killed some and carried the others away captive; and how by the successive persecution of bigoted portuguese, grasping hollanders, and their bloodthirsty hindoo conquerors, they were reduced to a small weak and poor tribe.

After Dr. Buchanan's visit, these jews were supposed to have quite sunk and declined in every way, but a friend having placed in the hands of the Rev. Mr. Forster two hebrew rolls of handwriting, he opened them and found that they were exquisitely done, one roll on parchment, the other on red goat-skin. Both manuscripts came from the jewish treasury at Cochin and were given by the jewish high-priest to the officer from whom Mr. Forster's friend received them.

The handwriting on red goat-skin proved to be a copy of the canonical Book of Esther; but the one on parchment not only disproves the idea of these jews being utterly sunk in ignorance as they were said to be, but gives an unbroken picture of their history, wanderings, and sufferings from the days when they hung up their harps by the waters of Babylon.

These records were written, or rather engraved, upon brazen or copper tablets, at first in Hebrew, but later on in the Malabar language and characters. These tablets were carried off by the dutch, nearly a hundred years ago, to Amsterdam. The jews however sent some of their learned rabbis to Holland to make copies of them in order to draw up a history. The request was granted, a piece of condescension on the part of those who stole them which merits to be recorded, and from these copies was drawn up the history which Mr. Forster obtained in this way. Some of the original copper tablets of the time of Nebuchadnazar had become illegible, as one may easily believe, but translations had been made into the Malabar dialects, and engraved on fresh tablets. The account is important, as this history is now considered to prove how authentic jewish records really are.

All this is credible enough. The marvellous tenacity with which these people have clung to the rites and prejudices of their forefathers has enabled them to rise above those storms which have laid the mightiest empires in the dust, but the next account of them is so extraordinary, that it may possibly excite some scepticism; as my object is however rather to draw attention to the light these investigations may throw on the history of races than to go fully into the

matter, I will simply give a brief sketch of the subject, and then leave the reader to draw his own conclusions.

I have already said that Eldad the Danite had found settlements of the ten lost tribes among the Tartars. It is hardly likely that such a statement would escape ridicule. Like many an old tale it was laughed at by some, refuted by others, and neglected by the rest. Now we are told it is true, and that the fact of a great hebrew colony among the Chozar jews is as certain as any historical fact in the annals of the world. The royal family of this great tartar tribe were jews. "None save a jew of the royal house could ascend the golden throne of the Chozars, and a jew beggar of kingly blood might, if he happened to be next of kin, be taken from the market-place and seated on the empty throne." For three centuries these Chozars were the lords of central Asia.

Mr. Forster tells us that almost the first name that met his eye in Ptolemy's land of the Chozars was that of Tos Manasseh, "the far-banished Manasseh." Further on he found the name of the people of Macha, the very name given by Eldad as the seat of the lost tribes of Simeon, Ephraim, and Manasseh. In the home of the same race in D'Anville he found preserved the well-known names of Esther and Ashor; and lastly on the very confines of China he found in Ptolemy the mountains of Isagur,* and on a mountain range moreover, exactly as its seat is represented in the much-questioned letter of Eldad.†

Now among the Chozars we find repeated the same

* The lost tribe of Issachar. † A New Key, &c., p. 319.

strange thing as at Malabar, namely the separation into white and black tribes. In Afghan again the small ugly black Naussers claim to be the children of Israel just the same as the others do.

The great founder of all these distant colonies seems to have been the illustrious Nebuchadnazar, one of the greatest kings and lawgivers of any age. This extraordinary man, when he besieged Tyre, sent out expeditions both by sea and land to sweep the phœnician colonies from before them. This step just mentioned by Strabo, is fully confirmed by the Cochin manuscript, which states that he sent a large body of emigrants to the south of Spain, that they landed in Andalusia, where they founded Lusina on the Tagus, Toledo, Maqueda, and Escalona, names derived from the Hebrew.* Toledo is the oldest town in Spain, and the oldest building in it is a jewish synagogue. When Alphonso the Sixth recovered Toledo from the Saracens, he was appealed to by its jewish population, on the ground that they were not the descendants of the murderers of Christ, but of the ten tribes, whom Nebuchadnazar had sent thither as colonists. The appeal was graciously answered, and the transaction was ordered by the king to be enrolled in the archives of Toledo; so I suppose their arguments or proofs had great weight in those days at least.

It is quite possible that they reached England at a very early period. Lord Lyttelton in his life of that great king, Henry the Second, says,† "That they (the jews) had been here several centuries before the

* Derived from Makedda and Askalon.

† Life of Henry the Second, by George Lord Lyttelton, vol. 3, p. 265.

entrance of the Normans (though probably not in so great numbers) seems to be proved by a canon published by Egbriht, archbishop of York, in the year 740, which forbids any Christians to be present at the jewish feasts."

Supposing these facts are true they are utterly unprecedented. These jewish colonies assailed by every power of destruction have not only maintained an existence but survive in full vigour and bid fair to retain their pristine power and numbers. The jews must have outlived nearly if not quite every empire contemporary with their early history; and as to the colonies of these empires they are either obliterated or survive only in the vilest and most degraded forms. Strange mystery of life!

This vast extent of colonies formed and upheld by the outcasts of a vanquished and degraded race seems almost incredible, but all the searching and grubbing among old monuments and traditions which has been carried on of late years, seems to prove that the world of historic times was peopled to a very great extent in this way. Possibly they effected some good in their fashion; they may have carried with them the germs of commerce; they may have told the rude people they sought out about the manners, buildings, and arts of the East, and thus sown the seed of improvement of which they were as unconscious bearers as the stream which bears to our shores the fruits and seeds of a tropic land.

Such then are the few faint outlines of far-off traditions. Like figures seen through the mists of dawn, dim, uncertain, and grotesque in their outline, but none the less real, we view the phantom fathers of

mighty nations with the same craving interest that grows upon us as we read of the old pilgrims of Bible times. But if I were asked do they now "inhabit" or hold these lands where they settled of yore, I should answer that my conviction is, excepting some jewish tribes, they do not. Here and there a feeble perishing remnant like the gipsy may linger, but as tribes they have faded away before the races they conquered.

CHAPTER VI.

THE FIRST LANGUAGE.

"Man is man only by means of speech ; but in order to invent speech he must be already man."

We can scarcely wonder if we find that those who have embraced Mr. Darwin's views, who can see no difficulty in improving the eye of a trilobite into that of an eagle, and the brain of an ape that left no trace behind him save his fossil bones into the mind that could pen the "Novum Organon" or the "Iliad," should have welcomed the theory of the Aryan language, and even go beyond the principal expounder of this view in England.

Like Mr. Darwin's theory Professor Max Müller's* is wonderfully seductive. The work in which he has given his doctrines to the world is a splendid specimen of writing and often of reasoning too. The language is clear and yet lofty, abounding in noble similes, and the chain of argument is so clearly brought out and so well connected, that the reader is borne along like a knight-errant of old on some tranquil and enchanted stream amid strange quaint scenes—the power by which he is made to move is irresistible, yet it is produced without effort.

Language then according to Professor Müller is

* Lectures on the Science of Language, by Professor Max Müller, 1862.

not the growth of any people or nation as we now see them, the norm, the germ as purely as the germ is the whole man in embryo, sprang up in the wilds of Asia, and the havoc we work in it is none of our choosing. "Though there is a continuous change in language it is not in the power of man either to produce or to prevent it. We might think as well of changing the laws which control the circulation of our blood or of adding an inch to our height, as of altering the laws of speech, or inventing new words according to our own pleasure.* As man is the lord of Nature only if he knows her laws and submits to them, the poet and philosopher become the lords of language only if they know its laws and obey them."

As soon as ever a language is fairly formed, it becomes subject to a fatal form of phonetic disease which is often so virulent that it will eat way the whole body of a word and leave nothing behind but decayed fragments. No love can guard it from the assaults of its natural foe, no veneration protect it from that downfall which sooner or later awaits any spoken tongue. The sacred language of the hebrew lawgiver and the hindoo priest share the same fate as the harsh croaking of the bushman and the rude lisp of the Borneo wood savages. Some may survive longer than others by inherent strength of constitution, but sooner or later all perish in the maw of the great devourer, Time. Doom may be deferred but cannot be evaded.

"Venit summa dies et ineluctabile fatum."

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* "The great Augustus himself, in the possession of that power which ruled the world, acknowledged he could not make a new latin word" (Locke).

These terrible changes in our language, these changes which are steadily bringing us to perdition, which are fast making Addison and Shakspere as unreadable as Gower and Wycliffe, while they in their turn recede into the same obscurity as Beowulf and Alfred, are not due to the fantasies of would-be great folks who think affectation of learning respectable; they do not spring up in those mysterious mythical senates which rule over phrases and fashions; they do not arise in the hot brains of the men who write sensation dramas or cook well-seasoned polemic dishes for the morbid appetite of daily readers. Not in the least. Amidst the dreary wastes of Siberia or Lapland, on the lonely pampa, on the storm-beaten little island tenanted only by some fisher family, language is changing even faster than in the lands of letters and science. "The ancient huron language is almost entirely different from the present." "We read of missionaries in Central America who attempted to write down the language of savage tribes and who compiled with great care a dictionary of all the words they could lay hold of. Returning to the same tribe after the lapse of *only ten years* they found that this dictionary had become antiquated and useless." Robert Moffatt tells us that the villagers of the african desert often have to leave their children for weeks under the care of two or three infirm old people, and that when these children grow up they retain so many of the words they used in play that in a generation or two the entire language is changed.

A norwegian colony which settled in Iceland in the ninth century maintained its independence for about 400 years, during which time the old Gothic which

they at first spoke became corrupted and considerably modified. In the meantime the natives of Norway, who had enjoyed much commercial intercourse with the rest of Europe, acquired quite a new speech, and looked on the Icelandic as having been stationary and as representing the pure gothic original of which their own was but an offshoot.

A german colony in Pennsylvania was cut off from frequent communication with Europe for about a quarter of a century during the wars of the french revolution between 1792 and 1815. So marked had been the effect even of this brief and imperfect isolation, that when Prince Bernhard of Saxe Weimar travelled among them a few years after the peace, he found the peasants speaking as they had done in Germany in the preceding century and retaining a dialect which at home had already become obsolete.*

Many more instances might be adduced, but for these the reader is referred to the work itself; sufficient to say here that I think Professor Müller proves his point, which is that isolation breeds dialect: so soon as a few families are by any circumstances in any part of the globe, separated to a great extent from the rest of the world, they begin by a process so slow as to be unnoticed by themselves to pronounce and apply certain words differently from other families, and this habit, gathering force and weight with successive descents, ends by entirely changing them. In mountain districts, in scattered islands, in lands much diversified and separated by rivers, chasms, and hills, the same process goes on. I believe it was first

* Lyell on the Antiquity of Man.

stated in the "Vestiges of Creation" that this tendency is so strong and general, that perhaps there is scarcely a family in England that does not pronounce some words differently from others or use them in a different sense. I quite believe it, and if the reader will diligently take note of such instances I fancy he will come to believe it too.

Eternal change, ceaseless decay, such is the doom of the most polished as of the rudest tongues. Language perishes as fast in the forum as in the war speech by the council fire, or the drunken orgy by the Gaboon or Senegal. In the time of Horace the old roman tongue was obsolete—as obscure as some old saxon chronicle to us. The salian priests could hardly understand their own hymns. It was not the venal faction of Rome that did this. It was not the roman snob, as intense in his snobbishness as the boasting tasteless uneducated englishman, boring his dear Horace about the monstrous sum he had given for yon bird or hare, which Horace did not think a bit better eating for that. No, it was the old incurable phonetic disease.

In vain do academies prescribe laws, in vain does the critic lash the exuberant maudlin of the lowest class of newspaper writers, the wretched taste of the punster, the affectation of the swell; he might as well try to stay the working of the laws that doomed the saurian and mammoth to extinction. This doom, however, is none of man's evoking. He has no more part in it than he has in the flight of time or the decay of the forest: the laws which regulate decay "were not made by man; on the contrary, man had to obey them without knowing of their existence."

In its internal structure language suffers no change of form though it may lose its vitality, as the skeleton and brain, the heart and lungs of an old man but a few days from the grave are the same structures in their essence as in the same man at twenty or thirty. The greek and latin grammar taught at Oxford or Gottingen are really what Dionysius taught at Rome and Alcuin at York; they may have changed as much in their look as we have changed in our vestments since the days of the Egberts and Edwys, but beneath the surface grammar has suffered no more transmutation than a portion of the heavens that has long lain hid from view has undergone from the agency of the clouds that obscured it, or the strata of the earth from the forest that has grown upon their crust. The savage pedant who would castigate some poor lad for not knowing or not comprehending *his* peculiar views about the aorists, may now betake himself to Styx or Acheron as fast as he likes; any grammar that can be read at all will do just as well as *his*. After all, he can only teach a dry meagre outline of the principles of language, and that was taught just as well a thousand years ago.

By means of this decay all languages have gradually degenerated till almost mere accident, some chance instance of isolation, has here and there preserved them at all, or in any way allowed us to trace them back to their source. Where all the languages of the earth, some eight or nine hundred, came from, long puzzled philosophers. That sound scholar and truly wonderful man Sir William Jones was one of the first, if not the very first, to find the key to this mystery in the sanskrit, to observe that it was a lan-

guage of wonderful structure, more perfect than the greek, more copious than the latin, more exquisitely refined than either, and that it was impossible to compare the three without arriving at the conclusion that they had sprung from a common source.

Some of the more eminent of those who entered upon the subject at all were at once struck with the irresistible nature of the evidence upon which these conclusions were founded, and according to a well-known law the soundness of their arguments was the very reason why others pronounced it unworthy of any credit whatever. Dugald Stewart denied the reality of such a language as the sanskrit altogether, and wrote an essay to prove that it was a literary forgery by those arch-scoundrels the Brahmins ; and as in the days of Socrates and ever since there were plenty of people to applaud the spirit that would take any trouble, put forth any motive, brand, garble, and insinuate, do anything in fact but read and weigh with an impartial mind. Professor Müller says the first person who gave a shock to the comfortable security which followed this fierce onslaught upon the believers in sanskrit was Frederick Schlegel, who if not a great scholar was a genius. He vindicated the claims of the old indian writers against those who would have set them down as savages, and his ideas were soon received with the highest approbation. But sanskrit, old, pure, and tough as it may be, is but one of the eight children born of the aryan tongue. Among the other branches into which this great tree of language is found to divide are the greek and bactrian, lithuanian, old sclavonic, gothic, and armenian.

Gentle reader, did you ever hear of a teutonic language of which your own was a humble offshoot? If so, dismiss the dream. There never was a common teutonic language; there was no great sacred fountain from which flowed out and broke into branches the great high german river of language; there was no low german sluggish stream meandering away through the flat muddy domains of the Low Countries to feed the stagnant waters of the frisian and dutch tongues, the flemish and our lowly english. The low german is a "mere creation of grammarians who cannot understand a multiplicity of dialects without a common type."

Did you not, too, once think that greek was the mother of latin? That the tongue of Achilles and Zeus, of Calliope and Urania, of the fauns and dryads, was the tongue of the stern proud race taught by Romulus and Tarquin? Wrong as much as ever. The enchanter waves his wand, and the image graven with such toil on the mind of our youth for so many long generations at once becomes as broken and dim as the shapes in an enchanted mirror when the distracted gazer finds his tongue. "The idea of making greek the parent of latin is more preposterous than deriving english from german."

There is another dream, I do not know if it is heeded now by many, but I know I have often heard it recited in lectures; I have read it in books till when I see the first symptoms I know as well what is coming as though I had the gift of second sight. I mean a dream about the richness and variety of certain languages, usually attended by very humiliating reflections upon the great poverty of our own and some

others used by equally degenerate races. For instance, this scaldic poetry, about which everybody is getting so sick that they groan at the very title of a book on it, contained a hundred and fifteen names for Odin, while an island was allowed to possess as many as a hundred and twenty. But this very exuberance, like the pomp of luxury in a state, was only a sign of decay—it was no more a token of strength than is a ponderous mass of fat or too deep a colour of the cheeks. As a florid style in architecture or poetry is a certain mark of decrepitude, so is a plethora of names an evil which cures itself by rapid decay and death. Even cases do not belong to the fine hardy tongues which drive their roots deep into the soil ploughed by the first speaking races. "The people with whom language grew up knew nothing of datives and accusatives;" a statement which must make many of our schoolboys conceive an intense admiration for such a wonderful people, and an ardent desire to raise an altar to them on which might flame as a burnt sacrifice all the books out of which they have to learn datives and accusatives.

Who were these people that constructed language in this way? They were the great aryan conquerors who first of all formed language and then split up into hordes, since which time their tongue has been breaking into a thousand strange dialects, decaying and losing power and beauty. "The whole framework of grammar," says our author, "the elements of derivation, declension, and conjugation, had become settled before the separation of the aryan family."

The Aryans, though tillers of the soil, had made great advances in the arts and luxuries of life. "They

knew the arts of ploughing, of making roads, of building ships, of weaving and sewing, of erecting houses; they had counted at least as far as one hundred. They had domesticated the most important animals — the cow, the horse, the sheep, the dog; they were acquainted with the most useful metals, and armed with iron hatchets whether for peaceful or warlike purposes. They had recognized the bonds of blood and the bonds of marriage; they followed their leaders and kings, and the distinction between right and wrong was fixed by law and customs. They were impressed with the idea of a Divine Being, and they invoked it by various names."

Their name is now only preserved in India in the term Aryavartâ, the abode of the aryans. The followers of Zoroaster maintained it longer, and in their Zendavesta it still means venerable as in sanskrit it meant noble. The land which they spoke of as the aryan must have been "as far east as the western slopes of the Belurtag and Mustag near the sources of the Oxus and Jaxartes," from whence they spread away like rivers south and west, till they reached the Indian Ocean and the Persian Gulf, pouring away over Persia, Greece, and Italy, until they possessed all the great lands which have ever been famous in history as the seats of letters and arts. Nay we are told that late researches have rendered it not improbable that they reached Ireland.

There is nothing improbable in the whole matter, but the reader who imagines that this theory is based on documents, inscriptions, and buildings, and who might credit it if supported on such grounds, will scarcely be prepared to yield a blind assent when he

is told that the assumption of their having overrun a country is often based on the fact that the root of their name Ar has been found in the language of the country. The proof that they poured from Chorassan to northern Greece is found in the old name of Thrace, which was Aria—that they stretched along the Danube to Germany is known by the solitary scrap of evidence that in the west of Germany near the Vistula we meet with a german tribe called Arii, a name which Grimm, a man of profound learning, derived with much more probability from a gothic word signifying army. Ireland was peopled with them, because Erin can be traced through a dozen phases to Er, which of course is the same as Ar, and even according to O'Reilly meant noble in Irish as Arya did in Sanskrit. Aryan is proved to have been used as a title of honour among the persians on the faith of the cuneiform inscriptions, but the Rev. Mr. Forster has I think shown *that the translations of these inscriptions are not in any way to be relied on.* There cannot be the slightest doubt that the welsh were aryans, for Silure, their ancient name, comes from Zil or worshippers of the sun, and Ur as clearly comes from Ar. Elymais was aryan because "its name has been derived from Ailama, a supposed corruption of Airyama." Classical latin is said to be one of "many dialects spoken by the aryan inhabitants of Italy;"* but further on we are told that we look in vain for any traces of the national name among the greeks and romans. Well indeed might one of our greatest modern writers say that "words are the most vital and the most imperish-

* Lectures on the Science of Language, p. 58.

able of man's creations." Why at this rate every word with an *r* in it might be traced back to this prolific radical.

This word of might, Aryan, comes from Ar, to plough or open the soil—the old english ear used in the sense of plough by Shakspere. It was the root of the latin word for plough, it is found in the old Norse for the same thing, and aroma very likely came from the same source, because the smell of a ploughed field is pleasant.

Prior however even to the aryan there was a turanian tongue used by a people of vast antiquity. Their language is even now spoken over a vast portion of Europe and Asia. What portions these are our author leaves us rather uncertain about. He tells us the turanian family of languages "comprises in reality *all languages spoken in Asia and Europe* and not included under the Aryan and Semitic families, with the exception of Chinese and its cognate dialects. In the great continent of the Old World the semitic and the aryan languages occupy *only* what may be called the four western peninsulas, namely India with Persia, Arabia, Asia Minor, and *Europe*, and we have reason to believe that even these countries were held by turanian tribes previous to the arrival of the aryan and semitic nations."* According to this account then the turanian language comprises with certain exceptions all the languages spoken in Asia and Europe, and in the very next sentence we are told that the semitic languages occupy four peninsulas in Asia, the names of which are given, and Europe, leaving us plainly to infer that they occupy Europe.

* Lectures on the Science of Language, p. 290.

Yet for all this the turanian, aryan, and semitic languages need not necessarily have sprung from independent and separate roots, so that I suppose we must still find some grand radical tongue, some pre-aryan or ur-aryan, from which they come, only the aryan language was it seems a vast improvement upon the older turanian, the words being far more symmetrically and naturally constructed.

Professor Müller is however very cautious about drawing the inference that because all dialects of mankind issued from one fountain-head, the human race must therefore have descended from one common pair. "For language may have been the property of one favoured race and have been communicated to the other races in the progress of history."* But at p. 290 our author has told us that a great language has descended from a race which held a great part of Asia and Europe "previous to the arrival of the aryan and semitic nations." Under such circumstances Professor Müller has exercised a wise discretion in arguing, not for the necessity, but for the possibility of a common origin of language.

He speaks repeatedly of the science of language, but how he proves it to be a science or indeed what he proves it to be at all passes my comprehension. He carries us on to a height where we expect to behold the source of language revealed to view as the traveller is carried by his guide to the source of some sacred river, and there he disappears; just as we think we are getting to a point where we must be told the grand mystery of speech our light vanishes

* Lectures on the Science of Language, p. 329.

like a will-o'-th'-wisp, and we find ourselves deep in all the mysteries of the classification of tongues. He expects us to believe in the science of language and yet tells us that what confirmation about its origin his belief was wanting in has been supplied by Darwin's "Origin of Species," a kind of proof which however easily it may satisfy Professor Müller will most certainly not be admitted by some of the coolest and most cautious reasoners. He believes in Mr. Darwin's theory yet he justly assails one of the most vital points in the doctrine, the possibility of a transition between man and the brute. He utterly scouts the idea. "Man speaks," he says, "and no brute has ever uttered a word. Language is our Rubicon and no brute will dare to cross it. This is our matter-of-fact answer to those who speak of such development as if it were established beyond all contradiction, who *think* they discover the rudiments at least of all human faculties in apes, and who would fain keep open *the possibility that man is only a more favoured beast,* the triumphant conqueror in the primeval struggle for life. Language is something more palpable than a fold of the brain or an angle of the skull. It admits of no cavilling, and no process of natural selection will ever distil significant words out of the notes of birds or the cries of beasts." *

This is something like writing. There has been so much rubbish written about anatomy, with these interminable strings of dry names which teach nothing about the real pith of natural history and leave people only more bewildered, there is such a sickening heap

* Lectures on the Science of Language, p. 357.

of dry husk and shell and so little real sweet kernel in it, that it is quite refreshing to come upon a passage which contains sound sense and plain speaking in the same breath.

Professor Müller runs down the idea that language could have arisen from men having begun by imitating sounds such as the roaring of the sea, the quacking of the duck, and the murmur of the rising wind, and says that Herder after having long strenuously defended this bow-wow theory renounced it later on in life. His argument is that there is not the similarity we think between the sounds animals give birth to and their names, and if there were that we do not use it. We don't call a dog a bow-wow, or a cow a moo, or a lamb a baa. It is from some term expressive of a quality or use, from some nobler source that names have been drawn. Raven came, not from a word signifying the crying of the bird, but from a root embracing cries and murmurs in general. Thunder came not from a root imitating this solemn sound, but from a word signifying to stretch, the common source of such terms as tender and thin. Sugar is a sugary word in its very sound, but it sprung from sarkhara, which is not in the least sugary or sweet either. Nor is squirrel derived from the quick rustling of this pretty creature; only go back as far as the greek and we find it in words signifying shady-tail.

All this is very sound in its way. The instances by which the bow-wow theory is refuted are well chosen and well told, and like most of the work will be read with delight and admiration, but the question as to how far all this settles the imitative origin of words must be handled in a different way. In the first place it might

I think be argued with great truth that we rarely attend so strictly to the sounds of animals as we think we do. Possibly men lose the faculty or aptitude for it as they recede from the savage state, and no longer require the same observation or have their senses sharpened by the necessity for incessant watching. Some people think a dog does not say bow-wow, nor a cow moo. Again I think there is another formidable objection—we don't know how those who invented these words pronounced them. One might fancy that pronunciation had descended in an unbroken line of tradition. Certainly not more so than the meaning and use of words, and these are undergoing ceaseless change. Even that solid and almost immutable language the greek is no longer spoken as in classic times. Men are quite in the dark still as to how the romans pronounced C. If the reader will select a german who does not know one word of english and give him an english book to read, he will have some idea from the pain with which he follows the thread of the recital, how widely different the most familiar words would soon sound if transplanted ever so short a distance. How much more easily then may sounds have changed in such vast lapses of time as those through which the aryan tongue is supposed to have lasted, added to that through which those languages in which these imitative sounds sprang up, suppose them to be ever so modern, must have endured. It is quite possible that men in the first instance formed names and adjectives from roots signifying some property, but that generally they took the names of strange animals, plants, trees, metals, &c., from the natives of the country, and that the first names given to animals

were made up much in this way; that names of qualities grew up almost imperceptibly from interjections of admiration, wonder, fear, and disgust briefly expressed by savages and afterwards expanded into words; that these became recognized as emblems of some fixed idea; that in the infancy of each tribe they were few and simple; that owing to the vast fundamental similarity of brain and larynx, of speaking and thinking which runs through nations, similar sounds were adopted in widely remote parts. All this is probable enough, and I must confess that I see nothing in Professor Müller's work to overthrow the opinion.

I am glad to see that so eminent an authority as Mr. Crawfurd has pronounced dead against what I can only consider as a dream. If there were any truth in the aryan theory thus advocated, it would, Mr. Crawfurd says, of necessity follow that there would be no language at all in Western Asia or Europe, ancient or modern, and that sanskrit, greek, latin, with all the modern languages, would be reduced to the rank of mere dialects, or subdivisions of one primordial tongue, the airy and fabulous aryan, the mere creature of teutonic imagination.

CHAPTER VII.

THE FIRST ALPHABET.

"Res ardua vetustis, novitatem dare, novis auctoritatem."

The arrow-headed writing has generally been considered one of the most fruitless puzzles a man could well waste his time upon. Compared with it, squaring the circle or finding out perpetual motion were looked upon as very simple matters. A square there must be equal to a circle—that was quite clear; and really there was nothing absolutely to prevent man from finding it out. Perpetual motion, it was said, exists among large masses of matter amidst suns and planets; why not among smaller ones? The philosopher had pointed out the law by which the satellite revolves round its planet and the planet round its sun; why might not the mechanic reduce it to practice, and compel a pith ball or a brazen sphere to whirl round a mimic sun so long as their constituent atoms held together? The genius and energy which had made the chronometer and the steam-engine might master the law which bids matter rest when not moved by a higher power. It had almost been done. A lead ball had rolled up and down its little brass Simplon for years and bade fair to roll for years to come—why not for ever?

But to decipher the arrow-headed writing, the tongue of Ninus and Balshazzar, of Darius, Hys-

taspes, and Cyrus was another affair. For ages no human being was known to have spoken the tongue of the great kings—not one line of its ancient and mysterious characters had been read. Science had tried her necromancy in vain; the stubborn rocks refused to yield up their secret even at her potent bidding. The carved and painted walls and drawings, the monuments and cities were crumbled into dust or buried in ruins—nay, according to Newton, the very ruins of Nineveh had perished. *Ipsæ periere ruinæ.*

"Euphrates'* tide
No more shall hear the lovers' tale beside
Its forest margins—nor upon its stream
Shall ever more the gilded barges glide
And glance beneath the silvery moonbeam;
For Ashur's glory's vanish'd like an idle gleam." †

The war-axe of the bactrian had burst her palace gates—the persian had spurred his swift steed over her sons and daughters slain by scores of thousands in her streets—the hand of her last king had fired her halls and given to the flames the banners torn from Babylon and Persia—the tomb of Semiramis and the abodes of his own concubines.

As for Babylon, "rent by the storm and crumbled by the blast," she was well-nigh as utterly gone. She was to be the home of the wild beast of the desert and the island, and she had become so. And now the lizard rustles amid the grass which grows on the halls of Chaldea's kings, the desert sand is her tomb, and the yell of the hyæna and the moan of the night wind are the last requiem of the city where Balshazzar

* Query the Tigris? † The Desolation of Nineveh.

drank out of Judah's golden cup.* Of her fabulous glory and long-protracted fall there remains

> "A monument to heaven—a wilderness—
> A river rolling through a lifeless land;
> A lone tower, like a beacon of distress,
> Pointing the index finger of Time's hand
> To buried ages—trackless seas of sand.
> The Romans' camp, the Arabs' city, all
> Mingled in dust—some wandering turban'd band
> Skirting the deserts—and ye have the fall
> Of Babylon and the desolation of her halls."

These scenes of ruin and decay lay too, it was urged, hundreds of miles from the great highways of travel and barter—every road to them beset by tameless savages, as wild as their deserts and as treacherous as the mirage; and when now and then some hardy wanderer took up his abode with these restless children of the desert, and after months and years of danger brought back a brick or inscription, the old marvellous yearning after these mysterious fallen cities of the river and wilderness revived; but as to even hoping they would one day be able to read their language, men thought there was as much chance of reading books written before the Deluge. The key was gone and the casket could not be forced.

So men contented themselves with admiring the winged bulls and bird-headed priests and bearers, the

* Overdrawn as this picture may seem, it grows faint by the side of Washington Allarton's description, who says: "His (Belshazzar's) powerless limbs, like a wounded spider's, shrunk up to his body (!), while his heart, *compressed to a point (!!)*, was only kept from vanishing (!) by the terrific suspense that animated him during the interpretation of this mysterious sentence; while the prophet stood before him like an animated pillar"!

magnificent calves of the assyrian officials; the soldiers swimming under water among the fishes; the singularly wide-awake look of some of the gentlemen—a look which I believe few living artists could copy, and which once seen can never be forgotten; the straight robes and horned caps; the immense stiff beards; the skeleton chariots; the sieges, battles, and triumphs of this once mighty people. But they did not care to look beyond this; not that they had ever ceased to feel interest in the desolation of Babylon and the fall of Nineveh, when—

> "As the grass is mown,
> Fell Ashur's sons unnumbered and unknown;
> Unseen their giant struggle and despair,
> Save of the heavens, now deaf unto their groan."

Had not Nineveh been the mighty walled city of a three days' journey round, built when Babylon was young, the proud head of one of the mightiest and most polished empires of any age; "more prosperous, fertile, and rich, more crowded with mighty cities, more embellished with magnificent fabrics, more highly cultivated with every necessary, and more perfectly beautified with every adornment of art" than any other capital, Babylon excepted, and hardly even surpassed by her? Was not Babylon the oldest walled city after the Flood? the city of Nimrod the mighty hunter, renowned even in these vast empires for its walls three hundred feet high,* and its hundred

* According to Diodorus, even the ramparts of Babylon were embellished with magnificent and colossal statues, representing eastern hunts and the triumphant returns of their conquering kings.

gates of moulded brass; the cradle of astronomy, the city of the handwriting on the wall? No, it was not this; the interest in these mighty and brilliant pageants can never pass away; it was that men believed the time wasted in trying to learn their history from their own records.

I admit that I was quite as incredulous as other people. I remember as well as if it was yesterday meeting Grotefend, and when my friend told me he was the man who had decyphered the "wedge writing," I marvelled whether or not his labours would ever end more profitably than those of the renowned Linkum Fidelius. Long after Lassen, Heeren, and finally Rawlinson had committed themselves to the great task, scepticism if silenced was not overcome, but the conversion came at last. Then, as usual, nothing more was said about doubts, want of proofs, contradictions, recantations, &c., of which at one time there had been some mention. Those who felt enough interest to decide at all decided now, not that the grand problem was to be solved but that it had been explained. There was no longer any mystery about it. We were now to learn from authentic records something about the real life of this mysterious people —how they ate and drank—how they married and were given in marriage. They were to tell us their history—how they conquered nations and took tribute from kings.

The Rev. Charles Forster in a most able and lucid work on the subject,* now says that these bright hopes were simply a delusion, and that there never

* The Monuments of Assyria.

was the least chance of our knowing anything of the matter so long as we relied on interpreters who followed such a leader as Grotefend.

Certainly Herr Grotefend's qualifications for the task and the way in which he set to work are unequalled in the history of letters. Being little acquainted with the oriental languages as he naïvely admits, he merely endeavoured to determine the value of each sign by a species of logical induction founded on a comparison of all the cognate inscriptions and the different combination of their characters. This method strikes me as being very like that employed at the Academy of Lagoda, where a sage wrote books by machinery, and seems to have struck Mr. Forster in much the same light. Herr Grotefend likewise thinking "it might prove interesting to know how a person *without any profound acquaintance with the oriental languages*" had contrived to solve in a few days a problem which had puzzled so many excellent scholars for years, proceeds to describe it. I shall revert to it presently.

"A man," says Dryden, "ought to be well assured of his own abilities, before he attacks an author of established reputation." Colonel Rawlinson is an author of established reputation, and Herr Grotefend has attacked him with so little reticence that he has no right to complain of being handled with severity. "I consider," he says, with a coolness which must be very agreeable to the subject of it, "that I shall be doing a service to those who know the eastern languages if I put a stop to Rawlinson's errors."* The

* Erläuterung der babylonischen Keilinschriften, 1853.

reader will be good enough to observe that this very modest person does not for a moment appear to have the slightest doubt about his ability to put a stop to "Rawlinson's errors."

As usual englishmen were true to their taste for overrating anything from such a source. They always take it for granted that a work by a celebrated german, if only bulky enough to look respectable and full enough of greek words and misty ideas, must be profound—there must be something in a system which begins with the root of life and thought and splits the shade of an idea into its component parts. So Grotefend's work was quoted by every scholar, while an english treatise superior in every way, in sound reasoning, in clearness and elegance, has not attracted one-tenth part of the notice it merits, because the author was too modest to put forth assumptions with the air of facts beyond dispute—too sincere in his vocation to encumber his work with useless verbiage. In Professor Max Müller's work on "The Science of Language," in a paper by Mr. Noel Humphreys "On the Cuneatic Characters" in the "Intellectual Observer,"* and in some reviews where I quite expected to see it noticed, there is not one word said about Mr. Forster's discovery.

How long are men going to bow down before these precious idols, to measure books by their size and dulness, to think that a clear sensible account of anything must be superficial, and to place faith in men who dread wit and sense as an owl dreads the inroad of sunshine? So long as this state of things exists,

* Vol. i.

the heavy german writers, who are certes the heaviest of their race since men began to write at all, stand a good chance of keeping in the first rank by that *vis inertiæ* which makes it equally difficult to displace an idol or a mountain.

Our reverence for german erudition and diligence, nobly won at first by a few great scholars and writers, has been sorely shaken of late by actual contact with the people. Men have found that there was not so much real labour under these mountains of verbiage as they expected. They have found both in the conversation and writings of the germans an amount of faith in their own value which would have been amusing had it not been so sincere. Every german feels convinced that all around him must take a profound interest in his performances. Schiller never doubted that every person to whom he read his awfully long plays must be in extasies. A german friend of a week's standing thinks you must feel delighted to hear him read his last contribution to the *Sauerkrautstädtische Abend-Zeitung*. Goethe quarrelled with every person who would not believe that his few crude hasty experiments about colours had overthrown Newton's grand views, and to this error he adhered, maugre every kind of proof, with an obstinacy that amounted almost to madness. Gustav Rose made two defective experiments on the model of the famous trials by Sir James Hall three quarters of a century ago, a hundred and fifty-six in number and conducted with the greatest care, in order to ascertain the effect of intense heat under pressure. Not finding with his two imperfect attempts the same results as Sir James, he not only presumed that he had refuted him, but grew didactic about the impropriety of

drawing hasty conclusions ; a step which drew down upon him a very plain contradiction from his friend the president of the Geological Society. When men find traces of almost childish credulity in the works of Humboldt, Goethe, and Schiller they must not be surprised to see the lesser gods of learning now and then allowing conviction to get the upperhand of sound judgment.

Next to himself the german puts his writers. Humboldt almost deified Goethe for that silly stupid production "Hermann and Dorothea." If such a work appeared from the pen of any english writer it would fall stillborn from the press, or be cut to pieces by the critics. Zimmerman called "Werther" a true natural romance. Kotzebue said it was a "wonderful philosophical romance," and that he would have willingly thrust his hand into the fire to rescue Goethe's shoebuckle. I leave the matter to others, but in the meantime I will just take the liberty of calling "Werther" a muddle of crime and sickly sentiment. I was repeatedly assured that the "Torquato Tasso" was a *himmlisches Werk*, and "Wilhelm Meister" the finest romance in the world; that Schiller thought his having lived to see this work completed was the most fortunate circumstance of his life; that people read these books twenty or thirty times and still found new beauties in them. Every celebrated man in Germany, and I was interested to find them so abundant in many rather obscure parts of the world, could enlighten the benighted stranger with "verbal utterances" on the æsthetic bearings of the great master for two or three hours at a stretch. I thought the one a tissue of improbable and immoral incidents, the other a piece of verbiage without one

spark of interest, one beautiful line of poetry, one grand idea—but then they were written by Goethe. Hegel praised Goethe's views about light on account of his (Goethe's) pure sense of nature which rebelled against Newton's "barbarism of reflexion," and Schelling did not wonder that the blind and slavish followers of Newton should oppose researches which showed that they had started with a fundamental error. No wonder that Grotefend triumphed and that one knows so little of the grand *old* german writers. After observing as a finale that I utterly disclaim any idea of impugning the merits or assailing the fame of the higher class of german writings I will merely say that what I condemn is the deference paid to these monstrous dry bewildering treatises, to read which means *tout bonnement* to waste so much time.

Herr Grotefend's plan then was as follows. Having seen a portrait which he was convinced must be that of a king, and having found that a word frequently occurred placed over a portrait, he decided in his mind that this word must mean king, or rather that it was the assyrian for king. This word was then taken as a starting-point, and wherever the letters composing it were found, they were first picked out and then the rest of the word made out by a similar process,—that is to say, *the whole theory from first to last was built upon an assumption.*

"Colonel Rawlinson's process," says Mr. Forster, "is simply the repetition of Grotefend's, namely : (1) The *assumption* of the existence of proper names in the unknown inscriptions ; (2) The conjectural verification of the assumed names ; and (3) The construction of an alphabet *based on this double assumption ! !*" The

italics and marks of admiration be it observed are by the author of this paper. Well might Mr. Forster say, "when all that is to follow depends upon the soundness of the alphabet, the thoughtful inquirer after truth may well pause to ask himself the value of an alphabet distilled from such an alembic."

I should imagine that if he paused a little longer and answered himself, he would be rather apt to put down its value as doubtful at any rate. In justice to Colonel Rawlinson, to whose high character I am most happy to bear a tribute of admiration, it must be remembered that he has honestly disclaimed all idea of holding himself up as a discoverer ; he has not put himself forward in the character of an oracle ; he lays no claim to being gifted like an ancient seer with power to decypher by some miraculous kind of induction secrets veiled from the rude gaze of common vision. The toil and danger of practically illustrating Grotefend's views have been his—the merit he leaves to those in whose footsteps he has followed.

It is rather mysterious that Professor Grotefend should have so often changed his opinion about his own discoveries, and more than once have utterly demolished the theories he had been in such haste to advance ; that Professor Lassen should have given to the world at least twelve characters *in which all his predecessors*, Grotefend included, *were mistaken ;* that Colonel Rawlinson should be at issue with M. Saint Martin about several of the characters, and about two of them at utter variance with every other authority, and that he should only decide finally upon an alphabet after stating that he had been entirely in error.

Besides, Colonel Rawlinson says the translations of Saint Martin and Burnouf* are altogether erroneous; that Burnouf out of twenty-four names of asian nations has only given ten correctly, and that Lassen has not only misunderstood the structure of the words but also the grammar. It is therefore not at all surprising that this justly celebrated writer warns his readers against trusting too implicitly in his (Colonel Rawlinson) versions, and tells them in the plainest terms that if they look for accurate translations they will be lamentably disappointed. The straightforward simplicity and honesty of this admission stand out in strong contrast with Grotefend's assumptions and convictions, which he wants us to take as the groundwork of one of the most vast and momentous discoveries in the history of languages.

Mr. Forster concludes that Colonel Rawlinson's reference to the hill dialects of modern Persia, as his key to the language of the Behistun monument, is completely knocked on the head by a discovery made by him; namely, that the ancient Persians, after the conquests of Cyrus, *had no native language,* but adopted and used only the chaldee, the idiom of their conquered provinces: just as the Normans did the English. This fact, he observes, is most curiously brought to light by an oral controversy between St. Archelaus, bishop of Caschara, in Mesopotamia, and the heresiarch Manes, A.D. 278, a native Persian, whom a courtier, St. Archelaus, at the court of Sapor, challenged to a public disputation in the forum of Caschara, in pre-

* Burnouf, according to Max Müller, was the first who, by means of the sanskrit and comparative grammar, deciphered the cuneiform inscriptions of Darius and Xerxes.

sence of the heathen magistrates who were to decide between them as impartial judges. Manes began the disputation with a train of metaphysical sophistries and subtleties. When it came to St. Archelaus's turn to reply, he commenced with a statement of fact as to the ignorance and incompetency of his adversary; his words are as follows: — "Persian barbarian! what do you know? You have no native language. The only language you can speak is *chaldee;* and if you do not know chaldee, you know nothing."

"Now Archelaus was a native Chaldean, living under the rule of Sapor. He was perfectly acquainted therefore with the spoken and written language of his persian masters, which was in fact, as he tells us, his own,—*the chaldee.* In the Book of Ezra we find the above statement of St. Archelaus as to the language in use in the Persia of the Achaemendidae and Sapanidae completely confirmed by the fact that while the rest of the book is in hebrew, the royal letters and decrees are all written in chaldee. That the ancient assyrian idiom was also chaldee we learn from the demand of the officers of Hezekiah to Rabschalech asking him to speak syrian to them."

The reader will bear in mind that there is no absolute test by which these assumptions and conjectures can be proved or overthrown. Pasargadæ was clearly persian, and of great antiquity. That was certain enough, however it might be disputed whether it was the ancient Persepolis or the modern Morghab.* The names of rulers enough stand recorded in history,

* Many writers long considered Pasargada and Persepolis to be the same place, and that its site was the mass of ruins by the Araxes, the Tucht-e-Jamschid of the natives.

and if a writer selects a hieroglyph from some city in which some great king was known to have held sway, and assigns to it any meaning not irreconcileable with tradition, he may hold his ground, at any rate till some better interpretation is found. He cannot be confuted as in a wrong solution of an astronomical problem; there is no authority to set up against him; no state archives can be disentombed to confound him with their grim, hard, irrefutable facts. The name of the king being assumed and admitted all the rest is easy. Some vague account of his deeds exists, and as the inscriptions are said to contain little more than names, little margin for errors and anachronisms remains.

As a sample of the mode of reasoning pursued by Grotefend, I quote his own words.* "I therefore read the line 'teshut tok retikot,' although *I must confess that none of these words* in which the second as well as the last sign in A and B is differently written, *answers to the mode of writing in other passages.*" Such license as this, with the aid of unlimited conjecture, belief and wild conclusions, makes the task of decyphering these old problems easy enough, and with the addition of as much faith as is requisite for believing in fortune-telling, any difficulties in the way are got over to the satisfaction of both author and reader.

Mr. Forster says that Grotefend's master-key, the word king from the supposed tomb of Cyrus, is useless, and that the characters signify not one word but two. The only safe plan he wisely contends is to verify our readings by comparing them with the pictorial scenes they accompany. In this, I think,

* Erläuterung zweier Ausschreiben des Königes Nebukadnezar, vom Schulrath Dr. G. F. Grotefend.

he is quite right—a language may alter by such imperceptible degrees that it is the work of years to trace its changes, and yet the change is so complete that in time it is almost as unintelligible to the natives as to the strangers. The englishman thinks the tongue of Lydgate and Gower a barbarous idiom; the scotchman of to-day finds it hard to grapple at first sight with the King's Quhair or the chronicles of John Barbour and Andrew Wynton; yet these men really wrote the same language radically as we do. But carved in stone, the bow and battle-axe, the bull and elephant, remain to-day as they were three thousand years ago.

One of the noblest records containing the arrow-headed writing takes its name from the mountain of Behistun, on the western boundary of Persia. It is of colossal size, and carved on the face of a wall of rock in a cleft of the hill. As it is two hundred feet from the ground, it has escaped alike the fury of invaders and the wanton desecration of the passing traveller; the roman legion, the phalanx of Macedon, the hordes of the wild turks, the cruel moguls of Genghis Khan, and the turbaned bands of the arab have swept by like the storm-wind and passed as lightly over it. Indeed in all human probability no one ever reached it since the artist carved it in the rock till Sir Robert Ker Porter had himself drawn up the precipitous cliff, and at a height which would have made most men giddy taken a drawing of the central picture. Colonel Rawlinson carried this daring feat out still more successfully and made a sketch of the whole piece of sculpture, copying at the same time the priceless inscriptions.

Mr. Forster took this tablet, and discarding the idea that arrow-heads meant anything more than straight strokes or simple lines, he found they represented several letters in the æthiopic and greek alphabets—that is to say, when he met arrow-heads formed thus  he used the letters as the greek ψ (ps); those shaped so  he used for the æthiopic H (z);  as the greek κ;  he converted into the æthiopic  (t) and so on. The simple down strokes he had found in all primitive languages to represent the vowels *a*, *i*, and *u*, the vowel *e* not belonging to any of the semitic languages, and he therefore used them as such. He thus got an alphabet, not so copious certainly as that of many of his predecessors, for it contained barely ten letters, instead of the forty of Rawlinson; but still an alphabet which so far bids fair to rank its discoverer high among the philologists of any age or country. It certainly clashes entirely with the complex structures of the german and french investigators; but on the other hand it approaches the simplicity of the ancient greek and phœnician, and it gets Colonel Rawlinson out of the difficulty he found in reconciling the rigour and compactness of the known semitic languages with the complicated and lax structure of those carved upon the rocks, which had been variously computed to contain something between forty and three hundred characters, as though the ancient schoolmasters had no better guides than the russians, who cannot agree among themselves as to the right mode of spelling so many words, or London aldermen who seem to agree that the use of h's and articles is a matter of taste.

Mr. Forster now subjected his plan to a much more

rigorous trial. Having formed the letters into words, he sought out words in the arabic lexicons and found distinct positive meanings to them. He compared these meanings with the subjects, and found that they mutually explained each other. He then took the only step that remained to take—he published to the world the illustrations, letters, and meanings in such a form that each man can decide for himself. It is impossible to offer here more than a mere glimpse of the clear and valuable explanations he has given; to appreciate the logical clearness, the sound reasoning, and research, the reader must turn to the work itself. Neither be it understood do I presume to decide in such a matter. I only say what I believe most unprejudiced men will say, that to my thinking Mr. Forster has fought his way into the very citadel of this enigma.

Layard in his "Nineveh and its Remains" has singularly verified the soundness of the conclusions drawn by Mr. Forster. On a slab at Nimroud forming part of a wall in the south-west palace, but brought from the most ancient edifice, he found the same characters as are usually written with arrow-heads formed here with straight strokes, and again on the earliest palace at Nimroud he found the same kind of writing with the letters made up of hammers instead of arrow-heads and wedges, a form which has been perhaps unconsciously revived and continued in many greek and other letters. Mr. Forster read this inscription by the same guide as the others did with the same results—but he says that what Layard took for hammers are simply the bricks used by these ancient builders. The artist had given his fancy wing and formed his letters of groups of bricks on the same

principle of taste that in our day leads an ambitious sign-painter to weave scrolls and flourishes into the shopkeeper's name, and prompts an inventive spirit to create the posture-alphabet which delights our childhood.

But if his delight at this discovery was great his disgust at the way in which he had demolished a grand structure almost counterbalanced it, and he must have felt like the explorers who broke into the ancient sepulchre of the etrurian king seated in the calm repose of death on his throne, and who saw the noble vision crumble into dust before the sound of the pick and mattock had well ceased to vibrate. He "found the whole of the Behistun inscriptions to be simply explanations of the history, the subject, and the circumstances of the central great picture, together with an account of the artist, of the machinery employed, and of the manner of the execution both of the sculpture itself and of the accompanying inscription." Again in the carvings of Babylon and Nineveh the reader will look in vain for chronicles of Ninus and Semiramis, the stupendous deeds and follies of a Nebuchadnazar * or Sennacherib—he will find at the best the

* Nebuchadnazar may be considered not only the greatest king of those times, but even one of the greatest warriors and monarchs of any time. After redeeming his country from the low state into which it had fallen, and overthrowing his powerful foes, he enlarged, fortified, and embellished Babylon to an almost fabulous extent, made the mighty canals for which it was so famous, built the great walls of Babylon, constructed the vast lake to irrigate the country from the overflowing of the Euphrates, built the hanging gardens for his circassian wife, and overran Nineveh, Phœnicia, Egypt, and Judea.

horn-book of a people who had no written history in the days of Cyrus.

The assyrian illustrations, as I have said, are those of the most commonplace events whether in peace or war—a knight bearded and helmed striding sword in hand from a moving tower,* or walking heavily armed up the outside edge of a ladder as steep as a house-roof † in order to take some liberties with the elderly parties on the wall, of whom there are generally three, two of whom seem as if according to the custom of their country they had come up the chimneys and stuck fast at the hips; but the inscriptions tell us nothing of desperate assaults by renowned warriors—that on the first-mentioned group only contains five words, and the one word Mr. Forster deciphers is dab or dababat, signifying an engine of war for battering down walls, which this is actually doing, as you see not only the hammers used but the bricks falling out as fast as they can. In a similar way a sketch also from Layard's Nineveh ‡ representing, according to Mr. Layard's account, a king seated on his throne within the walls of a captured city, means a far different scene if Mr. Forster's view be correct. The king is indeed seated, but it is in the chair of justice and before the gate as the kings sat of old in the days of Judah's power and grandeur. Around are the shops with all the stir and din of life; signs of useful toil and traffic rather than solemn ceremony; in one shop a butcher is cutting up a calf's head; in others chairs, couches, and pots are exposed

* Pl. 4, p. 67, marked by Forster as Assyrians. † Pl. 2, p. 13.

† See fifth plate in Mr. Forster's work, p. 70. The Monuments of Nineveh, 1849, &c.

for sale—the owners setting them off to the best advantage or driving bargains with their customers; in others we come upon a buyer and seller sitting face to face bargaining by gestures as they do now in the unchanging East. We see in fact a sketch of the market-place of Nineveh and the seat of justice, which has been administered, as is shown by the two mutilated wretches bringing up the rear with their hands chopped off. Again we have an assyrian horse-race—two sturdy dobbins being led out by a man appropriately dressed in a nightgown and stiff nightcap, while close at hand is a fragment of what appears to be a winning-post. But the inscription speaks of swift horses and binding with halters; not of the regal sports of Eserhaddon or Sennacherib.

Nothing in these sculptures exceeds the calm and benevolent expression with which a warrior allows himself to be cast from a turret or run through, as though perforation of the thorax or amputation of the head were decidedly a pleasant process. This amiable trait in the character of these long defunct victims of war is quite familiar to those who have looked at the engravings of the Bayeux tapestry, where the knights and men-at-arms, so far from feeling impeded in their movements by being transfixed with a few arrows or spears, seem on the contrary all the better for it. The only thing in the Nineveh sculptures that equals the placidity evinced by the sufferers on receiving their doom is the exquisite urbanity with which it is carried out. One gentleman defending a tower, but who looks as if according to a general and long-established practice he had stuck in the chimney-pot, has taken one of the besiegers

by the head and is quietly cutting off that rather essential part of the frame, or else cutting his throat; the suavity with which he effects this must almost recompense the sufferer for any little inconvenience the operation may occasion him. Another warrior is undergoing the process of having a tolerably large iron skewer passed through his neck; so far from taking umbrage at this step, or seeking from merely selfish motives to throw any impediment in the way, he has considerately raised himself up at great personal inconvenience in order to afford the operator every facility. This rather singular view of such proceedings is shared by the lower animals; a tiger is making a meal out of a haunch of *live* venison, the proprietor of which canters along as if it in no way concerned him, or as if there were no more vital connection between his fore and hind quarters than between those of Baron Munchausen's horse. A lion who has been shot by a king in the eye and lungs, which must be considered rather a wonderful feat seeing that the king looks as if he was aiming at the top of the nearest palm-tree, has plucked the arrow from his bosom and seems tendering it to the monarch in a very composed and polite manner, while another lion on whom a knight bears down with poised javelin, is standing on his hind legs and delivering himself of a speech with a freedom of action which can only be ascribed to strong feelings or intoxication.

Sometimes but very rarely we meet with exceptions to this amiable disposition. One combatant* on

* The Monuments of Nineveh, 1849.

whom another is falling from a battlement, certainly looks rather uneasy at the prospect and has put up his shield edgeways for the other's head to fall upon, but his fellow soldier immediately behind him, and into whose eye he is thrusting the handle of his lance, seems troubled by no such misgivings. One tiger too has got into a passion, but whether this is owing to having been transfixed by sundry arrows or to a hunter behind having caught hold of his tail, seems very difficult to determine.

One of the most important parts is the account of the writings on the famous obelisk of Nimroud, discovered and secured by the zeal and labours of our justly celebrated countryman Layard. According to Colonel Rawlinson, quoted in Layard's "Nineveh and its Remains," it contains the annals of the reign of the son of Ninus, but according to the version given of it in his (Layard's) last publication, one of the monarchs paying tribute to the great potentate is Jehu the king of Israel who flourished about eleven hundred years after Ninus. Be this as it may (and I incline to the view that it is of much greater antiquity than the latter supposition would make it) the obelisk is immensely old, and the scholar will be interested to learn that it is in remarkably fine preservation. "Scarcely a character of the inscription," says Layard, was wanting; "the figures were as sharp and well defined as if they had been carved but a few days before."

In this noble relic we behold at any rate a real scene from the grand pageant of assyrian life, wonderful alike in its pomp, despotism, and crimes; the life of the East, where the monarch and satrap

dwelt with their concubines in the colossal state of their mighty cities, and hard by the shepherds lived in tents with their flocks and herds. The elephant and rhinoceros, the bactrian camel and the lion pass over the stage; the tusk of the elephant, and the shawl from the primitive loom of the East; the fruit of the palm and woods fit for carving and building are borne as tribute or purchase to the mightiest monarch of the world. The paunch of the calf, still a favourite dish with the gipsies; the kettle-drums and dulcimers; the water-jars and skins of wine; the huge gorgeously tressed apes are all in keeping with the barbarous pomp of the time and the country. The sandalled foot, the hair all in a club behind, the fish-like eye, the long straight-bordered gown or robe, the cap, all show that the assyrian artist was drawing his own people. Here as in the days of old in Israel, men are clapping their hands, not for a signal as in the times of Haroun al Raschid, or even now in some parts of the East, but most probably as a rude kind of music for marching or triumph, without which they could perhaps no more keep their ranks than our sailors in the North could for ages have heaved the windlass without that wild mournful chant so familiar to those who have lived by the German Ocean.*

Here again the legends say nothing of processions on some grand state occasion, of solemn offerings to Ninus after his victories over the Bactrians and Medes,

* In the time of Alexander the tomb of Sardanapalus was still standing, distinguished by the statue of this wretched profligate, *in the act of clapping his hands* and bidding the passer-by eat, drink, and play, for other human things were naught. The old old moral of the rake's misery !

or of tribute paid to his sons; they speak of paunches, sounds of drums, of shed tusks (of the elephant), of men bearing burdens, of monkeys, &c. Mr. Layard thinks the figures on this nimroud obelisk represent a king with his viziers and eunuchs receiving tribute, but Mr. Forster believes this cannot be the case, as no tributaries appear on the same tablet with the king, that men are drinking and giving others to drink, with other incidents which would never have been permitted to slaves before the great king of Assyria, especially on such a solemn occasion. In fact he sees in it nothing but a scene from a caravan on its way across the desert. Our author gives here a proof of the correctness of his views, which appears to me so striking that I shall quote it rather more at length than I have done most of his statements. One figure from this obelisk is that of a man bearing a weighty burden on his shoulders. Under the figure Mr. Forster found an inscription which he made out to be tabar, meaning gold, and to use his own expression, "noted down the definition only in its general sense, without a thought of its more special meaning;" when one of his friends observed that the bag was evidently sunk in by the pressure of the shoulders, and that the bearer instead of grasping the ends merely touched them lightly with the points of his fingers, as though not supporting but balancing only the weight. Mr. Forster then consulted his lexicon more closely and found that the word really has attached to it the meanings gold, or fragments of gold, particles of native gold, gold before it has been tried in the fire, the country of gold dust, &c.; from whence the conclusion naturally flows that the bag

contained gold dust, which would take the form of the shoulder.

One great peculiarity of this writing is the strange way in which it sometimes runs. I do not know whether it is owing to some mental obliquity or not, but it has always appeared to me as if I could not exactly realise how people got on with some habits and customs so very opposite to those I had been taught. For instance, I never yet saw a jew take up a hebrew book and read it backwards and from right to left without assigning a strange perversion of ideas to the people who adopted such a singular mode of writing—it seemed even worse than the way of the old Greeks, who wrote one line backwards and another forwards, for that gave one something like a promise of one day or other ending in a natural style. But either process seems clearness itself compared with the method of the Assyrians, who wrote sometimes one way and sometimes the other, with now and then erratic flights of a still more embarrassing nature. One instance is quoted where the same word stands five times repeated one below the other, the fifth forming the first word of an inscription which runs from the centre of the line to join the word at the extreme left, thus forming a right angle and anticipating the irish idea of having a blunderbuss made crooked in order to fire round a corner with it. The reader is perhaps aware that many of the bulls attributed to the genius of Erin are to be found among the old greek writers, but he possibly learns now for the first time that Assyria was the land of this original thought.

I shall now conclude with a very brief account of

the principal figure in the celebrated carvings of Behistun, the supposed persian god Ormuzd.* According to Colonel Rawlinson this huge engraving on the rock was executed by order of Darius Hystaspes to tell future ages of his descent, campaigns and victories; of sundry events of his reign, such as the punishments inflicted on rebellious provinces and refractory satraps, some of whom he is immolating to his god Ormuzd, who hovers overhead in a most mysterious-looking vehicle holding the Zodiac in his hand. By others this personage has been conjectured to be a guardian angel or second self, and Sir Robert Ker Porter has described his vehicle to be a car of sunbeams. So far as can be gathered from the expression of his face it seems to him a matter of the most profound indifference what any person living thought of him or his chariot. Indeed he seems too much occupied in contemplating his right hand. If the reader can imagine to himself the look of Vishnu as he is represented on some sculptures after one of his singular freaks of abstraction, aided by a twist of the moustachio rather like that given by *Punch* to the late czar Nicholas, he may have some faint idea of the air of this personage, but the engraving alone can do justice to it.†

But Mr. Forster says the figure is not that of a

* Zoroaster taught that the Almighty created two gods or potent beings, to whom He imparted as much of His own nature as seemed fit. Of these Ormuzd remained faithful to his creator; the other, Ahriman, rebelled and became the author of all the ills to which man is a prey.

† This personage appears again at Nakshi Roustam, or the Mountain of Sepulchres.—Travels in Georgia, by Sir Robert Ker Porter, vol i. p. 517.

god at all, but simply a likeness of the artist himself, executed by his own hand, and representing him seated as he worked in a strong palm-leaf crate, lowered from the edge of the cliff and resting against a small platform.

I quite agree with him that it is very likely the work was done in this way, as it would have been impossible for any person possessed of nerves at all to stand on a ladder at a height of two hundred feet, and carve a huge piece of sculpture executed with the finest precision, and ruled and ornamented lines of characters done with extraordinary skill and care. Round the waist of the artist is a large hoop, with a coil of rope on it, apparently to prevent him from swinging against the rock. Further, Mr. Forster maintains, that instead of the Zodiac he has got a cymbal in his hand, which he is beating with might and main; that he is singing in most uproarious style the burden of the song which he has carved on the rock; and finally, that he is most palpably and thoroughly drunk; a view quite confirmed by the legend, which says that he *worked by moonlight and was elevated by wine!* Elevated, indeed! I should think so—much more likely that he was out of his senses not to wait till he got back to *terra firma* before indulging in such vagaries.

Here again we are told the legends are of the most puerile kind; they are mostly a long string of words and sentences of the same class, much like the maxims set in copy-books. Besides describing the disreputable position to which the artist has reduced himself, they allude to the acts of the king whose guards are shooting at the prisoners. We read of cutting stone and climbing

ladders, of capital letters, of a sack made of palm-leaves, and what seems a tribute of admiration to the qualities of the person destined to occupy it, whether regarded as a man or an artist; of writing and drawing lines on a mountain, and of these being elegantly ornamented and closely ruled (indeed he seems to have had no idea of hiding his light under a bushel, for he has particularly drawn attention to the excellence of his performance), of his looking like a dwarf or cut short by the legs (which he does), of figures being painted, of bows and arrows, the slaughter of captives with arrows; their crimes, chains, and wounds; their agonies, moans, and struggles; and "to look for the history of the Persia of the Achæmenides in such a document is about as reasonable as to look for the history of the England of the Plantagenets in the ballad of Chevy Chase."

The savage acts of the king scarcely deserve a better chronicler; he is simply glutting himself with the slaughter of helpless prisoners whom the fate of battles has given into his hands. He tramples on one who is convulsively striving to pluck out the fatal arrow with which he has been shot. Towards another of them, an Armenian with a horned cap, he seems to have conceived a mortal hatred, as he is not only looking most savagely at him, a mode of aggravating the terrors of death much in vogue with the ancient warriors, who probably attributed some mysterious influence to it, but he is snapping his fingers at him in scorn, a deed of daring eulogized by the artist with the word naka, which means he snapped the thumb against the middle finger.

One thing was not discovered—the name of Darius

Hystaspes. Mr. Forster found no proper name at all, and thinks if there be one it must be that of the great Cyrus. The word Kur however is found, which I strongly suspect to be the root or possibly the old nominative of the word changed by the Greeks into Cyrus (Κυρος). To this day the river then known as the Cyrus is called the Kur.

CHAPTER VIII.

DIFFICULTY OF DEFINING A SPECIES.

"Life is a shuttle."

FEW questions have excited more interest among those who care at all for natural history than the battle of life. The picture held up of the strong and cunning beast, the hardy plant, now slowly, now swiftly usurping the domain of races less fitted to endure—of all the various forms of life traced back to four or five primordial types,—has been, for the time at least, invested with a charm and interest which have left the opponents of the view almost at the mercy of those who uphold it. The great authorities rushed at once into the very thick of the conflict, and even the spectators seemed to have shared far more actively than usual in the excitement of the debate. I shall therefore endeavour to give the reader a sketch of the points in dispute, though I am far from sanguine about my success in doing this clearly.

The arguments in favour of Mr. Darwin's views of the origin of species are that the more we know of plants and animals the less able are we to divide them into species, or even to decide what is to constitute a species—that is to say to define it. No doubt a writer armed at all points can maintain this position; he can prove that it is difficult to define species, and show how vague and uncertain are the very pecu-

liarities relied on; he can demonstrate that "the most important vital organs are found to offer characters of quite subordinate value." If this reasoning be carried to its legitimate extent, there certainly need be no such thing as definition of any kind, and all such old terms as genus and species may be given up as obsolete. Unnatural treatment of the embryo may cause monstrosity; and monstrosities cannot be separated by any clear line of distinction from mere variations. Variations when inherited become permanent and constitute species. A variety may thrive so as to outvie the species it sprang from—it would then rank as the species and the species as the variety. A genus is only a number of species. Why separate genera any more than species? The line which parts one genus from another is as narrow as that which divides species. Thus a palm-tree and a blade of grass blend by imperceptible lines, and are really the same thing however different they may look. A Newton or Bacon is separated by no impassable gulf from a Laplander or a baboon, and the baboon is as closely linked with a sea-urchin or a turnip. You may have thought there was a gap, reader, but if so you are quite at sea in your philosophy, and the sooner you get rid of such notions the better. We are not so far as you think from the days of the schoolmen who argued so clearly and convincingly that there are no distinctions, and who thought it the greatest triumph of the intellect to prove that black was white.

It is difficult to define a species with perfect accuracy; an absolutely correct definition is one of the most unattainable things in the world, even in the

simplest and most elementary matters. Mr. Darwin would be puzzled to describe such a very straightforward simple affair as the motion of his body, for, absurd as it may seem, it is almost impossible to say what body and motion are. Bonnycastle tells that one philosopher finding himself quite unable to describe motion, got up and walked about the room to show what it was: the formula of the schools was that motion is "the act of a being in power as far forth as in power," which is rather obscure to say the least. The definitions of body given by metaphysicians are simply a jumble of nonsense. If we are to look anywhere for a clear description of such a thing it would be in Locke, and he tells us that our idea of body is that it is an extended solid substance. But I presume that a man walking about is not altogether an abstract idea, even if it cannot be described, and if writers cannot in words divide body from shadow and rest from motion, common sense can, which is of far more consequence.

It is under certain circumstances impossible to say exactly when a man has died, and therefore by such reasoning as has been adopted by some writers who support Mr. Darwin's views there is no difference between a dead man and a living one. Day passes into darkness and night again into morning by such imperceptible degrees that no observation can fix the exact line of separation, and therefore midnight and noon are interchangeable terms. In the rainbow no eye can trace the line where the yellow passes into orange or orange into red; they must therefore be one. The destructive lupus which seams the face like vitriol, the ancient leprosy which gives a man the look of a beast, are

united by the strictest bonds to the tiny lichen spot not bigger than a pin's head. If we can't separate species in nature, still less can we do so in diseases of the skin. The physician and anatomist would be alike puzzled if asked for any standard peculiarities which divide the species and genera of these disorders, but experience soon teaches when science fails that there are differences of the most vital import.

How far the reader may feel disposed to admit the view that the separation of species is a myth, a symbol, without any real foundation in nature, I must leave to himself. But if he is going to embrace Mr. Darwin's theory he must begin with this step, or I don't see how he is to get on at all. I do not consider myself qualified to give an opinion and therefore shall offer none, preferring simply to proceed with this sketch.

The next step then is to suppose that species change very gradually in the course of ages. All these old tales of monstrous floods and earthquakes, volcanic outbreaks, scattering death over whole kingdoms, followed by a lull and then by a new order of things, are improbable and unsupported by proof. It is far more likely they came in one species at a time, say at the rate of one a year—so imperceptibly in fact that no means of testing their first appearance can reasonably be asked for; this gets rid of any great effort of the creative power. The action having diminished in energy by spreading it over a million years must of necessity be different in nature and kind. Certainly species have died out since history began, but I am not aware that history records a new creation at all. As to the artificial creation of a new species I must, with all possible deference, say that I have not

yet heard of one authentic case where a species has endured when subjected to a rigid test.

The connection between the two parts of the argument I am quite puzzled to see. Granted that Elie de Beaumont, Murchison, Barraude and others, were quite wrong in believing in catastrophes of this kind, what connection is there here? Why should natural selection be more fitted to people the earth with varied forms than creation? The most fitting idea would be that creation required slow tranquil change to promote its grand achievements.

But if species are not created how comes it there are species? Why they come from a much simpler cause: like Topsy, they "growed." Something happens, some scarcity of a particular kind of food, some change of air or soil suited to particular animals or plants, and forthwith those which are better adapted to live under such circumstances thrive and multiply, the others perish. Some action of this kind must be going on to clear the ground. Beasts like man grow faster in proportion than their food. War, sickness, hunger, and avarice, Malthus tells us, check the growth of men,* or they would overspread the earth, devour every living thing, and then destroy each other. Just so is it with animals, and plants can of course only grow in proportion to the soil and water they can get at. From the slow breeding elephant, fifteen millions of young would spring in five centuries. A single spotted orchis would bear as many seeds in one year as would plant an acre of ground, the seeds of this would cover with plants

* An Essay on the Principle of Population, 1806; vol. i. Of the Checks to Population.

the Island of Anglesea, and the seeds from the Island of Anglesea would in the year following clothe forty-seven fiftieths of the globe with their flowers.*

This happening of something which gives to one animal the chance of life and condemns the other to perish, is nature's mode of selecting. As breeders of domestic animals, when they choose certain varieties in preference to others to breed from, speak technically of their method as that of "selecting," Mr. Darwin calls the combination of natural causes which may enable certain varieties of wild animals or plants to prevail over others of the same species "natural selection."

Mr. Darwin does not attribute to the climate or food much power of changing the animal; he thinks they may produce some slight increase of size, some difference in colour and covering, but that is all—they do not effect the essentials themselves, they simply call into play the power of selection.

"The trial of strength," says Lyell, "which must decide what individuals are to survive and what to succumb, occurs in the season when *the means of subsistence are fewest* or enemies most numerous, or when the individuals are *enfeebled by climate* or other causes, and it is then that those varieties which have even the slightest advantages over others come off victorious. They *may* often owe their safety to what would seem to a casual observer a trifling difference, such as a darker or lighter shade of colour rendering them less visible to a species which preys upon them, or some-

* Fertilization of British Orchids, p. 344.

times to attributes more obviously advantageous, such as greater cunning or superior powers of flight or swiftness of foot. These peculiar qualities and faculties, bodily and instructive, *may* enable them to outlive their less favoured rivals, and *being transmitted by the force of inheritance* to their offspring will constitute new races, or what Mr. Darwin calls incipient species. If one variety, being in other respects just equal to its competitors, happens to be more prolific, some of its offspring will stand a greater chance of being among those which will escape destruction, and their descendants *being in like manner very fertile, will continue to multiply at the expense of all less prolific varieties.*"

The italics in this passage are mine, otherwise I give the argument in Sir Charles Lyell's own words. I presume these arguments are feasible or they would not have been put forward by so sagacious an observer. To me it looks like a chain of dreams without a fact either at the beginning, end, or middle, with a starting point of which observation affords no instance, for where in a natural state are enemies more numerous or means of subsistence fewer than others, or rather where is the race of animals exposed to these dangers which is liable to extirpation by them? Superior powers of flight naturally enable an animal to escape which otherwise would fall a victim; but if animals with superior powers of flight are preyed on at all, they are preyed on by animals qualified to overcome or outvie them in this superior power, and when their enemies cannot effect it by force or agility they do so by stratagem. The salmon by its greater speed would easily escape when the perch or carp is taken, but the

eagle or dog-fish would not the less surely destroy it. The rabbit would escape the fox when the barn-door fowl even in its native state would fall an easy prey, but the fox will certainly outwit the rabbit when hunger drives him to further stratagem, or nearness of vicinity affords more tempting opportunities. Nature is not generally, so far as I have ever read, in the habit of creating animals without giving them the means of escaping famine. There is certainly no superfluity of food even for the most crafty and powerful; all must seek it amid obstacles, dangers, and toils, but the balance between the animals of prey and those they prey upon seems so maintained, that the idea of an absolute scarcity of food in the wild state might be safely challenged. It might well be asked if seasons of scarcity are a normal state among wild animals, or if they are often found in climates which have enfeebled them except when driven from their haunts by man. Their size, Mr. Darwin says, rather tends to aid extermination, as larger supplies of food would be required, but where is the proof that the supply of food ever failed?

Mr. Darwin admits that the balance may be preserved in creatures peculiarly exposed to destruction. "If not one head of game were shot during the next twenty years in England, and at the same time if no vermin were destroyed, there would in all probabilty be less game than at present." The reader will observe there is no mention of extermination in this natural state. Again, Mr. Darwin says, "I estimated (chiefly from the greatly reduced numbers of nests in the spring) that the winter of 1854-55 destroyed four-fifths of the birds in my own grounds, and this

is a tremendous destruction when we consider that ten per cent. is an extraordinarily severe mortality from epidemics with man."* Yet all seems to have come right again.

Besides this, it has been suggested that interbreeding may have destroyed some races, or at least deteriorated them—as the aurochs in Lithuania, the red deer in Scotland, and the bear in Norway.† But it would be more logical not only to show that interbreeding had taken place, but that it was at all likely to commence ere the numbers of the animal had begun to decrease from other causes, in which case it was not a cause but an effect of decay.

Lamarck, who seems to have been almost under some malign influence upon this point, suggested that the long neck of the giraffe might be owing to its having been stretched by successive races in their attempts to reach the lofty branches on which the animal browzes, instead of supposing as would have been much more rational, that the giraffe was created with a long neck in order that it might reach its food. "Mr. Darwin and Mr. Wallace simply suppose that in a season of scarcity a longer necked variety having the advantage in this respect over most of the herd, as being able to browze on foliage out of their reach, survived them and transmitted its peculiarity of cervical conformation to its successors." Lamarck's view is treated much as if it were a reverie; that of Mr. Wallace and Mr. Darwin like a philosophical suggestion, but it is quite as purely a supposition as that of the frenchman. The very starting point of

* Origin of Species, p. 71. † Ibid. p. 143.

the argument, the existence of the short-necked giraffes, is not proved, nor so far as I can see is it likely to be proved. When they have been found and shown to have lived at the same time with their more fortunate compeers it will be time enough to discuss the probability of their having died from famine.

In fact the reason why certain races of animals after a time die off, just as races of men do, is enveloped in the deepest mystery. With the exception of those exterminated by the brutality or folly of man, the most striking disappearances of this kind in modern times are those of the great auk, the rhytina an amphibious animal like the manatee lately extinct in Siberia,* and the moa of New Zealand. Supposing then for argument sake that these animals were not extirpated by man, can we trace their extinction to the causes suggested by Mr. Darwin? So far as I can see there is not a shadow of ground why such causes should be taken into account, or for believing that the food of any of the three failed. There was nothing to prey upon the moa, and as to swiftness of foot what bird could surpass it?

As this point is very important I will just quote Mr. Darwin's own words, and then ask the reader if there be any real essential difference between his theory and that of Lamarck. In the extent to which he carried it, in the recklessness with which he asserted it, Lamarck may have gone further than Mr. Darwin, but in the root of the question I see no distinction.

* A creature about twenty-five feet long. Old Bones, by the Rev. W. S. Symonds.

Mr. Darwin says, "I believe that the nearly wingless condition of several birds which now inhabit or have lately inhabited several oceanic islands, tenanted by no beast of prey, has been caused by disease" (p. 151). Again, in many dung-feeding beetles the front feet are very often broken off; in one sacred beetle of the egyptians they are totally deficient. Relative to this point, Mr. Darwin says, "it will perhaps be safest to look at the entire absence of the anterior tarsi (front feet) in this beetle and their rudimentary condition in some other genera, as due to the *long continued effects of disuse in their progenitors*" (p. 152). "Nor can I see any insuperable difficulty in further believing it possible, that the membrane connected fingers and fore-arm of the galeopithecus (the flying lemur) might be greatly lengthened by natural selection, and this as far as the organs of flight are concerned *would convert it into a bat*" (p. 199); "it is conceivable that flying fish which now glide far through the air, slightly rising and turning by the aid of their pectoral fins, *might have been modified into perfectly winged animals*" (p. 200). "Several facts make me suspect that nerves sensitive to touch *may be rendered sensitive to light, and likewise to those coarser vibrations of the air which produce sound.*" "If further the eye does vary ever so slightly and the variations be inherited, *which is certainly the case*" (p. 205). "The calf, for instance, *has inherited teeth which never cut through the gums* of the upper jaw, from an early progenitor having well-developed teeth, and we may believe that the teeth in the mature animal *were reduced during successive generations by disuse,* or by the tongue and palate or lips having become better

fitted by natural selection to browze without their aid."

Mr. Darwin further speaks of such things as hereditary diseases, as though they were quite established. "But *hereditary diseases*, and some other *facts*," he says, "make me believe that the rule has a wide extension" (p. 14). "The laborious breathing necessary in high regions would, we have some reason to believe, increase the size of the chest" (p. 218). Now, I have not the slightest hesitation in saying that Mr. Darwin cannot prove hereditary diseases to be more than the merest occasional coincidence not holding good once perhaps in a thousand times. In the chapters on genius and giants I trust I shall be able to show, that so far from variations in stature and genius being hereditary the very opposite is the case, and that the more these variations are developed the more certain is it that there will be no offspring at all, or one of a very perishable kind. In fact, we notice the striking instances of what we call hereditary disease, which may be one in a hundred, and never take into account the ninety-nine in which the child exhibits totally different forms of disease from the parent. The vast experience and learning of Sir Henry Holland and Mr. Lawrence yield but a few well-established cases of hereditary deformities or disease, the value of which is lessened when we remember that the children of unhealthy parents are likely enough to be unhealthy, and may as easily have the diseases of their ancestors as any others. But it is positively certain that there is no such thing as hereditary disease in the same sense as race is hereditary. Gout, scrofula, consumption, and mania do not descend

unaltered for centuries; either the disease dies out or the line becomes extinct; and if deformities could last through ages, not only would they have been chronicled before this, but every people on the earth would show porcupine men, six-fingered people, and hideous objects, increasing in number with each successive age, but no such thing has been recorded; at the end of three or four generations the variety is found to disappear. As to the influence of high regions, let Mr. Darwin consult the surgeons of life offices, and I fancy they will tell him that the chests of men who are the best subjects for examination are not in any way affected permanently or favourably by a residence in mountain districts. A more perfect myth than that which makes the people of mountain districts deep-chested cannot be found.

"I can see," Mr. Darwin goes on to say, "no very great difficulty in believing that natural selection has converted the simple apparatus of an optic nerve merely coated with pigment and invested by transparent membrane, into an optical instrument as perfect as is possessed by any member of the great Articulate class." "He who will go thus far, if he find on finishing this treatise that large bodies of facts otherwise inexplicable can be explained by the theory of descent, ought not to hesitate to go further and to admit that *a structure, even as perfect as the eye of an eagle, might be formed by natural selection, although in this case he does not know any of the transitional grades.* His reason ought to conquer his imagination" (p. 207). I believe most readers will be disposed to coincide with Mr. Darwin. He who will go so far as to admit that an eye or a nerve can be developed in this way will

have little difficulty in admitting any proposition whatever.

Mr. Darwin further remarks, "there seems to me to be no extreme difficulty in believing that natural selection has actually converted a swim-bladder into a lung or organ used exclusively for respiration." On this view it may be inferred that all verteberate animals having two lungs have descended by ordinary generation from an ancient prototype of which we know nothing, furnished with a floating apparatus or swim-bladder (p. 210), which means in plain English that mammals and man himself descended from fish. "So we may believe that the progenitor of the seal had, not a flipper, but a foot with five toes fitted for walking or grasping" (p. 220). "Let the feet of the titmouse vary and grow larger from correlation with the beak or from any other unknown cause, and *is it very improbable* that such larger feet *might* lead the bird to climb and climb more, until it acquired even the remarkable climbing instinct and capacity of the nuthatch" (?) (p. 257). "Analogy would lead me a step further, namely, to the belief that all animals and plants have descended from some one prototype" (p. 518).

Now, let Mr. Darwin's followers examine the history of the most artificial of all animals, man himself, and say if its revelations support their views. Here they may learn something of the changes induced at any rate during two thousand years by food and climate. But what history teaches us is that these agents exert no influence whatever which can be supposed capable of affecting the destinies of man.

In the first place food changes in a historical epoch

much less over any district ever occupied by any compactly spread race—such as the roman, greek, or german, than we might imagine; the form may alter—the essence remains the same. Perhaps no more striking case than that of the roman people could well be selected. We can trace their history, if not with the accuracy which two or three pedantic historians might demand, yet still with certainty enough for all practical purposes, from a horde of rude robbers and farmers, living on the spoils of the chase and the produce of the ground, till they became the most extravagant and corrupt debauchees ever heard of. But still all the elements of the food remained the same, and it is doubtful if ever the bulk of the people changed their style of eating and drinking to any great extent. It was only the very wealthiest romans, an Apicius or Lucullus, who could afford to eat nightingale livers and flamingo brains for supper, and this it seems was the meal that principally differed from those in the days of the kings.* Cooling their wine with snow, and having slaves to carve their food who could keep strict time with the music in their carving, are signs not causes of degeneracy, and hardly even to be called signs. Yet Rome, which for ages had almost always a mighty war on her hands which taxed her resources to the utmost, sank with such rapidity that in a century after her withdrawal from Britain it is doubtful if she could have at times raised ten thousand men worth bringing into the field. She went on dictating peace and war her own majestic way long after the old roman race had died out. It was only when the gorgeous bubble burst

* Reich; Die Nahrungs und Genussmittelkunde.

that men saw how weak had been the cohesion of its elements.

Again, it is pretty certain that the diet of the romans underwent no greater change than that of the english; yet at present, in spite of all forebodings to the contrary, it is quite clear that the english have not materially altered in any way. The jews, too, though they have clung perhaps more closely than any living people to the traditions and diet of their ancestors, must still in the course of their migrations have been compelled to make great changes for long periods of time. Yet there has been no great change in the physique of the jew.

When the British in 1611, 1641, and 1689 gradually drove away multitudes of the native Irish from Armagh and the south of Down, into a mountainous tract extending from the barony of Fleurs to the sea, these people were exposed to great want of food. Their posterity are now described as having open mouths, exposing their projecting teeth and gums, with projecting cheek-bones and sunken noses. In Sligo and Northern Mayo, masses of the people are spoken of as being about five feet two inches, pot-bellied, bow-legged, abortively-featured, and dressed in a wisp of rags; but these are effects which only endure while the causes last; raise these people from poverty and in a generation or two the degradation is gone. In some parts of Derbyshire the people are so pasty-looking, ill-made, and badly grown that a stranger would hardly take them to be english, but when they get into another county their children at once improve.

The changes of climate have as yet been deter-

mined with so little accuracy and completeness that it is very hard to say whether we can point to any one great district where it has materially altered. Certainly the draining of marshes and the felling of forests may have had some influence, but it can only have been of a trifling amount. Perhaps in Sweden and Iceland it has undergone more change than in any other part of Europe, but as yet we see no material alteration in the inhabitants of those countries; on the contrary, what little information has been collected is rather to the effect that the swedes are much now as in the days of Odin.

The influence of climate, especially when conjoined with an improvident use of a stimulating diet under the delusive idea of supporting strength, may produce wholesale destruction of life. The vanishing of entire regiments in India at such a rate, that out of a thousand men landed on its shores in eight years not one member of the original thousand is in existence, the rapid deaths in the West Indies and Sierra Leone are familiar to every reader. But this is death, not change ; such destruction as this leaves no posterity.

It appears too that mere change, even to the deadliest climate, is not so fatal as might be supposed if men would but follow the dictates of reason. Messrs. McCormick, Goddard, and Clark have been trying to show that the climate of West Africa is not necessarily the white man's grave. The two first of these gentlemen have each lived respectively for nearly fifty years at Sierra Leone and by the Gambia. Formerly, officers in the english, dutch, and danish services resided for ten, fifteen, and twenty years in good health at these places, and there are men now

in Europe in the enjoyment of fair health who have been at Sierra Leone for periods varying from twenty to twenty-five years.

However, suppose all these difficulties got over, admit that out of a great many species of animals and plants at any one time in existence, only a certain number survived in consequence of their being more favoured than others. The reader may possibly imagine that these were at any rate created. Not in the least. This is just the point that will *not be conceded, by some of Mr. Darwin's followers at least.* Nature did not create a fresh brood that some of them might succumb and the rest survive. Nothing now on earth was created as we understand the term. All creatures now living simply resulted from other species gradually altered by the two agents which are named—Atavism and Variability.

Atavism, I take it, consists in this—a child will sometimes be totally unlike either parent, and yet very closely resemble his grandfather or grandmother. I confess myself that I have very little faith in the doctrine; those who remember a grandfather when he was young are themselves old, and time has blunted their faculties even if their memories could be relied on to decide such a point, when a period of at least fifty years and often far more must have elapsed. I do not deny that old people may often recollect facts and faces well enough, but if a man in the prime of life will only go back to his schooldays, and observe how dimly he can recall the exact features of many of his playfellows, if he will think how he has painfully striven to trace the exact look and voice of the schoolboy in the old friend who comes

home after years of absence, and who is as yet only touched lightly by age, I fancy he will admit that twenty or thirty years later, memory dulled by coming decay and all the trials of life, might only too easily mislead him. For just such reasons, too, do I doubt whether any man's judgment can be relied upon, who even in the flower of his intellect would compare the child with the grandfather; he little knows what the grandson may grow to be in old age; no man can foretell that.

Out of so many illustrious families whose histories have been most minutely chronicled, how many marked instances of likeness kept up through long drawn ages could be found, and on what authority are they told? I answer unhesitatingly that here, where more than anywhere else in history we ought from the system of breeding in-and-in being so strictly maintained, and from pedigrees being far more perfect than elsewhere, to have the most authentic facts to deal with, we find only vague beliefs, which when they come to be tested are found to rest on popular belief, hasty impressions, and family vanity. Thus we are told of the marked likeness in the house of the ill-fated Stuarts, the proud and able Guises, and the illustrious Illezhazy family. But when we go into the evidence there are but a few dim records, gleaned perchance as much from the flatteries of the portrait painter as from the chronicles of the old historians. Miller tells us that Prince Charles Edward, the hero of 1745, is said to have very much resembled his remote ancestress, Queen Mary; he says he was much struck with the resemblance of their likenesses in "Constable's Miscellany," and adds that Sir Walter

Scott "has repeatedly embodied the fact in his *inventions*."* Yes, in quarries like these such facts may be found, but I suspect the lore of both those great and learned men would have been sadly taxed to yield half a dozen *facts* of the kind we want for science.

As to Variability, it means, I believe, that out of a certain number of animals of the same kind, one will for some reason or other exhibit a certain faculty or feature in a higher state of development than the others. Then take two such animals from the rest of a herd or flock, let nature surround them with causes which allow them to survive, and among the descendants of one or more such couples, the principle of Atavism will so assert its power that in course of time a new species will become perpetual; one step further and a new genus will be created. Variation is the very essence of the process; "without variation," says Mr. Darwin, "natural selection can do nothing."

"A breeder," says Lyell, "finds that a new race of cattle, with short horns or without horns, may be formed in the course of several generations by choosing varieties having the most stunted horns as his stock from which to breed; so nature, by altering in the course of ages the conditions of life, the geographical features of a country, the climate, the associated plants and animals, and consequently the food and enemies of a species and its mode of life, may be said by this means to select certain varieties best adapted for this new state of things. Such new races may often supplant the original type from which they may have diverged,

* Essays, p. 35.

although that type may have been perpetuated without modification for countless anterior ages in the same region, so long as it was in harmony with the surrounding conditions then prevailing."

Thus there are two kinds of selection, first that of choosing out of a number of species certain kinds which are to prevail, and then out of the descendants of these some of the most forward specimens which will pair and be followed by descendants superior to themselves; these will give birth to a still more forward race. Thus suppose that a community of dogs, twenty species in number, had lived much as they have always done for ages, fighting, hunting, and playing with one another; overspreading the land till there was danger of their eating up everything. A cold winter suddenly arrived, and the long-coated dogs rather liking it than otherwise throve apace, while the worse defended, such as the pointers and greyhounds, succumbed; the hardiest of them retreating to a milder part, the rest giving up; the long-coated dogs were thus selected. By and bye the water partly overflowed the land, and those dogs which could swim best, and best bear damp lodgings and fishy food, were selected by nature, thus getting rid of another incumbrance. Again a famine arose, they had cleared out their hunting-grounds, and unless they would sit at home and starve they must do something. Dogs have a very practical way of settling such questions; they go out in packs, attack every thing living, and when they have devoured the vanquished animal, they fall upon any of their friends and companions who have been put *hors de combat*, and conclude the entertainment by feasting upon them also. This is another

mode of selecting. By and bye some cold-loving dogs produced a puppy or two with a still more woolly coat than his father or mother, and a cousin or half-cousin equally more woolly having entered into the bonds of matrimony with him, a race of more woolly dogs sprang up and more suited to the increasing cold, till in due time kamtschatkar and russian dogs grew out of them. Among the hunters who fled southward some puppies showed a greater speed of foot or better wind than others, and as food grew scarcer throve where the others starved. For a very simple reason such puppies prevailed, as dogs would increase to any extent if not checked.

The most degraded and lowest nations favour this tendency. If there exist, says Mr Darwin,* "savages so barbarous as never to think of the inherited character of the offspring of their domestic animals, yet any one animal, particularly useful to them for any special purpose, would be carefully preserved during famines and other accidents to which savages are liable, and such choice animals would generally leave more offspring than the inferior ones (?), so that in this case there would be a kind of unconscious selection going on. We see the value set on animals even by the barbarians of Tierra del Fuego *by their killing and devouring their old women in times of dearth* as of less value than their dogs." Now I can understand the practice of eating twins, or the custom of the Fans who go to market and purchase a joint or a steak off a comely damsel or a sturdy warrior, but I cannot understand the taste of people who eat old women,

* Origin of Species, third edition, p. 37.

and I think the sooner the principle of selection begins to work in Tierra del Fuego the better.

This explanation may appear more philosophical than to suppose that nature creates the animal suited to the climate and food, but I cannot help comparing the whole theory to the golden chain by which Jupiter could upheave the gods, the ocean, and the land; all becomes possible so soon as we admit the existence of Jupiter himself. Mr. Darwin seems to have had the same feeling, for he warns us when thinking of natural selection against relying too much upon analogy. Indeed, I am more than half inclined to think Mr. Darwin is not quite in earnest about the matter. His candour in admitting the defects of his system has been justly called incomprehensible.

We find breeding by artificial selection spoken of as if it were quite established that breeders could really produce a new and enduring species by selection. But breeders have never permanently altered a species. What little is known goes far to prove that, if selected cattle are left to themselves, they would in every instance revert sooner or later to the stock from which they sprang. A valuable variety is only kept up with very great trouble and expense; breeders take very good care not to trust to inheritance of properties thus acquired. Mr. Darwin has not produced an artificial species* distinguishable by any fair test, or that could be supposed capable of lasting. Lastly, certainly not least, the authority and experience of the greatest english comparative anatomists now living, Professors Owen and Huxley, are quite opposed to the

* Popular Science Review, No. vii. p. 380.

idea that such influences can be permanent. The latter compliments Mr. Darwin, but he says, "for all this our acceptance of the Darwinian hypothesis must be provisional so long as one link in the chain of evidence is wanting; and so long as all the animals and plants certainly produced by selective breeding from a common stock are fertile, and their progeny are fertile with one another, that link will be wanting."

Some of Mr. Darwin's followers seem prepared to go much further. Man himself, according to them, is an improvement upon some lower animal. If I have read the passage rightly,* it was taken for a fact that Professor Huxley supported this view, but in his work "Man's Place in Nature" he certainly opposes it. He considers that there is an "entire absence of any transitional form or connecting link" between the man family and "the immediately following family." He distinctly asserts that the structural differences between even the highest apes and man are great and significant; and of what value the mere size of the brain, of which we have heard so much as a sign of approximation, really is, we learn from Professor Huxley himself, who, quoting from so many valuable tables of the weight of the brain by Wagner, remarks that the heaviest brain was that of a woman, next that of Cuvier, then of Byron, and then of an insane person. Now with this sort of evidence before us, what does it avail to say that the cranial capacities of some of the lower apes fall nearly as much, relatively, below those of the higher apes as

* Popular Science Review, No. vii. p. 401.

the latter fall below man, when these are quite as intelligent as the higher apes?

As I understand the theory, it means that man was not created, but that at some far-off epoch a class of apes began to exist. By and bye a change of climate, soil, food, or something of the kind came on, which caused the selection of a superior class of apes, better fitted for this particular climate and the kind of food they were supplied with. Now and then the stock turned out an ape or two having these particular points of vantage rather more developed; a pair of these improved apes more adapted to elude their foes and prevail over the weaker animals cast their lot together; out of their descendants other apes still more developed in such matters again paired off, and then out of them in time came man.

If it is not very gratifying to one's vanity to think oneself a remote descendant of that disgusting vindictive caricature of man, but it is some consolation to think that by the same reasoning we can trace the ape himself to some monad or mollusc.* There are a few troublesome stages on the way, such as that of passing through the forms of a porpoise, herring, mussel, &c., but nothing is impossible to zeal. The transformation, however, is a very natural one if we only admit the first step. Time in the eye of the geologist goes for nothing, a few ages more or less being of little moment; the number of steps through which the

* According to the author of the Vestiges of Creation the ancestors of the ape passed through one great stage of their existence in the sea under the form of Delphinidæ, a cetacean tribe.

ape improved must be left to future research or present conjecture; the facts remain impregnable in the opinion of those who teach them, and taught I suppose they will be. Till lately it was thought that varieties had their limits; Mr. Wallace and Mr. Darwin now say that if we admit that there can be variations, then we must admit that they may be indefinite; because we have noticed limits, that is no reason why in course of time these should not be removed or expanded; the reader must take Mr. Darwin's theory as he takes his wife, for better for worse, all or nothing. "He who has gone thus far," says this accomplished writer, for such he certainly is, speaking of one article of faith, "ought not to hesitate to go further, and to admit that a structure even as perfect as the eye of an eagle might be formed by natural selection, although in this case he does not know any of the transitional grades"! With such conditions the creation of man out of apes is quite a commonplace affair. It is a pity we cannot adopt artificial selection for the human race, and improve a good many specimens out of something far more savage and brutish than any ape, for sanguine indeed must be he who could spend a few hours in the dens of Whitechapel or Shadwell, and after all our fruitless trials, still dream of the improvement of the human race by any other method.

Wherever we find the faintest traces of man in his earliest stage, in the ape-like man of Neander Valley, in the rude savage of the old wintry valley of the Somme, whether we discover him in his rudest living state in the squalid natives of Tasmania, or the degraded-looking feeble Alforians, we find indubit-

able evidence of the use of weapons. The most man-like ape yet discovered, living or fossil, never used an implement of any kind, and if the anatomist were to show that in every region of the brain man and the ape are the same, reason must refuse to acknowledge a union of kind, where so vast a difference in reflective faculty must have existed as that between the animal that forged arms even of the rudest kind and the brute that never used anything but its hands to tear away its food. The gorilla feeds on vegetables, fruits, the pith of boughs, &c.; the orang on figs, blossoms, and young leaves, with strips of bamboo: it is not known to eat living animals. The gibbon eats insects, but appears to avoid animal food. Man in his earliest stages was essentially a hunter and fisher. Where is there one fossil to fill the vast chain of links between these two? or to connect these apes with the dolphin?*

There are no doubt inseparable difficulties in the way when we try to account for the vast diversity of mankind according to any theory yet proposed. A vast lapse of time must have been requisite to qualify members of the same race for the unhealthy coast of New Guinea, the fearful heat of Nubia or Abyssinia, the cold of Greenland or Siberia. Men totally diverse in stature, form, tastes, and culture are found living almost side by side for ages, as for instance the laps and the norwegians, or the russians and the samoiedes. Dark races are found in almost arctic lands; races very similar are found living in very different climates and on totally different food. Varieties of the parent stock, the caucasian race, have now been established

* Vestiges of Creation.

quite two centuries in America and South Africa, yet in no instance have they been known to offer an instance approaching the natives in feature and form. They undergo a certain amount of change in different quarters of the globe, and then unless refreshed by new blood, mostly die out or become very weakly. Sir Charles Lyell was disposed to ignore this, and to favour the old belief that all differences of colour and feature are due to climate. It is an acknowledged fact, he says, that the colour and features of the negro or european are entirely lost in the fourth generation, provided that no fresh infusion of one or other of the two races takes place. The distinctive physical features, therefore, of the aryan conquerors might soon wear out and be lost in those of the nations they overran. The features are lost because the race is lost. Sir Charles Lyell might the very day he wrote this have seen specimens of a people who have not changed much in colour and features during three or four hundred generations, the jews, because they have remained a pure race.

Again says Dr. Darwin, "innumerable instances are known to every naturalist of species keeping true, or not varying at all, under the most opposite climates." Small areas in the old world can be pointed out hotter than any in the new world, yet these are not inhabited by a peculiar fauna or flora. No two marine faunas are more distinct, with hardly a fish-shell or crab in common, than those of the eastern and western shores of South and Central America; yet these two faunas are separated only by the narrow but impassable isthmus of Panama.

But then we are told this view of all the vast variety

of creatures and plants evolved from a few primordial forms by a long unbroken vista of changes under the silent and unceasing operation of a simple law, is something grand. "There is grandeur in this view of life," Mr. Darwin says, "with its several powers having been originally breathed by the Creator into a few forms or one." No doubt there is grandeur, but incomparably more grandeur will there be in it when men have shown it to be rooted on truth.

"Mr. Darwin," says Lyell, "labours hard to show, and with no small success, that all true classification in zoology and botany is in fact genealogical, and that community of descent is the hidden bond which naturalists have been unconsciously seeking while they often imagined they were looking for some unknown plan of creation. To use Mr. Darwin's own words, 'the element of descent has been universally used in ranking together the sexes and acknowledged varieties of the same species, however different they may be in structure.'" True; but this descent has been regarded by the best naturalists in a very different light from what Mr. Darwin would throw round it. They have recognized in this very descent an element in the great idea of fixity of species.

The powers assigned to Mr. Darwin's theory of solving the hidden mysteries of life and growth are so vast that even now I pause to ask myself if I am not still under the influence of some delusion in doubting any longer. "In the first place, it would explain," says Mr. Darwin, "the unity of type which runs through the whole organic world, and why there is sometimes a fundamental agreement in structure in the same class of beings, which is quite independent

of their habits of life; for such structure, derived from inheritance from a remote progenitor, has been modified in the course of ages in different ways, according to the conditions of existence." Sir Charles Lyell further says it enables us to dispense with that principle of progress which geologists have thought they observed going on since creation began; it gets rid of Lamarck's monads, of the difficulty there has always been in accounting for a fact often noticed—the tendency in organs to reappear in a simpler and less developed form; it would explain why all beings are united by one grand and simple plan of structure, why races have been constantly dying out and others coming in (! !), and why certain species thrive so well in particular districts.

Again, it solves the riddle why naturalists can often classify animals with more certainty according to organs in a rudimentary state than when quite developed;* why there are no mammals in islands far from continents, except it be bats; why there is such a close connexion between the living plants and animals of any great part and those which are extinct; why a species which has once died out never reappears; why the further we go back the more unlike we do find the fossil plants and animals to those of the present time; why when some bed is discovered lying between two old ones the fossils in it "supply the missing link in the chain" ! !

"It is a general law," says Huxley, "that the more

* "The homologies of any being or group of beings can be most surely made out by tracing their embryological development when that is possible."—On the Fertilization of Orchids, by Charles Darwin.

closely animals resemble one another in adult structure, the longer and the more intimately do their embryos resemble one another: so that, for example, the embryos of a snake and of a lizard remain like one another for a far longer period than do those of a dog and a bird, or of a dog and an opossum, or even than those of a dog and a monkey."* Why is not this adduced in support of the hypothesis? It has a direct bearing upon the question of descent, and proves it as far as other facts do and no further.

Mr. Darwin's theory as put forward by some of his followers has one great merit—it is elastic enough, in all conscience; but this is just what might be objected to. By the aid of its light, and by stating suppositions such as the transmission of accidental qualities with the air and prestige of established facts, any theory can be made out; and those stupid persons who will stick to facts, who will persist in asking why such important matters as slight advantages, plants in a state of transition, &c., are not shown more clearly, must for a time at any rate be looked upon as utterly demolished and put to confusion.

Mr. Darwin's theory may do a great deal, but it does not supply the great piles of strata full of fossils below the silurian group which according to it ought to be there; it does not explain why spreading a layer of shell, sand, or marl produces crops of white clover where only heath grew before; and why, when furze is burnt down, it is succeeded by thickets of raspberries; why the more highly developed forms have not everywhere supplanted and exterminated the

* Man's Place in Nature, 1863, p. 65.

lower; why one plant has pointed and another obtuse leaves; why the electric organs of fishes have been formed, as Mr. Darwin himself admits; nor the presence of luminous organs in a few insects, which he also allows to be a great difficulty in the way of his theory. Mr. Darwin confesses that it does not explain why geology does not supply the missing links in the chain of being; but he does not admit that it does not ever supply even a very few of these links; that if a horse have descended from a tapir, geology has revealed little of the pedigree; why seaweeds creep up from the sea, and land plants go down to meet the sea plants; why the birds and reptiles of Egypt show no change of fixity during three thousand years even in the slightest particular; facts to which Cuvier would stick and to which Owen will stick. Mr. Darwin will at once say that the conditions of life have now remained uniform in Egypt for quite three thousand years, and that no opportunity for natural selection has occurred. Yet in that very land the old coptic race has decayed out by a process quite as sure as any natural selection can effect or promote, and other lands where selection has gone on have possibly shown quite as little change of fixity.

Mr. Darwin considers that his theory will explain several other points of which we have no other explanation; why at whatever period a peculiarity appears it tends to appear in the offspring at a corresponding age; that with the help of supposing vast gaps in geology it might even explain the distinctness of specific forms, though he admits this is a great difficulty; it would explain the tendency in large groups to go on increasing in size and diverging in

character, which Mr. Darwin contends is utterly inexplicable on the theory of creation; the variable appearance of stripes on the shoulder and legs of the several species of the horse genus and in their hybrids, by supposing them to have descended from a striped progenitor; why plants and animals on islands so closely resemble those of the adjoining mainlands, as for instance those of the Galapagos Archipelago of Juan Fernandez, &c., being like those of the neighbouring part of America, those of the Cape de Verde Archipelago and other african islands being like those of the african mainlands, facts which "it must be admitted receive no explanation on the theory of creation"!

As I have before said, I do not profess to offer an opinion, but I believe naturalists will confidently appeal to time to settle such claims as these. It is difficult to confute men on such points; any person can put forward a theory and say that to his thinking it alone solves the difficulties before him; a great naturalist like Mr. Darwin can of course easily do so. They need not even seek to throw upon Mr. Darwin the necessity for proving his position; they may rest secure in the conviction that there is as little difficulty in believing that stripes in the horse genus prove its descent from some zebra-like ancestor, as that a tiger or tiger-cat was their common progenitor; that we can understand how animals get to islands without adopting the theory of inheritance—the same power that placed them on the one might on the other; and that his theory would not explain the complete difference between the animals of New Zealand and of Australia from the neighbouring continents.

With such arguments in its favour it seems surprising why Owen, Prichard,* Hugh Miller, Huxley, Barraude, Pictet, Falconer, E. Forbes, L. Agassiz, and others, *including most naturalists according to Mr. Darwin's own statement,* should be so prejudiced as utterly to reject it; that it should have been condemned in reviews most favourable to Mr. Darwin;† that Sir Charles Lyell should himself at one time have been so prejudiced as to define species, and to "combat the notion that one species may be gradually converted into another by insensible modifications in the course of ages;"‡ that he should almost stand alone in admitting it; and above all that the records of geology should be so opposed to it, for they seem rather like the working out of a grand preconceived plan of successive creations very different in their results to anything brought about by selection. Professor Phillips recently remarked,§ that "in tracing the history of some of these ancient families of mollusca through the long course of geological time, hardly anything is more striking than the *continuity of the character of each family,* and the small additions which are made to it by ramifications of any kind. Side by side grow up with them many other families. . . . *These do not appear to replace the older types, or to be*

* The Physical History of Mankind, vol. ii. p. 342.

† The Quarterly, the Edinburgh, New Philosophical Journal, and Intellectual Observer.

‡ Principles of Geology, 1837—Preface. Mr. Darwin also believed at one time that species were independently created—Origin of Species, p. 6.

§ In his address as President to the Geological Society at the Annual General Meeting, February 17, 1860.

divided from them, but to take parallel and, it may be said, independent courses, so as to suggest to us, as to our lamented Forbes, the conception of epochs rich in additional generic ideas—a poetical mode of expression not really clearer or more precise than that of W. Smith, who regarded *the life of each natural group of strata as a separate creation, in which he is completely followed by D'Orbigny and a host of modern writers.*" "Is there," Professor Phillips asks, again referring to Mr. Darwin's views, "such a chain of life in existence? Has such ever existed? Is the actual life of the globe truly descended by ordinary processes from the earlier systems which geology has brought to light, so as in this sense to constitute such a chain?"

"We may confidently declare that in the actual system of nature *no such complete chain can be traced*—no possible art or arrangement can present plants and animals in one continuous series from a lower to a higher type."

I do not say that this is levelled at Mr. Darwin's doctrines, but it clearly runs counter to the deductions which must rise from his work. Miller speaks with equal decision. "There is nothing," he says, "like parental descent connecting the faunas of different ages. *Up* to certain points we find the recent shells exhibiting all their present specific peculiarities; and beyond that point they cease to appear. *Down* to a certain point the extinct shells also exhibit all their specific peculiarities, and then they disappear for ever. There are no intermediate species—no connecting links.*

* Testimony of the Rocks.

It is Miller tells us an extraordinary fact, that the order adopted by Cuvier in his "Animal Kingdom," an arrangement founded on the rank and standing of animals, coincides exactly with the order in which they have successively appeared upon the stage of life. Miller looks upon the size of the brain as the great test of a high or low order: brain, not bone, is, according to him, the test of development. Thus, in fishes, which were the first living things on our globe, the brain is to the spinal cord as two to one; in the reptiles which followed the fish the brain is one-fourth larger; in the bird the brain is about three times; and in the beast which followed the bird the spinal cord is four to one; while in man, the newest creature of all, the brain is twenty-three times larger than the spinal marrow. Professor Owen has advanced similar views, though he has admitted that one strange hoofed quadruped as yet offers a seeming exception.

Again, there is almost as steady a decline in the size the blood globules as we approach man, and there is among the mammals often as great a difference in this respect as between the mammal and the reptile. In the proteus, toad, and salamander, the blood globules range from one-four-hundredth to one-twelve-hundredth of an inch in long diameter; in examples of fish given by Wagner, from one-eleven-hundredth to one-two-thousandth. The reptiles the tortoise and snake mentioned by this observer and Prevost and Dumas are on the whole below the fish in this respect. In birds such as the common fowl, goose, raven, &c., we find a marked declension in size: they are as low as about one-two-thousandth and two-hundredth part; but when we reach warm-blooded animals and man

himself, we find them varying from about one three-thousandth or four-thousandth part of an inch to the seven-thousandth, this being the figure assigned to the cat.

Now it may be confidently asked if natural selection can in any case be *shown* to have achieved one step towards, not the performance, but the promotion even of so vast and momentous a change as this. Surely if such proofs are ever to be revealed some of them ought to be known by this time; few things of the kind can have escaped the ken of Lyell; Mr. Darwin has been gathering facts bearing on the subject nearly if not quite a quarter of a century; Mr. Wallace, who has written on the subject, was engaged for many years in collecting and studying the animals of the East Indian Archipelago. Wherever science has unfurled her standard these gentlemen are known as indefatigable workers; where then are their facts, and can they fairly be weighed in the scale against the law shown by Miller to have worked from the first on so long and enduring a scale and with such a studied and majestic regularity? Dr. Hooker, who had the manuscript of Mr. Darwin's work in his hands as far back as 1844, is a profoundly learned man, yet why does he not refute the assertion of Agassiz that no botanist has yet found a plant in a transition state? Does any one know the British orchids better than Mr. Darwin, and yet can it be said that he has pointed out in his work one positive proof of this theory? Are not the conclusions still drawn with too many "mights" and "woulds?"*

* Fertilization of British Orchids, p. 312.

We are told that a high development began earlier than was thought; the longer we live the older do we find the world. At one time it was thought the water-formed rocks were but a thin crust, yet in Britain we have already nearly fourteen miles thick of such strata, and some of them are but very thin, while on the continent again these very beds are many thousand feet thick; whole mountains of them may have been engulfed by the devouring seas. Hence, says Mr. Darwin, "we have no right to expect to find in our geological formations an infinite number of these fine transitional forms which in my theory have connected all the past and present species of the same group into one long and branching chain of life;" hence, too, he argues we ought not to consider the abrupt appearance of species as Agassiz, Pictet and Sedgwick think it is, a fatal objection to his theory.

We are also told that great fishes and reptiles appeared on the theatre of life long before the time generally assigned to them. Reptiles of the land belong to coal measures and sandstone, although till quite lately the days of the permian strata, much nearer our time, were assigned as their starting point. Twenty-five years ago it was affirmed that fish had not been found before the time of the coal measures; now they are traced back to the Llandeilo flags. The old red sandstone was at one time thought to contain few remains of life; Miller after ten years of labour showed that it was full of fossils. One true mammal has been discovered in the new red sandstone at nearly the commencement of this great series. However early we begin we find the first children of the monads the fishes, not rudely formed, shapeless, senseless, help-

less lumps of jelly and cartilage, but powerful, large, well formed and crafty. One of the very oldest fish yet discovered* had a defensive spine the fragment of which is more than twice the size of the largest spine entire of the Port Jackson shark; the dog-fish which represent such an early order are crafty in the extreme. The later classes of fish contain far more instances of monstrosity not only from defect as in the eels, but also from misplacement as in the flounder, plaice, turbot, &c., than the old Silurian fishes; the relative positions of the skull, neck, and parts corresponding to the fore and hind limbs and the tail are far more symmetrical in these very old fishes than in the more modern ones. Quite in the beginning, in the early times of the coal measures, we meet with noble trees of true wood; in the lower old red sandstone, in the days of that very early fish the Asterolepis, we find wood fossils at a time when Brongniart would have us believe that there was nothing better to be looked for than a moss or a lichen. "In the middle of this vast ocean," says Hugh Miller, "just where the last zone of the old red leans against the first zone of the silurian, we have succeeded in discovering a solitary island unseen before—*a shrub-bearing land*, much enveloped in fog, but with hills that at least look green in the distance."

Furthermore, a high order of fish is not only succeeded by a low order of reptiles, but the warm-blooded animals which appear when the dynasty of the reptile is about to pass away for ever are of a low grade.† This cannot be denied, but Mr. Darwin's supporters

* The Onchus Murchisoni. † See Appendix 17.

can, I suppose, explain it away by showing that the survivor had some "slight advantage" over its rivals.

For my part, so far as proof and possibility are concerned, I can scarcely see that Mr. Darwin's theory stands on a much firmer basis than many very beautiful and untenable theories which have been warmly accepted and powerfully defended; which were grand and philosophic, complete and perfect, and which wanted but one thing—an unbroken chain of proofs. Such was the nebular theory till some of the facts on which it rested were shattered by the revelations of the wonderful Rosse telescope; such was the development theory about which Oken made those profound observations, showing how the sea organisms by self-elevation succeeded in attaining into form, and who asserted that without doubt life began in India, though Scotland had a stately flora ages and ages before the Himalayas rose from the ocean; and such, after the fashion of its day, was the theory of a first creation of "Animals of disproportionate parts and of absurd and uncouth shapes," which Ray set himself to dispute more than a century ago.

Sir Charles Lyell most justly objects to the view that there has been a steady development since the beginning of life upon the globe. Dr. Hooker, he says, observes in his recent introductory essay on the Flora of Australia that it is impossible to establish a parallel between the successive appearances of vegetable forms in time and their complexity of structure or specialization of organs, as represented by the successively higher groups in the natural method of classification.*

* See Appendix 18.

To show how much in this theory depends upon suppositions, let the reader examine the following passage, which I have scored pretty freely with italics, and see if I have coloured the statement. "Let us," says Mr. Darwin, "take the case of a wolf which preys on various animals, securing some by craft, some by strength, and some by fleetness; and let us *suppose* that the fleetest prey, a deer for instance, had by any change in the country increased in numbers, or that other prey had decreased in numbers during that season of the year when the wolf is hardest pressed for food, *under such circumstances* the swiftest and slimmest wolves would have the best chance of surviving, and so be preserved or selected, *provided always* that they retained strength to master their prey at this or at some other season of the year, when they might be compelled to prey on other animals. I can see no more reason *to doubt this*, than that man can improve the fleetness of his greyhounds by careful and methodical selection, or by that unconscious selection which results from each man trying to keep the best dogs without any thought of modifying the breed."

"Even without any change in the proportional numbers of the animals on which our wolf preyed, a cub *might* be born with an innate tendency to pursue certain kinds of prey. Nor can this be thought *very improbable*, for we often observe great differences in the natural tendencies of our domestic animals; one cat, for instance, taking to catch rats, another mice; one cat, according to Mr. St. John, bringing home winged game, another hares or rabbits, and another hunting on marshy ground and almost

nightly catching woodcocks or snipes. The tendency to catch rats rather than mice *is known to be inherited.* Now, if *any slight innate change of habit or structure benefit an individual wolf, it would have the best chance* of surviving and leaving offspring. Some of its young *would probably inherit* the same habits or structure, and *by the repetition of this process a new variety would be formed which would either* supplant or co-exist with the present fancy wolf. Again, the wolves inhabiting a mountainous district, and those frequenting the lowlands, would naturally be forced to hunt different prey, and *from the continued preservation of the individuals best fitted for the two sites, two varieties would slowly be formed.* These two varieties *would cross and blend* when they met, but to this subject of intercrossing we shall soon have to return. I may add that according to Mr. Pierce there are two varieties of the wolf inhabiting the Catskill Mountains in the United States, one with a light greyhound-like form, which pursues deer, and the other more bulky, with shorter legs, which now more frequently attacks the shepherd's flocks." Of course the reader will at once see that these two varieties were not created to feed upon their peculiar kinds of prey, but that they were selected in this much easier manner.

CHAPTER IX.

THE LAWS OF LIFE.

"A mighty maze! but not without a plan."

THE laws which regulate life, health and death, and preside over the growth and decay of our frames, have always exerted a species of fascination over the mind of every thinker. Yet it seems to me that the only process by which the obscurity which envelopes them could be cleared away, the slow but sure process of heaping up facts and seeking to deduce some law from them, has gone on but slowly. I am therefore in hopes that any contributions may be of service, and that even drawing the reader's attention to them may not be without its use. True, to contribute materials now may aid as little in attaining the goal as simply heaping up stones and timber furthers the progress of a building, of which neither the plan has been traced nor the site chosen, but at some future day it may afford the means of framing laws not yet guessed at.

What I propose to examine is, not the origin of life, but the laws under which life acts when called into play; not to speculate why one man is a giant and another a dwarf, one a Newton or Shakspere and another an idiot or a brute, but to see what visibly results from an ordinary frame expanding to the huge bulk of O'Brien, or the human brain developing into

the almost divine nature which laid down the Principia and created the Iliad.

To this end I intend to analyze so far as I can the life of man as revealed to us by the light of individual history, to take simple facts which any one may verify and understand, and see what conclusions they appear to warrant. Physiology has taught us to prove the circulation and track a poison—it weighs breath in a hair balance and measures the blood globule to the five-thousandth of an inch, but when we ask it for the bread of common sense it gives us the stone of science. Anatomy lays bare the machinery by which the processes of life are performed and chemistry tells of what materials the machinery is composed, but so far as I can see, the motive power of life and its laws might remain a problem for ever if we are to trust to the scalpel and test tube. Just as a man may be a profound naturalist and yet know nothing of the nature and habits of the commonest animal, just as he may have every system and branch of science at his fingers' end and yet not be able to tell us anything of the horse and dog, the stoat and badger—so he may be a profound anatomist and not interest us—a learned physiologist and yet unable to tell us how to eat and drink, how to sleep and when to rise.

Do not be alarmed gentle reader, I am not going to let off a volley of facts. It will be time enough when philosophers have come to terms about them and they are not exactly doing that, albeit they do a great deal.

It may be safely said that as yet all the disquisitions and rules on diet don't enable us to state half a dozen practical precepts about eating or drinking

which would be generally accepted by the profession or which could be strictly proved. As to the nerves, all that has been doing the last quarter of a century has so far as I can see thrown little or no light on the laws of life, and Dr. Radcliffe's views seem likely to overturn most of what men have said and taught up to the present day, or are even now teaching and saying. Some few years ago a prize of £300 was given for an essay on the coagulation of the blood; Dr. Richardson who won it ascribed this change to the escape of ammonia; Professor Gulliver denies this, and in his lectures held at the Royal College of Surgeons, says, "Dr. Davy, too, before I had experimented with a special view to this subject, had come to the conclusion that the escape of ammonia is *not* the cause of the coagulation of the blood."

Hunter taught that the blood is the great seat of life, in fact that the blood is the life has ever been a standing text with most writers on the subject; but it seems to me very doubtful if this doctrine can ever hold its ground. The blood is the food from which parts are repaired. Any other part of the frame, such as the sympathetic, the brain, heart, lungs, &c., the removal of which would kill at once, is as much the absolute seat of life as the blood. Life can exist in the lower animals without blood as without visible nerves. The blood has no independent existence in or out of the body. Mr. Hunter's view that coagulation is a proof of this fact is now opposed by Mr. Gulliver himself, appointed to lecture on this very topic before the *élite* of the surgical profession.

To discuss such points then here would not amuse or edify the generality of readers. I prefer to take

such simple facts, as health, exercise, study, &c., about which he can judge for himself.

"It is my fervent belief," says a writer in *All the Year Round*, "that the natural history of England will never be properly written till it is taken in hand by the English gamekeepers. I maintain that old Targett, the gamekeeper at my friend Colonel Hanger's, who spends all day waiting for vermin, trapping and shooting, and all night watching for poachers in Redland woods, must know more about the habits and customs of the fox, the badger, the marten, the rat, and rabbit, than Professor Mole, of St. John's Wood, who never goes into a field, never rode after a fox in his life, was never present at the drawing of a badger, never fired off a gun, never dug out a rat, never bit the tip of a bull-dog's tail to make him stop fighting, who does not know how pheasants roost, could not catch a weasel asleep or otherwise, is in fact a poor, respectable, over-civilized, rheumatic, narrow-chested professor, very great with his books and lamps, but a mere ignoramus beside our tough friend Targett."

With the permission of philosophers I propose to see if this very sensible view of looking at the physiology of animals can be applied to men, and therefore beg to say that I am not going to make any statements about the exact number of grains a man perspires, eats and drinks, how much soda and iron he has in his blood, how much sulphur and manganese in his hair, or how much lime, phosphorus, and magnesia in his bones. These are matters for the chemist; my business lies more with his food, mind, dreams and habits. I dare say this is a very low commonplace way

of dealing with such matters, but I have the satisfaction of knowing that Sir Benjamin Brodie held very similar opinions. He says such inquiries will not in our present state of knowledge admit of being presented in the form of a systematic treatise.

As the first indispensable step in such a case is to trace out beforehand the plan to be pursued, I have adopted the following. In the first part of the paper then an attempt is made to sketch the history of man from the dawn of life to manhood—the second is devoted to the different forms of function seen in healthy men—while the last consists of an inquiry as to whether the laws of disease are similar to those of natural life and growth.

The first part however offers little to detain us here. We will suppose that our specimen is grown up, and that the philosopher is about to take him to pieces. What then is he going to do with him, and how is he to describe him?

The anatomist says he consists of so many bones, muscles, and pairs of nerves which convey sensation, of so many pairs of arteries which carry red blood to every part of the frame, and of veins which return it; of one heart, liver, and stomach; a pair of lungs, eyes, and ears; several yards of intestine, and so forth.

The physiologist says he is made up of so much fibrin, albumen, soda, phosphorus, &c.; that the said albumen and fibrin may be resolved into certain proportions of carbon, nitrogen, and so forth. The man learned in the microscope says he is simply a thing built up of so many cells and tubes which he distinguishes as blood tubes, air tubes, bone tubes,

and nerve tubes; and then comes the chemist who tells us that man is a fire in a moving stove, which requires to be supplied with fuel of a particular kind, comprising always water, oil, sugar, and farina, without any one of which combustion or life will not go on.

Many years ago, Bichat divided living man into two classes of structure or kinds of life—what the old physiologists called the animal, or muscles, brain, &c.; and the organic life, or those contributing to the support of the animal, as the stomach, lungs, &c. Not feeling very satisfied with this, I have at various times endeavoured to prove that three great varieties of life are represented in man by three varieties of structure, which are—

Firstly, the structures of organic life, such as the stomach, liver, lungs, heart, and ganglionic nerves, &c., the presence of which in a certain state of development is essential to the existence of every animal that breathes, and without some rudiments of which an animal is not an animal.

Secondly, a group comprising first the brain or rather that part of it which is devoted to reason or imagination, the exercise and development of which so markedly distinguish man from the savage and brute. Next the animal structures, such as the bones and muscles, the eye and ear, purely organs of passion and enjoyment. Lastly, the reproductive structures. I believe I was the first to show that the three divisions of this group so completely antagonize each other, that extreme development of the one class is always followed by diminished power in the other two; I venture to assert that this is a law which is never infringed, and if the reader will study the con-

clusions to be drawn from the chapters on Genius and Giants, I think he will admit that they prove this view.

Thirdly, the organs of extinct or always undeveloped life, such as the thymus gland, thyroid body, spleen, prostrate gland, &c., which perform no active function in the frame. A great number of prizes have been offered, some of them of high value, for the purpose of determining the nature of these strange bodies; but while their anatomy has been most carefully searched into, nothing has been made out respecting their use nor do I believe there ever will so long as such methods are adhered to.

In these organs it is almost impossible to induce disease. A slow sluggish growth which we can scarcely check by any known means seems the only action they are capable of taking on. The late illustrious Dr. Knox supposed that they link us by the tie of transcendental anatomy to races of animals which have perished off from the globe. This view is most likely the correct one, and it may be that as they are only lingering evidences of the vast and comprehensive scheme on which the animal kingdom was planned, they have just so much connection with our frame as is necessary to secure their existence but not so much as to allow them to participate actively in disease.*

Although these different systems are all composed of the same primitive tissues, fed by the same blood,

* Dr. Darwin had a person with a large hard spleen *for more than thirty years* under his care. The man, though very intemperate from his youth, lived to about sixty.—Zoonomia, vol. ii. p. 113.

inextricably connected by a common nervous system, and so linked together by the medium of the skin and cellular tissue as not to admit of any complete anatomical separation; yet a wide difference may be observed in the manner in which they are affected by disease, for certain forms of which certain parts of these systems or groups seem to have a peculiar capacity. Notwithstanding the constant use of such terms as a disease being driven into the system, no disease except it be hereditary ever appears in the same form in any two of these classes, and therefore *to speak of the repulsion of an eruption or an attack of gout from the skin or joint to internal parts* is simply to treat as a fact a dogma of which there is not a vestige of proof. Even hereditary diseases, if there be such things, manifest a strong disposition to confine their action to one class of organs; gout, consumption, scrofula, mania, show the same tendency towards a particular seat and ever-recurring type.

The whole business of man on earth is the performance of functions. This is the sum of his "being's end and aim." What then is a function? As the philosopher mentioned by Bonnycastle found it easier to get up and walk about to show what motion is than to define motion itself, so here it will be easier both for the reader and myself to give a few instances of what are functions than to attempt any elaborate description of abstract ideas respecting them.

The grand functions of life then are those performed by the structures of organic life, such as breathing, taking food, and digestion, the two last of which are common to the simplest and humblest animals—the lowest forms of life; those of the structures of animal

life, as working and thinking, &c.; and those connected with the continuance of his race.

Everything man does upon earth may be reduced to one of these three. The reader may not feel quite satisfied with such an arrangement. "Can the functions," he may say, "of the eye and ear be ranked as purely animal?" Philosophers tell us they are felt to be internal, and for that reason are conceived to be more pure.* They are certainly necessary to connect the brain with the outer world. Without their use men as a race would be poor grovelling brutes, but in themselves they only subserve the purposes of as purely animal enjoyment as the organs of taste in the case of the epicure.

Every function depends upon the presence of a power in the organ, for in every function there is movement, and where there is movement there must be power. The reader is not conscious of any movement in seeing or hearing—nothing seems more purely passive—merely to sit still, looking and listening without any other sign of mental activity, is constantly taken as the very type of repose, idleness, or stupidity. Seeing has therefore been considered quite passive,† but it seems to me that the impression made by light has been confounded with the perception of an object. "Attention," Lord Kames observes, "is requisite even to the simple act of seeing; the eye can take in a considerable field at one look; but no object is seen distinctly, but that singly which fixes the attention."‡ If the reader watches himself closely

* Kames on Criticism.

† Locke on the Humane Understanding, p. 273.

‡ On Criticism, vol. ii. p. 421.

when looking at a fine picture or listening to a lecture rather difficult to follow, or a noble symphony, he will be conscious that an effort is made in such things. He will perhaps be still more conscious of the effort if he analyzes the process by which he applies himself to work out a problem in Euclid, or a difficult sum in algebra. Thus for effort motion and power are requisite.

Man naturally rises from slumber in the morning. Like many other acts of life it is so common that the impulse which compels it escapes notice, and many a person would be rather puzzled to give a reason for it. People often say it is connected with the return of light, and that we in our natural state would rise and lie down with the sun. A very brief reflection would show how much error there is in the belief. Man sleeps much about the same time whether he has only two or three hours' night, as in the north of Sweden in summer, or sixteen hours as in the winter of that part of the world.

The question might be answered shortly enough on one ground; it might safely be said that man rises by day because he is peculiarly calculated to require the stimulus of light. Children born in caves and cellars are frequently not only sickly but deformed and deprived of some of their extremities. Far fewer dwarfs and rickety children are born in the worst drained, badly built houses of the suburbs than in the fine old picturesque courts. Nothing cuts up soldiers faster than night marching, and people whose occupation keeps them much up at night, such as watchmen, bakers, printers, and glass-blowers always show an early and marked decay of strength. In fact

daylight is as necessary for man as it is for the flower.

One reason—the reason one might say—why man rises at all is that towards waking time there is a return of vigour to the outward part of the frame. Of this there are many proofs; one is that more carbonic acid is breathed out of the lungs from day-break to noon; another that the pulse rises towards the time for waking. Dr. Knox of Edinburgh, one of the greatest thinkers and observers of any age, found from a very extensive series of notes made principally among his students that the pulse rose regularly towards morning. Guy did the same.* This disposition seems to prevail in disorders, which I shall endeavour to show are only an exaggerated form of natural action. One of the most regular forms of disorder, one of the favourite studies of physicians in all lands and all times has been fever. Now Dr. Gregory tells us that in all febrile disorders there is a tendency to get worse in the evening (or when the outward life is weakest), and to remit in the morning.†

Mr. Durham being anxious to ascertain the condition of the brain during sleep administered chloroform to a dog, and while it was insensible removed a portion of the skull, substituting for it a piece of glass. He found thus that when the dog slept the blood-vessels were comparatively empty, the arteries lost their bright red colour and assumed the blue colour of the veins, and the brain tissue

* Guy's Hospital Reports, 1st Series, vol. iii.

† Practice of Physic, p. 19.

collapsed, leaving a space within the skull which was filled with cerebral fluid. When the dog was awakened the blood-vessels resumed their functions and the brain once more filled the cavity.

How necessary sleep is to health, strength, and freshness most people know. Mr. Durham mentions that a chinese murderer whose punishment was total want of sleep, died on the ninth day. Brodie says that a gentleman who passed six days and nights without sleep, was seized with such illusions that it was necessary to place him in confinement. At the same time there are apparent anomalies which seem difficult to explain. Many persons have passed months without one night's good sleep, and therefore must have been in that time subjected to several times the amount of loss which in the one case kept up for a week had produced fatal results. The explanation is that in these persons the natural cycle of action and rest was never *completely* broken for a great length of time. A vast amount of interruption to natural action may be endured if it be spread over a sufficiently long period.

Sir Henry Holland speaks of the difficulty of explaining the physical causes of sleep as almost insuperable, and Dr. Graves* says that all the explanations of hunger are unsatisfactory, but according to the views now given I do not myself see any insurmountable obstacle in the way.

But why it may be asked is there a return of vitality towards the animal life in the morning? The answer is that rest beyond a certain time for any function means the beginning of decay and death of the parts

* Studies in Physiology and Medicine.

which perform this function. If they have no natural action they will have an unnatural one; absorption, wasting, and disease will come on; the stomach without food will digest itself. But provident nature has provided a safeguard, and at the first sign of this the vital power begins to flow from the seats of nutrition to the brain, muscles, and stomach. It resumes its seat in the organs of animal life, and in consequence man awakes to seek that food and action which employ these organs in their natural way.

The first function is exercise of the animal life either of the brain or muscles. Taking life all over the globe, it may be safely said that the muscles are most worked in the morning. Instinct has taught the working classes that this is the time for toil; it is a saying amongst masters who have risen from the station of labouring men, among captains of ships who have seen workmen of different nations, that there are no two hours of the day in which so much is done as in those before breakfast. Efforts have been repeatedly made, sometimes from pure humanity, at others from selfish motives, and at others again in the interest of commerce and policy, to change this and induce the men to begin work later and leave off later, but they have almost uniformly been resisted.

And yet this is at the close of a period when least food is taken, and in fact when food cannot be borne. It is only among those who have long reversed the ordinary habits of life, that even the hardest workers can take a hearty meal so early in the morning as four or five o'clock. It seems quite as universal a rule that the principal part of food is taken after the bulk

of man's work is done. The workman begins at six and goes on till eight—breakfasts—resumes his work at half-past eight, and works till half-past twelve or one o'clock, when he dines, rests now for an hour and continues till six; thus performing six hours' work before dinner and four hours after it; the latter part of the work being I believe with few exceptions worse got through than the other.

Again the merchant or lawyer gets through the bulk of his work before dinner, and as surely as men attempt to break through this natural tendency so surely does the health give way. The young in whom digestion is very powerful, bear it pretty well, but elderly and feeble persons soon find the ill effects of it. The more, too, a man works his brain the more does he require rest after dinner.

To what is this due? By what theory is it to be explained? The mechanical physiologist, who must always talk of man as if he were a steam-engine, says that motion disturbs the digestion. Very likely it does, but I want to know how? Mechanical physiologist says by the exercise disturbing secretion of gastric juice and causing contents of stomach to ferment, &c. But this is simply telling me the same thing in other words, so I give up mechanical physiologist and turn to nature, who tells me that the disturbance of digestion is as complete if a man goes off to his study, and sets to work upon the binomial theorem, and that the real secret is that the vital power cannot keep up two actions at one time. Weakly persons often feel chilly and sleepy after dinner, facts of which I see no explanation save by applying the same rule to them.

Exercise of the higher functions of the frame

follows naturally much the same path as that of the merchant, being chiefly performed between breakfast and dinner, or in the evening after digestion is pretty well completed. Some few persons work irrationally; astronomers and others are compelled to do so, but as a rule abstruse and vast problems are rarely worked out at other times. Bright immortal thoughts have often risen to the mind in the stillness of midnight, in long wakeful hours, as they will in the throng of business, in the dance, at the theatre, at lectures, or in lonely walks; Milton is said to have been in the habit of rising in the night and writing down his recollections of those grand visions, and many of his noblest lines are related to have been thus preserved. But the great labour of weighing, testing, and shaping out such thoughts is as much the work of the busy garish day as double entry is. Besides these thoughts at midnight are only fitful flashes of an overtasked brain, and as the tide of the vital power sets in towards the centres of nutrition they get fewer and fainter till they altogether cease. In fact persons who lead at all regular lives notice little of this kind of thing after two or three o'clock in the morning, for a reason to be afterwards given.*

I fancy it will generally be found that the most wholesome genial writing, like that of Scott and Washington Irving, Dickens and Shakspere, is done in the morning, or when the brain is well cleared up in the evening. The heated morbid fancies of a Schiller, a Shelley, or a Poe remind one irresistibly of spectres

* See page 375.

evoked by an over-busy brain in the depth of night when the mind should be asleep. "Goethe," says Lewes, "worked in the freshness of morning entirely free from any stimulus; Schiller worked in the feverish hours of night stimulating his languid brain with coffee and champagne."*

Owing partly perhaps to its being a higher strain on the system, and partly to its being more artificial in all respects than unskilled labour, great mental labour is rarely performed early in the morning.

And here I may advert to the frequent recurrence of the statements about these great men having habitually worked so long and slept so little—I believe that with scarcely an exception they are unfounded. What little I have met with in biographies is quite opposed to such a view, and the reader may feel assured that the brain of a Shakspere or a Newton has nearly if not quite as much rest as that of an ordinary person. The strongest brain requires repose just as certainly as the best muscles do. Napoleon has been often quoted as an instance of a man who took very little sleep. Bourrienne, who I suppose knew more of him than any other man, distinctly states that Napoleon almost always *when he could* took his seven hours' sleep, and eight when he could get it. Scott always wanted seven hours' complete oblivion to carry him through his vast labours; in short I may say that with the exception of John Hunter I have not found an instance of this habitual want of sleep. Hunter is said on very good authority to have frequently worked absolutely twenty

* Life of Goethe, vol. ii. p. 187.

hours out of the twenty-four, but then he possessed an extraordinarily strong constitution; he began this kind of thing late in life when the system necessarily demands less sleep, and a vast deal of the work at which he sat up so late was purely mechanical, and to a man fond of such pursuits of a devouring interest.

The second great act of daily life is the taking of food, which gradually gains the ascendant as the capacity for labour declines, ultimately overcoming it, to be in its turn dethroned by a still more important function the absolute nutrition of the frame.

The assimilation of food—that is the conversion of the chyle or the produce of digestion into the cells and fibres of which the whole frame is composed—being a higher class of function, naturally demands the presence of a larger amount of vital power; and it is a beautiful provision that a function which will not bear disturbance *should by its higher vital nature secure such a withdrawing of the vital power to it as leaves the other parts torpid* and thus incapable of disturbing it. So completely is the vital power abstracted from other parts during the time this function is going on, that not only are the muscles deprived of all strength, but the most active brain becomes more and more torpid. If the hand of a person in deep sleep be lifted it falls again without an effort at volition; if a sound or powerful smell or a strong light disturb his brain a fantastic vision is seen, such as never occurs in actual life.

During this process even the circulation, as has been mentioned, sinks, to rise again as the work of nutrition draws to a close. The breathing loses in power, and is performed with labour. Finally, some

observers maintain that the secretions are diminished during sleep.* Some of these facts I take from the writings of authors totally opposed to the views I hold.

Mr. Locke in speaking of sleep says, "But in this retirement of the mind from the senses it often retains a yet more loose and incoherent manner of thinking, which we call dreaming; and, last of all, sound sleep closes the scene quite, and puts an end to all appearances." Now, if the reader will be content to view the mind and vital power as one and the same, and to substitute for retirement from the senses retirement from the organs of animal life, such as those of seeing, hearing, &c., he will, I think, be able to see not only how closely Mr. Locke's brief description here shadows out the phenomena of sleep which I have tried to describe, but also that this retirement of the vital power is the only simple and tenable explanation of sleep that can be given. This view of the mind not always thinking, as some people would have us believe it does during sleep and dreams, is one that was shared by Sir Isaac Newton, a man whose mind approached so near perfection, whose every feeling was so near an embodiment of abstract truth, that I can scarcely fancy he could be wrong. Now I humbly submit that the law I have observed of the vital power rolling through a cycle of functions as regularly as the tides, alone explains this great truth on which these men were so agreed.

Night it would seem is not only the time for sleep, but peculiarly for death also, the dead of night, or from twelve to three, being the most fatal time out of

* Gregory, Conspectus, p. 179.

the twenty-four hours. The fact has been previously noticed, I believe; but the statistics from which I extract this result were published quite recently in the "Abeille Médicale." Sir Henry Holland says, that if he ventured to name any particular periods in the twenty-four hours at which changes most obviously take place, both in health and disease, he should fix upon the hour of two or three in the afternoon, and *the corresponding time in the night.*

If any part of the brain have been overtaxed during the day, sleep may be disturbed by a tendency the vital power seems to have to flow back suddenly and irregularly, but in gradually lessening force, to any spot where it has accumulated during waking hours. It is I believe from this very rapidity and equally quick reflux that we have these *short* vivid dreams, the loud sounds heard, and the splendid colours seen in them. The action is the same as in those dreams caused by loud noises, strong smells, bright light suddenly breaking into the room, pain, &c., though of course the cause is different; that is, the vital power is suddenly attracted to a part upon which an impression is made, and flows back as suddenly. But it will be noticed, that the higher functions of the brain, which demand the presence of a large amount of vital power, are not called into play. A man does not really *think* during his dreams; the seat of judgment remains unvisited by one stray gleam of intelligence. Nay, the very instinct of self-preservation seems in abeyance; a dreamer endures the extremity of peril and anguish without being able to move a step, though that one step would free him.

With regard to dreams being ever a transcript of life or a foreshadowing of what is to come, I think

the most cursory attention to circumstances will show that the view is untenable. Where great excitement, dread, or suspense have been endured, familiar forms will often revisit the chambers of the brain; but in every case there is something in the dress, words, or actions which the least reflection shows to be most glaringly at variance with everything that happens in actual life. Dreams indeed are far more purely physical results than many people think. I quite agree with Brodie, that association of ideas will not explain them; a distressing dream is often caused by acid in the stomach or pressure on a painful part, and is relieved by a dose of magnesia or a change of position. What has "catenation of ideas" to do with this?

That a brain so absolutely torpid as to be incapable of the simplest natural act even in a dream and when disturbed by realities, should yet suddenly acquire a power of looking into the future which far transcends the mightiest efforts of a Newton or a Napoleon, is simply the most incredible thing in its way ever heard of; and men who have really studied the subject may well afford to dismiss the belief that dreams ever appear as the harbingers of what is to happen with that pity which it merits. But nine men out of ten do not reason on such a matter as they would on a question of science or history, and thanks to the influence of a host of semi-scientific writings there is a wide-spread belief in dreams among those who might be expected to rise superior to such folly. It is easy to fabricate such things, and beyond all question many thrilling revelations are solely due to a morbid taste for the horrible and supernatural; but in other instances the writers clearly believed what they wrote with as firm

a good faith as ever was shown in the discovery of a planet or the invention of a new theory.

It is of no avail simply to deny these things, they are not so easily overthown by mere denial. A man if he likes may assert that the moon is inhabited by winged men, and was blown out of the earth in a fit of sickness, wherein the mother planet exploded like a bomb-shell; that comets are the abodes of the damned; that the earth rests on a rock; and that tides are not due to the influence of the moon. We know that these views are absurd, but some of them have been supported by clever men, and even when put forward by others it is not always so easy to disprove them. How much more difficult then with matters so remote from absolute proof as the mysterious operations of the brain, and how much better not to meddle with a subject than to use such vulnerable arguments as contempt and abuse, especially with enthusiasts.

A believer in dreams has outposts and defences difficult alike to storm or sap. He may resort to the weapons of chicanery; he may be as obstinate as a lunatic; he may take the very old plan of treating opposition as insolence, as doubting his word; he may require his adversary to assign a better explanation, which means appealing to ignorance; he may struggle for victory, not for truth, and thus give any person a great deal of trouble to silence him. Yet for all this he may be quite in the wrong.

The proof would be to record a prophetic dream and prove by collateral witnesses a clear connection between it and the event. As there are many persons so favoured as to dream of what is to come, there can

be no difficulty in the way. It will be said that this has been done. I have often heard it asserted. But in what way? Why, the youngest barrister, the poorest Sir Brieflesse, would pick such evidence to pieces in a case of law. No, no, this will not do at all. The dream, which is to confound all unbelievers must be drawn up and deposited in the hands of some keen lawyer or magistrate, some shrewd physician or man of science like Faraday or Owen. When only one dream proves true I shall turn believer myself,— but I shall wait till then.

It is very unfortunate such dreams should happen so rarely and occur in such a lugubrious form. What a pity they never warn us of impending ills, and give us a chance of remedying them beforehand, instead of just coming in time to fill the mind with dark forebodings and no more. Why do they never herald an escape from our bothers and snares, and why do they never save us a few years or even days of suspense by telling us that an unnatural sire is about to leave us a fortune, or the girl of our choice ultimately to make us the happiest of the happy? Is it because the mind when shaken by disaster instinctively clings to superstition if not fortified by study, and only then; that man is not superstitious when elated by good fortune?

By what agency too do they happen? In real dreams it is, now and then at any rate, possible to trace a direct connection with some palpable cause; it is possible, nay quite feasible, to understand that if any part of the brain have been much excited during the day there will be an erratic flow of vital power to that part during the night, which will cause what

happens in any disorder,—increase of some part of a function. We can understand how the same flow may be caused by a bright light or a loud sound. Here all is natural and connected so far as cause and effect are concerned; an impression is made upon some part of the frame, and the vital power obeys the irrepressible law under which it acts, *to flow to that* part on which a violent impression is made.

But when a man is present at the death-bed of a friend a hundred miles off, and a scene is enacted before his eyes, clear, connected, and actual, the case is widely different. Supposing he really saw the friend, not in the weird fantastic form with strange accessories as he would be sure to see him in a dream, but as in actual life, either the friend must have travelled bed and bedding to him, like the shrine of Loretto or Prince Camaralzaman, or he must have taken flight to his friend. But as this is not very easy, and as the dreamer could only have seen with his eyes and heard with his ears, I presume these vagrant bodies must have gone of their own accord, carrying with them their ministering nerves as comets carry their tails. They must possess a strong geographical instinct to wing their way by night through the trackless fields of air and to a spot whither their owner might be puzzled to direct them!

I have actually heard it asserted by a man who had taken high honours at Cambridge, that the soul might vacate its prison and visit some far distant scene during sleep when the wants of life no longer required its presence. I told him it certainly might, that I had known many instances where the soul had quitted the body during the night, but that in all such cases it

had taken a final farewell of its earthly habitation, or in other words that the person in whom this process occurred was always found to have expired.

But then again it is assumed that the spirit of the dying friend at the moment of death took his features, and thus attired appeared to the ghost-seer. Such an event, it is often said with all the air of an irrefutable argument, is quite possible. "There are more things on earth," &c.; "It is impious to set bounds to the power and will of the Creator," &c. Of course it is impossible to bound the power of the Creator, and equally as much to bridle the freaks and vagaries of the human mind. This much however may be safely said: there is very little in what we do know that looks as if the Great Being who rules the globe was much in the habit of carrying out His plans by such low charlatanry as sensation dreams and spirit-rapping. As to the vital power or soul, so far as we are permitted to *see* its workings, it is simply a power impressed for a purpose on living matter as electricity is communicated to a Leyden jar; absolutely separated from matter it seems to be perfectly inert. It performs its functions only in a frame it has tenanted from birth, and judging from what nature teaches we may safely believe that, divorced from that living frame, it can no more assume the form of man than the power of gravity can take the semblance of the meteor and the planet, or the lightning of its own free will put on the likeness of the jar in which the chemist imprisons it to do his bidding.

Of course I shall be told that men constantly see in dreams the figures of those who are dead. The fact is, the brain is trained to see particular forms just

as the ear and eye grasp particular things, and the long-practised hand of the musician or engraver mechanically grasps the tool. Dreams are only distortions of something heard or seen before; there is no creative power in them.

But then such visions have appeared during waking hours to living people, sensible men of the world. The statement is quite true, and its truth only shows how deeply superstition is rooted in ignorance. But a century or two ago clever men believed in things which their readers do not put quite so much faith in—witches for instance. Yet there were profoundly learned and inquiring men in those days, the reader will say. Learned they were, but at the same time utterly ignorant of those parts of natural science which would have taught them that witches never did and never could have done the feats assigned to them. But the reader objects that Johnson believed Cave saw a ghost, and Pascal long had a gulf opening at his feet. Then take these two instances: Pascal suffered under cerebral excitement, and Johnson it is known was a prey to the most miserable superstition. As he went rolling up a street he used to lay his hand on every stone-post (they were then set up in the streets in place of the modern curb-stones which have so detracted from the fine picturesque style of that day) and if he passed one without observing this solemnity he was sure to go back and fulfil it. He used to step upon the stones alternately with the same mysterious gravity. Who now supposes that either Cave or Pascal really saw what he supposed he saw, or rather who does not know that the objects supposed to be present really had no existence? And which of the men who would in our

day be chosen to decide upon such matters would admit either Pascal or Johnson as arbiters? Had it been a Newton or a Wollaston the case might have been different; but such men are not in the habit of seeing ghosts. Like omens ghosts are the offspring of disordered health or mind; they do not belong merely to ignorance. More than two thousand years ago we find the clearest-headed of those great men who formed the glory of Greece, despising and rejecting omens as they would now reject ghosts. The ghost proper, it has been well said,* is most useful as a forerunner of mental or physical disorder. It points to the doctor's consulting-room, not to the spheres; to decay, not regeneration; to lunacy, not inspiration; to Hades not Elysium; to physic, not to nectar. This is the true explanation of the ghosts seen by many clever men. There was some congestion of the liver or brain at work, and a good blue pill and black draught with a cold lotion to the ghost-seer's head, would have been more appropriate remedies than arguments.

In Germany men like Forster and Sömmering actually asserted for a time that Schröpfer could conjure up ghosts; Herder and Goethe believed in the influence of the will of a person upon another at any distance;† in fact, when Frederick the Great died sound sense and sober reason seemed to take flight together. Schiller was so lost to all sense of the ridiculous that he reported he had seen a vision in the woods of Bauerbach. He was very wrath with

* The Medical Critic, July, 1863: "Ghosts Patent and Prescriptive."

† Palleske's Schiller, vol. ii. p. 35.

"the dragons" at the time, so as he went wandering along suddenly he was dazzled by a bright light (he would have been rather more dazed, I suppose, if the light of reason had shone upon him), and a voice exclaimed, "What wouldst thou?" To this the poet replied in an appropriate speech, and a most interesting dialogue took place, which might have suited the storm and squeeze school, but which most sensible men would treat as the effusion of a person light-headed from fever or else stark mad.

Many of my readers may remember that a short time ago a series of ghost tales appeared in *All the Year Round*.* They were said to be by a physician, and were certainly among the cleverest things of the kind, capitally written and well adapted, from the pseudo-philosophic style and the professions of scepticism with which they were seasoned, to rivet the interest of those who would have paid little heed to a common ghost story. But when we come to analyse them there is not a tittle of evidence in their favour that would count as a grain in that delicate balance wherein men weigh such questions as gravity and magnetism, the orbit of a planet and the date of an eclipse.

They consist substantially of eleven tales, two of which are the physician's own and one his grandmother's, two are by the Rev. W. W. and one by a Mr. G. But what is most to the point is that of the eleven only two are given with the names of the persons who had to do with the ghosts; one of these is quoted from Mr. Bray's Life of Thomas Stothard,

* A Physician's Ghosts: All the Year Round, vol. i.

and describes the apparition of a genuine ghost; the other is from a narrative of a vision, not a ghost, by Professor Wilson of Edinburgh, who told the author that one day after a picnic dinner he was looking at his watch, which pointed to twenty minutes past two, when he felt a remarkable sensation pass over him and said to himself, "At this exact time my brother R. is dying in India," a piece of astounding precision in a man, supposing always that the narrative refers to Christopher North, who hardly ever knew what the right time of day was, and who sometimes wound up his watch twice in the twenty-four hours and sometimes neglected to wind it up at all. I suppose because such exactness was so little in keeping with his habits he was ashamed afterwards to allude to it in his writings, and his daughter is ominously silent about it in her life of him. However Professor Wilson made a note of the fact, and was of course in proper time duly startled by the news that his brother had actually died on this very day, and "at an hour which by allowance for latitude corresponded with that marked by my watch when I had my eyes on it." Indeed the punctuality with which ghosts keep any appointments they may happen to make is most edifying, and sets an excellent example to those whom they visit, so excellent that it is a pity they don't profit by such patterns. It is also a pity that as the sensation accounted for the difference in latitude it did not arrange its movements in such a way as to account for the anomaly of sound or form, whichever it was that conveyed the warning, getting from India to Scotland without an appreciable lapse of time. Supposing the distance to be six thousand miles, sound

would require three-quarters of an hour to travel that length.

Of the ability of Mr. Stothard to judge in a question which requires so sound a judgment, such careful weighing of probabilities, and at least some knowledge of science, I profess myself quite unable to give any opinion; but sure I am of this, that John Wilson, for I presume the writer is speaking of him, was one of the last persons in the world whose decision would have been taken in the scientific world as fit to settle a question of this kind. Had he chosen to say that he had seen a most impossible thing, a black sun and green moon, purple stars as large as dinner-plates, the interior of the earth, or a few departed worthies of Greece or Rome, men might have ascribed it to his having dined. Yet none of these absurdities could have possibly involved a greater violation of all we know about physics; a material communication there must have been, and as even electricity could not make such a transit without very great artificial help, there is a difficulty in the way which I do not see how to get over.

I have not the dates of their respective deaths by me, and therefore possibly the author of this story may refer to the late George Wilson. At the time when I first knew Wilson I should not have thought him a likely person to indulge in visions, but when I read his "Religio Chemici" I could on evidence have altered my opinion, and could quite believe it possible that his mind worn down by his long sufferings had become gloomy and superstitious.

In another paper in the same journal, also most ably written, the hero of the story is a young gentle-

man who set off from Harfleur to Quillebœuf; and while at the latter place busily employed in playing at skittles heard his name twice pronounced by a woman's voice. On reaching home (Harfleur) he learned that his godmother had died during his absence, "pronouncing my name twice and breathing her last sigh at the moment of the second summons I had heard." The same creditable punctuality as ever. Here the spirit must have taken flight before the old lady died in order to speak to him at the exact moment of her death, or else a sound must have travelled in a moment from Harfleur to Quillebœuf, which supposing such matter-of-fact people as scientific men are in the right when they assume that sound travels at about the rate of 1,120 feet in a second, looks very like a direct violation of a natural law. Besides voice depends for its very existence upon the vibrations of the vocal cords. No airy tongues, now-a-days, could pronounce men's names without their aid, and here the vocal cords were lying in the windpipe of the old lady at Harfleur.

Another story is told in the same journal* of a young lady who got into a railway carriage and travelled with the artist, the narrator of the story. The young lady or ghost wore a substantial dress, which did not collapse at all as if hung upon a mere mist or air. Nothing betrayed to the traveller that he had before him the ghosts of a gown and a pair of gloves; its ghostly hand held a real Bradshaw, for it was his own which he lent the ghost. The ghost dined with him at the table of a family he was visiting; neither

* Mr. H.'s own narrative: All the Year Round, vol. vi

the master, mistress, or servants spoke to the ghost or even appeared to see her; she was only visible to the artist. I can understand a person firmly believing in the supernatural giving credence to all this, but I can't understand any person believing what follows, because it involves faith in impossibilities; the thing simply could not occur except the person who saw it was himself under the influence of a delusion. "She made an excellent dinner; she seemed to appreciate both the beef and the tart, as well as a glass of claret afterwards." How did she get them? and how strange that a servant should set a knife and fork, a plate and a glass for a person he didn't see there, and that no one should observe the vacuum made in the tart! Some instance of the communication between her and the lady and gentleman who presided over the eatables must surely have been noticed by the artist, unless she communicated a ghostly influence to all around her, and in order to make herself sociable partook of a ghost of a slice of beef on a ghost of a plate, and took a ghost of a glass of wine in the same way. Ghosts too of salt, pepper, bread, water, &c. ministered equally to her necessities, for no one seems to have noticed these things travelling over the table towards an invisible centre of attraction, as must otherwise have been the case. Finally the artist afterwards talked to this mysterious person in the drawing-room *in the presence of several people*, yet very strange to say no one noticed that he was talking to nobody!!

Eminent physicians whom long experience has taught how purely such phantasies are things of a bad digestion and torpid bileworks, an overworked brain

or too much anxiety, and that the way to "minister to a mind diseased" is to set the health right, could count cases like these by the score. They could tell endless tales of patients who in the delirium of fever and drunkenness see such things, and of course act and talk just as though material images had appeared to them; they could relate how in slight cases of delirium tremens, when reason still retains some hold of her wonted seat, men see figures, observe the faces gibe at them and the mouths mock them with all the force of life, hear them repeat some never-ending word or sentence, dread to be alone with them, and yet all the while know the whole thing to be a delusion. To some disorder of this kind may be attributed ghosts seen under such circumstances as Mr. H. describes. Either there was a material appearance, which I think I have shown to be impossible, or there was simply a figure seen by the eye of one person only, visible only to him. But if this be a ghost, then every person who dreams or has delirium sees ghosts.

Could indeed the spirits of the dead revisit those they loved so well while on earth, what happiness might they not often bring to hearts now shut while this life lasts to every other source of joy, and how often might not the well-remembered voice chase away the clouds of trouble and despair and cheer the weary on their path. Why should they not be rather welcomed like the grand things told by religion and science than shrunk from with awe?

"If from the cerements of the silent dead
Our long departed friends could rise anew,
Why feel a horror or conceive a dread
To see those friends again whom once we knew?"

In the same way as the vital power flows back to the brain so does it appear to revisit the muscles during sleep, as they frequently start in persons whose health has been disordered or who are excessively tired, in consequence of a disposition in the vital power to flow away more slowly from or to flow back more readily to a part which has been a great deal exercised during the day, as the reader may easily observe for himself if he likes. This, it seems to me, is the cause why people are, as it is often said, too tired to sleep, and I have seen no explanation of fatigue which appears to me so satisfactory. Moreover I imagine I see in this fact a simple elucidation of matters, which appear perplexed and inexplicable when expounded by the light of arguments often contradictory and generally given piecemeal.

Thus Dr. Gregory says that during sleep the nervous power is less. But if I understand the matter rightly, the nervous power means such portion of the vital power as is attracted to the nerves by their exigencies, and as during sleep so much vital power is drawn away for the purposes of nutrition, there is less left for other parts. Dr. Conolly in one of his lectures in the *Lancet* cites the case of an insane young lady whose "days were passed in misery, but during sleep the dreams were uniformly pleasing and happy." Dr. Conolly thought it seemed in this case as if different parts of the brain were active in the states of waking and sleeping. It may be a distinction without a difference, but it seems more simple to trace the absence of the feeling of misery to the abstraction of the vital power from the unhealthy part of the brain for the purposes of nutrition as in the other cases.

Thus then we may assume that nature has traced out three great distinct phases of the cycle of vital functions, exercise, taking of food, and nutrition—even the natural daily craving of every healthy man for fresh air being a part of the great action,—that the vital power revolves through this cycle once in twenty-four hours or with each revolution of the earth on its axis, that the natural tendency in the vital power is to flow to and put in motion only a set of organs at a time, and so strong is this disposition to employ only one great division of the frame at a time, that even in the case of exercise of the brain and muscles, where one part is given up to great activity the other cannot be very vigorously exercised, or in other words, that even the divisions of the great groups into which the frame may be resolved conform rigorously to this law. If then it can be proved that the natural performance of a function is marked by an accumulation of vital power in one part and a diminution of it in another, a great step is gained towards simplifying the question.

Disease and disorder certainly appear to say so, just as much as health. As one set of functions are called into unnatural activity the others are less perfectly performed. In any kind of fever, such as scarlet fever and measles, as the skin gets hot and the pulse rises, so does the stomach lose its power of taking and digesting food and the mind grow less capable of attending to work. In tremor, as irritability and agitation of the muscles increase the pulse loses its power more and more; in tetanus the spasms gain ground with the fall of the pulse and the declining hold of the vital power on the nobler organs. In cholera the

cramps in the muscles, or increased violence of action in the muscular system, augment with the collapse in the heart and brain.

What then is the motive power by which these changes are accomplished, by which the eye sees the beauties of earth and the stars of heaven, by which the ear hears the strains of Mozart or Beethoven, and the mind revels in the writings of a favourite author, by which the stomach changes fish and fowl, plant and water, into blood and nerves, bone and muscle? Is it one simple power, or a compound of several? Is there a nervous, a muscular power? Or is it all the operation of one simple principle? And what is this principle or vital power?

One set of men say its source is electricity; others say a fluid secreted in the brain or nerves. The great John Hunter looked upon it as a tangible substance, something like brain, and diffused through every part of the frame. A third class, like Newton, say they don't know.* Chemists seem disposed to refer its operations to the favourite theory of the day, and rather to look upon it as a result of combustion than as an agent. Lastly we have a host of people who broach some crude view of their own or adopt the first they find with equal facility.

The theory of the vital power being a form of electricity has ever been a favourite. There is a good deal of similarity in their phenomena. The vital power acts with much the same instantaneous rapidity

* Voltaire says that a person who was taking a walk with Newton, asked him how his arm moved, and that he (Newton) answered bravely that he didn't know.

in many cases of sudden emotion or injury, sensitive persons are singularly influenced beyond all doubt by particular electric states of the atmosphere, and some disorders are clearly connected with certain changes in the electricity.

Mr. Hinton* looks upon Coleridge as the great apostle of this creed. "This idea, derived it is said originally from Schelling, is, that physical life is a process or mode of operation which we recognize under other names, as magnetism, electricity, or chemical affinity." Oken had no misgivings about the matter in a general sense at any rate; "organism," he says, "is galvanism residing in a thoroughly homogeneous mass. A galvanic pile pounded into atoms must become alive"! But as Oken says he wrote in a kind of inspiration and gravely tells his readers that quartz, felspar, and mica, the three constituents of granite, were the hail-drops of heavy showers of stone that fell into the original ocean and turned to rocks at the bottom"! I think we may hesitate about accepting his doctrines without examining them.

But I believe that with a few exceptions the best physiologists of the present day are agreed that the vital power is not electricity. Müller says, "we are by no means justified in regarding it as identical with the known imponderable matters or general physical forces, caloric, light, and electricity, a comparison which is refuted by any close examination." Every form of electricity can be evoked or generated by art; it can be poured into metals, kept in them, conducted off or allowed to ooze out; unlike the magnetic fluids which

* Life in Nature, p. 140.

never quit the substance that contains them under any circumstances whatever, it has a constant tendency to escape. None of this holds good of the vital power, and I feel compelled to say that, alluring as the idea has been made to appear, I can see no proof that it is identical with electricity, or that this powerful agent can evoke any form of life or effect any changes of so high a character as the vital power. It is highly necessary here not to confound two very different things. The blood and muscles may be full of electricity, every secretion may, as Wollaston thought, be the result of an electrical action, but this property of electricity they only share with all moist saline substances; it has nothing to do with the great controlling power within the frame.

But this much I can see, and everything seems to point to the conclusion, that it is possible there may be the same relation between electricity and the vital power as between electricity and magnetism, or between heat and motion; that is under certain circumstances the one becomes the other. The frame is so charged with weak electricity,* or with some force capable, as the reader will presently see, of being directly affected by electricity, that possibly every drop of serum may contain a certain portion, and the contact of two atoms highly charged with this force, one secreted by the male and one by the female, may be productive of the same

* "A simple but sudden and forcible contraction, by *will*, of the muscle of the forearm, evolves a current of electricity capable of passing through two or three miles of a helix coil."—Essays on Scientific and other Subjects, by Sir Henry Holland. I should be sorry to throw any doubt on a statement by this accomplished physician, but I really almost think there must have been some mistake here.

sort of change as ensues when the balance of electricity is restored by a thunderstorm, and result in the production of an atom filled with the vital power, limited in its nature and force by the nature of the parents which produce it; as distinct in properties from the two atoms which formed it as an atom of calomel is from one of chlorine or mercury, but unlike the chemical atom incapable of resolution into its primary constituents.

Dr. Radcliffe, who has investigated this subject in a very different spirit from Oken and Coleridge, in his lectures recently delivered before the College of Physicians stated as the results of several carefully performed experiments, that when the fibres of a muscle or a nerve of motion are in a state of inaction, they are with certain exceptions in a condition of electric antagonism, their sides presenting signs of positive electricity, their ends of negative electricity; under certain circumstances these conditions are reversed, the sides becoming negative and the ends positive; if two points of one of these structures in a dissimilar state of tension are included in the circuit of a galvanic apparatus, they give unmistakable signs of a current of electricity.

Now when a person dies, and that stiffening sets in which only relaxes with the dissolution of the frame into its primary elements, this natural electricity is altogether absent. When a living muscle is put in motion, or when a motor nerve is thrown into a state of action, then also this natural electricity is absent. But what ensues? Why, that the state of action in a muscle or motor nerve is accompanied by an instantaneous development of currents of electricity of high tension.

Again, a most important statement made by Dr. Rad-

cliffe is that continuous electric currents of low electric tension, instead of possessing that mighty restorative power which has been so often expected from them, and the utter absence of which has in the long run disgusted most men with electricity as a curative agent, seem to have a direct paralyzing influence upon that part of a motor nerve which is exposed to their influence.

"There is reason," Dr. Radcliffe says, "to believe that a motor nerve or muscle cannot be thrown into a state of action by artificial electricity unless it retain a certain share of its natural electricity." It is almost impossible to overrate the importance of this passage, especially as the utmost confidence may be placed in the observations of this accomplished teacher. To my thinking it goes further than any other evidence to prove the conjecture I have already ventured to put forth about the relation between electricity and the vital power and yet their absolute non-identity. For while we see by the workings of an electric shock or a stroke of lightning, that electricity like any other stimulus will in the living body attract the vital power to the part it assails, we may learn by experiment that it cannot evoke vital actions in the muscles and nerves from which the vital power has been withdrawn by death. Again, the vital power influences and arranges the natural electricity of the constituent elements of the nerves and muscles; while it is employed in another organ this electricity is quiescent; directly the vital power flows towards them this electricity assumes a higher tension.

Dr. Radcliffe also tells us that "the natural electricity which is present in a living motor nerve or muscle during the state of inaction is almost or altogether

absent when the state of action is produced by means of artificial electricity."* Then here artificial electricity and the vital power produce the same result.

"When a muscle or motor nerve is thrown into a state of action by mechanical or chemical causes, or by heat or cold or light, there is reason to believe that this result is brought about through the instrumentality of the natural electricity of the nerve; for it is a fact that the state of action thus produced is marked by the disappearance of natural electricity and by the contemporaneous development of instantaneous electric currents of high tension."†

I now put before the reader some facts about magnetism which may be placed as parallels, and may be safely compared with some of the most marked among the results spoken of by Dr. Radcliffe.

A magnet then attracts non-magnetized iron, but when two magnets are brought together the north pole repels the north and the south pole repels the south. Faraday has shown that if iron be hung between the poles of an electro magnet it will be attracted by both poles, and all substances affected thus by the magnet are called magnetic. But if a bar of bismuth be hung in this way it is repelled by both poles, and takes a direction at right angles to that which the iron took. Bismuth is therefore called diamagnetic. All bodies are either magnetic or diamagnetic; the former are very few in number, the diamagnetic are vastly in the majority and include such substances as oil, sugar, starch, &c.

Now it is pretty clear that the comparison of either

* *Lancet*, February 21, 1863. † Ibid. March 21, 1863.

class of phenomena with those resulting from the action of the vital power upon the natural electricity in nerve and muscle though close, is not complete. The living action resembles both, but I certainly think the action of one magnet upon another bears the greater resemblance to that of the vital force upon the electricity.

I have already spoken of the identity between the electric and magnetic fluids, and I presume the reader is familiar enough with the subject to require no explanation from me. It will be sufficient to remark that Professor Faraday showed that currents emanating from magnets could be conducted along metallic wires, that they convulsed the limbs of a frog and produced a spark by their discharge through charcoal. The agent that could do this could only be electricity. Hence it appears that electrical currents are evolved by magnets, which produce the same phenomena with the electrical currents from the voltaic battery; they however differ materially in this respect—that time is required for the exercise of the magneto-electric induction, whereas volta-electric induction is instantaneous.*

If it can be shown that the vital force is of the nature suggested, the connection between the vast extent and ubiquity of life with the changes of form it has undergone in the course of so many ages, and the almost boundless variety of changes electricity and terrestrial magnetism are constantly undergoing, will be rendered much closer.

"As M. Becquerel has shown that electricity of one kind or other is developed whenever the molecules of

* Somerville's Connection of the Physical Sciences.

bodies are deranged from their natural positions of equilibrium by any cause whatever, the chemical changes on the surface of the globe must occasion many variations in the electrical state of the atmosphere,"* and Mr. Babbage observes that in consequence of changes continually going on by the destruction of forests, the filling up of seas, the wearing down of elevated lands, the heat radiated from the earth's surface varies considerably at different periods. "In consequence of this variation and also in consequence of the covering up of the bottom of the sea by the detritus of the land, the surfaces of equal temperature within the earth are continually changing their form and exposing thick beds near the exterior to alterations of temperature." On connecting these two we find an almost unlimited field for observation of electric changes opened up, for the heat of the sun is very possibly an active agent in developing electric currents in or near the surface of the earth.

But this is not all; we are further told that in consequence of the four points of greatest magnetic intensity constantly moving their position, those in the north going from west to east and those in the south from east to west, the whole magnetic system of the earth is undergoing perpetual change. "Now Mr. Fox," Mrs. Somerville says, "has shown that the direction of the metallic veins must have been influenced by the direction of the magnetic meridians; and in fact almost all the metallic deposits in the world tend from east to west or from north-east to south-west." Magnetic currents then may have influenced

* Somerville's Connection of the Physical Sciences.

and still influence the direction of life, food, soil, water, and the distribution of plants and animals.

It now remains to examine the question of whether there are several forces in the frame or not. A muscular power, a nervous power, &c. are often spoken of, but whether these are mere manifestations of the vital power or whether it is supposed that the vital power called them into being is not always easy to make out. As some of these opinions reach back to the days of Galen and Hippocrates, I dare say the reader will forgive the shortcoming on my part if I do not go through all the authors who have treated of the subject. In fact it would be impossible to introduce such a long piece of analysis here, and I will therefore only touch upon a few points.

First of all the nervous force. For ages the belief that the nerves act by the medium of a fluid secreted in the brain and that the vital power resides in a nervous fluid has been upheld in one shape or other up to the present time, and many later observers have considered that though purely nervous it is yet secreted by the brain as by a battery, and accumulated in the nerves as electricity is accumulated in a Leyden jar. When it is used up and conducted off from the nerves the brain pours in a fresh supply.* Dr. Mason Good advanced upon this doctrine so far as to suppose that "the nervous fluid when first fabricated is homogeneous and probably changed by particular parts of the brain or of particular nerves themselves."

Till the question of whether magnetism and electricity reside in a fluid or are merely properties of

* Bostock's Physiology, vol. i. p. 233.

matter be decided, it would be useless to discuss so recondite a question as that of the vital power residing in a fluid. But I submit that the other parts of the doctrine, if it be in any way meant to say that the vital force is identical with the nervous force or fluid and is thus secreted, are untenable and not proven. As the vital power forms structures before the brain is developed, it can hardly be dependent for its existence at that time upon a battery not yet constructed. Besides myriads of creatures live very well without a brain; the cycle of life is completed without the battery once appearing on the stage. The simple jelly-fish eats and drinks, breathes and secretes, looks after the wants of life, and rears its family quite as well as most men, a great deal better than some with plenty of brains. As to Dr. Mason Good's theory, I can see in it nothing but pure conjecture, nor does a single proof that brain or nerves ever secrete a fluid of such a nature appear anywhere.

Neither brain nor nerves seem to be considered as the direct seat of the vital power; indeed some writers doubt if it has any particular seat. Müller says that the organizing principle as he calls it is not seated in any particular organ. Perhaps more than any other part the sympathetic nerves may be considered its head-quarters. Dr. Davy brought forward some facts showing remarkably how some injuries of a very slight nature, such as would scarcely be felt in other organs, when acting on a part largely supplied with sympathetic nerves will induce sudden and even fatal collapse, whereas the brain, heart, and spinal marrow will often bear a considerable amount of injury without any great disturbance of the system

being induced. Mr. Guthrie says that at the battle of Talavera a soldier was hit on the head with a twelve-pound shot, which drove some bone into and some brain out of his skull; yet after this he was seen walking about complaining very little.*

One reason why I have not attempted an analysis of the views held by different authors as to the nature of the vital power and its seat, is that most writers on the subject have rather alluded to it incidentally than sought to discuss it as a whole. Indeed I have sometimes been tempted to think that they did not think it worth their while to reduce their ideas on the question to order, to ask themselves accurately what was meant by such expressions as nervous power, vital fluid, animal spirits, &c. We can hardly be surprized when we find Mr. Locke, singularly accurate as he was, speaking of spirits as he might of planets or elements, about the probable number of which at least men were agreed. In his day it could scarcely be expected that anything should be known of the life of the blood or the nerves, but in an age when books on physiology are written with such dryness and precision as to be almost unreadable we have a right to expect something like clearness.

It is not perhaps the most easy thing to define a nervous fluid to begin upon. "I was once," says Locke, "in a meeting of learned and ingenious physicians, when by chance there arose a question whether any liquor passed through the filaments of the nerves. The debate having been managed a good while by a variety of arguments on both sides, I (who had been

* *Lancet*, 1852.

used to suspect that the greatest part of disputes were more about the signification of words than a real difference in the conception of things) desired that before they went any further on in this dispute, they would first examine and establish amongst them what the word liquor signified (!) They at first were a little surprised at the proposal, (!) and had they been persons less ingenious, they might perhaps have taken it for a very frivolous or extravagant one ; since there was no one there that thought not himself to understand very perfectly what the word liquor stood for, which I think none of the most perplexed names of substances. However they were pleased to comply with my notion, and upon examination found that the signification of that word was not so settled and certain as they had all imagined, but that each of them made it a sign of a different complex idea. This made them perceive that the main of their dispute was about the signification of that term, and that they differed very little in their opinions concerning some fluid and subtile matter passing through the conduits of the nerves, though it was not so easy to agree whether it was to be called liquor or no—a thing which when considered they thought it not worth contending about."

Till quite lately men often wrote about such topics much as they did in Shakspere's time. We hear of the circulation of animal spirits as though they were like the blood.* There was one kind of spirit for the blood, another for the liver, one for the heart, another

* "The brisk circulation of the animal spirits, occasioned by acute pain, continues after the pain is gone."—Kames : Essay on Criticism.

for the brain.* Among physiologists language has gradually grown more precise, but still the nervous fluid and muscular force, the action of the brain and the life of the blood are spoken of as if they were independent, and often in a manner calculated to breed confusion. It would serve little purpose to discuss the views of each physiologist; what we have to deal with is the ideas now prevailing, and every purpose will be answered by selecting two or three quotations to show what are the current doctrines of the day. I must confess that they often leave a sense of obscurity on my mind as painful and embarrassing as those employed in former times. It is not that I feel dissatisfied because writers do not prove the nature of the vital power or do not attempt to define it, but there is an incompleteness in the description, as if they had hesitated to say how far they could go with a sense of being quite right and when that certainty stopped. In some other cases again I must take the liberty of saying that the views given do not seem to me borne out by the facts of the case.

Thus the illustrious Müller in his great work on physiology speaks of the organic force being generated by animals from their nutriment, but then there must exist a force within this which generates it which might just as well be considered the organic force. Müller is in doubt as to whether this organic force suffers destruction or waste during life, but he feels quite certain that at death it is resolved into "its general

* "Epaminondas displayed on this occasion (when tried before the Theban assembly) the superiority of philosophical firmness seated in the mind, to that constitutional courage which is the result of blood and spirits."—Gillies: History of Greece.

and natural causes," and if this explanation be rejected he does not see what we are to do. But I neither understand the possibility of the destruction of a force nor its resolution into its general and natural causes. Furthermore I do not see the necessity for its being generated; Müller himself has shown that there are strong grounds for believing that the organic force is always present in the same strength; then if it be there at birth why should a force be only generated to be wasted?

Then a compound system is discussed by the same author. It was suggested that the essential principle of vegetative life—the vegetative force—might be combined with the nervous power or the contractile power of muscles, that these might be united in the germ and manifest themselves in the different systems of organs which react on each other, so that the vegetative power or power of growth directed by the nervous force caused parts to grow. But this hypothesis was hardly before the world when it was found to involve so many contradictions that it could not hold its ground.

Müller who merely quotes this view suggests one much more lucid and simple. "It is," he says, "much more probable that these apparently distinct forces are different modes of action *of one and the same vis essentialis resident in the animal, which modes of action are determined by the different composition of the organs.* There is indeed an absurdity in the very idea that the nutritive force forms the nerves and that the action of these nerves when formed results from a force distinct from that which formed them. The vital force creates in animals all the essential parts and

generates in them that combination of elements the result of which is the power of motion and sensation, or the power of conveying impressions to a central part, which is also the source of the reflex actions." I conclude from this sentence that Professor Müller believes that the vital force forms all the structures in such a manner that they shall serve their destined uses; that is he almost reproduces the views of Buffon.*

The reader reflects what a very different matter the growth of a nerve or a heart is from anything that goes on when a wound is healed, or when the ordinary waste of the body is repaired, and asks if the vital force undergoes some diminution during early life, as certainly at no period when we can watch its operations does it possess the slightest power to form an organ or even a very small portion of it when once destroyed. The answer is that it never could; that it is more active at a very early age, but that seems to be merely because its circle of operation is so much more limited. The germ of all the organs, if not supplied at birth must be so at an extremely early stage. The vital force merely developes these, its powers are bounded to this, it never could construct a third eye or ear, and at whatever period these structures are destroyed in man they are never restored.

But the reader will ask, Do men recognize Professor Müller's doctrine? Is it taught in our schools? I

* "Les vrais ressorts de notre organization ne sont pas ces muscles, ces veines, ces artères, &c. &c. . . . . il reside . . . . des forces intérieures dans les corps organiques qui ne suivent point du tout les lois de la mécanique grossière que nous avons imaginée," &c.

really cannot say. Judging from numerous expositions of opinion which I have come upon in journals I should infer that it is not current. I select two specimens.

Dr. Goolden, writing in the *Lancet*, speaks of its requiring the agency of the nervous current *ejected by volition* to cause the absorption of poisoned fibre; * and Mr. Thomas Dickson in the same journal † speaking of a case of monomania says, "The diagnosis I formed was, that the pecuniary losses he had sustained had so affected him as to induce an almost complete torpor of the energies of the nervous system, which as might have been expected (?), reacted upon the brain, producing insanity and its accompanying delusions." And first it is necessary to observe that these theories are utterly unsupported by proof, and next that they involve a most complicated machinery. A nervous current ejected by volition requires a will quite unknown to us which has the power to eject a nervous current, and why in Mr. Dickson's case a torpor should *react* or why we should expect that it must react upon the brain, are difficulties which quite puzzle me.

Professor Müller says that every cause which changes the composition of the nerves, or in other words every irritant touching a part they supply though ever so slightly, produces a discharge as it were of the nervous force, and as the result of this, contraction of the muscles. But the result might happen just the same from the temporary presence of the vital power and its return without any waste at all, and I contend

* *Lancet*, December 3, 1853. † Ibid. 1853, vol. i. p. 512.

that all the phenomena of life are calculated to lead one to suppose that this rather than any waste ensues. I think it is hardly going too far to say that if the vital power be regarded as neither electricity nor as a nervous fluid discharged by shocks, neither generated by a battery nor secreted by nerves, but as a simple imponderable power given to the germ at the moment life begins, existing throughout life in the same form and vigour and taking wing at death, itself the soul and principle of life, appearing as the mind in the operations of the brain, as the organizing or vegetative power in constructing the frame, when repairing waste and executing the functions of life, never quitting the frame during life, admitting of no increase and suffering no decay, we shall at any rate get rid of a host of puzzling complications; we reduce the subject to its simplest form.

The reader will naturally ask what vestige of a proof there is of any such unity, or that the soul is in any way identical with the vital power. Not much perhaps, but at any rate such as is well worth looking into, and were there none I would suggest that this view might advantageously be adopted and all forces comprehended under the term vital force, in order that we might have one fixed algebraic term with a definite meaning instead of the confusing multiplicity of names.

We know that we possess a soul capable of regulating our actions, for otherwise how could it be made responsible for the acts of a hand and head it had no control over? We know that the soul influences the acts just as the vital power influences the functions. But the soul is the mind. "The soul," says Mr.

Locke, "is agreed on all hands to be that in us which thinks." The arguments of Cicero, who also showed the soul to be immortal and eternal, not in nature like the body, have never been overthrown. With characteristic candour both this great man and Locke have admitted that however we approach the subject it is hedged in with doubts and uncertainties.

But on the question of whether the soul and the vital power are one and the same force, or whether they are purely independent powers in the same domain, the opinions of philosophers are so discordant that one might well shrink from any attempt to reconcile them. Some like Stahl have answered the question in the affirmative; they consider the soul the same as the organizing principle or what I have called the vital power or force. Other writers are as directly opposed to this view; Müller says it is going too far to place the acts of the soul on a level with the organizing principle which creates the structures of the frame while it is obeying a blind law. Further on Professor Müller quotes Cuvier's opinion that animals acting by instinct are in a dream, and that what excites this dream can only be the organizing principle, a view he supports by saying that the presence of this organic principle in the germ and the apparent absence of any special organ for it in the adult, together with the fact that it is seen in plants, show that it cannot be compared with the mind which has its special seat in the brain.

At the first glance these views seem well grounded, they are put forward with an array of facts, authentic dates, and names, which with the high prestige of this justly celebrated teacher's name are well calculated to

deter one from entering the lists against him. But I see nothing which overthrows the view that there is but one power or force in the system, and that that power is simply the vital force or soul, the different manifestations of which are due to differences in the organ it resides in; which digests and absorbs in the lymphatic and capillary, thinks in the brain and sees with the eye, hears in the ear and moves in the arm and hand. As to the mind having its seat in the brain, I can only think that it would be simpler to consider the mind as the result of the action of the soul or vital power on the brain, instead of a separate independent force, for without a certain amount of brain and without proper avenues from the brain to the outer world there is no mind as we understand the term; the soul cannot think without a brain any more than it can see the material world without eyes. Amongst the many proofs in support of this I may mention the case spoken of by Mr. Gilbert of a young lady who being born blind soon after became deaf, and who, though she lived to be seventeen, never gave a proof of possessing anything that could properly be called a mind.

Supposing that the vital power, call it what you will, enters the germ before the nerves or blood are present, which I suppose will be admitted as it seems certain enough that life begins before these substances are formed; then it forms them, for there is no other power to do so, and what it can do once it may continue to do. Again, if the connection of any part with the rest of the frame be interrupted by mechanical means, such as tying a ligature tightly round a part, the most vital fluid, blood, or a highly vitalized

tissue, like nerve perishes; then if they have an independent life of their own there is still in the frame a power far above theirs, and that power if only for convenience sake I would call the vital power.

We know that when the vital power enters the germ life begins; throughout life we see no evidence of such a fact being repeated. If the actions of the vital power are so perverted as to interfere with the natural growth of the brain, the child is born without a mind and cannot be considered a responsible being.* Then arresting the progress of the vital power to a part has the same result naturally and artificially performed—namely, interference with the function. Mr. Lawrence sneers at the idea of mind existing in the very young creature, and asks if the little man shown by Sir Everard Home when eight days old had a mind. Certainly not a responsible matured mind, but the power which might one day have thought in the brain of this mannikin was there as much as at the age of eighty.

The very same stimuli applied to different parts will produce different sensations. Thus for example an irritant applied to a muscle produces motion, to a nerve of sensation pain. The electric shock which makes the muscles start and the heart beat, produces in the nerve of the eye the sensation of light, in that of the ear the sense of sound, in that of the nostril the sense of smell. Then one simple force may produce different effects in different organs according to their structure and functions. But the brain and stomach

* "The brain is only one condition out of many upon which intellectual manifestations depend; the other being chiefly *the organs of the senses, &c.*"—Huxley.

are different organs, and therefore a simple power like the vital power may produce their natural actions according to their structure, and thus think in the brain and digest in the stomach.

It seems to be quite taken for granted that because we cannot prove any particular view taken up with regard to the soul as we can prove that we have extracted a square or cube root, the subject must be too obscure to debate about. Pope's lines

> "Could he whose rules the rapid comet bind,
> Describe or fix one movement of his mind?
> Who saw its fires here rise and there descend,
> Explain his own beginning or his end?"

are I suppose quite familiar to the reader. They are very well adapted to round a period, but they don't set the case in a fair light, or rather those who apply them don't. Newton would have been just as much puzzled to explain the nature of the power of gravitation. The fact is that physiology is not so far behind the other natural sciences as might be supposed; the properties of the vital power are nearly as well known as those of caloric, light, and electricity; and if men would rest content with proven facts they might acquire as accurate opinions about the laws of life as of physics. "By putting together," says Mr. Locke, "the ideas of thinking, perceiving, liberty, and power of moving themselves and other things, we have as clear a perception and notion of immaterial substances as we have of material."

In many respects a perfectly healthy frame consists so purely of an assemblage of negative qualities that unless we could trace the results of disturbance of

functions in the form of excessive action of some kind or other, we should be left to learn what life is by the material teachings of anatomy and physiology or the wild speculations of metaphysics. It is of a healthy frame as of health, we can easier say what it is not than what it is. I therefore propose first of all to examine disorder and disease, two forms of disturbed function, and then two forms of abnormal development, namely of the brain and then of the framework of man.

Disorder and disease then so far from being departures from the operations of nature or violations of some law, are simply excessive actions of some natural function, or rather some part of a function and a less active performance of the other functions of the frame, accumulation of the vital power at some part and diminution of it at others. This in its simplest form, as a cold, headache, or neuralgia, is disorder; disease is the same thing with superadded change of structure in the affected part. There are many simple experiments mentioned by physiologists which show the steps by which disorder and change of structure may be seen to arise. If a grain of any hard substance be held against the eye, pain and weeping begin, redness and stiffness follow, and at last disease, ulceration, loss and change of structure result.

If the brain be persistently overtaxed it will soon be noticed that some other part is imperfectly performing its functions. We see this disturbance of the animal life in the relaxed muscles, languor, cold feet, loss of colour, and heat of the head at night; disturbance of the organic life is shown by dyspepsia, constipation, and a host of well-known symptoms. If the brain be

relieved from this overwork, if the patient gets on horseback every day or betakes himself to some good outdoor exercise, and sets his digestion in order again by a few purgatives and bitters, the improvement in these parts is soon seen, and the load is taken off the brain. There is now increased vitality in the structures of animal and life and less in the brain, proving it appears to me the reversing of the action as clearly as we prove a sum in subtraction by re-addition of the parts.

Something very similar is seen when the brain is under the influence of alkohol. The revolting symptoms of intoxication have been so often described and are unfortunately so well known that it is unnecessary to dwell upon them here. For our purpose it will be enough to say that they seem to resolve themselves into accumulation of the vital power in the stomach and intestinal canal, the heart and kidneys, with diminution of it in the brain and muscles. It is sometimes said that intoxicating drinks excite or stimulate those parts first of all. I never saw an instance where at any stage of the process a man really reasoned more soundly or was stronger than when quite sober, and therefore I doubt the fact.

In the convulsions from drunkenness, hysteria, or chloroform, it is often remarked how immensely strong people are. Many persons constantly speak of this as if it were an impregnable fact. True it is only for a short time they say, but the thing is certain enough. I take the liberty of doubting the position. I must confess that I am very sceptical as to whether the muscles are really stronger than at another time, but for argument's sake I will admit it to a certain extent. In place however of its being a

flaw in the theory of the action of alkohol I have just brought forward, I contend that it only strengthens it, while I think it adds another link to the chain of proofs that the vital power obeys such fixed laws of action. This power I have all along maintained naturally tends to flow back from the part in which it is accumulated in great quantity; it tends to recover its normal balance. Suppose then it really is attracted in great quantity to the organs which circulate the blood and digest the food, then any excitement which withdraws it to another part sets free to flow to that other part a larger quantity than usual. Under such circumstances it is easy to conceive that a part suddenly stimulated by the will or some fancied insult or cause of laughter may attract a violent flow of it, of which the screaming, laughing, and violent struggling are only so many manifestations.

I can fancy the advocate of such theories as diseases being due to blood poisons, of everything, growth, life, health, &c., being the work of the blood, pointing to the action of alkohol as an instance. The fluid is taken into the stomach, it can be traced into the blood, its action on the brain and heart is seen, the cycle of proof is complete. But hear what Dr. Marcet has to say on this point: "Raw spirits," he tells us, "taken suddenly in very large quantities have been known to cause insensibility so rapidly that this cannot be accounted for, unless by assuming that the influence was owing to a direct action of the nerves ramifying on the stomach;" and Macnish in his Anatomy of Drunkenness confirms this. Pommer, who made some very interesting experiments with injections of alkohol, could not detect the odour of it

either in the brain or the blood of the animal, and in cases where the injection of alkohol proved fatal, *no marks of disorganization could be detected in the blood,* which possessed *all its usual qualities of colour, fluidity, coagulation, &c.,* and Andral, a celebrated french physician, in ten persons who died from drinking enormous quantities of brandy, found no smell of it either in the brain or elsewhere. Under such circumstances we are told that "an instantaneous stupefaction ensues, and the person is at once knocked down."

A further illustration of this theory may I think be drawn from the study of the action of powerful external stimulants, such as extensive burns and scalds. Of course the parts on which they act and the symptoms they induce are widely different, but these are mere accidents; the essentials of the action which are what we have to look at are exactly the same. There is a powerful action of the skin set up, and the vital power is so irresistibly attracted thither from the internal organs, that if a very large amount of skin be scalded or burned the unhappy sufferer always sinks, whether any internal organ be affected or not.

In these as in many other forms of accident men say the patient dies from the shock inflicted, and then they seem to think they have said enough. The term is supposed to include everything, though many of those who employ it so freely would be rather puzzled to give a clear explanation of their own views as to the manner in which a shock acts. I remember a case in which by a collision on a railway a man was rendered almost useless to himself and society. There was not a sign of internal injury and very little if any outward damage; yet at the end of a year he could not sign

his name. He brought an action against the directors, and one surgeon who gave evidence in the case spoke of the nervous shock being the cause of the prostration and debility under which the patient suffered; but when asked to explain what he meant by shock to the nervous system and how it acted, he wisely fell back upon generalities and said that he knew what it meant as any practical surgeon would, but that he must decline to attempt a definition. The fact he considered undoubted, the nature of the fact and its mode of action were too recondite questions to enter upon.

Now, had he said that apart from any mechanical injury it inflicts, a shock simply means violence applied to some part of the frame, and in consequence attraction of the vital power so thoroughly from other parts as to leave them too little for the proper functions of life, I don't see that there would have been so much difficulty in explaining the matter. In the case mentioned it may be surmised that the shock produced a violent concussion accompanied by great fright, that this force acted on some part of the brain, if the seat of fear be in that organ, and that it withdrew the vital power from the muscles.

Some of the passions act still more quickly though in much the same way. Thus in sudden emotion, great enough to induce fainting, the vital power seems to be so completely withdrawn to the seat of the passions, wherever that may be, that the structures both of animal and organic life are deserted by it. For it must be obvious that when a man cannot stand, the muscles by which he stands are weakened or that the power in them is lessened, and

that when the heart ceases to beat the same change is taking place in it.

How far we are to believe some of the tales so often alluded to, of people dying while in the midst of health from the effects of sudden joy and fear, it is difficult to say. I confess myself extremely incredulous on the point and rather disposed to admire them in an epic or romance than to give them a place in philosophy. They are often spoken of, but when we come to sift the evidence on which they rest, we find that one writer has borrowed from another till there is no clue to the beginning of the story.

Thus Dr. Darwin, in his great work on the "Laws of Organic Life," says it is well known that many persons have died instantaneously from the painful excess of joy, but he does not give a single case in point.

One of the few instances told directly by any modern author is that given by Mr. James, in his "Life of Richard the First."* This famous writer, one of whose novels is worth a score of the rubbishing sensation things by which men pander to the most despicable taste, tells us that "when the army of Godfrey of Bouillon approached within sight of Jerusalem, such enthusiasm seized them at the sight of the holy city that some cast themsleves on the ground, some fainted, and some *died upon the spot.*" It is always sad to be obliged at the call of reason to dissolve the bright visions created by genius, but it must be done. Truth must pronounce Mr. James's history to be in some parts rather romantic. He talks of

* Vol. iii. p. 18.

"thousands on thousands" falling at every moment in a fight by the Euphrates, so that if the fight had lasted two minutes, more men must have been exterminated than in the dreadful fields of Leipzig, Waterloo, and Inkerman, all put together!

However useful in moderation, however absolutely necessary within reasonable limits for high health, it is yet certain that immoderate exercise of the muscles will as surely destroy the health as excessive exercise of the heart, stomach, or brain, and probably were our observations acute enough we might reduce to an accurate figure the time it would take to wear a man down by walking or riding.

If the healthiest exercise possible be carried to the length of extreme fatigue, it will be found that after a time the mind can with more and more difficulty be directed to the consideration of abstruse subjects requiring great mental exertion, and consequently a larger supply than usual of vital power. So far as biography can enlighten us on this point, it tells us that great works and great thoughts have seldom been produced by men undergoing excessive fatigue at the time. In fact I think it will be found, that though some very famous men have distinguished themselves by their power of enduring fatigue, like Napoleon, Wellington, Nelson, and Alexander, great thinkers have generally shunned it, partly from the strong instinctive action of this law, I expect. Moreover, I doubt whether the great ideas and vast projects which animated these men, who, like Napoleon, signalized themselves in both fields, thinking and action, arose to their minds during the fatigue of campaigns and marches so much as amid lonely quiet

walks. Bourrienne relates that Napoleon used to weave his vast projects for—

> "The rise of empires and the fall of kings,"

when he was taking his constitutionals, and that he used every now and then to shrug his shoulders with a mighty effort as if he was "compressing thought." Goethe used to say that all his best thoughts and expressions came to him while walking, but then this was amid some gentle stroll or pensive saunter, not when going four miles and a half an hour. According to Maturin's statement, he had not found a reliable account of any person who could write poetry under a burning sun or a bright moonlight. A certain amount of rest and abstraction always seems necessary for mental work. Gibbon dictated walking, but it was in his room; Molière wrote with his knees in the fire, and Lord Bacon in a small room which helped him to condense his thoughts.

If the strain which great exercise brings to bear upon the muscles be carried to such an extent as to induce complete exhaustion, it will be found that the mind at last becomes indifferent to everything beyond gratifying the craving for eating, drinking, and rest. A man utterly wearied out

> "Dreams as appetite is wont to dream,
> Of meats and drinks, nature's refreshment sweet."

Many instances have been recorded where death has occurred from this cause, as when people have lost their way and wearied themselves out in vain attempts to find some place of rest, in struggles to escape from

drowning, and in some rare cases merely from the effects of very long walks kept up for several days together.

Some authors hold that the organic force is here absolutely wasted; they suppose that in a healthy state just as much power is generated as can be consumed off by proper exercise of the functions, whereas during great fatigue the supply at last ceases to be equal to the demand, or rather it ceases while the demand continues. But they show no reason why it should cease, and the facts of the case are all in favour of there being only a limited supply.

"The more exertion," says Müller, "a man uses, the more active in general seems to be the decomposition of the matters in his body, and the more need has he for nutriment." Could it be shown that this decomposition was only bounded by the amount of the nutriment a man could procure, it might tell in favour of the idea of a secreted force, but it does not. Active exercise is natural to man, and in this natural state he wastes a certain amount of food. Let him undergo what fatigue he will, he does not digest and absorb more than this natural quantity. Besides, if more exertion required more food, this would always supply strength, and with an unlimited amount to eat and drink a man need never rest at all, which is of course absurd.

Sir Benjamin Brodie, Dr. Darwin, and Sir Henry Holland speak of the nervous power being exhausted by action and renewed by repose.* But Hunter's observation that two actions cannot go on at once in

* Medical Notes and Reflections, p. 332.

the frame seems to me utterly opposed to the view, and Sir Henry has himself afforded illustrations of the law laid down by Hunter. He mentions two cases of palsy, in one of which the attack relieved a long standing irregular action of the heart and in the other reduced the pulse from 120 to 70 or 80 beats. Now such facts help to show what I have often said, that as one action increases another must decline, and this proves more a unity of power than any secretion of it.

I could relate a crowd of facts to show that the more severe a symptom such as pain, the stronger must be the dose of the remedy which is to call back the vital power to its wonted channels. Thus a delicate woman will take with impunity 150 drops of laudanum to relieve severe pain, whereas if she were well, such a dose would so attract the vital power to the part it lodged in as to make her ill, if even it did not prove fatal.

Again we know that the vital principle does move. Parts which have become so frozen as to be utterly without sensation or power of movement, recover their natural state, the vigour extending steadily to them from the living parts, and the same thing is seen when pressure has been kept upon a nerve, the return of the vital power through its proper channel being marked by that peculiar sensation in the part, described by its having gone to sleep.

Probably the explanation of the results which follow excessive fatigue is that the vital power gradually deserts the brain and then the vital organs to such an extent as to leave them incapable of continuing their functions. I think this is still further proved by what

we often hear about these people rallying a little on reaching a place of rest and yet sinking after all, as though the tide of life obeyed its natural tendency to flow back so soon as the cause of its withdrawal was removed, but that it could not reach the vital organs in time to supply the heart and lungs. It would also explain why these persons are neither capable of mental exertion nor of digesting much food at first, and why in men exposed to great cold and fatigue at the same time, strong stimulants such as brandy, instead of acting like cordials, prove often fatal poisons.* It is then a wonderful provision of nature that by merely feeling fatigue men should be compelled to guard against a constant source of danger to life, as we could not measure the action of exercise by any other test, and if we could it is doubtful whether one person in a thousand would be so prudent as to attend to aught but a warning of the most peremptory nature. In fact were this restraint withdrawn, exhaustion would soon number its victims by tens of thousands. The mad rage for wealth, the instinct of providing for children, the passion for fame, and the restless voice of duty, ambition, gaming, and pleasure would each and all have their holocaust.

But then the reader will say if so much power flows into the muscles during the great strain of prolonged exertion, why is it that they do not become stronger

* Dr. Erasmus Darwin relates a well-attested history of two men who set out to travel on foot in the snow, one of whom drank two or three glasses of brandy before starting, while the other only took his usual food. The man who took the brandy died on the road, while his fellow-traveller got through the journey safe and sound.

instead of become weaker and more incapable of exertion. The answer is that the presence of an excessive amount of vital power in a part, instead of producing a greater amount of natural activity in it, always produces derangement of function;* muscles do not become stronger than their natural structure will admit of. Possibly the vital power becomes located in the nerves of sensation supplying such muscles, for among the first symptoms of inflammation, which is the result of a similar but more active flow of vital power to a particular spot, are pain, disorder of sensation, and disturbance of function.

One of the most beautiful exemplifications of the strong tendency of the vital power to resist disturbance in the performance of its functions is seen in the study of great mechanical skill; instances of this almost without number might be easily quoted, but let the skill assume what form it may, the same working of the law is manifest. The hand of the most skilful artist tires in time, in other words the continued presence of an accumulation of vital power produces disorder of function (excess of sensation) shown by weariness and pain; writer's cramp is a very familiar instance. Again this study shows how much exercise avails in directing the vital power to a part and how almost mechanically this power is at last guided; thus the artist sketches a beautiful form and the billiard-player executes a difficult stroke almost mechanically, yet in

* "Even a simple difficulty of recollection, where the mind intently concentrates itself in inward search after some of its own former operations, *becomes painful when long continued, and thought is often lost in utter confusion.*"—Sir Henry Holland's Medical Notes and Reflections.

years of inaction either may utterly forget his craft. Coupling this with the fact that the most minute inspection, nay even the scalpel of the anatomist, reveals no distinction between the hand of a Raphael and that of a man who can never get beyond a vile caricature of the human form, between that of a chronometer-maker or cameo-engraver and that of a helpless mortal who cannot form a letter well, I am inclined to conclude that beyond all doubt the artist is indebted for the mechanical part of his vast skill to the presence of a larger amount of directed vital power in the part he employs.

If the reader will try the experiment he will find that with practice he may strike as many as four or five thousand blows in a day, whereas scarcely any amount of strength or perseverance will enable him to strike a tenth part of that number without stopping. He may observe the same result if he will try to hold an image continuously before the mind; the power of doing this for any length of time is less than men think it. The simple reason appears to be that in the first case time is allowed for the vital power to flow back from the arm to other organs and thus exhaustion is prevented.

It has been observed that activity of the brain and of the muscles when in excess equally disturbs the functions of digestion and nutrition. Sir Henry Holland says that even thinking about one's digestion interferes with it. This explains why society and cheerfulness, being a less strain upon the vital power than intense thinking and brooding which solitude is calculated to foster, are said to promote digestion. The fact seems to be that they do not interfere with it.

This investigation would be incomplete without discussing the cause of death. The reader may smile and think how vague a term the cause of death must be when there are so many causes. To be more precise then, I purpose to inquire the mechanism by which the cause of death produces the effect, or death itself, and when we find that the same vital force which raised the body from a germ like the egg of a mite, and fashioned it to be a giant or a Homer, which fed it and made it strong for the battle of life, should be the same force which causes it when the last hour draws nigh to prepare the way for the extinction of earthly life in the frame, our wonder only rises higher at the functions performed by so simple a means.

Anaxagoras of Clazomene who first taught the heathen mind that the great promoter and ruler of the universe was a self-existent, immortal spirit, pure and incorruptible, told a stranger who was lamenting that he must die an exile far away from home, that it mattered little, for in every land the path to Hades was the same. I trust I shall be allowed to add to this sublime sentence that in every form of death the path is also the same.

Death people often say poetically is a long sleep, of which it is indeed but the cold and pallid image.* In the grave the good sleep the sleep of the righteous. Since poetry began, sleep and death have been counted twins, and the father of gods and men never distinguishes between them when he bids Phœbus Apollo bear his beloved Sarpedon to Lycia. Virgil made them half-brothers, and most men have cared little to disturb the verdict.

* "Quid est somnus gelida nisi mortis imago?"

Müller speaks of death as if it arose from the decay of the vital power. He says, "At some period or other this change necessarily ensues spontaneously in every living being; the state or influence which maintains the elements in their peculiar combination becomes more and more feeble, and is, at length, no longer able to counteract the tendency of these elements to form binary compounds among themselves and with other simple substances in the atmosphere." But it may be observed that here the decline of life is mixed up with the decay which ensues after death, and which in no way begins till after death.

The same writer throws out a conjecture but so carefully worded that he appears to say almost as much against his argument as in its favour. He observes that the increasing fragility of old age might arise from the products of decomposition constantly increasing as we get older, till their chemical affinity at last came to balance the vital force; but then he creates an obstacle to this which appears to me insurmountable, for he says, "in that case the vital force must diminish from the very commencement of life," an assumption in support of which I see no proof. Dutrochet would have us suppose that the changes of old age depend upon the increasing accumulation of oxygen in the animal frame, but it does not appear that the accumulation of oxygen has ever been proved.

I believe that when life itself is studied by any unbiassed person, it will be observed that death in all cases simply results from the vital power being so completely withdrawn from the vital organs, by some agent which attracts it to one particular part or parts, that

their natural action ends, and that it has no power to set them in motion again. It matters not whether this agent is applied to a distant part of the animal system as in the case of electricity striking the heel, or prussic acid touching the tongue; whether it impinges upon a vital part as when a knife goes through the heart, or a frightful sensation calls the whole vital power to the brain; whether it is withdrawn by a rapid disorder as when the stomach is perforated by an ulcer or the slow attraction of a chronic abscess, the manner of action is the same.

The reader will naturally ask, Does this hold good of natural decay? I believe so, for this reason,—throughout life we may trace a gradually increasing slowness in the mode in which functions are performed, from the case of the infant where the mere prick of a pin will raise the pulse twenty or thirty beats, to that state of torpitude in old age in which burning and gangrene cause little sensation. Probably the task impressed upon the vital power is to harden the tissues, especially the nerves, with advancing age, so that they will *fulfil their* office with more and more toil till at last the vital power cannot traverse them sufficiently to impel them to their actions, and life ceases. We see then that death is in all respects a widely different process from sleep though it has been so favourite an image of the poet's to paint them as twins, and that it is always one and the same result from a similar mode of action, performed by the same agency and ensuing under the same law as exercise and digestion; *namely, the passing of the vital power to any part of the frame touched by an agent having a particular affinity for the vital power.*

But it is now time to examine the view generally entertained respecting what is more usually known as disorder and disease, and to this I purpose giving up a separate chapter or two.

CHAPTER X.

LIFE IN THE BLOOD.

"What a thousand years since would not to a rational man, contemporary with the first voucher, have appeared at all probable, is now urged as certain and beyond all question, *only because several have since, from him, said it one after another.*"—LOCKE.

IN this chapter I set out with the supposition that every person living has a theory for any disease under which he may happen to suffer, at least I never recollect to have met with any one who could not explain the pathology of his malady to his entire satisfaction. Either "its in the blood," or "on the nerves," or "its got into the constitution."

But it is particularly on the state of the blood that every person comes out so strong. He (every person) may suppose "its on the nerves" when he has got fits or low spirits, but no sooner does he espy a crop of boils or an outbreak of spots, than anything like hesitation vanishes and he at once rushes *pleno rivo* to the conclusion that "its in the blood," which of course must be purified. On being asked how he knows that "its in the blood," he can only say that it must be there or in "the humours." Tell him that what he calls humours are simply excretions or secretions, which being expelled from the circulating system previous to being discharged in great part from the frame, can have no influence good or bad, and he retorts, "then where is it if it's not in the blood?"

which is rather a puzzling question, and adds, "of course if medicines cure the disorder they can only do so by purifying the blood," so that the cycle of argument is completed to the great edification of all concerned. To reason against such arguments or with such people at all, is simply to waste time and patience :—

> "You break his web of *sophistry* in vain,
> The creature's at his dirty work again."

The doctrine that every disease is caused by a blood-poison of some kind or other, after having been several times at a heavy discount and as often revived in a different form on account of its great convenience, now bids fair to exterminate all others, from the believer in Sir Benjamin Brodie who referred the injurious action of tobacco to its volatile oil getting into the blood of the unhappy smoker, to the ambitious student who tries his "prentice hand" at diphtheria or scarlatina, a blood poison seems to make the world of medicine kin.

Finding that it has become the fashion to account for all disorders on this principle, I was credulous enough to believe that people who were so perfectly satisfied about the matter, were quite prepared to give a full account of every point pertaining to a blood-poison. I made my inquiries in the full assurance that I should be utterly put to shame for being so ignorant as to ask such a question ; that I should be forthwith overwhelmed with proofs, references and authorities. "Is a blood-poison," I asked, "one which though localized deteriorates all the blood without once entering the circulation ; does it incor-

porate itself with the blood, or does it simply travel in the same vessels as the blood, like two streams which meet and roll together but do not mingle?" but I could never get an answer. I could not learn whether a blood-poison is solid, fluid, or gazeous. I was not overwhelmed with proofs, reader, or anything of the kind; on the contrary to my great amazement I could not find one single author living or dead who could say with a safe conscience that he had ever once taken the trouble to satisfy himself as to the form and nature of any of the poisons in the blood he talked about; indeed most persons when asked at all only smiled compassionately, as if the very fact of putting the question smacked a little too strongly of ignorance or lunacy.

I beg to say my conviction is that the whole thing is a sheer delusion, and that there is no such thing as a blood-poison, that the belief is just one of those things which

> "The superstitious idle-headed eld
> Received and did deliver to our age,"

and that the term is in fact a mere symbol, a bond of common intelligence between the patient and surgeon, for a person is of course quite disposed to side with you at once if you explain a disease by telling him that it has got into his blood; and when one author tells us that it possesses "physiological attributes," "but no anatomical attributes," I can only suppose this strange description means when put into the crucible and reduced to plain english that the supposed virus has no existence except in the mind of the writer, or when Sir Benjamin Brodie speaks of it

as though it were accumulated in the system like electricity in a Leyden jar or generated like gas, and says, speaking of an impending fit of gout, that "after a while the poison as it were *explodes*," * and the person in whom this takes place, instead of being blown up has a fit of gout, I sceptically think and say that an explosion must burst something. The fact that surgeons have so long employed these symbols, proves that the mind when unable to bear the strain demanded by strict search and accurate definition of such abstruse subjects, will seek at any sacrifice for repose and security in familiar images. I feel compelled to believe that there is not and never was a drop of tobacco oil floating in the veins of any mortal since the red man first smoked his weed by the banks of the muddy Orinoko. But it is a most convenient term, for what more could any reasonable person desire in the way of information than be told that his disorder is in the blood? what figure of speech, in common use at least, would enable him more effectually to terrify his friends and relatives than to tell them that his blood is poisoned?

To begin upon, the very term is a misnomer. It is one of those wretched imitations of german of which we have had more than enough, and which being totally unsuited to it can only injure our language. If it is absolutely unnecessary to choose between corrupting our grand english from living streams and extinguishing it by means of the dead languages, let us in the name of common sense and convenience keep to those words which we have used in such matters for

* Psychological Inquiries, p. 71.

centuries. I would therefore suggest as the easiest plan to exchange our language gradually for greek, and that some attempt be made to destroy our tongue with classical correctness. For instance in the present case I would propose blood-poisoner or something of that sort, on the model of one of Homer's stupendous names.

Whether this tough theory of blood-poisons first sprang up among those who practised the art of medicine, or was adopted from the traditions of the vulgar, who rate a homely simile or the dictum of some pragmatical old nurse or herbalist much on a par with the doctrines of a Harvey or Hunter, is a problem which in all probability will for ever remain unknown. It is not a marvel that such a simple expression, such an easy symbol should have been adopted by the unlettered; the marvellous part of the matter is the utter absence of proof in medical writings; in the building up of a theory of disease on a purely ideal basis, on a term not even yet defined; as though medicine were for ever to enjoy a perpetual immunity from such troublesome processes as induction and analysis.

Any one who is sceptical as to this being really the way in which medical questions are only too often dealt with, has only to read the history of cholera in 1849, or that of our most recent visitors diphtheria and typhus. If he object to do either, as he most probably will, let him go through some of the letters on smoking published in the various journals, and he will soon see how friend and foe alike ignore the necessity for proving or disproving the chimera of a poison in the blood, a state of matters which might make Lord

Bacon or Mr. Locke shake in their coffins, and which simply means what I have just said, that modern pathology rests upon a basis never yet proved, and depends for its existence upon a term never yet defined. "We talk," says Dr. Adams, "of the extirpation, extermination, and eradication of a poison, till at last we reason upon it as if there were really roots which we were to destroy (!) and at least a certain quantity of some substance which we have the power of discharging from the system"!

We smile complacently at the vagaries of the old writers, crotchets so absurd and useless that we have barely preserved the traditions of them. We feel quite satisfied that we should never have committed the preposterous folly of writing huge tomes which nobody read to prove that disease and remedy alternately triumphed or succumbed, as naturals or non-naturals, as heat, cold, wet, or dryness predominated; we are graciously pleased to wonder at the literary tournaments held to decide whether a given disease should be ascribed to a conjunction of Mars and Saturn, to a lentor of the blood from too much seething or working of the animal spirits as raspberry jam is spoiled from over-cooking, or to the workings of phlogiston, the incarnate spirit of inflammation, a sort of bottle-imp only that it did a thousand times more mischief. We are amused to find the self-same disorder ascribed, in one age to an acid, in another to an alkali, in a third to worms, in a fourth to a ferment, and in a fifth to a difference in weight and velocity between the blood, the remedy, and the poison. Now and then in an introductory lecture or at a professional *soirée* we lament in a very becoming manner,

that of some fifty thousand volumes written on medicine and surgery a large proportion should be made up of utterly useless speculation; and then proceed to do precisely the same thing in another form, as if resolved that we at any rate will not change with the changing times.

"Tempora mutantur, nos *non* mutamur in illis."

Indeed if a prophet were raised from the dead to teach men what no living prophet will ever teach them, viz. not to think themselves infallible, and if he were in want of a text by which more than any other he could show how little they are disposed to learn experience from the past, and how easily dogmatism usurps the place due only to labour and genius, he might choose the sad lot which has befallen so many beautiful theories. Certainly their inventors never dreamed that they might one day become the theme of such a homily; on the contrary each one in his turn seems to have been perfectly satisfied that *he* had discovered this secret, when, alas, he was only maintaining the pyramid on its apex to fall before the first breath of opposition. Perhaps they thought it was their duty to let off a theory; at any rate many persons seem to think this is a necessary step towards treating a disease, through which each doctor must go just as he takes measles in childhood. "Every man has his views about consumption," a friend said to me one day, "and B. has his you know." This however is of less moment, as after a year or two nobody reads theories, for which they perhaps console themselves by moralizing on the fate awarded to the dis-

coveries of other men; and who would not be proud to cast in his lot with Harvey, Galileo, and Jenner? In all ages readers seem to have troubled themselves very little about the matter, or to have occupied themselves with crotchets equally groundless and preposterous. Alas, to crown all an ungrateful posterity classes their labours with those of the ingenious philosopher whom Mr. Gulliver found trying to carve sunbeams out of cucumbers and calcine ice into gunpowder, or of the metaphysicians who demonstrated that the number of angels who could dance on the point of a needle was neither more nor less than ten thousand, and that any one who sought to diminish this number even by a cypher, was a monster only fit to be burned at the stake and have his ashes scattered to the four winds of heaven.

The mind insensibly fills with melancholy on reviewing the long vistas of the past, crowded with the debris of structures ushered into the world with so much certainty that they would survive and now so utterly forgotten; of theories supported with so much useless hostility and bitterness and upheld by so much labour; the toil of years surviving only in the form of ruins, on which shines here and there some grand truth like a star shedding its mild and beneficent light on a long-deserted city.

In other arts, or in sciences, terms to which such a latitude could be given are not allowed, nor would the mere convictions, the silent assent of even a Newton, a Linnæus, or a Locke be admitted as a proof from which there was no appeal. Since the first shepherd counted and named the stars in the deep blue chaldean sky as he watched them from the plains of Shinar, it

had been held that a change in the weather was connected in some mysterious way with the revolutions of the moon. Not a husbandman sowed his fields, not a fisher spread his nets in the sea, not a hunter sought his prey on the wolds, but clung devoutly to this creed. Now we are told that in twenty years educated men will no more believe in it than in witchcraft, the changes being found to coincide about once in five times. Why is it that in medicine alone man improves so little on the rude traditions of ancient times, that while the subordinate parts such as anatomy and chemistry have advanced so far towards perfection, our knowledge of the real process of disease and the empire of medicine over them remains much as in the days of Ambrose Paré and Roger Bacon? that the discussion as to whether the cholera is contagious or not is the counterpart of the debates on the plague in Constantinople during the reign of Justinian in the sixth century, which ended by a majority of the citizens deciding against the contagious nature of the malady? a flight of time that takes us back to the days when the last insignia of republican Rome were borne through the streets of old Byzantium and the children of Artaxerxes were still seated on the tottering throne of the great king.

So needless, so profitless has this contest about the infectious nature of disease appeared to many observers, that a very ingenious attempt was made by Dr. Christison to explain the discrepancy by suggesting that it depends more upon a difference in the constitution of the mind that upon anything in the facts supporting either view, and Dr. Watson has

noticed that the non-contagionists seem to belong to the liberal party. But if the reader will purge his visual or mental nerve of the gross doctrine of disorders being in the blood, and admit, if merely for the sake of argument, that the beginning of a disease is nervous, then to my thinking the difficulty is solved.

To what cause must we attribute the utter absence of all progress on such points? Is it that the subjects are so obscure that a victory would yield no laurels to recompense the toil it would demand; is it the conviction that no power would move men to break through the obstacles interposed by routine and apathy; or is it for the reason Lord Bacon gives, that "they find that mediocrity and excellence in their art maketh no difference in profit or reputation towards their fortunes"? Something of this kind I think must be at work. For a time indeed the genius of Hunter bid fair to break through the dark cloud which has so long brooded over the scene, but with him and one or two of his immediate followers, Adams, Jenner, and that villain Sir Everard Home, died out every trace of that pure spirit of research which so strongly marked Hunter, as though his powerful mind had been buried in St. Martin's Church along with his mortal remains, and had left no more trace behind it than does an image on a mirror or the keel of a vessel on the ocean she has traversed.

What little has been proved by experiments on the lower animals is only calculated to throw doubt on the nature of the prevailing doctrine. I do not allude to the atrocious cruelties practised by such fiends as Majendie on poor dumb creatures, whose helplessness should have given them some claim to protection, but

to some performed with all due care and consideration for the poor brutes on which the trials were made. The reader may consider this strong language about the "hellish Majendie," as Beckford most justly called him; I certainly mean it to be strong, for I consider him a monster only fit to be hanged, and hanged he would have been if I had had my way. And when we reflect that these shocking experiments never saved one human life, never soothed one pang of suffering, never solved one useful question, the indignant conviction forces itself upon the mind, that the learned societies who gave such men medals, prizes, and honours, or rather who did not expel them with ignominy and shun them, and the journals which lent them at least tacit support, are in this respect a disgrace to the age.

What experiments then have shown amounts pretty much to this. In the first place the amount of fluid which induces disease is so small that in other fluids it would not make the smallest change. It shocks all reason to be told that a drop of vaccine or small-pox fluid, not bigger than the point of a pin, can impregnate twenty or thirty pints of blood with disease. Even if these disorders be accompanied by changes in the blood, which we are told must be ascribed to the poison, we know that while they produce no lasting visible alteration in this fluid, they do induce such a change in the system that they are seldom taken twice.

It will triumphantly be asked, then how could it act on the solids? Nerves and muscles must be as hard to influence as three or four gallons of blood. Not quite; nerves are acted on so powerfully that

even death may follow where not a drop of fluid enters the system, as in fits of passion, death by lightning, in poisoning by prussic acid, where death is so sudden that there cannot possibly be time for it to traverse one-hundredth part of the circulation.

If there were any great amount of disease in those very affections said to result from a blood-poison, if disease were the living actual thing we might infer it to be from the manner in which it is spoken of, there would surely be traces of it in some of the worst cases, something visible to the microscope or the test-tube, yet no one has seen such a thing. No malady is so frightful, produces such a tempest so to speak in the human frame, as hydrophobia, yet neither in blood drawn during the struggle for life nor in that examined after death has a globule of poison ever been found. Nay there is generally not even a vestige of inflammation or of any change in the blood, except evidence of its not having been properly renovated in the lungs, or perhaps some slight escape of blood from the over-strained vessels. Again mental toil, anxiety, bad food and air, and sedentary occupations, produce in some persons every variety of eruption and ulceration without its yet having been found necessary to invent a blood-poison for them, though how long they will enjoy this immunity it is impossible to say.

Men constantly talk about poisons being taken up into the system. Now there are only capillaries and lymphatics to take them up, little hair-like vessels with pores so excessively minute that they can be just made out by the best microscope, and therefore how a poison is to get into the blood without being decomposed or dissolved is a matter I freely confess I don't

understand, and nature does not seem to understand it either, as such secretions have never been found in the blood unchanged unless they got in by a wound.

It not unfrequently happens that a man is bitten by a dog and months after gets hydrophobia; one man was stated to have died in Millbank prison from this dire malady after having been years shut up where no dog could possibly have got at him. A case was recently mentioned in the *Medical Times* where the patient first denied having been bitten at all and then admitted having been bitten seven years previously. Here we are told the poison lies dormant in the blood, which means in plain english that a few globules of pus or serum can reside unaltered for months or years in the midst of an immense body of fluid, undergoing such ceaseless changes that one-fifth of its entire bulk is thrown off in the course of the twenty-four hours, which is much the same as saying that a gallon of wine poured into the Thames would still be wine at the end of six months; that a drop of a most perishable fluid fructifies in the most vital of all fluids, and that while the frame is daily throwing out pounds of secretion without the slightest trouble, it cannot get rid of a few atoms of an imaginary or at any rate invisible poison, without exciting so fearful a convulsion of the frame that the sufferer invariably succumbs.

This is about as tremendous a bungle on the part of nature as could well be conceived. I can't imagine a more ponderous and clumsy mechanism than an animated frame *so constructed as to have all the trouble of absorbing a poison merely to get rid of it by an alarming disturbance of the system, and only too*

often the destruction of life itself, especially as the more active and effectual the process the greater the danger. If cholera, boils, and such things be an effort of nature to relieve the system by throwing off the poison, it would be highly improper to check the process in any way, yet in the former case, and very often in the latter, it is the only chance of saving the patient's life, though it certainly rather damages the favourite theory.

Every person knows that mercury is now and then despatched in pursuit of this demon-poison. Perhaps he (everybody) can tell us how it happens that the quicksilver gets at the poison as I certainly cannot. In the first place it must turn into liquid or vapour to enter the blood-vessels, the orifices in them being too small for solids to pass through even to accommodate the theory. Now I need scarcely say that calomel and blue pill are neither vapours nor liquids, and if this little difficulty were overcome and the quicksilver introduced into the blood, the admirable experiments of Mr. Henry Lee show that as soon as it reaches the minute vessels of the lungs towards which it *must* go, such inflammation is set up that it cannot possibly pass further. The blood has no power of keeping mercury in solution and it is not hot enough to retain it in a state of vapour. Indeed nature has guarded most jealously against the intrusion of poisons, apparently because she has no express apparatus for throwing them off again; the surface from which they can be taken up is very limited, the exterior of the body is enclosed in scarfskin almost impermeable to poisons, and the mouth is so protected by the strong sense of taste and the saliva, that only a most deadly poison

such as prussic acid could do harm before nature made an effort to reject it.

Though it be true that solutions of certain salts and vegetable matters, not convertible into the usual products of digestion, are when introduced into the stomach taken up into the blood, unless they happen to irritate the stomach so rapidly that they are expelled before they can be absorbed, yet what does this look like? Is it a salutary attempt to absorb a poison and then unload the system of it? Not in the least; a far simpler method would be to throw them off without taking them up at all, as happens when they do irritate the stomach enough. It simply means either that the stomach has no proper power of selecting what is fit and what is not, or that such a power may be overcome by the very substance against which it is exerted. No facts could be found more opposed to the view I have been combating than those to be learned from poisons, since we see that the most deadly ingredients, when once introduced into the system, may destroy life without an attempt being made to expel them.

But if, in violation of the laws of nature, solutions of irritant vegetable or metallic bodies or animal secretions of an injurious nature are thrown into the stomach, the work of expulsion at once begins, the efforts of nature are directed towards preventing the poison from getting into the blood, not towards absorbing it first and then freeing the sufferer from the burden.

If this difficulty of getting them into the blood be overcome, if a breach be made in the fortress of life, by introducing them directly into the veins, such vio-

lent attempts to bound their action and check their progress, such anxiety at the heart, swooning, and loss of strength ensue, that life is often lost in the struggle. But it is in that part where they are introduced that these alarming consequences begin, and so powerful is this tendency, so easily is it aroused, that even opening a vein and throwing in a little melted fat or milk may bring on faintness, dyspnœa, or death. Yet Mr. Lee tells us that the vomiting and purging resulting from the injection of putrid fluid into the cavity of the peritoneum "are evidently an effort of nature to relieve the system." They are evidently induced by the poison, but so far from being an effort to get rid of it they are an obstacle. Were they not present the poison might be quietly taken up and expelled in a harmless form; they exhaust and destroy the patient, perhaps before one drop of the putrid fluid reaches the intestines whence it could be thrown out; they are a violent form of that sympathy of contiguity which nature established for rational and normal purposes, not to eject poisons.

It is true that if a perfect solution, whether of an irritant or narcotic, be introduced into a vein it is carried towards the heart, but then this is simply because the veins are meant to convey a fluid in this direction, and because nature has not guarded here, as in many other instances, against man's violence and folly. When once taken up we see these substances *destroy life without an effort being made for their expulsion,* certain poisons as they are, so that it would be hard to find a doctrine more opposed to what little is known on the subject than that which asks us to believe that poisons are taken up only to be

thrown out again, and it arouses my astonishment to hear people speak of these things as though they were dealing with some impregnable fact.

Again, if an irritant be inserted under the skin, as a thorn for instance or a grain of poison, nature deals with it in the same way; such an inflammation is set up as will form a coating of lymph around it, and thus erect a barrier against the further progress of mischief, often so impenetrable that these substances, especially if not poisons, remain for years in the body.

But men will say the whole profession believe in a blood-poison, they cannot all be wrong. Yet it is not so many years since the whole profession were almost to a man in favour of bleeding for complaints now treated very differently and at least quite as successfully. At one time the profession were with few exceptions united about the propriety of treating sundry disorders by inducing perspiration, yet Sir Henry Holland now says that no more beneficial change has occurred in modern practice than the abandonment of this method. With such examples before my eyes I prefer evidence to authority, and I shall follow the example of Cobbett, who said he would rather run the risk of being wrong than lose the credit of being right.

CHAPTER XI.

LIFE IN THE NERVES.

"I really believe that most of the disorders human nature is liable to, arise from the nerves being affected."—JENNER.

THEN is it all on the nerves? I cannot help thinking that it is, that every disorder or disease is purely nervous in its essence, in the radical nature of its action; every subsequent or additional alteration of function or structure being simply an accident. An assertion so distinct about a subject so very recondite as the nature of disease is of course not so easy to prove, and I therefore submit the arguments which follow with a deep conviction, that however complete and forcible they may appear to me they may seem in the eyes of the reader both feeble and irrelevant. Still as I feel the conviction that the more carefully we study disordered actions, the more clearly will it be seen that they consist in failure of action at one part and excess of it at another, I am quite willing to expose this view to any fair test.

I believe the dawn of this view is due to the illustrious Jenner, the greatest benefactor to the human race that ever existed, the prophet who really stood between the living and the dead and stayed the plague, and who may at a rough computation be said to have saved more than twenty millions of lives since this century began. "You will think it odd in me,"

says Jenner, in a letter to the Rev. Mr. Clinch,* "to assert such a thing; but I really believe that *most* of the disorders human nature is liable to *arise from the nerves being affected,* and consequently subjecting the blood-vessels to a disordered action." The odd part of the matter appears to me that no person noticed what a core of solid truth lay hid in the remark. Apart from the idea of the disturbance of the blood-vessels being anything beyond a secondary matter, a mere accident, I see nothing but profound truth in it.

The doctrine then that disorder consists fundamentally in disturbance of the functions of the vital power is I think only conformable to what we are taught by the structure of the frame, by the invariable results of transgressing the natural instincts and by what we see in disorder. Dr. Conolly has admitted the nervous nature of mental affections. He says: "It may perhaps be strictly said that all the forms of mental disorder are dependent upon one of three states of the nervous system—a state of increased or a state of diminished or a state of unequal excitement of the nervous system," and as the brain is essentially like other parts of the frame another step is gained here. Mr. Lawrence observes very forcibly that as the general basis of the structure of the various organs is the same, so all the morbid affections must be somewhat similar, because each part can only exhibit those diseases which the elementary parts and structures are capable of exhibiting, and that though it may be true that disease differs in the various organs of the body, yet the dif-

* Baron's Life of Jenner, p. 93.

ferences are only in form, the essential nature of the disease remains the same throughout.

Dr. Dickson argued in his "Fallacies of the Faculty" that treatment should be uniform in all diseases, and as the profession did not adopt his views or even pay any particular attention to them he showed his knowledge of one branch of treatment, that of the human mind, by adopting a very successful plan. People do not care for being disturbed in their ideas and physicians are only like other persons, so they ignored the work, possibly considering that a book which was cheap and intelligible must necessarily be low and quackish. But Dr. Dickson had no idea of allowing this expectant plan which succeeds very well with quiet compressible people to be carried out in his case; so he abused a few members of the profession in a rather flattering way, and in return some of them, the late Mr. Wakley for instance, abused him in a way that was not at all flattering. But instead of being put down he only rose more vigorous from the fall, and as occasionally happens in such cases beat his antagonists on some points at any rate.

However attractive may be this idea of reducing all diseases to one form, I believe it to be utterly impracticable in point of treatment. Disorders might as regards their seat and influence upon life and health be very fitly distributed according to the class of structures they assail, for whatever may be said they all have a tendency to keep to the class they begin in, whether this be the structures of animal life, organic life, or extinct life. As respects their treatment again they might be arranged according to the tissue they

are seated in. Some authors are disposed to think that apparently very different affections are really the same disorder, owing their diversity to being developed in different tissues. Thus cold, neuralgia, and rheumatism are almost certainly the same malady in different textures.

Again apart from the obstacle lying in the observation of Hunter that medicines act as if different parts of the frame were assigned to them, I see the most formidable objections to the theory in the different action of medicines in the very same disorder in different structures. Thus inflammation of the lungs is perhaps more powerfully controlled by tartar emetic than by any other drug, but in inflammation of the lining membrane of the abdomen tartar emetic would most likely seal the patient's doom while opium often acts as a charm; in inflammation of the eye neither of these remedies appears at times to possess the least power. Some inflammations of the skin such as eczema and erysipelas are subdued by wine, bark, and ammonia, which are considered certain to aggravate inflammation of the eye or lungs. Such opinions may seem very heretical to those who look upon diseases as a palpable something which can be drained off, destroyed, or eliminated as in chemistry; who talk of it as though they could measure it by rule and compass, and pit cold lotions against so much heat, and leeches, calomel, and opium against so much redness and pain.

The simplest form of disorder is that of shock —that in which the vital power is so suddenly withdrawn from the rest of the frame to the part where

the cause of the shock operates that life ceases in consequence. The most familiar forms of this are death by lightning or from prussic acid or a blow on the stomach or head. It has repeatedly happened that a man has taken a large dose of prussic acid and died so instantly that the poison could not have got into the circulation; in some instances the unfortunate victim has not once made a movement. A man whom I knew said good bye to his wife and drank off a dose of prussic acid before her eyes; he was according to her account dead before he could well have swallowed it all. A dog has been killed by a single drop of pure acid applied to his tongue or eye. When a horse is bitten by the vivora, a small green snake found in La Plata and Buenos Ayres, it dies sometimes in four minutes.

In death from lightning, again, no vital organ is assailed in general, at least in the cases I have read; not unfrequently only the heel is struck. There is no serious destruction of tissue, only a small hole as though a red-hot skewer had been forced in with a burnt or shrunken appearance of the parts around, yet death is so instantaneous that many seem almost to have died before they fell.*

"A man," says Brodie, "receives a blow on the head, he becomes insensible and continues so for a few minutes or several hours. He dies in consequence of this or some other injury, and on examination after death the brain and its coverings appear to be perfect

* Graves expresses his conviction that trees may be killed by lightning, not from any scorching or burning heat, but from the violence of the shock, and mentions that Carvalho killed a plant with electric shocks too slight to impair its structure.

in all their parts; so that the most accurate anatomist can discover nothing different from the natural appearance of these organs."

Men have repeatedly been killed by blows on the stomach, some of them very slight indeed. During the building of the East India House one of the workmen was raising a stone when another said, "Let a better man try," and gave him a slight blow on the stomach in play. The unfortunate fellow sank down and died almost instantly. "A blow on the stomach," says that great surgeon Sir Charles Bell, "like the *coup de grace*, will destroy life on the instant." Similarly a person may die from the shock of a blow on the heart when little or no blood has been lost. "History," says Mr. Guthrie, "preserves the fact that Latour d'Auvergne, who had obtained the honourable title of premier grenadier de France, and captain of the forty-sixth brigade, fell and died immediately after receiving a wound from a lance in Neustadt." The lance struck the left ventricle of the heart, *but did not penetrate its cavity*.

Dr. Bostock, Davey, and others have mentioned many cases where the most vigorous search after death failed to reveal any marks of disease. In short, cases of this kind abound to such an extent that they might be quoted by hundreds, possibly by thousands; I cannot see that it would serve any purpose to cite more than I have now done. The grand point is to show that disorder may run its course and end in death owing to a powerful shock, where there is no sign that the blood has anything to do with it. Then other disorders may do the same: the other symptoms may be merely extraneous,

distinguishing one disorder from another as separate features distinguish different men, while the grand fundamental points of form and feature remain the same.

Another very common form of disorder is fainting, called, for no purpose, that I can make out, syncope. "In syncope," says the eminent Dr. Marshall Hall, "the whole of the phenomena appear to be dependent upon the sudden abstraction of blood from the brain." This might do very well for fainting from great loss of blood, but surely it cannot for a moment apply to fainting from many other causes. I have seen a powerful man to all appearance with plenty of blood in his brain, fall like a stone to the ground at the mere touch of an instrument: a healthy-looking man fainted so utterly from removing a small blister that he fell into the fireplace and nearly burned half his ear off. A fine strong girl one day met a gentleman she was most anxious to avoid; she simply gave a slight groan and fell instantly. A healthy powerfully built man who had never seen anything of the kind before, was so suddenly overcome by looking at an operation that he rolled off his seat without a word; he stood close to me, and the first intimation I had of his condition was his falling against me and nearly precipitating me into the floor of the operating theatre. Now here we have no evidence of any process like extracting the blood from the brain with a pump or squeezing it out with a hydraulic press, but we have pretty clear proof that an impression was made upon the touch, sight, and feelings, and that if there were any removal of blood from the brain, which I totally doubt *not knowing where it could get to*, it was secondary and unimportant, so that I cannot understand how this view of

Dr. Hall's could be anything beyond taking an effect for a cause; for granted that the blood was suddenly abstracted from the brain, it could only have been done by driving it out, for which there is no mechanism, or attracting it away, in which case the phenomena are not dependent upon the abstraction, and the abstraction and other phenomena are dependent upon an impression. Besides persons in a weak state of health can get very well through a deal of mental work with as little blood in their brains as some of these people could have had when they fainted.

Again compression of the upper part of the spinal marrow is as certainly and often as suddenly fatal as any interference with the lungs or heart, or with the formation of bile in the liver or carbonic acid in the lungs. This has repeatedly happened from accident, as from a man being thrown from a cart or falling from a house roof or from striking the head suddenly against an archway when riding. Still more to the purpose it has happened from disease and yet from first to last the patient has never had any symptoms of the affection. Sir Charles Bell speaks of a patient who died in this way; the man's sister said he used to complain of pain in his back after taking long walks and that "all the complaint which he had was this pain in his back."

As disease is but disorder with the addition of some change of tissue, an element more of growth or destruction, it is not necessary to dilate upon it to any great extent, for in respect to the laws which regulate them, what holds good of the one must of the other. It will I trust suffice to point out

one or two instances showing how purely vital this action is, how little it supports the chemical and mechanical doctrines now so prevalent, and what a striking disparity there is in many cases between the amount of mechanical disturbance and the disorder set up in the system.

Thus it has repeatedly happened that a man has been bled to the extent of a hundred or a hundred and fifty ounces in a few days, while the loss of a very small quantity of blood in a person labouring under malignant disease has destroyed life. On one occasion a surgeon opened a small abscess near a fungous growth on a girl's leg; the contents were chiefly blood, and before two ounces were taken away the girl sank and died. The removal of a nævus or mother's mark has caused the death of a patient when very little blood has been lost, and death has followed a gush of blood from a very small artery giving way. Mechanical physiologists want us to believe that this all comes from the blood being suddenly withdrawn from the heart, forgetting to tell us why the heart does not collapse in so many cases of violent and sudden bleeding from wounds; why the action of the heart can be arrested for so many minutes or hours without any collapse and whether they have ever assured themselves that the heart did collapse.

The loss of a large quantity of serum, the formation of which requires but a low degree of action and a great quantity of blood, may be borne without materially injuring health or comfort, and yet in this very person and at this very part the forming of a small quantity of pus, requiring a higher degree of action but less blood, may produce the most serious results. Thus in

the Medico-Chirurgical Society's Transactions * there is recorded a case of ovarian dropsy where the health remained unaffected while the cyst only secreted the usual fluid, but where death at once ensued when pus was formed in another cyst.

Some years ago I published the history of a case of death from cold applied to an enlarged breast. While the breast was growing the patient suffered no material inconvenience, but the breast having been frozen to check the growth, acute inflammation set in and the patient, a fine healthy woman, suddenly sank and died. Now I am certain that there was not more blood abstracted from the system here than I have often seen in a wound in some drunken brawl. As to poisoning of the blood there could be nothing of the kind. The breast was like a lump of cartilage.

In disease the same law prevails as in disorder from stimulants and shock, namely that a small amount of very sudden disturbance is much worse borne than a large amount spread over a long time, just indeed as we might expect; *e. g.* a large chronic abscess has grown as it were in parts where a small abscess suddenly formed would prove fatal.

Diseases and the destruction of tissue they produce are cured and their doings repaired in proportion to the simplicity of the structures they invade. Fat, cellular tissue, blood being quickly formed are soon lost and soon regained; skin gland, nerve and organs once destroyed are never repaired; there is no second pushing out of the vital power as during the first months of growth.

* Vol. iii. p. 40.

Certainly in some diseases most confidently set down to blood poisons, while most violent and lasting changes are impressed upon the *actions* of the frame, the amount of lasting influence exerted on the blood is imperceptible, if indeed any take place at all. Thus small-pox and cow-pox, while they bring on so far as I have been able to learn no enduring change in the blood, effect such a wonderful revolution in the susceptibility of the body that it now remains unaffected by a contagion which formerly threatened life itself. In hydrophobia as has been said there is just as little evidence of any change.

So far then as I can see into the matter, and I profess to go no further than any person can by simply divesting his mind of theories and observing for himself, all that the phenomena of life, growth and decay, of health and sickness really teach us is that there is but one power in the frame, the vital power; a fixed, imponderable, invisible quality impressed upon the clay of which we are made in order that certain functions may be performed; that growth, formation and disease are varieties of the same action; that any change we see in their products is not a new element, but only the result of the preponderance of some natural ingredient; and that there is no necessity for such an intangible phantasy as a blood-poison to explain what we know of nature's wondrous and beautiful works in the great archetype, man.

Every abnormal action is marked by a failure of vital power at one or more parts of the frame, and an accumulation of it in the suffering organs; the varieties of disease must depend on the constitution of the part assailed, and the object of the physician must be

to attract it back to those parts where its presence is required, and as all the functions demand the presence of a certain amount of vital power for their due performance, there is a constant tendency to restore the balance deranged by disease. In chronic disorder the strain on the economy seems too slight to rouse up any violent action in the other parts, and we can only effect a cure by irritants, which carry the vital action so high that when the rebound takes place it reverts to the normal state; like a bent spring which when bent still further straightens itself by the recoil. This fact, so constantly ignored, appears to me the basis on which physiology must rest. Considered in its most comprehensive sense, excessive local action embraces every variety of disease. How, let me ask, are we to reconcile the fact that a disease, erysipelas for example, is treated with equal success by one surgeon with purgatives, by another with incisions, by a third with powerful stimulants, unless we admit that disease is ever an excessive local action, *admitting of cure by any means capable of directing anew the vital force into its normal channels.*

By observing closely we may see the working of a law which though its agency is visible enough, proves very difficult to define. Hunter described some of its results as the law of remote sympathy, but it appears to me to have a far wider range than he gave it, and to embrace not only disease but the reasons why some medicines fail and others succeed in certain complaints. This law really is that if a cause of disorder be applied to a certain part, the vital power will not only flow to that part but to another and distant part also. Again in certain

affections, medicines acting upon one particular organ will have no control over them while those which act upon another part will, albeit both these parts may be remote enough from the seat of disease. For instance in lock-jaw, keeping the patient constantly intoxicated with rum-punch has often carried him through this fatal malady. Dr. Watson suggested a free use of wine, and Dr. Radcliffe says this has now been tried with success; he has seen "two cases in which strong and general tetanic spasms relaxed rapidly" when the patient was kept always nearly drunk, and several cases have now been placed on record in which Dr. Watson's view was successfully put in practice. Now here is an instance in which the most powerful medicines repeatedly failed to withdraw the accumulated vital power, and yet milder remedies and closely allied in their nature to those remedies that failed, did so with success.

Perhaps the day is not far distant when the workings of this power may be explained by a law as simple and beautiful as that of gravitation, and when the gross theories of materialism will be left to the unlettered. At present one might feel justified in despairing of such progress. Presumption has so thoroughly taken the place of argument and labour that I have often read in the medical journals the most positive assertions as to the nature of disease and of the vital power, without one word of comment from the editors as to this exhibition of monstrous vanity and dogmatism.

One important point would be to find out, if there is any connection between disturbances in the electricity of the air and disorder of the health, what

this connection is and to what laws it is subject. That perturbations take place under certain circumstances in the electrical state of the nerves and muscles may be regarded as proved, and I think I can show that changes in the electricity of the air will induce certain forms of disorder. I have already stated that the vital power is less easily disturbed the better the health and the constitution; now the question whether the health or the constitution be disturbed in this way is another term for whether or not the person will suffer by the impact of the contagious air (though of course original constitution of particular organs may have something to do with it), and there is a more marked connection between the alterations in the state of the atmosphere and in the health than is generally imagined. In this case it will not be difficult to understand that a power which influences health and is so closely connected with the changes between action in muscles and nerves, without which all vital actions would be at a stand-still, can greatly affect the growth and decay of particular races, the very existence and welfare of which seem *to depend upon a special, peculiar, and unchangeable form of vital power for each race.*

In order to see if I could obtain any evidence as to this question, I selected a very common form of inflammation. As it is very painful, patients generally apply soon for relief. A tolerably long period was chosen so that the results might not be vitiated by any hasty conclusions. Three large hospitals were visited, and the books on being searched gave, for the year 1852, three hundred cases, and for the year 1853, five hundred and nine.

In the first year there was a slight but steady rise up to the end of the third quarter of the year, when the proportion increased so rapidly that in October there were nearly twice as many cases as in the highest of the preceding months, and then the number again declined till the end of the year. The smallest number of cases occurred in June, July, April, and January.

In the year following, 1853, the greatest number of cases which occurred in any one month took place in July, when there were sixty; a striking contrast to the same month in the year preceding, when there were only five; confirming a view I long ago stated that mere heat and cold have in themselves very little to do with disorder of the health. Next to July in this year stand December and October, which yield respectively forty-six and fifty-two. The lowest number is met with in March, May, June, and August, of this year, which give an average of less than thirty-two; while January, April, and November show about half as many more.

Now, when examining the tables of the heat, wind, &c., during these periods, I could find no changes which at all tallied with the variations in the number of cases of disorder; but, on turning to the electrical column of the meteorological report, some changes were noticed which seem to coincide with those in the amount of disorder. For instance, during the first eight months of 1852 there was an exceedingly small number of cases; now, during the greater part of this time the number of days on which negative electricity was registered is very small indeed. Week after week

the electricity is reported as positive, with moderate tension. In the second week in September the number of cases is greater than had been noted for a long time; and now the electricity is reported negative and very active. Immediately after this there is a fall in the number, and the electricity is again marked positive and active. Then, after a slight wavering, a great increase in the number of cases is found for many weeks after; and from this time till Christmas the reports give "no electricity at all." But here unfortunately the clue of the investigation is lost, for the electrical apparatus having got into a difficulty with a gale of wind, came off second best, and was so damaged in the contest that a long time elapsed before it could be set to work again. In all these cases the reports of the electricity were taken from the returns of the Registrar-General.

Beyond all doubt, electric disturbances in the atmosphere produce visibly what are often the forerunners of disorder. On the 8th of May, 1831, the air in the neighbourhood of Algiers was so full of electricity that it appeared to be on fire. Luminous points issued from the ends of the hair and the tips of the fingers of the officers. *All those exposed to this air suffered from spasms in their limbs and weariness.* Any considerable fall in the barometer which is accompanied by a change in the electricity produces in many persons a lassitude, followed by restless and uneasy sleep, or frequent and laborious breathing.* Sir Henry

* Medical Notes and Reflections, by Sir Henry Holland. Sir Henry believes the sirocco is a current of negative electricity.

Holland remarks that the mere dryness of east winds will not explain the aching and languor they produce. Suppose this to be the case there remains but the electricity, as it seems incredible that malaria could be carried so far. Dr. Ure, in a paper read before the Royal Society, stated that the effects of negative electricity in the air, as observed in the long room of the Custom House, were vertigo, fulness and tension about the head, quick and feeble pulse, and defective circulation in the legs and feet. Positive electricity is stronger by day, and negative electricity by night; but whether there is any connection between this change and that of the greater number of deaths in the night, my information does not enable me to say.

Again, in childhood, when disorders spread most rapidly and growth is quickest, the nerves are proportionately larger than in the adult.* They are absolutely enlarged in some disorders. The nervous symptoms essentially begin first in fevers, and are greater and more constant than the disturbances of the blood. If the reader will go through Dr. Copland's admirable description of "The Stage of Invasion" of fever, he will find not a symptom but what might arise purely from an impression on the nervous system. A person has been known to run through these alone from exposure to the causes of fever for too short a time to allow of the virus entering the blood. Dr. Darwin mentions that he was stooping to look which way the water oozed from a morass as a labourer opened it

* Lectures on Physiology, by W. Lawrence, p. 169.

with a spade, when he inhaled the vapour, which occasioned an instant sense of suffocation so that he immediately recoiled. He believed that he only inhaled it once, yet he had a regular cold fit of ague after it. Cholera is sometimes so rapid in its action, that Mr. Twining said people died of it as quickly as by drowning.*

* The Ganglionic Nervous System, by Dr. J. G. Davey.

CHAPTER XII.

LIFE OF A GIANT.

"It would much conduce to the magnanimity and honour of man, if a collection were made of the ultimities (as the schools speak) or summities (as Pindar) of human nature, principally out of the faithful reports of history; that is what is the last and highest pitch to which man's nature of itself hath ever reached in all the perfections both of body and mind."—LORD BACON.

I REGRET that all my efforts to learn something really worth knowing about the natural history of giants, have been almost as fruitless as those given in the chapter on species. Indeed the present writer has a heavy charge to bring against the british public; he accuses it of neglecting the giants. In its youthful days it enjoys the services of these benevolent men; they are as much an institution as the british lion, the man in armour, or the javelin men; but it cherishes the british lion, it takes the man in armour to its heart, it upholds the javelin men, and ungratefully forgets the giants.

Not the giants of whom the knight of the rueful countenance was wont to discourse beneath the cork-trees of La Mancha; nor those of whom Spenser sang in his sweet, dreamy, half-finished tales; nor the giants thirty-six feet high found near queenly Athens; nor the monster Mazarino, whose head was the size of a large cask and whose teeth weighed five ounces each; nor the ancient king of Dauphiny, whose mortal

remains rest in a tomb thirty feet long: the said remains being twenty-five feet in length, with teeth the size of an ox's foot and a shin-bone measuring four feet—which means that, despite the tradition that gave the name of the giant's field to the spot where he was buried, and that his remains are said to have been found in a real tomb of brick, on which lay a grey stone bearing the words Theutobachus Rex cut on it, he was not a giant at all, but like Mazarino and divers others, an extinct mole or mammoth or something of that kind; nor Philargyre, the "great gygant of Great Britaine;" nor the giant Ferragus, eighteen feet high, slain by Orlando, nephew of the immortal Charlemagne; nor the hairy giants of the South Sea; nor those slain by our immortal Jack; nor a thousand others, for the old monks and chroniclers were somewhat given to credulity and knew not the bones of a hippopotamus from those of a giant. Thus Father Jerome de Rhetel, missionary in the Levant, in a letter written from the island of Scio giving a long narrative of the finding of a giant's skeleton in the wall of a village named Chailliot, not far from Thessalonica, says that a tooth of the under jaw weighed fifteen pounds. Now this is a good deal less than the tooth of a mastodon often weighs.

A hundred and fifty years ago some huge bones, probably of the mastodon, were found in New England. The notorious Increase Mather, a great man among the rebellious tyrannical puritans of that seditious spot, sent an account of them to London, describing them as being the remains of the giants before the flood. One tooth was four pounds and three quarters in weight, and a thigh-bone seventeen feet

long is spoken of; respecting the latter we may assume there was some slight mistake.

In Kirby's "Wonderful Museum"* will be found a tale which looks as though there were a basis of truth in some of these old legends. We are there told that at Triolo, a castle in Upper Calabria, some labourers found in a garden an entire skeleton measuring eighteen or more feet in length; the head being two feet and a half in length and the grinding teeth an ounce and a third in weight. *The skeleton lay stretched upon a mass of bituminous matter like pitch;* the bones were extremely brittle and easily crumbled into dust.

Now I think the old writer has here unwittingly given the best proof that his story was true. It is not easy to imagine for what purpose he could have invented this part about the skeleton lying stretched upon a mass of bituminous matter like pitch. Yet the geologist knows this is precisely what was very likely to happen, if some great fish, a shark for instance, had been stranded at this spot and rapidly covered with mud. It is what has happened to uncounted millions of fish in old rocks.

But to return, it is the real domestic giant whose interests are now represented. The writer appears in behalf of the melancholy but benignant-looking giant of the caravan, such as he rises up amidst the dreams of bygone times when the writer was admitted to the privilege of seeing him for twopence, fittingly dressed in a rather antique and very faded suit, and generally accompanied by some other prodigies of nature, which

* Vol. ii. p. 378. 1804.

the public was also graciously permitted to view for this ridiculously small sum.

Many a time and oft has the author wondered whether the giant always lived in that small yellow house on wheels, with the bird-cage, regulation chimney, and brass knocker; whether all through life he continued to give an account of himself every quarter of an hour; whether he ever grew tired of showing the size of his foot, and having his sides poked and his legs pinched by sceptical old gentlemen who wouldn't be put down; whether when he grew old he still continued to walk about the streets at two in the morning, lighting his pipe at the lamps; whether he married the giantess, or the pig-faced lady, and retired to live in his castle.

In his youthful days the writer wanted to be a giant himself, and several times thought he had discovered an infallible method of attaining the object of his ambition, such as overfeeding, stretching by dint of violent jerks from beams, &c., to the great amazement of his relations and friends. He failed egregiously however; indeed with the exception of several strains and one rather hard fall across a washing-tub he cannot report any particular results.

For this failure he feels grateful. Apart from the fact that the giant is essentially short-lived, and that he is generally a poor credulous blundering creature, he is the most unhappy of all the tribe of wonders. The pig-faced lady may hide her facial angles behind a Shetland veil; the albino can dye her hair and wear spectacles; the living skeleton may now assume any size he likes by the help of balloon sleeves and peg-tops: the dwarf is petted and kissed, retires with a

fortune and a wife three times his size, generally a lady of a masculine turn of mind who quells anything like rebellion by putting him upon the chimnĕypiece till he has had time to think matters over and cool down somewhat, for these little men are marvellously fiery. To the giant alone is denied alike the pleasure of retirement and the bliss of connubial life; he is interdicted from appearing in public except while there is no public to appear in; he pines while living and dies of his own greatness ere half the span of his life is run.

As I have already said, the unmerited neglect of these eminent men has rendered it rather difficult to procure authentic information respecting them; but such little scraps as have been gotten together by a faithful admirer are now presented to, it is sincerely hoped, a repentant british public.

M. Le Cat gives in his memoir a long list of giants from the days of Hercules to the middle of last century, and from seven feet to a trifle over fifty, to which the reader is referred for further information. Now it is possible that in the midst of all M. Le Cat's fables there may be some which are not altogether to be rejected. It is quite possible as he says that Hercules was seven feet high, though it is doubtful whether we can take the evidence as absolutely certain; it is likewise possible that the emperor Maximin was above eight feet high because we have skeletons to prove that men can grow to this size, and that Antoninus was seven feet seven;* that the giant Galbara brought from Arabia to Rome during the time of

* He was a syrian and lived in the reign of Theodosius. He died at the age of twenty-five.

Claudius Cæsar and stated to have been nearly ten feet high, was eight feet and a half or nearly nine feet high, and that Secondilla and Persio, keepers in the gardens of Sallust, were really only six inches less than the arabian. But it is very doubtful if the learned Platerus ever saw, as he is said to have seen, *several persons* as big as these monsters, or if any person ever yet saw more than two real giants in his lifetime; it is very doubtful if another worthy whom he quotes saw a girl ten feet high, and it is quite certain that the tales of Orestes being eleven feet and a half and Ferragus being eighteen feet high are nothing but inventions of the old chroniclers, on a par with nursery legends and hobgoblin stories.

M. Le Cat however is left far behindhand in such matters, by the industrious and credulous Wanley in his "Wonders of the Little World," where the reader fond of the marvellous, and the philosopher fond of contemplating the love of the marvellous in others, may alike expatiate in legends of all varieties of the human race from mannikins a few inches high to giants bigger than steeples.

Ireland has long been famous for producing exotics of this kind, and perhaps the largest skeleton to be found is that of O'Brien, or Byrne, in the College of Surgeons. This ambitious young gentleman came over to England and exhibited himself as the "Irish Giant," and having died, was dissected and labelled with this title. But at the very time when he was being converted into an interesting specimen of osteology, the real O'Brien and real irish giant was alive and as well as a giant could be.

He was born in the year 1761 in the barony of

Kinsale in Ireland, of obscure parents, who like those of most giants were people of only middle size. His name was Patrick Cotter, which he bore till some one persuaded him that he was a descendant of the far-famed Brien Boru, upon which he took the name of O'Brien and agreed with his friends that he very much resembled his ancestor. His genealogy was never very strictly inquired into, and as his father was a bricklayer the family must have lost caste as well as changed their name. He was brought over to England by a rascally showman, who in order to coerce him into signing articles of slavery for three years trumped up a fictitious claim for debt, and he would have been sent to Bristol gaol had not an english gentleman, seeing this simple-minded creature in a state of dire bewilderment and distress, to his honour most generously become bail for the poor giant. The englishman having rescued him from the clutches of the showman, enabled him to set up for himself, whereby he realized thirty pounds in ten days. He continued at this work from time to time for twenty-five years, and then having realized a nice fortune retired to Bristol, where two years afterwards he died of disease of the lungs in his forty-sixth year; thus reaching the extreme limits of a giant's life. The wonder is that he ever lived so long as his huge frame seemed to be only half vitalized: when he walked he never lifted his feet from the ground, but went shuffling along in the most painful manner, sometimes resting his hands upon the shoulders of his companions; in this way he used to be seen scrambling up Holborn Hill at two or three o'clock in the morning, appearing greatly fatigued, as well he might after showing himself all day. As soon as he

got to level ground however he managed to walk so upright that he often had to take care not to hit his head against the lamps. When he stood up he used to put his hands upon the small of his back, as if his spine wanted keeping in shape.

It was O'Brien who frightened the watchman by lighting his pipe at a street-lamp. The man coming suddenly upon this appalling spectre at dead of night, with the top of the lamp in his hand and a pipe in his mouth, fell down in a fit and was carried to the nearest lock-up. Another time the giant's carriage was stopped by a highwayman, when O'Brien putting his head out of the window to see what was the matter, the terrified highwayman immediately clapped spurs to his horse and fled.

O'Brien was the king of his tribe, and—as far as was possible for a giant—enjoyed life. He was wont at times to retire from the busy haunts of man and reside in a mansion near Epping Forest, which had once belonged to a nobleman and has since been converted into an inn. If any curious reader should wish to trace his footsteps he could hardly find a sweeter spot. After a wander among the glorious green winding lanes, the sweet woodland stretches, full of bushes, brambles, and ferns, fragrant silent glades bedizened with primroses in spring and hedge-roses in summer, with here and there a peep at the glorious remnants of the old woods and fine uplands; the fine comfortable old country houses only seen in England, and the grand old roman camp by the way; let him, I say, after this betake himself to one of the comfortable picturesque hostelries with latticed windows, flagged passages, and well-kept garden with its old

trees, and there in some snug little parlour, gay and homelike, with its old china, glass cupboard, and well-rubbed furniture black with age, he may enjoy such a dinner as a man may hardly match in many a long day's ride. From that day forth I prophesy that he will say the giant was wise in the true lore of life.

By the time he was forty-three years old he had made enough money to give up exhibiting, which he always disliked, and he sagely resolved to withdraw from the public view and spend what remained to him of life among his friends, of whom he had a large circle and by whom he seems to have been generally very highly esteemed. For this purpose he selected the Hotwell road, Bristol, where he passed the rest of his short life.

He seems to have been an amiable, quiet sort of giant, indeed the only thing in general which seemed to trouble his equanimity was bad luck at cards,—not that he was afraid of losing his money, but that he was possessed of a weakness common to many persons, the dread of being beaten. Up to the last he loved to meet his friends over the cheerful glass and pipe.

"His stature increased till he arrived at the age of twenty-five, when his growth abated somewhat" (pretty nearly time), but he continued growing a little after that period till he attained the height of eight feet seven inches; his foot being seventeen inches and his hand twelve inches long.* He took very good

* This was decidedly small for a hand in comparison with that of several giants. The hand of Thomas Bell, the Cambridge giant, only seven feet two inches, was eleven inches in length.

care no one should dissect him, for his grave was dug twelve feet deep in the solid rock; after which it was thoroughly fastened and watched. The leaden coffin used to hold his immense frame was nine feet two inches long, and the wooden case enclosing this four inches more in length.*

In an engraving of him in Wilson's Wonderful Characters, he is represented by a very pardonable anachronism in company with the living skeleton, Daniel Lambert, and Geoffery Hudson who does not reach near so high as his knee. He looks a very benevolent person with a pensive expression of face, and seems to be gently deprecating the attentions of an invisible dog. He is dressed in the short-waisted broad-skirted coat and waistcoat, the knee breeches and stockings of that day. Even these clothes were such an object of attraction for the public that his servant to whom he bequeathed them exhibited them, stuffed out into the effigy of the human figure, at several places in London.

Since then no one has appeared who actually could have disputed the palm with either of the irish giants. There is an account given of the greatest english giant in Kirby's Museum. His name was James Toller and he was born at St. Neots, in Huntingdon. "At the age of ten years he had attained the surprising height of five feet and upwards; at the age of eighteen years he had reached the height of upwards of eight feet one inch and a half, and was still in progress of growth." He had at the time this memoir was written two sisters who bid fair to outshine him

* Wilson's Wonderful Characters, 1826, vol. i. p. 421.

big as he was, one at seven years of age being nearly five feet high.

Now if this man had gone on growing at the most moderate rate he would far have exceeded O'Brien, possibly even Christoff Münster. O'Brien grew till after he was twenty-five years old. Suppose Toller had grown, say two inches a year, which is very slow work for a giant, he would have been far above nine feet high; but all at once he seems to have disappeared and I find no further account of him.

The irish giant whose skeleton is such a striking object in the Museum of the College of Surgeons in London had a very brief career of it. Being addicted to whisky and having one day lost all his money, he gave himself up to such a debauch (to drown care) that his health broke down and he died at the age of twenty-two.

It was believed by his friends that he was buried at St. Martin's-in-the-Fields and his coffin was certainly taken there, though he wished that his remains should be sunk in the sea, having the same superstitious fear as his rival lest the doctors should get hold of his body and dissect it; but John Hunter was determined to have his body and actually paid five hundred pounds for it. The skeleton is eight feet high. It is well and strongly made, the huge frame being quite symmetrical except that the neck of one thigh-bone is longer than the other; the tissue of the bones however does not seem to be so compact as in other skeletons. Large as the head looks there is not more room for brain than in a man of moderate size.

The writer having seen with his own eyes this skeleton, and having learned that the skeleton of this

giant's great rival lay many feet deep in a rock, was not a little startled by being told that the skeleton of the irish giant was in the anatomical room of Trinity College, Dublin. Sure enough a giant's skeleton is or was there, of which the following history has been given.

The celebrated Berkely, Bishop of Cloyne, of tar-water memory, in one of his rambles found a boy seated on a door-step, apparently in an advanced stage of hunger and poverty. Being of a benevolent disposition the bishop relieved his necessities, but being also of a philosophic turn of mind he subjected this hapless orphan to a series of interesting experiments, putting him through the fattening process by which prize pigs and bullocks are brought to the verge of suffocation. Indeed it is not at all likely that the energetic prelate stopped at any half measures, as he once nearly hanged himself in order to learn what suspension was like. These succeeded to perfection; the youth shot up like a scarlet-runner and at sixteen years of age was seven feet high. M'Grath (that was his name) now made the tour of part of Europe as the "Prodigious Irish Giant." But the bigger he grew the more fatuous and helpless he became, until at last he died a giant's death of sheer old age when little more than nineteen. This M'Grath or M'Garth was born in the year 1736 in Tipperary. His parents were not remarkable for their stature, being of the middle size, as was often the case with the parents of giants. None of the other children were taller than ordinary persons. In the account given by Kirby he is put down at six feet eight and three-quarters when sixteen, his hand being then as large as "a middling shoulder of

mutton." We are also told that when he came back to England he measured seven feet eight inches without his shoes, and that he died in May, 1760, at the age of twenty-four, partly perhaps from the effects of an intermittent fever which seized him in Flanders.

Dr. Musgrave sent to the Royal Society an account of a young irishman, Edward Malone, seven feet six high when he was nineteen. Dr. Molyneux however told the Society that he measured this man himself in Dublin, and that he was at that early age seven feet seven without his shoes: so that we are indebted to Ireland for four authentic modern giants.

One summer evening as the writer was passing through a beautiful little burying-ground near Hanover, he observed a figure sculptured on a tombstone, more like a Guy Fawkes than anything else except that it had no pipe in its mouth and stood upright, which of course a genuine guy could not do. Otherwise it had the true tumble-about, helpless, half wide-awake look peculiar to these creations of youthful fancy. It was the likeness of Christoff Münster, born at Erlosen near Münden, June, 1632, and defunct at Hanover August, 1676, so that he lived almost as long as the great O'Brien. His effigy is in the costume of the body guards of the Elector in which he served; the tasselled cap, long single-breasted tunic, and slashed hose. In his simple and pious epitaph he is represented to have been four ells and a half high. The lowest calculation of the old german ell is twenty-four inches french, but a friend accustomed to german measures computed four ells and a half at nine feet and a half. If this computation be correct he stood

nearly a foot higher than Patrick Cotter, and was by far the biggest man of modern times. He was also a little taller than Goliath, whose height (six cubits and a span) is put down by Kirby very fairly I think at "about nine feet three inches;" yet "the staff of his spear was like a weaver's beam."

He also was given to lighting his pipe at the lamps! and had to stoop down to get at them. Being an object of much solicitude to his paternal government he was allowed eight times as much food as any other person, which he always promptly disposed of, to say nothing of a loaf or two at his own cost into the bargain in which he frequently indulged. Having been guilty of disobedience to his commanding officer he was put into the stocks, or rather pillory. It is needless to say that he was congratulated respecting this distinction by the boys of the place who waited in a body upon him for that purpose. As in addition to the consolation derived from their very sympathising remarks he endured all the discomfort of an extremely cold winter's day (which in Hanover means something like cold), he resolved to change his quarters, and having by a desperate effort uprooted the huge pole to which his neck was chained, he took it on his shoulder and walked off with it to the nearest public-house.

Kirby mentions that a german giant was exhibited in the year 1664. He stood about nine feet and a half high. I should not be at all surprised if this was our old friend Christoff Münster.

In the year 1613 a young man was brought to Basel and shown there as a great wonder. He was eight feet high and strongly built, though lean. The

only disproportionate thing about him seems to have been his hand, which was sixteen inches long or quite four inches longer than O'Brien's. He had no beard and was said to be only twenty-two years old. There is no further mention of him, so that he possibly at a very early age shared a giant's fate.

It is uncertain whether Belgium or France has produced a real giant, that is to say, something above seven feet and a half. M. Le Cat, a professor af anatomy, in a memoir read before the Academy of Sciences at Rouen, mentions a giant shown at Rouen in 1735 who was more than eight feet high, but in the extract given from his memoir, for I have not been able to trace the date of the original, it is not stated to what country this man belonged. "Bernardo Gigli, an Italian, attained the height of eight feet when only eighteen years of age."

Holland gave birth to the giant of Utrecht, described by both Diemerbroek the anatomist and Mr. Ray. They agree in their accounts that he was eight feet and a half high, with well-shaped limbs. Leyden possesses the frontal bone of a man who must have been nine feet high at least if not very much more. It *is quite double the size of the frontal bone of an ordinary skull,* and from the engraving and careful description of it in the Royal Society's Transactions there seems no reason to think that this size is in any way owing to disease.

Scotland has in modern days given to the world one fair-sized giant—Big Sam, the Prince of Wales's porter, who was nearly eight feet high, robust and well made. His size was no burden to him and he was as active in his movements as other men; he

performed as a giant in the romance of Cymon at the Haymarket. "Sam," says Kirby, in his "Museum," "stood very near eight feet high; and he was frequently to be seen amusing himself looking over the gate of Carlton House, by which means he saved himself much trouble in opening the gate to inquirers, whose principal business was for the purpose of contemplating Sam." But his health failed so fast in the prime of life that he had to return to his native country, and there, we *believe*, soon afterwards died. But Kirby says "he was unfortunately drowned by the shipwreck of the packet in which he had taken a passage to his native land (Wales) on a visit to his friends." Sir Thomas Dick Lauder has likewise preserved the memory of a gigantic highlandman who shattered a prize-fighter's skull with a single blow of his fist, carried off a cannon he was set to watch and put it in his bed, thinking this was the best way to take care of it on a wet night. He laid the famous Captain Barclay on the ground as if he had been a child. He was a merry giant, loved the highland fling, and danced it to a good old age; but like Thomas Bell the Cambridge giant, General Man, Bradly of York, Hales the Norfolk giant, Walter Parsons, King James's porter, and William Evans, of Monmouthshire, who succeeded Parsons in that office, he was not much above seven feet and only fit to rank in a lower class than the Irish and Hanoverian Giants.

M. Le Cat speaks of a scotch giant hight "Funnum who lived in the time of *Eugene the Second* king of Scotland" and measured eleven feet and a half in height. If any person can give a full and true account of this worthy he will throw some light upon history.

James, the second Duke of Queensberry, had a giant son. What his exact size was I cannot make out, but it is said to have been immense, which may mean anything. His coffin in the family vault at Durisdeer is of great length. He was a perfect idiot, and being one day deserted by his keeper, who had gone forth with all the rest of the household to hear the debate in the parliament house at Edinburgh about the passing of the Union Bill, he broke loose from his confinement and made his way to the kitchen, where he found the turnspit boy sitting by the fire. He seized the lad, killed him, took the meat off the spit on which it was roasting, spitted his victim, whom he half roasted and was found devouring when the duke returned with his domestics from his successful attempt to carry the union with England.*

I believe Evans was as tall as any of these giants, if not the biggest of them, being seven feet six, or two inches taller than Parsons, who like Hales was knock-kneed and unlike Hales splay-footed. Hales indeed but for this defect would have been a splendid specimen of a man. He was, when I saw him about eleven years ago, decidedly fine looking with a cheerful intelligent face.

Kirby also speaks of Edward Bamford, a native of Staffordshire and a hatter in Shoe Lane, who was seven feet ten inches in height and died in 1768 at the early age of thirty-six years. Almost contemporary with him was Henry Blackler, exactly the same height, who exhibited himself in 1743, and called himself the "British Giant."

* Hone's Year Book, p. 794.

I have not been able to procure any account of the death, age, or physical characteristics of any of these men except Sir Thomas Dick Lauder's giant, of whom there is a most interesting and amusing biography in his "Highland Rambles, and Long Legends to shorten the Way."

England has made one or two tolerable attempts to produce a first-class giant, that is to say eight or nine feet high. One of these productions, Toller, has been already spoken of, another was chronicled by a Mr. Dawkes,* surgeon of St. Ives, in that quaint, vigorous, natural style which gives such a peculiar charm to the medical writings of a century and a half ago, and the loss of which has made modern medical works almost unreadable. The first communications respecting the prodigy in question were made to Dr. Mead and the Royal Society, who encouraged Mr. Dawkes to prosecute his inquiries, for at that time learned men did not think such matters below their notice. The Royal Society was then in its prime; it had emerged from the puerility of the seventeenth century; it had got beyond the cherry-stone of Patin with eighteen carved heads upon it, the lion of Leonardo da Vinci which ran before the French king dropping fleurs de lys, the mechanical magpies, &c., and had not yet grown so learned as to be insufferably dull, a cætus deorum into which only the pure sublimation of abstract knowledge can be admitted. Men looked then upon the growth of a young giant, or the chronicles of an old tree or

* Memoirs of the Life of a Boy, by Thomas Dawkes, of St. Ives, Huntingdon. London, 1747; an Account of the Gigantic Boy of Willingham; Philosophical Transactions, 1744.

tower, with an amount of interest which seems now to be considered hardly respectable.

This immense creature, long known as the gigantic boy of Willingham, was called Thomas Hall and was the son of a little father and almost a little mother. He himself, at his entrance upon this scene, was only a fine lusty baby, but he soon began to grow at a rate which astonished the whole neighbourhood, and when two years and eleven months old he was more than three feet nine inches high. Two months later he had reached the height of three feet eleven, growing at the rate of nearly an inch a month. Nearly a twelve-month after he had attained the height of four feet five inches, so that had he grown to manhood at this rate he would have been at least nine or ten feet high.

The cause of the first check in his growth appears to have been extreme stuffing. After his third year he was taken about for a show and created an extraordinary sensation. But he was so crammed that he soon learned to care for nothing but dainties, and was frequently "debauched with wine;" a nice state of matters for a child three years old. The natural upshot was that he had a crop of boils, fell into ill health, and was checked in his growth. Previously he had been but a small eater and drinker.

His bulk and strength were quite proportionate to his great height. Before he was three years old the calf of his leg was above ten inches round, and he weighed, in his "cloaths," four stone two pounds; when five years old he weighed, even after his illness, upwards of six stone. His strength was prodigious; when less than four years old, Mr. Dawkes saw him take a hammer, seventeen pounds' weight, and throw

it from him to a considerable distance, and when little more than three years old he could place a large cheshire cheese upon his head, and lift a runlet (two gallons Winchester measure) full of ale to his mouth and drink freely from it. By this time he was the champion of the school; boys of seven or eight years had no chance against him; he never condescended to fight with them; he simply collared them and laid them on the ground. Sometimes at a later date he would offer to fight all the boys in the school, two at a time, and threaten to put them in his pocket. When he was five years old and still suffering from illness, Mr. Dawkes got him to exhibit his strength. A wheelbarrow of uncommon size and very heavy, being made of green wood, was selected; one of the biggest boys in the school got into it and Tom trundled him off with ease. Two of the biggest boys then got in, and the young Anak made it move "two rotations of the wheel." This was all he could do—and not amiss either, as the two boys weighed twelve stone two pounds and he was not well.

Even at a very early age his voice was like a man's, "very groom," one of his biographers quaintly calls it. When three years old he seems to have possessed as much sense as boys of five or six, and by the time he had passed his fifth year he behaved himself in every way as a grown man. He was extremely fond of music, sculpture, and painting, and "seemed rather inclined to mechanics than to any other kind of learning." His look was rather savage and always sedate. Though never violent or cruel he seems to have had as little of love as of fear in his composition, and of the latter he had certainly little enough for he

was as "indomitable as a panther" except with Mr. Dawkes, who kept him in awe by threatening him with his dissecting-knife. Even this gentleman never seems to have succeeded, notwithstanding the extreme interest he took in the young monster and the frequent valuable presents he made him, in thoroughly gaining his affections. Always cold and gloomy after his illness, he grew more silent as his short life drew to a close.

In January, 1747, Mr. Dawkes found he was ill of fever and kindly sent him some medicine. This the boy refused to take and his biographer heard nothing more of him till June in the same year, when meeting Dr. Heberden, he was informed by him that the poor lad had got "a Phthisis Pulmonalis," or in other words was dying of consumption. The kind-hearted surgeon accordingly went to see him. Two days afterwards he quietly breathed his last, having only grown one inch in the preceding eight months. His strong natural courage never deserted him and he viewed the approach of death with perfectly undisturbed fortitude; though he disliked to talk about it as he did about most other matters. Some months prior to this he rejoiced in a thick pair of whiskers and had a beard. Old age seemed to gather fast upon him towards his end; his corpse had all the appearance grey hairs excepted, of a man who had died at extreme old age, so that the story told by Pliny of a boy who at three years of age was four feet high, and that of the lad mentioned by Craterus who married and died, leaving issue, in his seventh year, are not so profoundly improbable after all.

There can be little doubt on the mind of any one

who has read Mr. Dawkes's narrative that it is extremely accurate; it bears internal evidence of this. Lord Sandwich who had seen the boy, could not believe that he was so young, but Mr. Dawkes having "happened into" Lord Sandwich's company, the subject was mooted, and such a host of witnesses and affidavits was brought forward that none but those silly people who pride themselves upon their incredulity could refuse to believe.

Mr. White, an eminent surgeon recently dead, mentions a boy who used to come to his house and who was three feet two inches high when only two years and a half old, was built like a Farnese Hercules and able to lift forty pounds with ease. M. Breschet showed the phrenologist Spurzheim a boy who at three years of age was three feet six and three-quarters. Mr. South, the surgeon, had under his care a boy who at little more than three years old was three feet seven high, weighed four stone eight pounds and had a splendid development of muscle. I confess myself however unable to give any further account of these prodigies, as I have not been fortunate enough to trace their subsequent career in the least.

Mr. Cheselden published an account * of a skeleton dug up in the site of a roman camp. This great anatomist and surgeon estimated the height to have been eight feet four in the living person. It is stated in the Annual Register for 1763 that some workmen who were digging a vault under the master's apartments in the Charter House, came upon a very large skeleton,

* Philosophical Transactions.

the thigh bone being two feet two inches in length and the other bones in proportion, though it is not said whether any person competent to decide this point ever saw them. In the same work and for the same year it is stated that a gentleman who rented the lime quarries at Fulwell Hill near Monkwearmouth, Durham, in the year 1759, while digging in search of stone removed a ridge of limestone and rubbish, in the midst of which was found the skeleton of a human being which was measured in his presence and proved to be nine feet six inches in length, the shin-bone or larger bone of the leg being two feet three inches long. The head lay to the west, and was defended from the superincumbent earth *by four large stones*. The measurement may have been incorrect, but the kind of soil is just that in which we might expect to meet human remains, and the mode of burying has a strong resemblance to that practised in the stone age. Indeed I have sometimes wondered whether some of the immense tombs thought to have been raised over the bodies of kings might not have been piled up over the frame of some mammal of a race fast verging to extinction, the tradition of which gradually became indistinct and then lost.

It seems strange that we can get at no reliable account of the Patagonian giants. Commodore Byron said that out of a body of about five hundred Patagonians whom he saw, few were less than seven feet and none less than six feet six inches. While Byron was gazing at them in wonder his first lieutenant Mr. Cumming came up and was as much astonished as the commodore. "I could not," says Byron, "but smile at the astonishment which I saw expressed in

his countenance, upon perceiving himself, *though six feet two inches high*, become at once a pigmy among giants." Mr. Clarke who sailed with Commodore Byron and who, in the last voyage of discovery, succeeded on the death of Captain Cook to the command of the two ships, says in a letter to the Secretary of the Royal Society that some of them are certainly nine feet if they do not exceed it, and that the commodore who was nearly six feet high, stood on tip-toes and tried to put his hand on the head of one of them which he could just do; now this man was not one of the tallest. Mr. Clarke says there was scarcely a man among them less than eight feet and that "they are prodigiously stout and proportionably made as ever I saw people in my life." "The women I believe run from seven and a half (feet) to eight."

Buffon however denied that there was a race of giants, and M. de Bougainville, who reached Patagonia only three years after Byron (or 1767), says they are not gigantic, and that what makes them appear so is "their prodigious broad shoulders, the great size of their heads and the thickness of all their limbs." He again is contradicted by Captains Wallis and Cartaret, the latter of whom measured some of them. A gentleman in the navy who about twenty years ago measured three hundred, told me that more than fifty were over six feet six, and many of these fifty above seven feet.

In every instance vast physical development was purchased at the expense of all that renders life precious—health, active energy, intellect, duration of life, enjoyment of society, and the hope of offspring. Even extraordinary stoutness tends to produce similar

results with the exception of the intellect, which though it has never appeared in a highly developed form, still seems to retain all its energy at any rate in very stout persons, with an instance or two of which this chapter shall close.

As a farther proof it may be said that so far as my researches have led me to assume anything for certain, it is that the men distinguished for great age, as Henry Jenkins, Parr, James Stuart, and others, and those remarkable for extraordinarily strong constitutions or great vigour of the organic and animal life, were in all cases middle sized or not very tall or stout men.

Every englishman has heard of Daniel Lambert, but every englishman does not know that he possessed, except as regarded his corpulence, one of the finest constitutions possible and that he was one of the most temperate and active of men, yet he died apparently of sheer exhaustion at an early age. The only disorder he ever suffered from was a slight attack of inflammation, or feverishness, although if he got wet through he would never change his clothes, and when out boating was often drenched the whole night. On one occasion he was engaged with some friends in drawing a pond, and as they were accustomed at these frolics to souse each other thoroughly, Lambert forestalled them by first of all walking up to his chin in the water; he passed all day in his wet clothes, merely threw them off when he returned home, and the next morning when they resumed their sport he put on the same dress still wet. Then in the course of the day he lay down in the boat and slept comfortably for a couple of hours, from which very

rational proceeding he experienced no discomfort whatever, though the weather was rather inclement.

Possibly his extreme temperance contributed to his resistance of cold, as he was a small and careful eater. He never drank anything but water, though being a fine singer, having a remarkably full, powerful, and extremely clear tenor voice, and being very fond of society, he was exposed to great temptation. He slept less than other men and could always wake within five minutes of any time he wished. He never almost went to bed before one o'clock and was never more than eight hours in bed, slept with his window open and with his head no more raised than other people. He felt no inclination to drowsiness either after dinner or at any other part of the day, and his breathing was always so perfectly free and active that he did not snore at any period of his life, which for "a man of continual dissolution and thaw" seems perfectly wonderful.

Lambert's parents were in no way remarkable for size, nor were any of his family inclined to corpulence with the solitary exception of an uncle and aunt by his father's side, who were both stout people. Besides a brother who died young the only other children his parents had were two sisters, both persons of the middle size.

He was so active that even when he had grown to be a big man he could kick to the height of seven feet, and when thirty-two stone weight he walked from London to Woolwich with less fatigue than several middle-aged men. His vast bulk and the rapid growth of it gave him no pain and before he was so very stout he never knew what it was to lose his wind;

and even then he felt so little discomfort that though he could not walk up stairs on account of the exertion necessary to lift so enormous a mass against the force of gravity, yet he could walk very well he thought on level ground for a quarter of a mile or so. He could stoop to write without any trouble.

In his youth he was passionately fond of field-sports and always retained his taste for them; especially however and to the very last he seems to have loved cock-fighting, which in those days was passionately pursued by gentle and simple, even by people who would have been shocked at the idea of being thought cruel or vulgar. He was also a famous otter-hunter, fisher, and swimmer, and in the intervals when he was not travelling to exhibit himself enjoyed looking after his game chickens, setters, pointers, and terriers, of which he had a fine collection, and reading the Racing Calendar.

By the time he was nineteen Lambert began to think he should be a very stout man, he was very powerful and made flesh fast, and having succeeded his father as gaoler at Leicester, he attributed his subsequent rapid and steady growth to having so little exercise, an opinion which though very common is one I totally dispute. Lambert was long after this much more active than the majority of even very lean men; in fact it was his immense and rapid growth that gained upon his activity, not his indolence that allowed his vast frame to attain such an unheard of size.

Even when he was such a monster he was still conscious of being adequate to extraordinary exertion. While showing himself in Piccadilly a person chose to

be extremely impertinent to him, for checking him with great firmness and propriety when making some very ill-bred remarks; Lambert cut the discussion short by threatening to throw him out of the window unless he instantly left the room, which he did without raising any objections.

The immense amount of oil contained in Lambert's frame enabled him to float like a cork. From his boyhood he was an excellent swimmer, and lads of the town who wished to learn flocked to take lessons from him. When he grew so very stout he also grew so light that he could swim with ease in the Soar with two ordinary sized men on his back.

He was a man of a peculiarly honourable, retiring, and delicate mind; it was long before he could bring himself to endure being stared at as a show and he always knew how to meet and repel impertinent questions. Indeed he was not only a most generous and honourable man but of the most humane and noble disposition; not content with discharging the duties of his office as gaoler with the most unceasing kindness, he always exerted his best offices during the trial of every prisoner. Few it is said left the prison without testifying their gratitude, and the magistrates settled fifty pounds a year for life on him when after a few years of office he gave up his trust.

It may be safely said that few men ever led a more stainless life, or were more justly and widely esteemed by all around them. What some persons might value more, and what certainly does seem strange is, that a man in his position should not only have manifested all the tact, high sense of honour and propriety, but have expressed himself with all the correctness and humour

of a polished gentleman and scholar. On several occasions he showed that he was quite as good a match at repartee as at fisticuffs.

He was chivalrously brave, and on one occasion when two Savoyards had loosened a she-bear upon a fine dog which was barking at it, finding all his remonstances thrown away, he snatched a pole out of the hand of one of the fellows and dealt the bear such a blow that he stunned her. The dog got away, but, the bear turning upon Lambert, the dog again attacked it in the most gallant style. Lambert rained blow after blow, and as he was in the flower of his strength and could carry five hundred-weight with ease, his blows must have rather astonished the brute; still she pressed on, defending her head in the most scientific style, and her antagonist having fallen owing to the slippery state of the ground, which was covered with ice, she gained on him so fast that by the time he was on his feet again she was so close upon him that he felt the heat of her breath. At this crisis he gave her a blow on the skull with his fist which brought her to the ground; she immediately took to flight, the people tumbling over one another in heaps to get out of the way, while a smaller bear with a cocked hat on, which had been standing upright against a wall staring at the scene, no sooner beheld the issue of the fray than it took off its hat and turned a somersault at Lambert's feet in token of submission.

Lambert died without any visible disorder and quite suddenly, in his fortieth year. So little did he anticipate his end being near that on arriving in the evening at Stamford, where he died, he sent a message to the editor of the *Stamford News* requesting that, "as

the mountain could not wait on Mahomet, Mahomet would come to the mountain;" a request with which Mahomet complied. He retired to bed rather fatigued with his journey but cheerful as usual, and died before nine o'clock the next morning.

At the time he died he weighed nearly fifty-three stone, being almost nine stone heavier than Mr. Bright of Maldon the last time he was weighed. Lambert was nine feet four round the body and three feet one round the leg; yet so little inconvenience or oppression did his immense bulk occasion him, that Dr. Heaviside said his life was as good as that of any other man. It was necessary to take down the wall and window of the room in which he lay to allow his coffin to pass to the grave, towards which it was rolled on cog-wheels. His coffin measured a hundred and twelve square feet.

The famous Bright of Maldon in Essex, who flourished in the early part of last century, would in all probability have far outstripped even Lambert had he not died at the very early age of twenty-nine. Unlike Daniel Lambert, Bright was descended from a family greatly inclined to corpulence both on the father's and mother's side; indeed many of his ancestors had been very stout people, — a tendency which ran out to perfection in him. He was always very fat from a child, although he was very strong and active. From his earliest days up to within two or three years of his death he took a great deal of exercise, which, as has often been noticed in such persons, had no effect in retarding his enormous growth. He was a good walker and a very strong man, but one of the most incredible things told of

him is that he used to follow the hounds on horseback after he had come to weigh between thirty and forty stone. There is no accounting for what blood and pedigree will do, but I should have thought only the mammoth horse nearly twenty-one hands high, which was shown a few years ago, could have carried such a ponderous mass of bone and muscle over a five-barred gate. When he did get a "purl" he must have come down with tolerable impetus.

We have said he was very stout as a boy, but there was nothing to indicate that he was one day to be the stoutest man for his years ever seen in England,—perhaps in the world. At the age of twelve he weighed ten stone four pounds, horseman's weight, or a hundred and forty-four pounds; but this is not so very unusual. Several young people have been exhibited heavier than this, and I have seen a young man in Cumberland who weighed thirteen stone when thirteen years old, and a boy in London (both pursuing their ordinary occupations) who weighed quite fourteen stone by the time he was fourteen years old, though a great deal of his school-time was given up to attempts at reducing his weight by means of incessant exercise, a pony being kept on purpose for him. The extraordinary thing about Bright is that he grew faster almost every year; by the time he was twenty he weighed twenty-four stone, and before he was twenty-eight he was forty-two stone twelve pounds weight, with only his waistcoat, shirt, knee-breeches, and stockings on. As an experiment, these articles were afterwards tried and found to weigh sixteen pounds. In Hone's "Every Day Book," however, his weight is stated at six hundred, *one quarter*, and nineteen

pounds," which, if I understand it rightly, for the one quarter makes it rather obscure, means forty-four stone three pounds. What was his exact weight at the time of death, only thirteen months later, is not known; he had, however, grown at the same rate as ever, which was computed to be two stone a year; so that he must have been about forty-five stone, or with his clothes on forty-six stone. As he was then only twenty-nine years old he was clearly a very much greater prodigy than Lambert, and had he gone on at the same rate he would at forty years old (Lambert's age when he died) have attained the incredible bulk of sixty-seven stone.

Mr. Bright is described in that immensely valuable storehouse of notes and queries, Hone's "Every Day Book," as having died at Maldon at the age of twenty-nine years. His biographer calls him "an eminent shopkeeper" of that town, and says that at the time of his death he was the largest man living, or that had ever lived in this island. He stood about five feet nine inches high; his body was of an astonishing bulk, and his legs were as large as a middling man's body. Though of so great a weight and bulk, he was surprisingly active.

After Bright's death a wager was proposed between Mr. Codd and Mr. Hants, of Maldon, that five men of the age of twenty-one, then resident there, could not be buttoned within his waistcoat without breaking a stitch or straining a button. "On the 1st of December, 1750, the wager was decided at the house of the widow Day, the 'Black Bull,' in Maldon, when five men and two more" (!) "were buttoned within the waistcoat of the great personage deceased. There is

a half-sheet print published at the time representing the buttoning-up of the seven persons, with an inscription beneath to the above effect."

It is said that he was less temperate than Lambert, and that the consequences of self-indulgence were a disease in the legs which embittered and shortened his existence.

The next eminent person in point of weight was an immense cornishman, Anthony Payne, the Falstaff of the sixteenth century. At the age of twenty he measured seven feet two inches, with limbs and body in proportion, and strength equal to his bulk and stature. What his exact weight was is not stated, but he is spoken of as having exceeded another mighty cornishman, Charles Chillcott, of Tintagel, who weighed almost thirty-three stone; he must therefore have been no chicken. Like Lambert and Bright he was uncommonly active in body, and of a remarkably firm mind, besides possessing a "large fund of sarcastic pleasantry." Indeed, his great prototype Sir John, and Quin the actor, a remarkably stout man, seem to have been made to show that fat people are by no means stupid. He must have been a nice person to joke with certainly.

"In early life" says his biographer "he was the humble but favourite attendant of John, eldest son of Sir Neville Granville, afterwards Earl of Bath, whom he accompanied throughout many of his loyal adventures and campaigns during the revolution and usurpation of Cromwell." We are also told that his high spirits enabled him to cheer his lord during the many mishaps and trials which he, like so many cavaliers of that day, had to encounter. Certainly it would

have been difficult to find a more eligible companion in such a strife, and perhaps no knight errant was ever so well suited. It is gratifying to know that his noble master was not unmindful of his services, and that Charles II. behaved better to him for his fidelity than he did to many of those who served him and his father with such heroic and unselfish loyalty. He was made one of the yeomen of the king's guard, and when the Earl of Bath was created governor of the citadel of Plymouth, Payne was made a gunner there. "His picture used to stand in the great hall at Stowe, in the county of Cornwall, and is now removed to Penheale, now the seat of the Granville family." At his death the floor of the apartment was taken up to remove his enormous remains. As he died in 1691, he attained for his size, a very fair age.

The fat Prussian boy, Hermanes Bras, shown at Bartholomew's fair in 1819 exhibited this peculiarity, that he began to get "amazingly lusty" at six months of age, and when he was fifteen months old he was nearly eight stone weight. This ponderous juvenile grew so steadily that when he was eighteen years old he was very nearly thirty stone weight. He was then nearly six feet high and in the girth of his arm and leg rivalled Lambert, the calf of his leg being nearly three feet round and his arm two feet; still seeing that he was as tall as Lambert and quite seventeen stone lighter, there must have been a vast difference in the frame of the two men. He is described as being very active "as active as a man of the common size," which is utterly incredible, fond of music, a fair performer on the violin, and able to converse in German, French, and Dutch, with fluency. The reader

will possibly think it not so very remarkable that a man should be able to speak his native tongue.

If the reader should ever find himself getting very fat, steadily dilating into that semblance of an oblate spheroid which was once the distinguishing beauty of the burghers of Manhattan, it may be some comfort to him to know that there are means of reducing himself to natural compass if he will only use them. Mr. Wadd in his amusing work* mentions one man only five feet high, and yet twenty-three stone weight, who in six months brought down his weight more than five stone, and another who being obliged from a sudden attack of poverty to enter the workhouse, had all the trouble of reducing his weight taken off his hands and so effectually performed for him, "that from being as corpulent a person as ever I saw, he had become altogether as thin." Another corpulent person who lived in a garrison town, which was taken by the French, was by them shut up in prison, possibly because they did not know what else to do with him, and at the lapse of twenty years was found alive and well, being quite freed from any burthen of fat, so that the process here was almost as effectual as in the workhouse. Dr. Gregory reduced a patient eight stone by putting him on a diet of brown bread and tea with apples, he also took a pint of port or sherry every day.

Avicenna, who was a very practical man though a quack, used to recommend fat patients to take a pound of oil of violets mixed with melted beef suet; this took away their appetites he said (I should think it

* Comments on Corpulency; Lineaments of Leanness, &c., by William Wadd, Esq.

did). Other authors have recommended the german girdle of emptiness, the Elixir Proprietatis, pills made of ashes of cray-fish, sponge, and pith of sweet briar, which must have been very efficacious, and several others on which Mr. Wadd dilates with a grim humour that is perfectly irresistible. One stout gentleman found that with plenty of animal food his fat manifested no change, but a nervous state under which he suffered got decidedly worse, then after two or three freaks, such as living on nuts, he really succeeded by means of a vegetable diet, in bringing himself down nearly two stone in twenty-one days, when a jollification upset everything, and vitiated all the results.

The real secret of failure in most cases is that men won't starve themselves a sufficiently long time. In general they are abstemious, but very few men can stand absolute starvation for a long time. They will do anything but the one thing which is absolutely necessary, go without food. A fat sportsman consulted his surgeon as to what he should do to get thin: "Keep your eyes open and your mouth shut," was the very matter of fact advice. "Poh! nonsense," said the refractory patient, "that won't do for me; "*give me something to take!*"

Here then are several variations which might very easily have been inherited and turned into species, and if the reader will go through Lawrence on Man, Graves's Studies in Physiology, and a few other authorities, he will be able to add to the list; but I don't think that even then he will find any which have become hereditary, a fact which I leave the followers of Mr. Darwin to solve as they best can.

CHAPTER XIII.

LIFE OF MEN OF GENIUS.

"The proper study of mankind is man."

In conformity with the plan already spoken of in the chapter on the laws of life, I now proceed to place before the reader a sketch of the principal results in the human frame from great development of the brain. So far as seemed compatible with a careful and clear outline of these results I have abridged or compressed them to the utmost extent, so much so that I am afraid I have rather erred on the side of incompleteness than redundancy. Even now they may appear tedious and overloaded—still as the conclusions to which they seemed to lead startled and interested me, I am not without hopes that they may interest the reader. If he finds nothing new he may yet be led to reflect upon the agency of the law which seems to operate so incessantly against the over-accumulation of genius and wealth, and to cause the stream of power and riches to flow back to the hands of dull mediocrity; to watch the cyclical operations of the vital force regulating at once the simplest functions of life and the work of the mightier powers of intellect; prescribing at one time the limits of fatigue or the digestion and at another controlling by the extinction of a family the growth of a power which would reduce the rest of the race to utter slavery—for I think it

is impossible to deny that such must have been the case had the children of great conquerors continued the work of their forefathers, and the sons of great statesmen and speculators successively added to the vast accumulations of those who founded their families.

The selection of the names intended to exemplify the "marks of genius" may appear arbitrary. I can only plead in excuse that the silence of biographers on points I sought to elucidate, compelled me often to limit myself to those histories which yielded information on such topics, and that if I have omitted many celebrated names it was from no wish to set up any novel standard of merit, but because I thought the list already long enough, and that I could add nothing likely to repay the trouble of reading.

After going through numerous biographies the first thing I made out was, that it is impossible to be a genius and a big man at the same time. The heaven-born spark, the divine afflatus, must not be lodged in too ample a tenement. It is not impossible to find great ability and energy established in a bulky habitation of flesh and blood, but then there are so often drawbacks attendant upon this. Thus Ariosto, Johnson, and Scott were all three burly fellows, but Johnson shook and rolled about like a huge jelly-fish; Scott was paralysed from childhood, and Ariosto was ill made. Caius Paterculus says that Cæsar exceeded his fellow citizens in stature, but then he seems to have had no hair on his skin and very little on his head. Constantine was of large stature.* Alfred the Great was tall and stout, but

* Gibbon: Decline and Fall of the Roman Empire, vol. iii. p. 148.

weakly from his childhood to the close of his noble and eventful life. M. Gaillard* fixed the height of the illustrious Charlemagne, a very practical man and no unworthy follower of Sigbert and Clovis, at six feet and a quarter of an inch. Columbus was tall and well-formed. Cromwell was a big fellow; and Buffon and Bœrhaave, quite as able men in their way and perhaps much more useful, were tall, commanding, and powerful in their build; Bœrhaave especially was a remarkably powerful man; Boyle was tall but slender and emaciated. Alexander von Humboldt has been described as being tall and strong but thin, round shouldered and troubled with an organic tic which always made him pronounce sh like s. I saw him at the railway station at Hanover in 1849 with the late king of Prussia, and certainly should not have called him by any means a tall man. Humboldt though I suppose he knew more of science than any man that ever lived, having studied it with scarcely an interval of rest for seventy-six years, was not a man of creative genius, neither was there anything of the Kepler or Newton in him.

Christopher North who can I think scarcely by any possibility be placed in the first rank, is described by De Quincey as being within half an inch or so of six feet, but Mr. Southwell puts him down at only five feet ten. I have often seen Wilson and been close along side of him, and I should certainly have said he was an immensely strong man, quite six feet high with enormous breadth of shoulders. He must at any rate

* Gibbon: Decline and Fall of the Roman Empire, vol. iii. p. 377.

have been rather a contrast to his friend De Quincey who was considerably under the middle height and slender of form. The palm however for size must be given to Schiller who stood six feet three, german measure, though certainly the only palm for absolute excellence I should be disposed to award him, as it quite surpasses my understanding to comprehend how people could ever compare him to Byron, or why such tiresome vapid stuff as the Yungfrau von Orleans can be put alongside of many good spanish or english plays of which we rarely hear even the name. That Shakspere and Homer should be distasteful to him and that he should admire Rousseau, is a proof that his judgment was certainly not of a high order.

But these are striking exceptions, and the utmost height even such favoured mortals attain to is (Schiller excepted) about six feet, or the minimum size for the Guards. This is an exceedingly painful statement to make, as the imagination naturally connects great deeds with a lofty presence. The older writers clearly looked upon them as inseparable. It was ever the Achilles, the Hercules, the Theseus, that charmed the mind. It was to no purpose that great Homer drew his portraits of the crafty Ulysses, and spear-shaker Tydœus, from nature; that he made the first a square high-shouldered greek of the true varmint build, the other—

"Whose little body lodged a mighty mind,"

like our own Roebuck, or the renowned William the Testy whose magnanimous spirit utterly consumed

him. It was all in vain; a creed proof against the experience of life and the teaching of Homer was hardly likely to yield to time. The greeks continued to lay as much stress upon height as the Horse Guards, and fined a little general (Agesilaus) for marrying a little woman. The scythians, impressed with the fame of Alexander, were astonished when they found him a little man.* The ridicule of Addison was powerless against the despotism of belief† and the genius of Garrick had to bow to the influence of a long-cherished theory—the immortal little actor could not play Hamlet (who seems after all to have been a fat imbecile young man of very moderate personal attractions) without an extra inch of leather on his heels, while Johnson felt himself almost bound to apologise for Milton not being "of the heroick stature," and Gibbon said of Belisarius that "his lofty stature and majestic countenance fulfilled their expectations of a hero." As Mr. Tytler has well remarked, the bulk of mankind are ever more captivated by what is wonderful and romantic than interested in the truth.

And yet history tells us that the masters of the intellectual world at least, and very often of the material part of it too; those men who rise up as has been finely said of great events and troubles of state, as though Heaven sent them to point out to nations on which side lies their safety and on which their ruin‡—were frequently enough, insignificant, though respectable persons. Alexander the Great was a wry-necked little

* Kames on Criticism, vol. i. p. 186.

† "One would believe," says the great essayist, "that we thought a great man and a tall man the same thing."

‡ Carlo Botta, Storia d'Italia.

monarch;* others have rather extolled his beauty, not an uncommon attribute of great genius. Of the renowned Narses, the contemporary of Belisarius, Gibbon tells us that his feeble and diminutive body concealed the soul of a statesman and a warrior.† Mr. Tylor, in his Anahuac, says that there still exists an extremely small suit of armour said to have been worn by Cortes, the very smallness of which he considers a proof of its having belonged to him. Mr. Tylor adds, that when Mr. Bullock saw the tomb of Cortes opened some thirty years ago he was surprised at the diminutive size of the skeleton; and of Charles the Fifth Miss Pardoe says, "*of middle height* and weak health, he possessed no energy of either voice or gesture; his under lip was heavy and pendant, his eyes cold and colourless, his face long and melancholy in its expression, and nothing in his appearance tended to reveal the extent of that genius and strength of character by which he was subsequently distinguished."‡ Napoleon, certainly a very handsome man, was, as is well known, short and squat, "le petit caporal." Wellington was decidedly taller than his illustrious rival, while Nelson was little bigger than a boy. These men stand confessedly among those at the very summit of fame in arms; but after them come a host of lesser names, heroes of all sizes except the right size, from the little weakly Agesilaus, and Julian the Apostate, victor and successor of Constantine, to the days of the unhappy Condé, slain or murdered (tastes differ) at the battle of Jarnac, and the unconquered

* Gillies' History of Ancient Greece.

† Gibbon, Decline and Fall, vol. iii. p. 148.

‡ Court and Reign of Francis I. vol. i. p. 310.

Suwarrow, with here and there a burly form like that of Cromwell towering above the crowd.

And when we come to great poets and painters, and mighty thinkers, who heave up the world of thought as with a lever; men who like Bacon, Hunter, and Newton, looked into the cloudy realms of times yet to come—the brilliant meteoric dreamers—we find the regulations growing still more stringent, especially on approaching ages that afford us certain knowledge. Thus Aristotle is said to have been of slender form and weakly figure; Terence was of moderate stature and slender; Peter the Hermit, like his great prototype, Saint Paul,* was short, mean in appearance, and of a most unprepossessing look altogether;† while St. Paul is pourtrayed in "Leisure Hours in Town," as not only dwarfish, but bald and stammering. Paracelsus, who, whatever his errors, was a most extraordinary man, was, to judge from his skull, not bigger than a boy. Harvey, the real discoverer of the circulation, "was very small in stature;" according to Mr. Johnson, the biographer of Coke, "rather below the middle size." Tycho Brahe, the renowned astronomer of middle size; as was also the famous Burman, of Utrecht, a man of extraordinary abilities.‡ Sir Thomas Brown, the justly renowned author of the Religio Medici, was of moderate stature. Madame de Raimond Poisson says that Moliere was rather tall than short, with a good carriage and a handsome leg, that he walked with great gravity and had a very

* Histoire de St. Thécle; Dict. Phil. vol. i. p. 397.
† Life of Cœur de Lion, by G. P. R. James.
‡ Johnson's Lives of Eminent Persons.

serious look. He had a large nose and mouth, thick lips, a swarthy complexion and large black eye-brows by the play of which he made his physiognomy very comic. Newton again was a short compact man much like Plato;* but of Bacon's stature, the author is driven by the absence of any accounts to confess his entire ignorance. Mr. Hepworth Dixon describes him as slight in build, rosy and round in flesh; he also speaks of him as being handsome, with a straight strong nose of the pure english type. Wren was thin and low in person.

When the House of Commons, in one of the many infamous persecutions De Foe suffered, resolved to burn one of his books† by the agency of the common hangman, they described him in the proclamation as a middle-sized spare man of a brown complexion and dark-coloured hair, a hooked nose, sharp chin, and grey eyes; features in which he remarkably resembled his illustrious friend William the Third.

Voltaire was a thin puny being. John Hunter one of the greatest of men, who really foresaw not only the germ but almost the mature fruit of the sublime doctrines sketched out by Carus, Goethe, and St. Hilaire, "was a little sturdy fellow" like Hogarth, while his illustrious brother Dr. William Hunter was not only short but slender also, and strange to say his almost equally illustrious brother-in-law Matthew Ballie was in person below the middle size. Sir Joshua Reynolds is said by Northcote to have been rather under the common height. Goethe, more a philosopher than

* Sir David Brewster's Life of Newton, vol. ii. p. 413.

† The Shortest Way with the Dissenters.

a poet, was of medium stature if we may trust Schiller in such a matter—Mr. Lewes makes him an inch or two over this. He had the front of Jove himself, a fine aquiline nose, arched lip, and magnificent lustrous brown eyes, being extremely handsome. He has been described as rather tall, and is said to have looked so, but this is explained by his having such a commanding presence. Like many such persons he was extremely sensitive to atmospheric influences. Jenner, "dieser Britte unsterbliches Andenkens," was rather under the middle size, "his person was robust, but active and well-formed." * Milton was of the same low compact build as Burns. Pope was a weakly being so low in stature that to bring him to a level with common tables it was necessary to raise his seat, and Moore was very like him, being "a little, a very little man." Thomson like Byron was just above the common size, being five feet eight and-a-half, and both inclined to get fat. Savage, Johnson tells us, and he knew him well, was of middle stature and a thin habit of body. Bloomfield when a boy of fifteen was not bigger than lads generally are at twelve. Of Mozart, the biographer in the "Penny Cyclopædia" says, "in bestowing on Mozart so abundant a share of genius and such exquisite sensibility, nature seems to have thought she had been sufficiently bountiful. Physical strength she denied him; small in stature, slight in construction, and feeble in constitution, he was not calculated to reach even the middle period of life." Beethoven just attained the middle size, and was stout and of a strong looking figure; with him we must close the list not for want of matter but of space.

* Baron's Life of Jenner.

Again; deformities are no passport to the enchanted land of genius. An occasional limp is rather an advantage than otherwise, as in the case of Scott and Byron. Pope, too, was not a fine figure, nor was Johnson, but nature seems to have in general steered clear of embarking such a precious cargo as genius in a warped and twisted craft. Very great ugliness is always objectionable, though intruders of this class have been allowed, especially when the disfigurement took place after birth.

There certainly have been some singular looking mortals among great men, but it was some slight eccentricity of feature that distinguished them rather than downright ugliness. In person, Virgil is said to have had a clownish appearance, and to have been very shy and diffident and of feeble health. William Taylor, the old barber who used to shave Thomson the poet and dress his wig, told the Earl of Buchan that the author of "The Seasons" had a face as long as a horse, and that his hair was as soft as that of a camel, "yet it grew so remarkably that if it was but an inch long it stood upright *an* end from his head like a brush." The wig was certainly a monstrous invention, an absurdity worthy of the age which first saw it, the age which matured the growth of a wretched degraded burlesque of greek architecture with all its tawdry gilding, hideous statues and gin-palace pilasters, but even the huge full-buttoned periwig of Anne's day must have been something better than hair like a camel's and standing up like a brush. Thomson also stooped, perspired enormously and was rather corpulent, so that when he and Pope were together they must have been a strange-looking pair,

Pope being little, thin, ill-made, and grotesquely dressed.

Schiller too was a most singular-looking mortal. His legs says Scharfenstein were nearly the same size all the way down to his ankles, his neck was long, his face pale, his eyes small, and encircled with a red rim: then to see his uncouth head *stuck full of curl papers* and a huge queue dangling from it, in addition to which Emil Palleske admits that he had red hair and freckles * with an extremely shrill voice, that he was short-sighted, that his limbs failed in elasticity, and that at first sight the (his) face had something of a bird, of an oriental aspect in it.

When he was "packed into a uniform of the old Prussian cut, particularly stiff and ugly for surgeons; on one side of his face three formal pipe-clayed rolls representing curls, a small military hat scarcely covering the crown of his head, from which was suspended an enormous queue," and his long throat strangled in a narrow horse-hair stock, he must have looked a genuine original. "His feet were particularly curious, and owing to the thick white felt that lined his gaiters, his legs were like two cylinders and of a larger diameter than his thighs which were compressed into tight-fitting breeches. In these gaiters and boots, thickly coated with blacking, he moved stiffly, unable to bend his knees properly, just like a stork." A symposium of such oddities, with Johnson in the chair and Scarron for vice, would have been a sight for the gods, who might with great propriety have sent that amusing old cripple Vulcan to wait upon them.

* Schiller's Life and Works, vol. i. p. 49.

A man of great genius especially if of a poetic turn is not expected to have red hair; brown is the favourite colour, but auburn is allowable and so are certain intermediate stages. As we have just seen, one of Schiller's biographers says he had red hair, but his sister Christophine describes him as having light yellow hair "encircling his pure white forehead;" perhaps this was a delicate way of putting it. Black, especially where it is the custom of the country to wear hair of this hue, is in good taste. Furthermore a genius is not to affect any great singularities, such as having one eye of one colour and the other of a different tint. Blindness is of course not counted as a blemish.

Hugh Miller says of Wellington, Washington, and Cæsar that "had they all been brethren, the family likeness could not have been more strong. There is the same hard mathematical cast of face, the same thin cheeks and prominent cheek-bones, the same sharply defined nether jaws, the same bold nose—in each case the indented aquiline — and the same quietly keen eye. And in the countenance of Cromwell, though more overcharged as perhaps became his larger structure of bone and more muscular frame, we find exactly the same lineaments united to a massiveness of forehead possessed by neither Washington nor Wellington." *

The same writer speaking of Bruce and Burns says, "In general size, the head of the indomitable king who so strongly impressed his character on a rude and turbulent age, and the head of the no less indomitable

* Essays, p. 50—57.

peasant who in an age of thinking men stamped the impress of his scarcely less deeply, exactly resemble one another. They were heads of about the same bulk as the head of Dr. Chalmers. Both display great animal power. There is a towering organ of firmness in the monarch which we miss in that of the poet, and larger developments of cautiousness and hope; but in imagination and intellectual benevolence, the scale predominates greatly on the other side." *

Dr. Wilson in his "Religio Chemici" † says of Dalton, "the second Newton of english physics," "In stature Dalton was about the middle size, of strong rather than of elegant proportions. The likeness between his head and face and those of Newton was often observed during his lifetime, and is said to have become more striking after death. When engaged in study a certain air of severity such as may be seen in the busts of Newton, shadowed his features; but the gentle smile on his lips showed even the inexperienced physiognomist that it was deep thought, not angry passion, that wrinkled his brow." If future researches should show that a particular style of thinking, such as was certainly common to those illustrious men, is connected with a particular class of physical development, I plead that the fact must be looked upon as a possible illustration of the hypothesis I have spoken of.

Having thus arranged what size he is to be and what sort of hair and complexion a man of genius is to have, it may be as well to furnish some instructions respecting his health, the conditions of which nature

* Essays, p. 138. † P. 357.

has made almost as stringent as those relating to height and thickness. Be it known then that a genius may have as many headaches, colds, and sore throats as he likes; gout too and heartburn are included, or he may have a fever if he prefers it, or fits of some kind in moderation, but he must not meddle too much with real downright diseases such as cancer and aneurism; genius being I suppose the parent malady that like Aaron's serpent swallows up the rest. Johnson is a rare instance of a scrofulous poet, and Napoleon an equally rare example of cancer and genius united in the same person; a combination to which he perhaps owed the loss of his throne, as if he hadn't had such an irritable stomach and hadn't eaten that mess of garlic and mutton at one of the most critical moments of his eventful campaign in Saxony, he would not have been obliged to leave the field of battle, and therefore might not have lost the day, the connection between which and his final overthrow is too apparent to require any further remarks, unless indeed the reader prefer the theory of Mr. Lizars, that like every other evil change in the fortunes of men, it all arose from some person or other being addicted to smoking. Gainsborough is said vaguely enough to have died of cancer in the neck.

Even that interesting disease consumption is quite out of his way. The very few who have been cut off by it were simply young men of great abilities, very promising certainly, but never of the genuine metal. Sad as the early fate of Kirke White and such men appears, it was in some respects a mercy. They would have borne badly that cold neglect and censure

to which genius, if not ever gaining ground, must lay its account. When such men perish young, the world compares their fall to that of a fair young flower struck down by the deadly breath of the wanton changeful spring; when they linger on, the world compassionately gives them to know that in its opinion they have made a mistake in choosing letters as their calling. To revert however, Washington Irving was indeed pronounced consumptive, and got so far as to have a pain in his chest and a cough. When he set out on his famous voyage to England, that voyage which was one day to give to the world those exquisite pictures in the "Sketch Book" and "Bracebridge Hall," the captain of the ship confidentially observed that there was a chap would go overboard before they got across. Captains of ships are occasionally wrong in such matters like other people, and Irving enjoyed such good health for very many years after, that with the exception of a tiresome eruption he was scarcely even troubled with anything that kept him a day in doors. The truth is that men endowed with great genius are of better stuff, and though not always long-lived, scarcely ever die very young. When they are cut off in the prime of life it is generally by some severe acute affection, such as ague, against which the strongest flesh and blood are of no avail.

A remarkable proof how tough they really are is the fact that many of them—Kepler, Addison, Voltaire, and Fontenelle among the number—were in their infancy such puny little manikins that no one thought they could live at all, yet they managed pretty well upon the whole. Kepler was a seven months' child, and extremely weak, thin, and

sickly; Addison was so weak and unlikely to live that he was christened the day he was born, and yet would have probably attained a good old age had it not been for his habits and domestic unhappiness; as it was he died in his forty-eighth year. Voltaire and Fontenelle were born almost in a dying condition; Voltaire indeed was baptized immediately, as it was never thought he could live, yet one died in his eighty-fifth year, and the other lived to within a few weeks of a hundred.* Poor old Stowe, the truth-loving chronicler, was marvellously afflicted with gout,† yet he contrived to rub on some fourscore years. When Goethe, who lived to be an old man, was ushered into this scene, it seemed very doubtful to those who beheld him whether he was not more dead than alive, in fact he was black and almost lifeless, which are not very reassuring signs. He also flirted with death. By dint of dissipation, bad diet, and absurd endeavours to carry out Rousseau's rubbish about returning to a state of nature he contrived to make himself thoroughly ill, and was seized when he was nineteen years old with such violent bleeding that his life was only saved by the merest chance. Long after this he was troubled with a tumour in his neck but of what nature is not said; it had to be frequently cauterized, but that was thought nothing of in those days.

Gibbon was very weak and delicate in early life as was Pope; Aristotle was of puny frame; Demosthenes was naturally of a poor constitution and suffered from

* How tough also some lady writers are, the reader may see in the 99th number of the *Quarterly Review.*

† Habits and Men, by Dr. Doran.

shortness of breath. Lord Brougham, speaking of Black the great chemist, says, "His health was never robust; it was indeed precarious at all times from a weakness in the bronchia (*sic*) and chest, but he prolonged life by a system of the greatest abstinence, frequently subsisting for days together on water gruel and diluted milk." Watt the engineer was so sickly in boyhood that he was prevented from benefiting much by school instruction. Burke was very delicate when a child, as were the celebrated Haller and Schiller, who was very subject to convulsions, in fact he continued to be disposed to spasms. I suppose it was something of this kind that upset him before he underwent the mysterious process of having his "poetical receptivity and spontaneity restored" by reading a friend's works. After his death it was found that one of his lungs was destroyed, but it seems to have been done, not by consumption, but by water in the chest.*

Perhaps few men of genius tried hardships more than Beethoven in his wandering style of life, yet the only illness which he ever had was that of which he died. Nelson was another reckless mortal; he was a poor weakly lad, yet he stood ague, poisoning, dysentery, the sickening heat of the West Indies, the cold of the polar seas; the most severe duty perhaps that any seaman ever went through, and the crushing sense of as bad treatment as any servant of his country could well be subjected to. With all this "there was reason to suppose from the appearances upon opening the (his) body, that in the course of

* Palleske's Life of Schiller.

nature he might have attained like his father to a good old age."*

The magnificent description then of—

> "The fiery soul that working out its way,
> Fretted the pigmy body to decay,
> And o'er-informed the tenement of clay,"

is, though sublime, inapplicable. It is not so easy to o'er-inform the tenement of clay, and those who are fond of consoling themselves by dwelling upon the results of overloading the brain might do well to bear in mind what Bacon says—that if too much bending breaks the bow, too much unbending breaks the mind. Graves accounts for the long life of authors by supposing that literary pursuits are favourable to longevity, but I don't see it in that light; I believe the reason to be original goodness of constitution. Sometimes one might wish it to be otherwise. To think of Dryden offering Lord Clifford "the wretched remainder of a sickly age worn out with study and oppressed by fortune;" of Milton descending to the grave, blind, poor, and forsaken; of Swift a driveller and a show, and Scott sinking beneath his long and fruitless toils, is almost enough to make one desire for them the lot of Shakspere and Byron. Even fame often comes too late—

> "The guerdon when he hopes to find,
> Comes the blind fury with the abhorred shears
> And slits the thin-spun life."

Nor does the poet go mad though genius has been looked upon as so nearly allied to insanity that some of

* Southey's Life of Nelson.

those very profound persons who understand everything and believe nothing, by dint of which they convince themselves if they induce no conviction in others, have viewed it as a variety of madness (even some very able men have shared this belief).* A gentleman however of a different stamp, a really clever and amusing writer, has lately attempted to show that they are all just the merest trifle off the balance, a little cracked, screws he calls them; this I admit because I believe everybody is that at times, but anything like real madness I deny. Poor Cowper was certainly somewhat insane, but he seems to me more an instance of a madman turning poet than of a poet going lunatic. Tasso was said to be mad, but was certainly not a whit more so than many persons at large. I know of no other instances; the temple of the soul may be a little strained and wrung, but it is made of first-rate material. The partition between wit and craziness may be thin, but it is as strong for all practical purposes as sevenfold brass. It is weak-minded people generally who go mad.

If genius be a malady it is as truly epidemic as measles or scarlet fever. Every person has heard of the Augustan age, the age of Leo the Tenth, of Louis the Fourteenth, and of Anne. There is more meaning in this phrase than we always find. The greek dramatists came so close together, that before the last of them went down into the grave, ere the mighty hand that drew Cassandra raving before the palace of

* "Great wits are sure to madness near allied."

"The lunatic, the lover and the poet,
Are of imagination all compact."

Atrides, and the awful picture of Prometheus launched into the abyss amid the rending of the earthquake and the wild roar of the thunder, had crumbled into dust, the drama of Greece was gone to return no more.* One age produced the comedies of Cratinus, Aristophanes, Eupolis, and Menander; Philemon and Diphilus created the new comedy in a few years; Terence and Afranius were contemporary.

"In the times of the two first Cæsars which had the art of government in greatest perfection, there lived the best poet Virgilus Maro, the best historiographer Titus Livius, the best antiquary Marcus Varro, and the best or second orator Marcus Cicero, that to the memory of man are known."† Horace and Virgil were born within five years of each other. Within eighty years came all the great historians of Rome, except Cato and Livy. One age produced most of the great painters of Italy; and one short cycle gave to the world Spenser, Shakspere, Cervantes, Bacon, Napier the mathematician, Tycho Brahe, Kepler, Vieta, and Galileo; less than an age brought forth Milton, Butler, Molière, Boileau, and Dryden. Wellington and Napoleon, Humboldt, Cuvier, and William Smith the great geologist, were born in the same year, and the great age which has just passed away gave birth to the contemporaries of Scott and Byron, of Goethe and Burns.

While human passions remain the same as in the birth of our race, and while that element of the mind continues unchanged which recognizes the demonstration

* Ueber dramatische Kunst, von Augt. Wilhelm von Schlegel, vol. ii. p. 200.

† Bacon's Advancement of Learning.

of physics, that which created the dignity of the Apollo Belvedere or Diana the huntress, or designed the wondrous glories of York and Lincoln Cathedrals, of tower-crested Prague, and Cologne with its forest of pinnacles, the picturesque dresses and rich colours of the mediæval times, seems gone. As we look down the long vista of vanished years, the various forms of genius grouped together might almost be compared to a lofty tree of which each successive branch departs more and more from the original type, or a mighty building the growth of successive ages, of which the newest parts have in time so varied, that we hardly recognize the radical elements of form though still present. No clue to this problem, instances of which might be multiplied to an enormous extent, has been afforded as yet; Humboldt traced one branch of it so far as to work out the gradual introduction of pictures, the inroad of statuary, the heavens and the fields into poetry. The explanation has been suggested that it is owing to the craving of some new field of distinction. Dr. Gillies is one of those who have advocated this view. "Great genius," says this gentleman in his fine history of Greece, "is rare and commonly disdains imitation, and the first poetical prizes being carried off, men who felt the animation and vigour of their own powers, naturally directed them to objects which possessed the charm of novelty and promised the hope of excellence."

It does not seem to have occurred to those writers, that if no other cause were at work we might very reasonably have expected to find a succession of great writers in a much shorter space of time, and that a century or two must have exhausted every topic but

science, on which genius has ever shed its ennobling and hallowed rays. Why under these circumstances might we not have had a race of men following as fast on the heels of Socrates and Plato as they did on each other, immortal emulators but not rivals? why should not the age of Mecænas have been followed at once by the savage simplicity of Dante, the genial beauty of Boccacio, Chaucer's deep love of nature, and Shakspere's titan-like strength? Why is it that we find five or six immortal men living so near each other that all had seen each other, and then a pause of centuries, if mere dread of imitation were the reason of their wanting followers?

I would venture then to inquire whether it may not be due to some molecular change, akin to that in the eye and mind which enables them to see beauty where it was not visible before—as after instruction, and whether it is not probable that parts of the brain of man undergo some slow, constant mutation, the work of an immutable law of constant transformation, just as we see whole races of men flourish and then fall into decay.

When we trace back the history of any great art, any discovery, any change in the national laws or popular tastes and habits, any innovation on the ballads, songs, legends and belief of a people, we find that so far from their value and beauty appealing at once successfully to the eye and brain, they have in every instance been met with overwhelming hostility and ridicule; yet once rooted in a land they cannot be weeded out again. Then it is clear that the people think differently, that is to say a function of the brain is differently performed, owing to a change in matters

which the people had no share in bringing about, and if the power and direction of thought depend upon conformation of brain as there seems every reason to believe, a change of thought so entire and lasting may be accompanied by infinitesimal change of structure.

It is certain that changes take place by which whole races perish off. So completely and rapidly has this ensued even within the period of written history, that over great part of the earth there is nowhere a large tract of country on which a bygone empire has not left its traces or even held its seat; growing from a rude horde of warriors and hunters till men felt the necessity for laws; crushing every rival by war or policy; guarding every point with skill; handing down the memory of its great deeds by inscriptions on the stone and rock, and then in every case just as it attained the greatest height of splendour and power, it began to decay, as the sun only towers above the crest of the mountain to sink into the shadow of the valley or be quenched in the ocean.

"Quicquid ad summum pervenit ad exitium prope est."

The causes to which this decay is usually ascribed seem to me to be quite inadequate to account for it. Luxury, corruption of manners, effeminacy, are the means generally spoken of; debauchery of manners is a favourite cause with some writers. But luxury in the proper sense of the word was never greater at Athens or Rome than it now is in Paris or London. If by corruption of manners (I borrow the phrase) is meant the same thing as debauchery, it is impossible to reconcile the view with the fact that many

most flourishing nations have passed through long periods of debauchery which it would be hard to exceed. Let any one examine the revolting pictures of the excesses under the regent Orleans, the court of Francis the First, those of Louis the Fourteenth and Fifteenth, and even the time of Henry the Fourth, the scandalous license of english manners as portrayed in the pages of the "Spectator" and other writers of that day, the universal drunkenness that prevailed throughout England and if possible more generally in Scotland to within a very recent period, and say if Carthage or Thebes could have revealed more degrading scenes. As to effeminacy we never see it spread except among nations on the decline; in England it may be said to have gone out of date; the mincing fops and beaux of Pope and Richardson, the dandies of George the Fourth's day, are passed away to return no more, and therefore here the cause certainly existed without the effect. I have touched upon this subject already, but as the belief is so widely spread, I will at the risk of being thought tedious adduce another instance opposed to what I consider an untenable view.

The fall of Persia was even more mysterious and sudden than that of Rome. Within fifty-two years the hardy warriors who had conquered the vast forces of Babylon and overrun the city itself, had sunk into such universal depravity and cowardice, that hardly any number of them could be made to assail a determined phalanx of greeks. For a time indeed the strong hand of Cyrus kept things together. His wonderful administrative and fiscal genius, his vigilance and integrity prevented at any rate the decay from showing

itself, but at his death, the fall of the empire was like that of a glacier, which has been stayed in its headlong course while the melting of the ice below has made its downward path more easy and rapid. Now it is scarcely very probable that there was any material difference in the food of Babylon and Persia, nor is the climate of the conquered province more enervating than that of the other. As to luxury having effected this change I must say I am rather puzzled at the very outset to define what luxury is. If it means eating rich food and drinking too much wine, sleeping on soft couches and wearing fine garments, I think from what we know of the habits of the wealthy in England and France we may dismiss the idea as unworthy of a second thought, and it is very doubtful if ever the mass of the people were in a position to indulge in such things except just after the sack of some town. Besides the thin poor wines of those days could never have done much harm to a healthy race, and if they had drunk tokay and curaçoa every day, it is impossible to imagine a whole people being ruined in five hundred years by such a cause.

Sir Archibald Alison would have us believe that the stay of states is the valour and patriotism, the virtue and religion, of a few of the ruling class. Let us try the case of Rome by this test. The six princes who flourished between Domitian and Commodus have been eulogized as a group of unequalled minds, as an unbroken chain of virtuous, pious, learned men.* The life of Adrian was one long toil to repair the roads, bridges, ports, and towns of the great empire, to

* Bacon : Advancement of Learning.

improve its irrigation and navigation, its trade and policy. Yet these efforts did not even stay the downward course of Rome. The fact is the race had grown old; the piety and wisdom of old age will not keep an empire together. Their learning was like that of the monastery and schoolmen; Adrian desired to comprehend all things; Antoninus who followed him would carve an argument into atoms; Marcus Aurelius who followed him was a sort of angel as well as a philosopher, but in not one of them do we see a trace of a Scipio or a Romulus.

A much more plausible argument is that advanced by Gillies, Alison himself, and others;—viz. the invariable ruin that ensues from the hasty adoption of democratic views of government. That ruin ever has followed and ever will follow, the falling of government into the hands of the people is, so far as we can judge by the past, an absolute certainty, but this seems to me more the way or mode in which a people decline than the cause. Absolute governments have fallen just as often. Indeed free government seems to me an offspring of the mind, of the physical form of the brain, and just as inborn in every succeeding race in some countries, as it is utterly foreign to the immutable people of the east.

A man of genius must not on any account have eminent children. An illustrious house is quite allowable; a line of Rollos,* of Vernets or Bayards,† of Scipios or Plantagenets, but not of Newtons or Shaksperes; we may have the wit of the Sheridans, that is so far as the reader likes to credit the tales about

* Acton Warburton.

† Histoire de France, par le père Daniel, t. x. p. 140.

wit, but we shall not have that of Falstaff twice over. Even the first class succumb to the prolonged action of the law; Horace Vernet is just dead and with him dies the race of the Vernets; he had no son, and his only daughter, who married Paul Delaroche, died childless in 1845.

What seems strange is that the very bent of mind which most distinguishes the sire is often least shown in the son. We see the great Mushirwan Chosroes, the conqueror of Justinian, the dreaded rival of Belisarius, whose reign is extolled by the poets as the golden age of persian rule, succeeded by the wretched Hormizdas, a cruel, vain, degraded beast. The son of the proud and able Ifa Mahomet Khan weak and imbecile; the race of Charlemagne, as of so many great soldiers and rulers, little better than sots and fools; Richard Cromwell, the son of the lion-hearted daring Protector, a simple-minded squire contented to live as plain as Mr. Clarke of Cheshunt; the son of the brave incorruptible De Foe a mean villain; the darling child of Napoleon, born king of immortal Rome, to whom the conqueror of eleven monarchies bequeathed a mighty lineage and an early tomb, satisfied with a colonelcy in the army of Austria, a country in all ages without the ambition of conquest or arts, the natural foe of France and Italy; the daughter of the sturdy Milton, infirm and unlettered; the heir of Lord Eldon mad;* the son of the polished Chesterfield an incurable booby; the brave and resolute Henry the Fourth followed by the feeble Louis the Thirteenth, a puppet in the hands of his favourites.†

* *Times*, January 17, 1853.

† Life of Henry IV. by G. P. R. James.

Among many other instances, I will take first two great military kings of England and Scotland; the two most renowned soldiers of that age, Edward I. and the illustrious Robert Bruce. Edward, the greatest of the proud and handsome Plantagenets, admitted by a justly esteemed scotch historian (Mr. Patrick Fraser Tytler) to be the ablest prince of his day, of unconquerable resolution, an iron will, an activity that even surpassed the labours of his ancestor, Henry II., and scarcely knowing what defeat was, was succeeded by a son who seems to have vacillated all through his sad reign between the most childish arrogance and the most pitiful imbecility; while the kingdom which Bruce had wrested from the english by so many desperate struggles, and which he had governed with such ability, was betrayed and deserted by a son so lost to all sense of duty, so forgetful of all his father's glory, that he proposed of his own free will to leave it on his death to an englishman.

One example more, that of Chaucer, "chiefe Poete of Brytagne," "rose of rhetors all." We are told that he grew exceeding rich, having (as Speght says) "at one time almost a Thousand pounds per Annum, a very large Estate in those times, and scarce credible to have been acquired by a Person in his station,"* indeed he (Chaucer) admits that he had grown wealthy. He was patronized by two kings in succession and befriended by the famous John of Gaunt, "time-honoured Lancaster," a great patron of learning. Even after he had rendered himself suspected and lost his wealth,

* The Canterbury Tales of Chaucer, 1741, xvii.

which was soon got rid of by a fugitive for treason (as he became), he retrieved so much that he was enabled to pass the latter part of his life in comfort at his "small but neat castle," where afterwards dwelt Charles Brandon, Duke of Suffolk.

He had two sons, Thomas and Lewis. The second son was a pupil of "the famous Nicholas Strode," but nothing seems to be known of him after his tenth year. Thomas married "one of the greatest fortunes in England, Maud, daughter and heir of Sir John Burgershe," niece of the Lord Chancellor and Treasurer. He was made chief butler to the king, speaker of the House of Commons, sheriff of Oxfordshire and Berkshire, constable of Wallingford Castle and Knaresborough Castle, in great favour with Henry IV. and V., and was sent "embassador" into France on several occasions. By his wife he had one daughter, Maud, married three times, and last of all to the famous de la Pole, Earl and afterwards Duke of Suffolk, beheaded by the yorkists. His son had five children. What became of four of them I do not know, but the one who succeeded to Chaucer's estates and particularly the Hospital of Lincoln, after one or two ineffectual attempts, succeeded at last in compromising himself so thoroughly in some treasons that he was beheaded, and all the estates of Chaucer's family came to the Crown. He was not cut off by any severe, sudden act of vengeance; he forfeited his life as the just punishment for repeatedly and perversely plotting against one of the most sagacious and powerful kings of his day. Thus a house which might in a generation or two have stood forward among the ancestral families of England, ended in two sons, one of whom

is lost sight of after his tenth year, and the other of whom has a daughter, of whose five grandchildren four disappear at once, while the fifth is beheaded for downright stupidity.

How often do we see the workings of the same law manifested in the most common relations of life! How rarely does it happen that the father, successful to his utmost wish in his career, can make his son follow in the same chosen path! The keen, indomitable statesman rears a booby whom all his consummate tact can scarcely save from making an ass of himself, or a mere machine who can never be got beyond the trammels of the stiffest forms of routine; the shrewd, far-sighted, profound merchant accumulates a princely fortune to see it pass into the hands of a mere animal, whose highest aspirations are limited to the prize-ring or the turf, his intellect, heaven save the mark, hardly above that of the hounds and horses he spends his time with; the place-hunting, bullying lawyer who measures everything by success, whose code is to gain by any wile or lie, fights against all around him for the sake of some graceless nincompoop. Even the rage for possession is powerless against the law; the miser leaves his adored money to a spendthrift to be wasted in senseless debauchery.* He has toiled and heaped up for an end as bad as that which waited on the accursed toil of Sisyphus,

"Damnatusque longi
* * * * laboris."

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* "The first a reservoir to keep and spare;
The next a fountain spouting through his heir."

Mr. Lewes after observing that he is not aware of any musical genius springing from a family in which during two generations musical aptitude was not remarkable, speaks as if entirely opposed to the general opinion, and I therefore give his views. Popular experience, he tells us, pronounces the children of great men to be dunces, and he wants to know how this is to be reconciled to the doctrine of hereditariness, which rather hard word means the doctrine that form, features, temperament, acquired habit, diseases and strange forms of structure are transmitted to offspring, but the law by which they are transmitted is still hidden from us. Mr. Lewes thinks some part of the difficulty may be explained by supposing that the children of great men have been rather calumniated. "I am not so certain," he says, "that these much decried children have been dunces. If they have seemed insignificant when compared with their fathers, they would have been estimated quite otherwise had their position been otherwise; and the man who bearing an illustrious name, seems unworthy of the burthen, would be lauded by his biographers as a man of considerable merit had he been the father instead of the son of a genius. In our own day Byron, Coleridge, and Leigh Hunt, were the fathers of children remarkable even among the remarkable, and Shelley's son has faculties which would have distinguished any one bearing a less honourable name." I can only say that I am quite ready to set facts against this writer's views, and as to genius or anything else being hereditary I think if any theory is to rely even in the least upon such a foundation, that it has not a leg to stand on.

But it is much more *en règle* that a great man should have few or no children at all, for if he be blessed with any, they perish in an age or two as surely as the spring flower that has bloomed too early will sink beneath the returning fury of the east wind. Of all the illustrious men who have adorned the last five centuries I believe not one, with the exception of De Foe and Waller, has left a family that survived through the fourth generation; very few indeed outlived the second or third, by far the greater number dying with the parent tree, or if here and there some straggling branch survived, the members of it soon sank into such deep obscurity that they can now no longer be traced.

To an overwhelming preponderance of great names there is no family at all, or if there were the biographers have forgotten to name it. Indeed they generally think such matters below their notice; they can find plenty of time to decide some trumpery dispute about a text or date, which is the more sensible, as the next writer will reverse their judgment and the reader cares nothing about the matter; they can trace a family to the days of Alfred or William the Conqueror, but they seem to think it is sheer waste of labour to tell us even in a dozen lines how an author looked, dressed, and lived, which are just the very things most persons want to know.

There can be little doubt that this absence of family is the work of some immutable law. The result is far too uniform for mere chance. In whatever land we take up the thread of the story, however far we go back, even to the dim and grand old times when Homer drew earth-shaker Poseidon heading a charge of

the Greeks, or Jove reclining by streamy Ida, or still farther when Orpheus sang in Thrace of the great men of old, and Moses laid his hands upon Joshua that the son of Nun and not his son, might lead Israel into the land of promise, we find it at work, and so far as can be seen, it is destined to work so long as men shall achieve mighty deeds and be enrolled in the chronicles of fame. The life of Confucius and Zoroaster is the life of Aristotle and Socrates, of Bacon and Newton; the childless old age of Plato and Æsop is repeated in the histories of Voltaire and Gay. The same narrow circle bounds the family hearth of Sophocles and Shakspere, of Milton and Dryden, and Cæsar and Alexander leave their vast empires to the children of other men, as Napoleon and Nelson must have done, had the one dreamed of conquests and the other been able to retain them.

It is almost needless to say that the loss of so many of the writings of the older authors, which followed upon the fall of the greek republics and the decline of the roman empire, together with the wars which raged like some chronic disease in these states, leaves us quite in the dark about Homer, Hesiod, and even much later writers. Where Plutarch, now nearly eighteen centuries ago, could only gleam a few brief records about some of his heroes, we can scarcely hope with the greatest amount of diligence to trace anything that is certain. What is known however most strongly bears out the view given above.

Of Homer as might be expected nothing is known; in fact, considering the great discrepancies as to the date at which he lived, if anything had come down to posterity it could only have been received with the

greatest caution. Hesiod is not spoken of as having any wife or family. Æsop's descendants, if he ever had any, must have soon died off, for when the Delphians offered compensation for his death, the only person who came forward to claim it was a grandson of his master, no one more nearly connected with the sufferer having appeared; at least so says Herodotus "qui ne ment pas toujours."* Confucius had only one son, from whom however three thousand chinese are said to have sprung; a very possible fact, but one of which the proofs must be so vague and distant that the reader must believe just as much of it or as little as he likes.† Pindar had a son and daughter by his two wives, Sophocles also two children by his two wives, Herodotus two sons who died before him. The illustrious Pericles, one of the most brave, munificent, eloquent, and profound men of the great Athenian school, wept over the tomb of his last child who fell by the plague, but as his family is spoken of as numerous before the outbreak of this dire malady, we can only conjecture that he might in the course of nature have left children.‡

Socrates, it is well known, was married to a lady whose energetic disposition, and it is said taste for practical jokes, were fitted to bring out into full relief the forbearance of the great sage's temper. When he fell a victim to that diabolical spirit which persecuted Alcibiades, Pericles, and so many illustrious

* This polite expression of opinion respecting the old historian is borrowed from M. Voltaire.

† Confucius is introduced here because as far as possible chronology has been taken as a guide in the arrangement of the names.

‡ History of Ancient Greece, by John Gillies, vol. ii. p. 226.

men, he was visited in his last hours by his wife, who is said to have brought with her their infant child. If however the speech assigned to her at their last meeting be correct, I should be inclined to doubt if she was quite such a pestilent jade as she has been described. Scolds in general are clever women, shrewdly given to talk, and she seems decidedly in this instance at least to have talked very little and very commonplace. "Socrates," she said, "here come your friends whom you for the last time behold, and who for the last time behold you." As her husband was quite aware of all this previously, it appears in no wise very pathetic or quite like rising to the dignity of the scene. Socrates however does not appear to have felt disposed for her society any further, and she soon raised clamour enough to atone for any silence she had been compelled to observe.

By this excellent lady Socrates was the father of three children. Xenophon is vaguely said to have had some children. Gillies simply says, "Gryllus the son of Xenophon fell in the battle of Mantinea," but it is said that when he built a temple to Diana on the banks of Elian Sellenus, his *sons* often hunted the wild boar and red deer in the neighbouring woods.

When Epaminondas, mortally hurt in the bloody fight of Mantinea, lay dying in his tent, those around him lamented that he should die without children to inherit his mighty name and emulate his noble virtues. The dying hero, with the prescience of genius, told them that he left two children, Leuctra and Mantinea, which would transmit his renown to the latest ages, and he was right. Plato seems to have lived in the strictest celibacy all his life. Aris-

totle had a son and daughter by his two wives, and Demosthenes had a daughter, of whom the only mention I find is that her father put off his mourning for her when Philip of Macedon was murdered, in order that nothing might mar the intense satisfaction he felt on learning the fate of one whom he considered the oppressor of his country. Alexander the Great left no children living, (unless it were his natural son Hercules by the daughter of Darius, of whose further fate I find no account), but his wife Roxolana was pregnant at the time of his death. Anaxagoras had children, for when told that they were dead he said he knew that they had been born mortal. Respecting Archimedes, Anacreon, and Empedocles, I find no history whatever of any family.

The absence of allusions to the children of their great men in the greek writers, and those who have compiled from them, struck me forcibly. I felt drawn to the conclusion that in a country where the claims of genius were so freely recognized (after death only it must be confessed in too many instances), and where above all the domestic habits and lives of all classes were so well known, this silence must really mean the same absence of family as in our own day; that the land which fired the genius of Pindar was no more prolific than hard-working England.

Ovid had a daughter by his third wife but seems to have been blessed with no family by the others. Horace, no mention of wife or family. As Virgil left all he had (the manuscript of the Æneid amongst the rest, with directions that it should be burned) to the Emperor Augustus, Mæcenas, and two other friends, it is most probable that he had no other heirs. Quinctilian

says that Livy left behind him a letter to his son recommending the study of Cicero and Demosthenes. Terence is said to have left a daughter.

Passing them we come to the dark ages of the world. The great emperor Heraclius left but two sons, and the life of one, Gibbon tells us, was a long malady. The character of Mahomet's first wife, if not of his second, is so very doubtful that we may as well dismiss the subject.* Charlemagne had several children, and as he is said to have had nine wives, besides falling over head and ears in love with a corpse, the account is quite feasible. Alfred the Great, again, left five children, three of them being daughters. Mr. James, in his life of Cœur de Lion, for whom he might justly claim a much higher title than that of a mere knight-errant, considering him as a great general, speaks of course of his marriage, but not of his having any children.

Wallace, if indeed even the most partial of his admirers can rank him among great generals, seems never to have married, while the illustrious Robert Bruce, who may I suppose be ranked as Scotland's greatest general of ancient times, and who added to the vast courage and resolution of Wallace, sound judgment and great practical sense, had by his first wife a daughter called Marjory whose only son mounted the throne under the title of Robert II., and by his second wife a son named David who succeeded him, Mathildis who married an obscure person called Isaac, and Elizabeth who became the wife of Sir

* For some very interesting information on the mortality of Mahomet's family, see Gibbon (edition in four vols.), vol. iii. p. 435.

Walter Oliphant of Gask; he had also a natural son of whom I have no particular account after seeing him figure in the disastrous attack on Mar's army at Dupplin. As to his only legitimate son, he was one of the most contemptible characters of his day. To a very feeble and limited capacity he united great obstinacy, a haughty temper, an extreme love of pleasure, and a disposition to make any sacrifice for the immediate gratification of his personal resentments.* With such qualifications it is not all surprising that he very speedily got into hot water. Genghis Khan, the only man I suppose who after all ever conquered Asia, had three sons, and with him we may end the list.

Not to weary the reader let him take one or two solitary instances and run over the lives of a few of our poets. He will find that Chaucer had two sons, whose fate I have already sketched. Shakspere had three daughters, "of *which*," says the biographer quaintly, "two lived to be married, Judith, the elder, to one Mr. Thomas Quincy, by whom she had three sons who all died without children, and Susannah, who was his favourite, to Dr. John Hall, a physician of good reputation. She left one child only, a daughter, who was married first to Thomas Nashe, Esq., and afterwards to Sir John Barnard of Abington, but died likewise without issue."†

"It is a curious fact," Hugh Miller remarks in one of his delightful essays, "that Shakspere like Sir Walter Scott cherished the ambition of being the founder of a

* Lives of Scottish Worthies, by Mr. Patrick Fraser Tytler.

† Rowe's Life of Shakspere.

family." "All his real estate," says one of his later biographers—Mr. C. Knight—"was devised to his daughter Susannah Hall for and during the term of her natural life. It was then entailed upon her first son and his heirs male, and in default of such issue on her second son and his heirs male, and so on in default of such issue to his granddaughter Elizabeth Hall; and in default of such issue to his daughter Judith and her heirs male. By this strict entailment," remarks the biographer, "it was manifestly the object of Shakspere to found a family; but like many other such purposes of a short-sighted humanity the object was not accomplished. His elder daughter had no issue but Elizabeth, and she died childless. The heirs male of Judith died before her. And so the estates were scattered after the second generation; and the descendants of his sister were the only transmitters to posterity of his blood and lineage." Of Spenser's numerous family only three sons and a daughter were reared, and I cannot trace them further.

Of Ben Jonson nothing is reported in any biography. Milton had surviving children only by his first wife; they were girls, and the eldest, deformed and infirm, died a wife, while the next one died single; the youngest married a weaver in Spitalfields, so that her father's hatred of high society must have been thoroughly gratified in this instance at least.

The utter downfall of this illustrious man's family reveals one or two of the most touching episodes in the history of letters which we possess. When the masque of "Comus" was performed for the benefit of Milton's granddaughter, for which Johnson wrote the

prologue spoken by Garrick, the great moralist in announcing the time and place of the performance, quoted from Dr. Newton the interesting statement, that all Mrs. Foster's (the granddaughter's) children were dead, "and that in all probability *Milton's whole family will be extinct with her*, and he will live only in his writings. And such is caprice of nature, this granddaughter of a man who will be an everlasting glory to the nation, has now for some years with her husband kept a little chandler's or grocer's shop for their subsistence lately at the Lower Holloway, in the road between Highgate and London, and at present in Cock Lane, not far from Shoreditch church." *

It has been said that Milton's children went forth to poverty. The author has since been informed that Dr. Newton's surmise was not verified; that some children of one daughter survived, and that since the world lost sight of them better times have dawned upon their fortunes. He is heartily glad to hear of it, as the few glimpses revealed by the biographers of the past century gave little hope of such a happy turn of matters. Dr. Newton perhaps looked only at the fact that this Mrs. Foster had lost all her children and forgot that she herself was one of a family of ten.

Beyond all doubt the reader has seen or heard of Holland House—

> "Reared by bold chiefs of Warwick's noble race."

A noble house it is too, worthy of the founders and of those who lived in it. The memory of Shippen and Fairfax, of Rogers, Sheridan, and Fox seems to linger

* Johnson's Works, 1818, vol. x. p. 48.

and nestle in the grand old place, and still in fancy we can see Cromwell and Ireton talking together on the lawn and Diana Rich frightened at her ghost, and Addison writing his sketches in the long gallery. Now it was most probably at this very house that the great essayist received a visit from Milton's daughter, as this happened not long before his death, and he died here. It must have been a touching sight to see the old woman stricken with poverty, talking of her father and family to the kindly genial Addison; his fine features saddened with the inroads of domestic unhappiness and fatal sickness. It is said that he told her she had no need to say whose child she was; he knew it from her face. If so, Addison must have been more familiar with Milton's portraits than most men of that age were. Probably he had studied some bust like the noble one in Cripplegate church, which is that of an old man strongly marked, one who had thought and suffered much. Certainly he never saw Milton; he was a weakly baby of two years old, tottering feebly about the little rectory at Milston, when the great poet died, and Milton's youngest daughter must have been nearly if not quite seventy when he saw her.

A sad parallel to this may be found in Mr. Foster's biographical essays, where we find the last male descendant of dear old De Foe all but closing his eyes in dire and long-borne poverty. His pitiable condition was discovered almost by accident, and a subscription was set on foot by some gentlemen as much distinguished for their humanity and kindness as for their abilities, who soon collected enough to enable him to pass his last days in comfort. After payment of all expenses

incident to his illness and death a small balance was handed to his daughters.

Of Butler it is related that he was married, and that is all we are told. There is no mention of his having had any family. Waller had a large family, still represented. Parnell, two sons who died young and a daughter who survived him. Congreve, so far as I have found, had no family, and Gay, Johnson, Swift,* Goldsmith, Otway, Savage, Cowper, and Shenstone may without further ceremony be ranked under the same head.

As to Thomson, since all the profits which his tragedy "Coriolanus" produced when brought upon the stage after his death, were given to his sisters, it is most probable that he had also had no family of any kind. Dryden had three sons: Charles, who was usher of the palace to Pope Clement XI., and was drowned in an attempt to swim across the Thames at Windsor; John, who is said to have died obscurely at Rome; and Henry, who entered some religious order. Fielding seems to have been only once married; he left a widow and four children, the utmost latitude in this way attained by any writer of his stamp, for I suppose it will be admitted that in respect to creative genius Fielding ranks far above such a class as Waller stood in. Young, like Addison and Byron, had an only child. The further fortunes of the two first I have not been able to trace very well, but Byron's daughter has been dead some years, and sleeps by the side of this matchless poet in the vaults of Hucknall church, and

* Johnson's Lives of the Poets.

now her only son, Lord Wentworth, has followed her to the land of shades. When she was laid in the vault with Byron, there was in it one vacant space more, and Lady Byron, consistent unto death, did not choose that it should be occupied with her remains; it will be better filled with those of the grandson, which it is to be hoped will never be allowed to rest save by the side of his mother and grandsire.

Sheridan had one son by his first wife, who had much of his father's talent, but fell a victim to indulgence. Sheridan married again, and had also a son by his second wife.* Michael Bruce sank into the grave at the early age of twenty. Chatterton died a mere boy. Crabbe is briefly spoken of as having a second son. Burns stands almost alone in having surviving sons. Moore outlived his family, and Scott's race is so completely extinct that the author believes not even a grandchild is now alive. The escutcheon so cherished at Abbotsford now figures on the hatchment, blurred by the herald's "painted tears," as a sign that it has for the last time told the sad tale of another death. Yet Scott was a man of great physical strength and endurance, and few young men ever bade more fair than his eldest son to turn out a model of manly strength. "When he was fifteen years of age," says Washington Irving, "he looked quite nineteen; and by the time he had grown up, he was at least six feet three high without his boots."

The fate of few great writers has been more affect-

* Hone's Every Day Book.

ing than that of Washington Irving, the exquisite, genial humourist, the immortal chronicler of Manhattan's happy days. Devotedly attached to a girl, worthy of him in every way—Matilda Hoffman—his heart really broke when she died quite young. From that day he seems to have closed his soul to anything like love to woman, though constantly in contact with some of the most attractive of their sex; yet, he never alluded to this part of the story, never mentioned the name of Matilda Hoffman, and even nearly thirty years after her death, could not hear it without the most violent emotion.

"And thus the heart will break, yet brokenly live on."

Of Wordsworth, Southey, and still more recent writers it would not be proper to speak, so that I now find it necessary to take up other forms and fashions of genius.

Perhaps a few words about the great captains and statesmen of modern times may not be out of place here. Oliver Cromwell had six children, but only two survived him, though he died at the comparatively early age of fifty-nine. Marlborough's line sank as rapidly as it rose. His only son died prematurely, and on the death of this child the fine estates and renowned title passed to his daughters; but the eldest died leaving no son and these great family honours passed to her sister, and through her to her husband Charles Spencer, Earl of Sunderland, in whose house I believe they still remain. Charles the Twelfth seems to have had an inborn, unconquerable aversion to women altogether. Captain Cook,—no mention of wife or family. Suwarrow's one son is spoken of.

Neither of the two mighty chiefs Fox or Pitt seems to have had any family. Nelson, in the last entry in his diary before the deathless victory of Trafalgar, left to the beneficence of his country his adopted daughter; and the beneficence of his country responded so nobly to the wish of the mighty hero, that but for private charity she might have starved. "This child," Southey says, "was believed to be his daughter; and so, indeed, he called her the last time he pronounced her name."

Among the great english painters, architects, and artists, I find nothing said with respect to the families of Lely, Kneller, Holbein, and Morland. Hogarth had no children. Garrick was married, but there is not a word of his having had any family. Sir Joshua Reynolds,—not spoken of as being married; indeed he bequeathed nearly all his property to Miss Palmer, his niece, afterwards married to the Earl of Inchiquin. Gainsborough married, but there is no allusion to his having had a family. Nollekens is spoken of as wealthy and childless. Mrs. Siddons had four children of whom only one survived her.

I am quite unable to give any account beyond a few meagre scraps of information of the fine old scottish poets Henrysoun, Dunbar, Lindsay, and others. Sir David Lindsay had no children. Gavin Douglas is said to have had a natural daughter; I find no account of other children. I regret this most deeply, for their claims to our admiration have been only too long ignored and too little inquired into; although, for tender beauty and faithful description of nature,—for fine perception of all that is solemn and affecting, and for simple and noble style, they have

never been surpassed by any race of poets, and rarely equalled. Had space and the nature of the work permitted, I would have given a few brief extracts to show all this. Yet so utterly were most of these great writers neglected during their lives, and so little has been done till quite lately towards vindicating their great names, that even the most laborious historians have only been able to give imperfect accounts of them.

The great poets of other countries seem to have got on much in the same way. Dante, about the comparison of whom with either Homer or Milton I would just venture to suggest a doubt, maugre the very decided opinion of Voltaire, had two sons, and from what we are told possibly a third. Petrarch wanting to drown that absurd passion for Laura, formed a connection which resulted in the birth of a son and daughter, the son however died before him. Boccaccio, no mention of any wife or family. Ariosto two sons and even a grandson.* Machiavel left behind him five children almost in poverty. Camoens no relation of wife or family, thus with his frightful poverty at any rate exempting some few atoms in the general stock of humanity from an additional share of misery. Tasso seems never to have married. Cervantes had a daughter, Doña Isabel, who took the veil four years before his death. Joseph Scaliger never married, indeed I should think he never had time to do so, for he is said amongst other things to have read through all the greek authors in two years, and to have studied so hard that he passed whole days without eating,

* Lives of the Italian Poets, by the Rev. H. Stebbing, 1831.

which the reader can believe if he likes. Corneille was married and it might have been thought that he had descendants, as some years ago the *Times** stated that the present emperor of the French had granted from his privy purse a pension of two thousand francs a year to the Mlles. Corneille. There is however nothing said as to what branch of the family these ladies descended from. It is reported that Voltaire, who with all his errors and bad principles certainly possessed a spirit of chivalry and princely generosity, hearing that a grand-niece of Corneille was entirely without fortune and *almost without friends*, took her into his house at Ferney where she completed her education. Moliere was married but left only a daughter, a clever girl.† Boileau does not seem from the biographers I have consulted to have married, and this also holds good of Fontenelle and Metastasio. Goethe had two sons, one, the last born, only lived a few days. The eldest died before his father; he had married and the year after Goethe rocked the cradle of his *first* grandchild, so that I presume he had more; though none are mentioned in Mr. Lewes's work.‡ Mr. Thackeray who studied when young at Weimar, told Mr. Lewes that he never saw Goethe but three times; once "he was caressing at the time a beautiful little golden-haired granddaughter, over whose sweet fair face the earth has long since closed too." It was stated not long ago that Schiller's only daughter was present when the statue recently erected in his honour at Munich was unveiled.

* June 10, 1853.

† Vie de Moliere, par M. de Voltaire.

‡ Life and Works of Goethe, 1855.

Along with them may be ranked the great painters, architects, and musicians, over whose lot fate rules with the same stern impartiality. Thus Albert Durer had a wife but we hear nothing of his having children. On both points their biographers are silent respecting Michael Angelo, Raphael, and Domenichino; Correggio had a son and three daughters. Vandyck married and left one daughter. Claude, no mention of wife or family; in fact when he died his only surviving relations were two nephews and a niece to whom he left his property. Rembrandt had a son, Titus, who inherited his ample means; he was the pupil of his father but being Rembrandt's son was the only distinction he ever enjoyed. Of Teniers the younger and by far the greater there is no mention of wife or family, and the same of Murillo.

Of Handel again there is no evidence that he ever had either a wife or family. It is said that while at Venice his wonderful genius made sad havoc with the affections of a very famous and beautiful singer of the name of Vittoria, "but in this as in every instance of a similar kind, Handel showed no disposition to avail himself of any partialities exhibited in his favour,"* music in fact was his idol; for it alone he lived, thought and worked. Haydn was married, but soon after his marriage he was separated from his wife and left no children. Mozart, sublimely gifted Mozart, left behind him a widow and two sons, one of them adopted music and was living a few years ago, but he inherited his father's goodness rather than his talent; the other entered the austrian service and I have

* Gallery of Portraits.

never heard that he distinguished himself in any way. Beethoven, like Handel, was never known to form a tender attachment of any kind, unless it were for that Adelaide to whose memory, he composed the divine air which bears her name.

Again the philosophers appear in modern times to have fared almost as ill. Roger Bacon seems to have kept his vow of celibacy. Respecting Copernicus I find no notice of any wife or family. Paracelsus not spoken of as being ever married. Bacon was married but had no children. Kepler had children but I have not been able to trace their fate; they were probably soon lost to view on account of their indigence, for when this illustrious man died his widow and her offspring were in such poverty that they had not even the common necessaries of life. Galileo when seventy years old is spoken of as having lost a beloved daughter who was his stay, and of having had an illegitimate son. Harvey the discoverer of the circulation of the blood, a profound observer, though married never had any issue,* and the famous Des Cartes seems to have had neither wife nor family. Of Sydenham, of whom it was truly said that fame shed her brightest honours on his head, Wallis in his brief life of him is silent. Boyle was never married. In the Life of Locke given in the large edition of his works published in 1794 there is no allusion to either wife or family. The illustrious rivals Newton and Leibnitz seem also to have never married and to have had no children; a coincidence repeated later in Lagrange and Laplace.

* Life of Sir Edward Coke, by E. W. Johnson, vol. ii. p. 443.

Of all the offspring of the famous Burman of Utrecht only two survived.* Bradley the famous astronomer left one daughter but his line has now been many years extinct. Robert Simpson the restorer of Euclid remained unmarried. Boerhaave had four children of whom three died in infancy. Of Haller's wife if he had any I find no account. Franklin married and had children, a grandson of the eminent philosopher is also spoken of. Buffon left an only son who perished on the scaffold for the crime of being an aristocrat. Hume seems to have had no family.† Linnæus was married, but the only notice I have found of his family is that he joined with his profligate wife in persecuting his equally profligate son. Johnson, the rude coarse Johnson, had no children and was better without any. William Hunter who would have been the most illustrious man in his profession of that day, had he not been contemporary with his renowned brother, had no family and left nearly the whole of his large property to persons who were only distantly connected with him.

Sir William Jones the great sanskrit, persian, and oriental scholar, seems to have had neither wife nor family. Baron speaks of Jenner as having a family and celebrating the birthday of his eldest son. Brougham introduces to us Robertson the historian's eldest daughter and also his son, but like most biographers he gives us very obscure information on such points. Kant seems never to have married. Edmund Burke had a son who died before him. John Hunter was married but childless. "Watt," says his eloquent

* Johnson's Lives of Eminent Persons.

† Gallery of Portraits.

historian Lord Brougham, "had been married as early as 1764 to Miss Miller his cousin, and had by her a daughter who predeceased him, leaving children, and a son James who still survives, inheriting the scientific tastes, the extensive knowledge, the masculine understanding and the scrupulous integrity of his father. By his second wife Miss Macgregor, whom he married in 1776, he had one son Gregory, who unfortunately died in October 1804, after giving an earnest of brilliant talent and accomplishment." * Lavoisier was married and strange to say his widow also married a scientific man, the famous Count Rumford. Wollaston says Dr. Wilson "led a solitary life and was never married." Laplace no family, nor had Gibbon or Sir Humphrey Davy, though married. Porson lost his wife two years after he married and seems never to have sought wedlock again. Cuvier had four children by his marriage with the widow of M. Duvancel but they all died before him. Of all the family of the illustrious Robert Knox, the greatest anatomist and one of the most profound observers of his day, I believe only a son and daughter now survive.

There is no need to go into statistics here, even with the temptation before one's eyes of all this preponderance of daughters. But let any one simply review the history of his private friends or the annals of a village, and he will find the decline of one family almost invariably so balanced by the rise of another, that no such wide-spread decay can be traced as has now been chronicled. Were such results as these to ensue in a village they would depopulate it

* Lives of Men of Letters and Science.

within half a century, an event of which there is no record except among races like the red indian doomed to decay. Of course war, famine, and pestilence unpeople whole realms, but that arises entirely from visible causes and is therefore a different matter. Besides it is quite a mistake to suppose that wars however bloody and wide-spread, or plagues and earthquakes produce any enduring diminution in the population of a country. The wars of the roses and the league, the revolt of the Netherlands, the thirty years' war, the ferocious cruel wars begun and carried on by those champions of liberty and humanity, the republic, the convention, and Napoleon, produced so little lasting effect, that at the lapse of a quarter of a century the devastated countries were as well filled as ever.

There has been many a sad chapter in the history of genius, but the stern tale told by these figures is the saddest of all. A man of genius is perhaps in many respects more purely the child of destiny than people think him; in this part of his fate certainly there is clearly more of destiny than of choice. He reaps indeed the fame for which he has struggled, because there is no genius without the strength that always wins in the end. Biography shows that all that neglect, stupidity, and even the fiendish malice of foes and critics could invent, while it never yet destroyed a line worth saving, really adds more lustre to a writer's renown, as the blackness of the cloud lends beauty to the lightning and the rainbow. But the picture of his life is saddened with the decaying hues of autumn, the fame of his triumph is borne to us on the hollow voice of the winter wind, and his glory is

like the mournful beauty of the evening star when it dwells alone in the heavens, or beams fitfully through the clouds of a winter's night.

Perhaps after all it is better thus, for though not so inattentive to business as is generally supposed, men of genius seldom attain to such independence as to finish their labours in comfort and maintain a family at the same time. To their honour be it said that they are almost totally free from crime, a fact of itself sufficient to upset the abominable doctrine maintained of late, that out of a given number of people a certain number must turn out bad, must commit crime; a most mischievous deduction, for nothing could be more likely to determine a hesitating scoundrel than to represent him as the victim of fate. It is true that we may here and there find an incurable, perverse spendthrift like Savage; a drunkard like Porson; a brute beyond all redemption like Johnson; a free-handed insolvent like Steele, who when asked to return money could implore, flatter, complain, cajole, or anything else but pay it; a muddler like dear old Goldsmith and a cowardly villain like Rousseau; but these are only scum on the mighty stream. Men of real genius are above such miserable folly, just as they are above the debauchery and mischief so often vulgarly attributed to the character. The writer's creed is that true genius may give way to folly now and then, but that it will shake off all depravity like dewdrops from the lion's mane.

Mr. Lewes says,* "the slenderest acquaintance with biography tells us that genius is not always

* Life of Goethe, vol. i. p. 147.

found respecting minor morals, and that the biographies of men of genius are very unlike 'moral tales.' Nor are the conjugal chapters in such biographies by any means the pleasantest to read: Shakspere, Milton, Dante, Byron are not easily to be surpassed as poets, but as husbands it would require a race of Griseldas," &c. To me it appears that there is not the slightest ground for bringing such a charge against men of genius; taking them as a whole they are as good husbands and fathers as any other body of men. Nor do I think the examples very happily chosen; the idea that Shakspere cut off his wife with the second best bed to show that he was not reconciled to her, has in my estimation been quite disproved. As to Milton's wife, she had only herself to thank if her husband threatened to take another wife; if she chose of her own free will to stop away for months and prefer the society of her relatives to his, she could only expect that any man except a downright fool would not allow such work to go on, and Lady Byron put herself out of court when her gloomy cold unforgiving nature carried her so far that she refused to allow her ashes to lie with those of her maligned husband, who, whatever his follies, was kindhearted, generous, affectionate, and forgiving.

The physiognomy of great men does not seem to have been examined with the care it merits. We are familiar enough with their features, but they have not been studied to see if they yield any clue to a law regulating growth in any way. It would be most interesting to see if they vary like the succession and arrangement of features and the size of the frame in certain races of men; I believe this to be the case,

nay I believe some law of this kind extends to all habits and tongues. For instance, however english might change there is little probability that it would ever take up sounds like the polish, for these are not the genuine offspring of an english brain and larynx. Thus, too, a certain cast of mind will always be a reflex of a certain cast of brain and a certain developement of bone and muscle. The features being based on bone and muscle, will a certain class of mind be connected with a certain class of features ?

CHAPTER XIV.

LIFE OF THE WATERS.

"The rain which we see descending was thawed for us out of icebergs that have watched the polar star for ages : and lotus lilies sucked up from the Nile and exhaled as vapours the snows that are lying on the tops of our hills."—RELIGIO CHEMICI.

THE reader may be surprised to hear that the scenes of violence and destruction spoken of in the chapter on geology, the mighty changes effected in the shape and even in the very existence of countries, the total disappearance of whole races and dynasties of powerful and ferocious animals, have been brought about, not by the tempest and earthquake but by such insignificant agents as the atom of the chemist, the animalcule of the microscopist, the labours of the coral and chalk insects, the slow action of subterranean force upheaving the land, and the silent working of the restless water; above all by the potent agency of these two last.

The changes produced by the upheaval of the land have passed in review before the reader, and any disquisition as to the causes which are supposed to produce it would only lead one into a perfect quagmire of theories, speculative and unsettled as yet, and not likely to interest any person who had not a very strong appetite for dry details. Want of space will not allow me to say more about the chalk hills and coral banks, so that the agency of earthquake and that of water alone remain to be noticed here. The

former of these I shall pass over as briefly as may be; for the earthquake and volcano, fearful and destructive as they may seem, are often of far less moment in respect to the globe and its inhabitants than many a muddy river or some headland that changes the direction of an ocean stream. "If all the nations of the earth," says Lyell, "should attempt to quarry away the lava which flowed during an eruption from the Icelandic volcanos in 1783 and the two following years, and should attempt to consign it to the deepest abysses of the ocean, they might toil for thousands of years before their task was accomplished. Yet the matter borne down by the Ganges and Burrampooter *in a single year*, probably *very much* exceeds in weight and volume the mass of Icelandic lava produced by that great eruption."

Mr. Mallett and Professor Perrey of Dijon have catalogued six or seven thousand earthquakes, and every succeeding year adds largely to the number, while thousands of such convulsions take place unheeded deep below the ocean, in deserts, in ice-covered districts, and in rude lands inhabited by savages of which no record has yet been begun. Yet after all, their action has been most insignificant as regards the surface of the globe, except on the spots immediately convulsed. Within historic times all the earthquakes in Europe have produced less change than the wearing of the sea has effected on the coast of England alone. Like the volcano and hurricane their grandeur and violence make them appear of more importance than they possess. The first Napoleon caused more deaths than all the earthquakes since the days of Noah; the filthy state of our towns and our dislike of

that despotism which can alone secure cleanliness and health, destroy more human beings every year than Napoleon lost in the russian campaign, and the cupidity of shipowners, aided as it has always been by the supineness of sailors, has cost more ships and lives than all the storms that ever blew.

For the information and comfort of those who feel interested in earthquakes it may be useful to remark that they can have one at any speed they like, from six or seven miles per minute at California to thirty-four miles a minute at Lisbon, and as there is an earthquake every nine days on an average, with a preponderance in cold weather and at the new and full moon, they may according to the new tables rely upon having one sooner or later; indeed by waiting long enough they can enjoy the excitement of one at home, as there were a hundred and eleven in the british islands during the first half of this century. They are however very poor affairs, not to be compared with the fearful throes which ever and anon shake the coasts of Iceland or the plains of Calabria. Mr. David Milne indeed wants us to believe that there is a central point of disturbance, a sort of hotbed of mischief, just below our island, capable of breaking the backbone of the country. This would be quite an easy task for an earthquake at all like those of Aleppo and Messina, Lisbon or Quito, but it is difficult to believe in earthquakes here despite the recent visit of a stray disturber; they went out of date with the great wealden lizard and mammoth. The author remembers one, or rather he remembers being told that one occurred in the night, for he slept very soundly through it. It appeared to be a most contemptible

thing and decidedly of less effect than the rumbling and tumbling made by a well-laden van rolling along. Indeed with the exception of frightening a large Newfoundland dog and making an excitable frenchman quite melodramatic, it passed off without any very visible results.

Like the pig and crocodile the dog is affected with singular violence by the earthquake. All animals are manifestly very uneasy and alarmed at such times, but the pig, ass, alligator, and dog seem quite to lose their senses with fear. "The crocodiles in Orinoka," says Humboldt speaking of the effect of earthquakes, "generally as dumb as our little lizards, leave the sheltered bed of the river and run roaring to the wood."

The influence of water as has been said, is far more profound and wide-spread. Magnetism, central heat if there be such a thing* and electricity, play their parts in the great changes animal and vegetable life are constantly undergoing, parts it may be quite necessary, but so inferior in supporting life to what is effected by this mighty fluid, that without its aid the earth would be no better fitted for the home of animated beings, than in the days when, a boundless waste of rocks glowing like a furnace, it swept through the cold and silent fields of ether. Yet to most persons beyond the immediate interest taken in a flood or a drought, the doings of the great waters are of little moment. They know that without rain, corn and grass will turn to useless stubble, that the hardiest plant will bloom no longer and the deepest-rooted tree

* See Appendix 19.

will at last wither; but they no more think of the wonderful chemistry involved in the question, than the schoolboy who is told that three-fourths of the globe are covered with water and that water enters largely into the composition of plants and animals.

Water is the blood and chyle of this crusted globe, without water there could be no life as we understand the term—no stir and bustle. "Death would reign everywhere, silence and stillness would take the place of that universal movement which now characterizes our earth." One-half of the time the surface of the earth would be calcined by the heat, the other half of it would be wasted by more than arctic frosts and passed in all the gloom of the blackest night. The sublime words of Goethe's archangel,

> "Es wechselt Paradieseshelle
> Mit tiefer schauer-voller Nacht,"

would only express the normal state of night and day.

The watery changes which take place on our earth are not effected by the great rivers and lakes, though these take their share of the work, but by the tiny stream and humble water-shed. Men are struck by the picture of the Ganges rushing in the flood season at the rate of nine miles an hour, and bearing away seven thousand million tons of mud to the Bay of Bengal, which means that if this sediment had to be transported by man, a ship of fourteen hundred tons burthen would have to be sent off heavily laden every hour day and night during the floods. There is something indescribably grand in the idea of the Mississippi rending away whole islands; of the cataracts of Niagara; of the unparalleled majesty of the

Amazons; of the tidal wave of the Atlantic seven thousand miles long and two thousand wide, and of the mighty Gulf stream cleaving with its indigo-blue waves the green waters of the Atlantic, its vast current, twenty-five hundred feet deep, forcing its way through the ocean at the rate of five knots an hour, carrying to the Orkneys and Iceland the mimosa* and cashew-nut, the Jamaica bean and west-indian legumes, so fresh that plants might sometimes be raised from them. But these mighty forces are feeble in comparison with those of the unseen waters; the principal rivers do not carry off more than one-sixth of the whole rainfall even in tropical climates.

Water penetrates into everything save metals and even into some of these, especially iron and lead. It permeates wood when sunk deep in the ocean so that it will no longer float when brought up again. Nearly all the earths, flint, lime, alum, magnesia and clay are pervaded by its influence. All soils even the hardest contain water in abundance, few having less than one-eleventh, some being nearly half water. It penetrates every rock, till sandstone becomes so full of it that one or two million gallons of water can be pumped daily from a single well, while chalk is still fuller of water. The microscope has shown that water is even contained in some of the primary rocks, quartz often holding it in such quantities that the cavities are large enough to be seen by the naked eye, while granite† is supposed to contain two gallons of water in each cubic yard.

As a solvent it is as active and ever present. It

* Fraser's Magazine, 1863, October.

† Composed of mica, felspar, and quartz.

dissolves metals and eats away iron in such quantities that almost every spring contains some. Nothing in the shape of rock seems proof against it. The warm waters of Plombières, though they contain only half a grain of salts to every quart of water, have made their way through a bed of concrete ten feet thick laid down by the Romans to convey the waters to the baths, and have metamorphosed both the cement and the bricks of this bed. The hardest marble the sculptor can pick out contains quite half a pint of water in each hundredweight. Hard as flint proverbially is, high pressure steam, aided by a little potass or soda will soften it to a jelly which can again be dissolved in cold water.* The hot springs of Iceland break up even the hard glassy lava. It seems probable that it has once at least dissolved out and laid down again the fire-formed mica, feltspar and quartz just as it is doing now; the salt and bicarbonate of soda in the Lake of Tezcuco are got by the water wearing down the decomposed porphyry, a rock so hard that ages after the waves have destroyed the granite around, it is seen in the Orkney and Shetland Islands towering above the surf and defying the tremendous billows of the Atlantic, which often in storms launch stones several tons weight up precipitous cliffs twenty or thirty feet high. Dr. Hibbert mentions one block more than eight feet long and five feet thick, which was at once torn from its bed and swept away eighty or ninety feet, the waves having first fretted away the granite and serpentine with which it once formed part of an iron-bound cliff.

By water alone the earths are made useful to man.

* The Great Stone Book of Nature, by D. T. Ansted.

Water breaks up the hard bed or matrix in which they have lain for ages, transports them to the bottom of lakes to form at some future date fat meadows and garden lands, dissolves out the gases, mixes them with the salts and thus forms building stones, lime pits, nitre fields and other storehouses of mineral wealth. Our invaluable salt springs which have flowed for ages and which are worth far more than many a gold or silver mine, are generated by water acting on the red marl. Water falls on the leaves of the trees and herbs, takes up the carbonic acid they are throwing off, falls on the ground, sinks through, lights upon limestone rock and turns it into marble. The beautiful ka-o-lin from which the Chinese porcelain is made, is simply useless felspar changed by the chemistry of water. The contest about some forms of granite being due to water or to fire seems now likely to be settled in favour of the idea broached some time ago, namely, that the appearances in question are such as could only be produced by the combined action of water and heat. M. de Beaumont considers that there is no reason for believing that granite may not have contained water at the time it was thrown out. M. Daubrée enclosed minerals in a glass tube partly filled with water, fixed the glass tube in an iron tube, and poured water between the iron and the glass to fill up the space between; the iron tube was then tightly closed with a screw and exposed for several weeks to the heat of a furnace never less than 850° Fahrenheit. The result of this was that the glass was changed into a substance like the Chinese porcelain powder or ka-o-lin; the water was charged with an alkaline solution of flint, while in the opaque substance into which

the glass was changed were found crystals of silica having the look and form of quartz.

The great mammoth cave of Kentucky and the vast caverns of the Adelsberg, the labyrinth of Crete and the wonders of the Peak are alike due to the action of water upon limestone. The immense beds of egg-stones (öolite) were formed by some nameless shallow quiet sea rolling regular coatings of lime round some millions of little nuclei, each consisting of some tiny shell or skeleton; the beautiful deposits in the hot springs of Iceland are owing to the silica in the water, so that myriads of ages before the water glass was known, nature had made it and copied the recipe into her great stone-bound book of secrets and marvels. There was always plenty of material on hand as the sea contains in solution, besides as much epsom salts as would physic all the inhabitants of earth, five hundred millions of millions of tons of flint. Indeed Humboldt puts down the flint acid (*Kieselsäure*) as the most widely dispersed chemical substance that we have.*

The beautiful agates and chalcedonies, the rock crystal, amethyst and cairngorm, the cornelian and blood-stone, the fine onyxes and agates from which the rare old cameos were made, are formed from solutions of flint in water. The emerald and beryl are thus made with the addition of a rare earth called glucina; in the garnet and carbuncle lime is added. The precious ruby, the blue sapphire, and the violet amethyst are almost worthless alumina crystallized from watery solutions, the violet and blue tints being given by manganese. In some regions these stones are prepared on a grand scale; parts of Scuir More are

* Kosmos, B. i. S. 283.

one great storehouse of beautiful stones formed in this way. Miller compares the cavities in it to the retorts of some vast laboratory, where we see in one a vesicle filled with green earth, in another one charged with calcareous spar, while in a third set chalcedony has crusted round the crystal.

Of the human frame water forms so large a part, that the most thoroughly smoke-dried old crone who ever ran the risk of being burned for a witch would shrink visibly if all the water were drawn off from her withered frame. A gentleman of comfortable dimensions if distilled quite dry would be transformed into a respectably dressed mummy, and the famous Daniel Lambert under this draining process would have dwindled to the weight of a small young gentleman in knickerbockers, so that we can understand how the sages in Beckford's wild eastern tale so utterly impoverished their radical moisture by weeping, that their eyes dried up in the sockets and their beards fell out by the roots. Every day of his life man throws out by his skin and lungs quite two pounds of water. Without water he could not bend a muscle or feel by a nerve; the atoms of every bone are dissolved or diffused in water before being built up. All tissues owe their flexibility to water of which they contain at least four-fifths, mechanically or vitally, not chemically, combined with the animal matter * which deprived of its water becomes wholly insusceptible of vitality. Finally when life is extinguished water will take off a photograph of any creature or even a trace of it, the eye of a fish, the feather of an extinct bird, the track of a sandstone reptile; it will even preserve man himself, dissolve

* Berzelius.

out the nitrogen and saturate the part with flint till it becomes as little susceptible of change as the pebbles on the seashore.

The plant which is the slave of the animal, gathering aliments from the inorganic kingdom and changing matter which could not in any way sustain life into food for everything, could not do its drudgery without water. In our islands three to five million pounds of water are exhaled yearly in the form of vapour from the leafy surface of a single acre in crop. Every plant that dies sets free so much water in proportion to its bulk; a ton of grass represents two hundred weight of hay, and this when chemically or geologically dry, represents again a much smaller amount, while some plants and fruits, as the water melon, are so largely made up of water that in hot countries a man might devour such fruits almost as he would drink simple fluids. Grain seems to retain water with as much tenacity as the rock itself. M. de Luca found a large quantity, quite a fifth part of the whole bulk, of water in loaves dug up at Pompeii.

When the plant dies the water enables it to set at liberty the starch and sugar in it to be digested into food by the chemistry of the animal stomach. When either plants or animals die they give out some of their mineral components in a soluble form * which they have abstracted by means of water from the earth; as they perish and rot water carries off from the air and the ground the minute particles of these com-

* "See dying vegetables life sustain,
See life dissolving vegetate again;
All forms that perish other forms supply,
By turns we catch the vital breath and die."

ponents, which are step by step borne away to the sea and laid down in beds; but no sooner are they upheaved again than the water percolates them, splits them when it freezes, wears them down by rills and streams, batters them into fragments by means of the waves, while plants fasten on them to extract the particles and again give them up to the animal, to reappear when this once more perishes.

Thus whether it is launched in the soft mud of the volcano, spreading destruction over the labours of man, or is boiled in the geyser, to all appearance for no earthly purpose beyond that of exciting wonder or amusing some cynical traveller; whether it thunders down the cataract or stagnates in the torpid jungle, water is the same untiring, mysterious agent, wearing down the old world and building up the new, refreshing the worn out soil and changing the sandy waste, the barren heath and the sea worn rock into pastures and woodlands.

What is the natural colour of water? The answer is rather difficult, simple as the matter may seem, for what could be easier than for a philosopher to take a little pure water and tell us what colour it is? But the philosopher would still have to decide whether what he sees is the *natural* colour, for water is never found pure, rain water is the nearest approach to it. And then the philosopher would be terribly puzzled to separate the exact amount of colour the water must necessarily receive from the vessel it was in and the objects by which it was surrounded.

Water then in its natural state, not defiled by the negligence and greed of man, may be had of any colour, black, brown, red, yellow, green, blue, sapphire

coloured,* white. Irrespective however of its contents, light, &c., its colour seems to be nothing at all in small quantities and blue in large ones. "The colour of water," says Mr. Woods, "will very often depend on the bottom upon which it rests. Thus I have seen the sea a light green when out of soundings and many hundred miles from the African coast, and I have seen the sea a deep blue at thirty fathoms close to a basaltic coast; but at Mount Gambier it appears to be the nature of the water; for no matter how white the limestone beneath may be, the water if of any depth is deep blue. I believe Bunsen has published reasons why blue is the natural colour of water, but I think if a careful examination were made its colour would be found to depend upon the salts it holds in solution."

The water of the thunder cloud is known to show almost black at times, that of the water-spout is said to be occasionally as black as ink. Not many months ago a large sea-spout was reported to have occurred off the mouth of the Keiskama River; it seemed so resistant that when the surf fell on it this was "launched forty or fifty yards into the air, the water for the circumference of half a mile around assuming *the colour of the blackest ink.*" In Bacstrom's Voyage to Spitzbergen † the author tells us that the water is green in the North Sea, blue to the northwards of "Shetland and *Ferro,*" grows gradually of a darker colour and "looks now (76° north latitude) of a deep black dye." A regular shower of red rain is reported to have fallen at Siena in Italy on the 28th of

* Oxonian in Iceland, p. 92.

† Philosophical Magazine, July, 1799.

December, 1860, and it was surmised that this might be owing to the salt in it.

The Red Sea lies amid the oldest historical lands and has been visited by learned travellers for ages. Yet the nature of the substance which colours it is not satisfactorily made out, indeed it is not so long since it was scientific to deny that it was red; the name we were told owed its origin to a false translation, it was never intended to call it the Red Sea. However Mr. Carter has at last pretty well set the matter at rest. It appears that at certain times at all events, immense patches not only of the Red Sea but also of the Gulf of Aden and even of the Indian Ocean are covered by a scum composed of minute short-cut filaments of a tiny plant. The prevailing colour is yellowish brown, *only once* he saw a portion of *brilliant red* and one of *intense green.* On examining some of these little bundles of filaments afterwards, they were faintly yellow to the naked eye and very pale green under the microscope. As far as can be made out by comparing notes it seems that on the whole the yellow colour is the most predominant, then the red, and after that the green. It is however supposed that the yellow colour passes into the red, but the matter is still involved in some obscurity. This scum had a most disagreeable smell like boiled chlorophyl.

Water may vary in specific gravity from that of the Baltic which is only a trifle heavier* than distilled water to that of Urumiyeh or Shahee, the specific gravity of which† is said to be so great that a vessel of a hundred tons burthen when loaded does not draw more than three or four feet, while the water is so

* 1·040. † 1·165.

sluggish in consequence, that a gale of wind does not raise the highest waves more than a few feet and no sooner has the wind passed off than they sink at once.

One of the most singular properties of water is that of becoming tough or ropy. I do not mean its power of being stiffened by the art of man, but of being battered and thrashed into ropiness by long and furious gales of wind. "Few people comparatively," says Mr. Ruskin, "have ever seen the effect on the sea of a powerful gale continued without intermission for three or four days and nights, and to those who have not I believe it must be unimaginable, not from the mere force or size of surge, but from the complete annihilation of the limit between sea and air. The water from its prolonged agitation is beaten, not into mere creaming foam, but into masses of accumulated yeast, which hang in ropes and wreaths *from wave to wave*, and when one curls over to break, form a festoon-like drapery from its edge; these are taken up by the wind, not in dissipating dust, but bodily, in writhing, hanging, coiling masses, which make the air white and thick as with snow, only the flakes are a foot or two long each; the surges themselves are full of foam in their very bodies underneath, making them white all through, as the water is under a great cataract, and their masses, being thus half water and half air, are torn to pieces by the wind whenever they rise, and carried away in roaring smoke, which chokes and strangles like actual water." I can quite conceive that very few people have seen this kind of thing, and that very few indeed could have retained sufficient sense at the end of the time to remember anything about the matter.

Another singular property is that of bending into shapes when frozen. The reader when skating on a large piece of water has doubtless seen the ice bend like leather, but I believe that till Professor Tyndall published his interesting experiments on ice, no one ever fancied it could be bent into a hoop or plaited into a chain. Such however is the fact.

All the world I suppose has heard of the movement of the glaciers, of how

> "The glacier's cold and restless mass
> Moves onward day by day."

The Görner glacier has been advancing for several years: Professor Tyndall was told by his host that within the last sixty years forty-four chalets had been overturned by its irresistible progress. A stake fixed in a glacier will sometimes advance nearly three feet in a day. The reason seems to be that a huge mass of ice grows on the mountain side or hill top by the gradual fall of snow in winter and the melting of this in summer, till it is top-heavy. It melts, slips, stops, freezes again, gathers weight, and thus grinds and slips along till it can get no further. Great interest has been excited about the movements of these huge masses, and Professor Tyndall not only devoted a great deal of time and labour, but frequently exposed himself to very serious danger in order to settle some knotty points.

He found, contrary to what was generally thought, that it is not always the middle of the glacier that moves most quickly, like tough mud, as some writers had supposed deeming the ice to be viscous; in fact he found no proof of the ice being viscous at

all. He found that sometimes one half of a glacier moves faster than another, and in order to ascertain how this is he performed several most interesting experiments in some of which *he bent ice.* A strong piece of box-wood was made like two thick bent plates with a space between them, something like a very large butter mould, only curved instead of flat. A cake of ice was laid upon the lower half of the mould, the top was placed over the ice, and the two halves were made to meet by the irresistible strength of a hydraulic press. When the top was taken off the cake of ice was found, not crushed into fragments as might have been expected, but cast into an exact model of the mould. In this way Professor Tyndall bent slabs of ice into half hoops and other shapes. I suppose the explanation is that the ice was crushed into atoms, and that these were again welded together by the immense force used, if so we can quite understand how blocks of ice may be crushed and re-formed in masses under the pressure of great glaciers.

So thoroughly does water enter into all the doings of this sublunary sphere that we find it alike in the icy winds which sweep over the arctic regions and in the hot simoom. The east wind which proverbially dries up the skin and makes a horse's coat stare, contains its due proportion of moisture just as air does after rain; in fact almost immediately after parting with any water the temperature of the air rises and a part of the water is taken up again. But the air is not merely modified by the water in it, that beneath it often exerts a most powerful and salutary influence. Thus while the shores of Labrador lie buried in ice and fog, the coasts of England and Ireland, though in the same

latitude, are favoured with almost perennial greenness from the action of the warm gulf-stream which bathes our shores, and the fiords of West Greenland are so tempered by the mingling of the western part of the gulf-stream with the Spitzbergen current, that the natives are rarely prevented from using their kyaks; in fact this mighty current even when it reaches the Bay of Biscay is often five degrees warmer than the Atlantic. Yet the direction of the gulf-stream depends upon a peculiarity in the shape of the land both temporary and accidental. A very slight change in the Straits of Bahama, far less than has been produced by many earthquakes, could at once so alter its route that in a single season our western coasts might be reduced to the sterility of British America; on such slight causes does the welfare of nations sometimes depend. In the same way as the gulf-stream now averts this catastrophe, the escape of warm water through the narrow channel of Behring's Straits mitigates the frightful cold of the polar regions and lessens their vast accumulations of ice.

Many persons must have noticed that when two rivers join their united breadth is always less than that of the two streams separately measured. This fact is generally viewed simply as a result, few have thought how widely beneficial is the principle involved. This narrowing causes a more rapid flow of water, and in consequence of this the most valuable parts of a country, the banks and islands at river mouths, are not perpetually overflowed and ravaged.

Even congealed into ice water is of such incalculable service that without it the machinery of the globe must come to a standstill. The mariner who

beholds huge icebergs careering over the Atlantic or looming through the palpable darkness of midnight, and the traveller who surveys the savage and fantastic desolation of Spitzbergen and Nova Zembla, may wonder what purpose such lifeless, dreary wastes can serve. Perhaps in themselves not very much, but they are infallible signs that nature has placed strong checks upon the over-vibration of the great atmospheric pendulum; they mask as it were her great flood-gates, the breaking of which would ensure the destruction of everything that now inhabits the earth.

If the movement of upheaval now going on at Cape North and Spitzbergen should increase even a little or continue at its present rate,* a trifling process compared with the great convulsions that must have repeatedly happened—the accumulation of ice in these regions would soon render the north of Europe uninhabitable. Where the engine-driver now guides the thundering flight of the locomotive with the steady smoothness of planetary motion, the icy stream and snow-swollen cataract would alone meet the eye; where the ring of the hammer and whirl of the spindle tell of man's daily toil, would be heard only the fall of the avalanche and the grinding of the icebergs. But a few short years and the polar bear and the walrus, the whale and the penguin, would again be seen in the German Ocean

* In his "Principles of Geology," Lyell has traced this upward movement of the land with his usual care and accuracy. Marryatt mentions an old clergyman who used to tell, that when he first came to his parish, the tower alone of the church at Stenkirk could be descried from the parsonage. At present, after a lapse of thirty years, the roof of the building is distinctly visible! ("One Year in Sweden.") Within the memory of living men islands have been joined to the mainland!

and St. George's Channel, the fertile fields of England would again lie buried beneath the clay-flood and the glacial drift, and the lowest hills would be covered with eternal snows.

Or were it to sink again by that process which has borne down tracts equally large to the bottom of the ocean, leaving a scarcely appreciable inequality on the surface of the globe, man with all his traditions, arts, and sciences would disappear from the scene, and his place would be filled by some of the huge forms, which like the temples of Egypt and Assyria tell of a mighty past in language that cannot be disputed. For a time, indeed, fanned by the cool breezes from the Atlantic, the temperate regions might be endurable by those who can bear the fierceness of a vertical sun, and the utter sterility of the tropic regions wasted by the heat, might be compensated for by the smiling corn-fields and blooming orchards of Spitzbergen and Nova Zembla, or the unwonted sight of the hare and partridge in lands now given up to the penguin and auk. Rich herds would graze where now no human being can long brave the cold; the dove might build her nest in the wooded slopes of Hecla and the nightingale might yearly renew her song amid the tulip groves of Iceland, where now stretch vast wastes as silent as death and as barren as the mine.* But ere long, this

* The trees now found in the surturbrand of Iceland are the tulip tree, which is known to have flourished there, the plane, walnut, and a vine, "affording unmistakeable evidence of a climate in the parallel of the arctic circle, which precludes the supposition of glaciers then existing in the neighbourhood, still less any general crust of continental ice like that of Greenland."—Antiquity of Man.

possibility would cease; nay, we are told that if this not very improbable change happened, the giant iguanodon might reappear on the wold, and the fish-lizard again be the sanguinary tyrant of the ocean and the estuary; again the bat-lizard might cleave with dusky wings the dank and poisonous air of the tree-fern groves, and the turtle might once more spawn her eggs "where now the walrus sleeps and the seal is drifted on the ice-floe."

But if there be a chance, a possibility of this, there is a certainty that we are at present tending fast and steadily the other way. The glacial period—the reign of winter in all its terrors is coming, and perhaps faster much faster than some writers think. The earth, said Professor Phillips, in his address to the Geological Society, "is losing continually a little of its warmth. It is growing colder in its whole mass—slowly indeed, so slowly that the effect has hardly been felt by any change at the surface during all the reach of history, but surely, regularly, and continually.

In that case this rate has been increasing very much more rapidly within the last few hundred years and again still faster within the last half century.* All through northern Europe trees and beasts have been dying out from the cold. To the south of the Wehner Sea in Sweden the red deer have vanished since the cold snows of 1700 extinguished them. In the cathedral garden of Linköping in Bishop Brask's time (Gustavus Vasa) walnuts grew and ripened and the nightingale sang amid the trees.

* See Appendix 20.

Indeed if north Sweden be rising at the rate of six feet in a century it must soon become waste.

The possibility too that this upheaval may occur from the attraction the moon exerts upon the fluid part of the earth, sucking it up with its crust into a ridge, is thought to be strongly confirmed by the fact that earthquakes are most numerous when the moon is nearest us, an opinion very ingeniously upheld by Adhemar and Le Hon, who maintain that there is an accumulation of ice from this cause at alternate poles for a long cycle of years. Professor Phillips, in his annual address to the Geological Society, simply alluded to the views of these gentlemen without either accepting or refuting them. I believe however it is now admitted that the length of time the glacial period endured, and the long interval which has elapsed since that time, are too strongly opposed to the theory, but I suppose nothing will induce the philosophers to let the moon alone.

Had man been able to read and interpret nature's signs aright, he might have learned from the denizens of the ice-fields how to get through the north-west passage by a very short cut. Whales it appears have got into Behring's Straits after escaping harpooning in Baffin's Bay; in one or two instances a fish harpooned in the Atlantic has been captured soon afterwards in the Pacific, so that there can be only a short distance between them, as the whale cannot remain long under water.

Not merely has water preserved the remains and chronicled the era of the stone lily and the lizard of the weald, of the cavern bear and the old english tiger,

but it has been lately made by man to reveal the doings of those who went down to the dark coasts of the past ages ago. Memphis and Heliopolis, old in the times of Herodotus, Homer, and Joseph, have been selected for an experiment to try what the boring-rod would reveal of the secrets that had been committed to the water age after age, and by the aid and energy of the generous Pacha of Egypt,* ninety-five pits were sunk on these sites. As the Nile accumulates almost exactly the same quantity of mud every year—about four inches in a year, judging by the mean of the experiments made by M. Girard with the nilometers discovered on Bonaparte's expedition into Egypt and the calculations of Mr. Horner,—the explorers were able to determine that men had lived there at least eleven thousand four hundred years ago, and long before this there must have been rude tribes who knew nothing of the potter's art, by remains of which the diggers were guided.

The results are so interesting that they deserve to be given in full. At six feet depth they found part of a human figure, and at ten feet (representing a flight of at least three thousand years), a fragment of a small figure of a lion, both in baked clay. There and two feet deeper were found shells of the Nile and the sea. Pottery was discovered at various depths from six to fifteen feet; that down to fourteen feet (four thousand two hundred years ago) being white; the rest consisting of coarse unglazed pots, jars, and saucers. At twelve feet was found a small fragment

* Abbas Pacha. After his death his successor extended the same noble generosity to the undertaking.

of coloured mosaic, at thirteen feet the blade of a knife made of copper hardened with arsenic; statuettes were dug up at depths varying from eight to fifteen feet and a tablet of inscription was found. They might very likely have collected many more of these interesting objects, but when they had pierced so low down that the water of the Nile began to soak into the borings, they were obliged to use so small an instrument for boring that only fragments could be brought up through it. As the excavations were made by intelligent persons, aware of the object of investigation but in no way likely to misrepresent facts, the conclusions may be considered worthy of all reliance.

Geology has taught us that every rood of land by the fruits of which man could live, has been manured at the bottom of the waters, and geography has shown that continents consist of so many roods lifted en masse when the due time came. Thanks to the indomitable energy of man, we are now by the aid of Brookes's apparatus able to discover how land is fertilized, even in oceans as deep as the Himalaya mountains are high. There were no slight difficulties to overcome before this discovery could be made, as any person will at once understand, who is told that to haul in only twenty-four hundred fathoms of line, without the sinker, it was necessary—not only to use a twelve-horse-power steam-engine, but to raise the steam until there was a pressure of twelve pounds on the square inch.

Soundings in the Atlantic have been particularly pushed forward, and have excited, on account of the telegraph cable, more general interest than

any others yet taken. They have revealed the fact that at least two hundred and thirty miles from the coast of Ireland the water is still shallow; or in other words that there is another Ireland only waiting to be raised—thus reversing the famous panacea for keeping the country quiet. It is just beyond this that the true Atlantic begins, the gulf suddenly sinking to nine thousand feet. Thus Ireland may one day have a coast-line as high as the Alps. The whole floor of the Atlantic is paved with a soft sticky substance, called oaze, nine-tenths consisting of very minute animals, many of them mere lumps of jelly and thousands of which could float with ease in a drop of water; some resembling toothed wheels, others bundles of spines or threads shooting from a little globule. Some however are endowed with the property of separating flint from the sea-water which is more than every chemist could do. There are hundreds of square miles covered with the skeletons of these little creatures. Part of this oaze is doubtless from the clouds of raindust, which rise from the vast steppes of South America in such masses as to darken the sun and make the animals fly to shelter, and which, after sweeping like a simoom over the country, lose themselves in the "steep Atlantic." No bones have been found of the larger animals, so that the kraken and sea-serpent might sleep their last sleep and leave not a tooth or a vertebra to tell the tale. Not a mast or anchor, not a block or strand, not a coin or a keepsake, has been found to testify of the countless gallant ships and more gallant men who have gone down amid the pitiless waves.

"Instead," says Lyell, "of its being part of the plan of Nature to store up enduring records of a large number of the individual plants and animals which have lived on the surface, it seems to be her chief care to provide the means of disencumbering the habitable areas lying above and below the waters, of those myriads of solid skeletons of animals and those massive trunks of trees, which would otherwise soon choke up every river and fill every valley. To prevent this inconvenience she employs the heat and moisture of the sun and atmosphere, the dissolving power of carbonic and other acids, the grinding teeth and gastric juices of quadrupeds, birds, reptiles, and fish, and the agency of many of the invertebrata." We are all familiar with the efficacy of these and other causes on the land, and as to the bottoms of seas, we have only to read the published reports of Mr. McAndrew, the late Edward Forbes, and other experienced dredgers, who, while they failed utterly in drawing up from the deep a single human bone, declared that they scarcely ever met with a work of art, even after counting tens of thousands of shells and zoophytes collected on a coast-line of several hundred miles in extent, where they often approached within less than half a mile of a land peopled by millions of human beings.

A gentleman employed by the dutch government to construct a geological map of Holland, and who accompanied Lyell in a journey over what had once been the Haarlem sea, told Sir Charles that he and those who worked with him had vainly searched for human bones in the deposits which had constituted for three centuries

the bed of the great lake. "There had been many a shipwreck and many a naval fight in those waters, and hundreds of dutch and spanish soldiers and sailors had met there with a watery grave. The population which lived on the borders of this ancient sheet of water numbered between thirty and forty thousand souls. In digging the great canal, a fine section had been laid open, about thirty miles long, of the deposits which formed the ancient bottom of the lake. Trenches also innumerable, several feet deep, had been freshly dug on all the farms, and their united length must have amounted to thousands of miles." But all the bed of the sea gave up were a few arms and coins, and some parts of one or two wrecked spanish ships. If so much had perished in a century or two, of all that sank in this dreary sea, it seems strange that anything has been preserved of man in river-beds and old lakes.

On our coast the water has been incessantly wearing away one place and filling up another. Tynemouth Castle now overhangs the sea though once separated from it by a tolerably wide tract. At Sunderland the beacon stands or stood where, almost within the memory of old men, people used to go to drink the waters of a spa. In Yorkshire the coast is fast wasting away; of many villages marked in the old maps only the name now remains. Lincoln with its sea-wall scarcely keeps out the encroaching waves; Norfolk and Suffolk are rapidly and ceaselessly eaten away piecemeal. In 1837 Lyell stated there was a depth of twenty feet of water, where forty-eight years before there was a cliff fifty feet high with houses on it. Further south again, Shipden, Wimpwell, and many ancient villages have

disappeared. In old times there was a wood a mile and a half east of Dunwich, but the greedy ocean has swallowed both the wood and old Dunwich itself. The church of Minster now near the coast once stood in the middle of the Isle of Sheppey. Reculvers, now being undermined, lay at a safe distance from the ocean; in Leland's time it was nearly half a mile from the seashore,* while along the south and west coasts the same wasting is going on.

In other parts the restless waves have silted up valuable harbours as if in compensation. The land on which Yarmouth stands only became dry firm ground in the eleventh century, and the sand-hills around it are continually increasing. The Ness in Suffolk is gaining on the sea. Rye, once destroyed by the sea, is now two miles from it. Sandwich, once a port, is now far inland, and from Richbury Castle the sea has still further receded, so that ere an age in geology has rolled by, the map of England will have to be recast.

But the havoc the seas work in this way is not so much their doing as that of the restless rising and sinking of the earth, which bars them out on one side only to let them in on the other; it is not the waters that encroach but the land that yields; the ocean does not retire, it is the upheaval of the land that rolls it back. Were Norfolk to rise and Kent to sink, the long buried lands would soon be reclaimed, and the long dried up harbours again echo with the unwonted din of commerce. The waters would soon do their

* Bibliotheca Topograph. Brit. 1790.

part in the task at the bidding of earth's superior power, for their life knows no rest; they toil on like old Time himself,—

> "And none can stem by art or stop by power
> The flowing ocean or the fleeting hour."

CHAPTER XV.

LIFE IN THE STARS, OR COLOURED STARS AND DOUBLE SUNS.

"Other suns perhaps,
With their attendant moons thou wilt descry,
Communicating male and female light."

One smoking hot afternoon, as the writer was leaving the observatory at Paris, now wondering whether it was not almost as ugly as some of the buildings in London, and finally deciding that it was not quite so well calculated to engender that fiendish feeling which the National Gallery, George the Fourth's statue, and St. John's Church, Westminster, always arouse in his bosom; again marvelling as to what the minister Colbert, who in huge perriwig and red-heeled shoes, ordered an architect also in towering perriwig and *talons rouges* to build this observatory, said when he saw what a nice affair his protégé had made of it, when the author was accosted by one of those wonderful little soldiers who are only to be seen in France. The beaming little warrior craved pardon, but would monsieur indicate the road to M. Arago's lecture-room? Monsieur accorded pardon without any reservation; he, the soldier, would traverse the court before him, enter by a door in the corner which showed face and mount a staircase to the right (or left), which would conduct him to the lecture-room.

The future field-marshal was not going to take M. Arago into custody for an infraction of the imprescriptible rights of man, or of that incomparable system which, in whatever it may begin, always "culminates in order," for it was in the days of the poor old citizen king—who after all left the french a great deal more liberty than the republic one and indivisible. No, he was going to assist at a lecture on astronomy by France's great proficient in that grand science, and I suppose most rational people will admit that he might have been worse employed.

Throughout the day the author's thoughts wandered away to the smiling little soldier in the observatory court. He could not help thinking that perchance, if our soldiers could now and then go and listen to a fine lecture without having to run the gauntlet of a whole host of irritating formalities, they might sometimes drink less coculus-indicus beer and figure less frequently in the police courts. Not even a lecture at the Sorbonne and the solemn memories inspired by the old building could keep him to the mark, and at last he determined to be present at one of M. Arago's lectures. He went and heard a lecture on the double stars which was worth going to Paris for, not the least of its charms being the fine intellectual head and infectious energy of the renowned astronomer himself.

The double stars, which now comprise most of the stars visible to the naked eye and many of which are coloured, are perhaps without exception the most beautiful discovery that modern astronomy has made, and certainly rank among the grandest wonders of the heavens. Our own sun is the noblest object yet

known to us; it has ever been the emblem of power, glory, beauty and purity; yet inconceivably nobler and more striking must be the spectacle of two suns brilliantly coloured, and seen from a world rolling so near them, that Humboldt has conjectured it may for days together receive its light from one at a time. There is something wonderfully grand in the idea of land and ocean, river and forest, glowing through the day with the fiery radiance of the ruby and orange, and when the wheel of night rolls o'er the scene, sleeping in the soft and lovely light of the emerald and topaz—of long day-dreams amid the gorgeous sheen of gold and purple light, melting away into the softer hues of azure and green which invest every rock and tree as with a mantle of loveliness, relieving the eye wearied with the blaze of more pompous colours. Sir John Herschel says "It may be easier suggested in words than conceived in imagination,* what variety of illumination two suns, a red and a green, or a yellow and a blue one, must afford a planet circulating about either; what charming contrasts and 'grateful vicissitudes'—a red and a green day for instance, alternating with darkness, might arise from the presence or the absence of one or the other or both." In strict truth fairyland has nothing more beautiful and weird than these stars, poetry nothing more lovely, and some of the most cherished of immortal thoughts and the most favourite images might here be more than outrivalled by the sober facts of science. As yet however they have never received much attention. Every bare and rugged hill, every yawning crack and volcano in the

* Generally the process is reversed.

cold and barren regions of the moon, seems to possess more interest for the star-gazer and photographer than these superb objects, about which little is known by the world in general, and not very much by the astronomers themselves.

These beautiful stars display all the gorgeous colours of the rainbow, often in the most striking contrast, as blue and orange, green and red. Sir John Herschel tells us that when one star is larger than the other, the greater star is generally of a ruddy or orange hue, while the smaller one appears blue or green. This to a certain extent may be due to the fact that when the eye is dazzled with any brilliant colour, a more feeble tint, which seen alone would look white or whitish, will then appear of such a colour as joined to the bright one will make up white; "thus a yellow colour predominating in the light of the brighter star, that of the less bright one in the same field of view will appear blue; while if the tint of the brighter star verge to crimson, that of the other will exhibit a tendency to green, or even appear as a vivid green under favourable circumstances." The former contrast, a large light yellow star and a weaker blue star, is beautifully seen in one of the stars forming the Crab, while the latter, crimson and green, may be observed in Andromeda. Sometimes the light of one is not sufficiently strong to affect the other materially and then this result is not brought about. For instance one beautiful pair in Cassiopeia reveal a lovely white star while the twin planet is of an exquisite ruddy purple. Now and then a single red star, of a colour well nigh as deep as blood, is found dwelling in virgin state, but no solitary blue or green star, of a very marked hue

at least, has ever been discovered. The superb double star in the Centaur, which Humboldt tells us is beyond all comparison the most striking object of the kind in the heavens, consists of two orange or ruddy-coloured stars making up a focus of light brighter even than Arcturus. There is a splendid pair in the Lion, gold and reddish green; the same constellation contains a pure white and blue star. The former is the finest star in the northern heavens, just as those in the Centaur and Cross are the glory of the southern sky. Generally if there be a blue star with another and any difference in size exist, the blue star is the smaller of the two, but in one star in Orion this is reversed, the larger star being blue and the planet white. Blue in fact is not a very favourite colour, there being twice as many red as blue stars; Struve however counted sixty-three pairs of stars both blue or blueish. Some again are of so undecided a hue, that like the famous chamelion of storied renown, while one observer says they are blue another maintains they are green. There is a star (gamma Virginis) silver white and pale yellow (this is an opening and shutting star); one (β) in the Balance, of a beautiful pale green hue; one (β) in the Scorpion, yellowish white and pale lilac; another (Antares) in the Scorpion is a very remarkable star, being blood-red, redder even than the fiery Mars, with a blueish-green companion. Antares is one of the stars that change colour so remarkably. It has been seen for a second or two of a deep crimson, then of a whitish colour, then of a crimson again. Aldebaran, the lamp of the Hyades, changes in much the same way but in a less degree. A third (σ) in the Scorpion is dusky white

and plum colour; a fourth (ν Scorpii) pale yellow and dusky hue; a fifth (ξ Scorpii) is really triple, being bright white and grey with a yellow star lying behind the white one; ρ in Ophiuchus is pale topaz and blue; another (36) in Ophiuchus is ruddy and pale yellow; a third (39 Ophiuchus) is pale orange and blue. ε Böotis is pale orange and sea-green; it is an exquisite star; another (ξ) in Böotes is orange and purple; a third (π Böotis) is white, the smaller star now and then appearing ruddy; a fourth (ζ Böotis) is bright white and blueish white; and a fifth (δ Böotis) is yellow and light blue or lilac.

Whatever be the source of the colour of the green or blue stars, whether they are, as Arago hinted it was just possible they might be, suns or worlds in a state of decay, mouldering into ruin, grown hoary it may be with crimes, follies, and regrets even more pitiable than our own, if such a thing be possible, it is now certain, that the beautiful conjunction of a soft colour with the fiery tints of red and orange is not alone due, as was supposed, to mere contrast. The large number of double stars in which both are blue decides the question; Humboldt and Herschel are agreed upon this point. When the colour of the smaller star is accidental it may be made to disappear by overpowering the light of the larger one, as by introducing a thick wire. When the colours are intrinsic, even though complementary, as red and green or orange and blue, this will not avail; the colour of the small star remains. The fact also that shooting stars and meteors are now and then seen blue or green, under circumstances which do not admit of the idea of contrast, must lead to the conviction that the colours of

these stars cannot be ascribed to any such cause, and that so far as we know they are not an optical delusion, but owing to colour in so far indeed as colour can be considered real.

Some few facts have been observed which go to prove that certain changes in the atmosphere of our earth, possibly also in that of these coloured stars themselves, may be concerned in this phenomenon. Professor Tyndall tell us that when passing a night at the "grands mulets," he saw one large star which excited great admiration. It shone out with great brilliance and changed colour incessantly, *sometimes flushing like a ruby and again gleaming like an emerald*. Many of the larger stars are now at times intensely blue or blueish green to the naked eye. During the very fine autumn of 1861 I noticed this distinctly night after night. If this state of matters existed in earlier ages, it seems strange that it should have escaped all notice. We hear of the silver lamps and the golden fires of heaven, but nothing of their blue and green hues. Are they then changing? Sirius seems to be doing so. He gives now a perfectly white light, and yet many old writers speak of him as a red star.

M. Schmidt, formerly of Olmütz, says that Arcturus has so changed colour, that whereas it was in 1841 nearly as red as Mars, it was in 1852 yellow without a trace of red. It is also to be remembered that certain rays which exist in our sun's light are wanting in the spectra of these coloured stars, and probably never exist in their light. In the zeta of Hercules there is an absolute want of blue rays. The moon, viewed near or just after a powerful yellow artificial

light, will appear decidedly blue, or as Schmidt saw it of a lively green, among the ruddy clouds of volcanic smoke and steam, which encompassed his observatory upon Vesuvius during the great eruption of 1855.

But our astronomical observations are not complete enough to decide the question of whether the stars are changing colour, and we cannot trust in such matters to any others. Poets and historians, often our sole reliance in matters of antiquity, are not to be depended on here. They have gone on for ages describing the stars as countless, as being like the sands of the sea, and people have gone on for ages believing them without any particular reason for doing so, as the stars they could see are certainly not countless. The grand image of the poet,

> "To count their numbers were to count the sands
> That ride in whirlwinds the parch'd Libyan air,"

may delight the ears, but it misleads the sense. It is a figure of speech by a great writer, not a remark by a sound astronomer. "Night's unnumbered planets" are very few in point of fact. On a clear wintry night the mind is struck with the apparent multitude of stars, yet there are really not much above fifteen hundred visible to the *naked eye*, and the number of those which can be seen at once is not above a thousand.*

The double stars are no rarity like Donati's comet. Sir W. Herschel alone counted above five hundred, and through the labours of his son, of Mr. Struve and others, nearly three thousand have now been discovered in the northern hemisphere alone, or more

* Humboldt makes the number much higher.—Cosmos, b. iii p. 146.

than half the number of stars visible with a low power. During his stay at the Cape of Good Hope Sir John Herschel added a great number, though they are far less numerous there than in the northern hemisphere. It is computed that there are about six thousand double (and multiple) stars. Only about four had been noticed or at least recorded when Herschel began to turn his powerful reflector on the heavens. Some have been so far decomposed as to admit of separation into three or even more stars. One set in the beautiful constellation of the Lyre shows like a pair of double stars, and one in stormy Orion * forms an irregular square of four rolling round each other. It may interest the reader to be told that the odds against even two stars getting together are about ten thousand to one, and against three being accidentally drawn into one cycle, one hundred and seventy-three thousand to one, so that we may safely pass by the idea of such an arrangement being the result of chance.

These marvels will repay the reader for any ordinary amount of trouble he may take to find them out and watch them. The Rev. Mr. Webb has given† some very clear and valuable instructions respecting the best method of observing these by persons not having access to an observatory. The majority of the double stars may be reached with a three or a three-quarter inch object-glass, many of them indeed with one only two inches in diameter. A moderately skilful hand may adapt even

* "Subito assurgens fluctu *nimbosus* Orion."

† Intellectual Observer, May, 1862. The reader will also find some valuable remarks in Telescope Teachings, by the Hon. Mrs. Ward.

a common small hand telescope to the purpose at very little expense. Mr. Webb says he has seen not only Mizar but even Castor with an object-glass of only one inch and a third. With a glass like this however it is almost needless to say, that it is of no use to station one's-self at a window, as except at a few rare times, when there is the same temperature within and without, the meeting of the currents of air passing in and out of the room makes such objects too indistinct. If a large glass be employed, and if the reader be anywhere in London, there are still difficulties to be overcome before it can be used at a window, unless it be in a very quiet place and in an extremely firm old house. The incessant shaking from the cabs and carriages is a bar to any accurate observation. Mr. Webb relates that when Troughton, of Fleet Street, used to watch the stars at his observatory there, he could tell by the vibration of the star in the telescope when a carriage was coming, long before he could hear the slightest sound.

The plan then is to betake one's-self to the garden. As to catching cold from the night air, I quite agree with Mr. Webb that it is absurd. However a glass really does suffer and catches cold in the form of dew; this may to a great extent be obviated by using a strong pasteboard or tin covering for it, called a dew-cap. The glasses when they are taken out to clean must be handled with the greatest care, as scratches are wellnigh ruinous to them. An old soft silk handkerchief is preferred by many persons for cleaning them. I think scarcely anything is superior to thick lint for such purposes.

Weather is really not of so much consequence as

might be imagined, and strange to say astronomers dislike those glorious bright nights when every star shines forth in all its lustre, and rather lean to a slight haze or a dull evening which we are apt to think the very worst, and when to the naked eye the stars seem shorn of all their glory. A windy night, when the breeze is strong enough to sweep away all vapours without shaking the house, is a great favourite with observers. When we come to reflect there is nothing to surprise us in all this; it is just what we observe in looking at a distant landscape. On a hot clear summer's noon, hill and dale, pool and stream are wrapped in a shimmering haze which often materially obscures the view of far-off objects, while on a dull or windy day they are minutely seen. Twilight and an hour or two before midnight are very good times for seeing the stars. With a moderately good sight, practice and attention are the chief requisites.

Among the best stars to begin with is Mizar in the Great Bear, first shown to be a double star by Riccioli, and again in 1700 by Gottfried Kirch and his scientific wife, who was subsequently in her widowhood astronomer to the Academy of Sciences at Berlin ! ! Like some others of the double stars, it seems now and then to have puzzled astronomers. Flauguergues only found out that it was double some thirty-seven years after he first noticed it, and it is more than probable that some astronomers of considerable standing overlooked the companion star long after it was known. "There is," says Mr. Webb, "a strange story told about Mädler of Dorpat as recently as 1841, when on observing this star by day, he was astonished to find it single; he waited till after sunset in vain, per-

ceiving in the meanwhile several other pairs difficult to be observed in twilight, but within an hour afterwards he found it double in all its splendour." Some of the roman astronomers are said to have made even a worse blunder about this very star.

It is a double star, one being white and one green according to one author, though another makes them both greenish white. It is very easily found, being above the horizon the whole year through, and the centre planet in the tail of the Great Bear—

> "Which turns round it there and watches Orion,
> And alone is not washed by the waves of the ocean." *

Near it is a star called Alcor, which will serve as a capital guide; it is a star of the fifth magnitude and forms the middle star in the team of Charley's Wain. Humboldt says it (Alcor) was called Saidak or "the trier," because on account of its smallness it tries the sight, requiring a good vision to distinguish it.

Another good star to observe is the polar star, one of those which go to make up the Little Bear; its colours are yellow and dull white. It is found by drawing a line upright through the pointers or two hindmost stars of Charley's Wain; on a bright evening it is easily seen, and once found it is easily remembered. Astronomers are by no means certain that it is a double star in the true sense of the word—that is to say, composed of two orbs, revolving round each other and forming the centre of a system round

* Ἥ τ' ἀυτοῦ στρεφεται, χάι τ' Ωρίωνα δοχεύει'
Οἴη δ' ἄμορρός ἐστι λοετρῶν Ωχεανοῖο.

which turn other worlds; it has been rather surmised that though both parts of this star lie in the same line of sight, still they are at an immense distance from each other.

The most northern of the two stars in the pointers (*a* Ursæ Majoris) is also a fine star. Both portions are yellow, and Mr. Webb says that the yellow hue of the large star is very beautiful; he remarks also that he has seen it look violet with a three and seven-tenths object-glass, and lilac with one of five and a half inches.

After this the reader may amuse himself with Castor, the steed-tamer; one of those twins whose history, birth from the egg, famous exploits in clearing the Hellespont of pirates, wars against the Athenians to get back their sister, and subsequent translation to the skies, and how italian sailors bent and prayed to them for fair winds when they sought the Tyrrhene seas, and how the first temple ever reared at Rome to greek gods was raised to them after the fight on the Lake of Regillus, are of course known to every school-boy; as he generally knows more about every such matter than well-read men, it is only right that he be at home on this subject. And now, it has been finely said, they roll round each other as lovingly as on earth they clung together. Castor however is a twin in another sense of the word, being composed of two stars nearly of the same size, "bright and pale white and greenish according to Struve; greenish yellow and greener according to Dembowski."* Sir John Her-

* Intellectual Observer, vol. i. p. 276.

schel considers this to be the finest double star in the heavens.

Another good object to study is a star in the Crab (Zeta). The two stars composing it are also nearly equal in size, and are both yellow. Præsepe, lying a little to the north-east of Zeta, may also be observed, and a double star (Iota) in the Crab is very beautiful and interesting, being composed of a pale orange and a clear blue star; Herschel the elder calls the orange star a deep garnet. The way to find this star is first to take Præsepe (north-east of Castor as has just been said) and draw a line from it to the polar star, bearing a little to the left, just where another line passing between Castor and Pollux would cross this at a right angle; there the star will be found.

The next star recommended by Mr. Webb is one (Epsilon) in the Hydra, but it is not so easy to find, for first a line has to be drawn from the pole star through Pollux to Procyon, a large star in the Lesser Dog. Then a line from this to Regulus passes just above a little group of stars marking the head of Hydra. The most northern of these is the star the reader wants; it is composed of two bodies, pale yellow and purple. There is also a red and blue star in the head of Hercules well worth seeing.

Some of these double stars are very unequally formed in point of size, one perhaps being nearly twice as large as the other. To us accustomed to think of one sun of one unvarying size, and to hear of its vast bulk wellnigh nine hundred thousand miles in diameter*

* One spot observed in the sun was quite forty-five thousand miles across, or nearly twice the size of the whole circumference of the earth.

spoken of with admiration verging upon awe, this disparity in size seems to indicate a cycle of times and seasons, a variety of life of every kind, completely bewildering in their nature. If our sun approached another so near as that in the Virgin seems to have done, everything on the surface of the earth and for some distance below it too would be calcined as if it were in a gigantic limekiln, or melted down into lava. It makes one perspire to think of a heat that can liquefy so many feet thick of ice in a minute, and which for every square yard of the surface from which it issues would require on our earth at least seven large waggon-loads, or about fourteen thousand pounds of coals every hour, to keep its furnaces going. Such is the heat of the sun; what then must it be multiplied perhaps by ten? True the change might be very gradual,—we should have time to prepare for it, and on the principle of natural selection I suppose some few would succeed. Still, unless we could find some cool shade below ground, like those beyond the Styx or the vaults underneath the palace of Djemshid, the intermediate period must be anything but pleasant. If this great increase of heat occurred suddenly there would be no need of any precautions. Under a heat of 500 degrees in the shade, everything that now draws the breath of life would speedily be stretched dead on the ground, the glories of Mont Blanc and the Wetterhorn would vanish like a dissolving view, and ere a month was over, the ocean after seething like a caldron, would boil dry and yield up its long-hoarded treasures when there was not an eye to see them. As their planets appear to be very near these double suns, perhaps a few score degrees of heat

extra may not make quite so much difference to the natives as they would to us, and they may defy roasting as effectually as the tenants of a comet, who, if they exist at all, must have occasionally to put up with a heat two thousand times that of hot iron. The author however inclines to believe with Professor Brien, that there is as much chance of a soap-bubble or a jet of steam being inhabited as of a comet, unless it be by the spirits who were at one time rather confidently asserted to reside there, though whether they were the spirits of the damned or the blessed the supporters of the hypothesis could not agree.

One purpose, and one of no slight consequence to those who reside on the planets, is served by this close proximity, as but for it one sun might occasionally carry off the world, moon, planets, and everything belonging to the other in its wake,—an event likely to be attended with disagreeable if not fatal consequences to the inhabitants. Philosophers indeed accept these incidents with the most laudable equanimity. Humboldt speaks of two planets dashing each other to atoms, "cosmical combats,"* just as he would of one ship running down another at sea; and Buffon considers a collision as a necessary step in the formation of a universe, the world, moon, &c., having, according to him, been chipped off the sun by an erratic comet crossing its path. In his great work on Natural History he has given an engraving, wherein the whole process is seen going on, to the

* "Two planets, rushing from aspect malign
Of fiercest opposition, in mid-sky
Should combat, and their jarring spheres confound."

great admiration of several small angels, all head and wings, who are looking at it with upturned eyes, in a kind of *extase*. Whatever relief this step may have afforded to the philosophic mind of M. Buffon, the incident itself must have been attended with rather startling results for the time being. Any person who has seen one of Mr. Brunell's Great Western engines thunder by with an express train, rolling, blazing, and screaming like one of Michael Scott's devils sent off on some congenial errand, shaking the very earth as it tears along, will have some faint idea of the shock a huge mass, moving at a thousand times the rate and perhaps five hundred million times the momentum, would give to any object it ran against, and would possibly agree with the author in thinking that the sun had rather a narrow escape on some of these occasions.

Occasionally some of the double stars appear with their respective halves in very close proximity to each other. One in the Virgin,* which presents the peculiar feature of having two parts of variable size, one being sometimes larger and sometimes less than the other, and which has been watched by astronomers for a very long time, in the early part of last century for a considerable period showed its dual nature when seen through a very common telescope. By the year 1780 the distance between the two suns had decreased a second, and it lessened from that time up to 1836, when they had got so close to each other that only the great refractor at Pulkowa, with a magnifying power of a thousand, showed any trace

* Gamma Virginis.

of a separation. After this singular proceeding it reopened, and is now a fine double star. Others again revolve at a distance of which mere figures convey a faint idea, if indeed they represent the idea at all. A celebrated double star in the Swan is composed of a pair of suns which sweep round each other in an orbit exceeding that of Neptune, and which takes nearly five hundred years to complete.

One circumstance connected with the observations on these stars will show the reader how astronomy bridges over the great wastes of time, and with what a grand and imposing progress it travels through so many eventful ages as unheeding of their changes as the sun itself. In 1718 James Bradley—the incomparable James Bradley, as Bessel most truly called him, afterwards astronomer-royal and according to Newton the best astronomer in Europe, then slowly climbing up the steeps of fame, and little dreaming of the coming day when he was to be immortalised by his discovery of the aberration (the first positive and unanswerable proof of the earth's motion), and when the first minister of England, Sir Robert Walpole, was to fight his cause so bravely in the House of Commons, and the people were to curse him for stealing eleven days of life from them by changing the style from the old to the new—had noticed the line of junction of the stars in the Virgin and made a note of it. Now this very note, rescued from oblivion by Professor Rigaud, served *more than a century afterwards* to verify the orbit of these stars, and to show that Newton's great law of gravitation extended its action to these far-distant regions.

Widely differing as they do from our sun, we can

scarcely feel any surprise at finding the remaining grand essential, their orbit, so totally opposed to our ideas of stability. Our sun may indeed be moving towards some undiscovered point in the Milky Way or even in the depths of space, but for all practical purposes it is so steady as to be a type of solidity, order, and system, and our planets move in a circle merely a little flattened (an ellipse), but some of these double stars describe a circuit like a spindle. Indeed some comets, that of Faye for instance, hold a much more regular course than many of our double stars; *e. g.*, those in the Centaur already spoken of, which seem to have reached the climax of aggressiveness in this respect.

For a long time the double stars seem to have served scarcely any other purpose than that of enabling astronomers to test their telescopes, for which they are very useful, especially the coloured ones; the companion in the polar star is constantly referred to as a test of a good glass. Yet more than eighty years ago Christian Mayer had watched them through the great Mannheim wall-quadrant, and described some of them, stating at the same time his conviction that they were either a sun and a planet, or two suns rolling round each other. At last the elder Herschel was induced to form catalogues of them in order to gather data for a particular purpose; but so vast was the problem that this distinguished astronomer was occupied with it more or less during the next twenty-five years. This mighty labour however opened up the path for most of the great discoveries respecting the immense number and importance of these double stars, and must for ever remain a noble monument of

Herschel's genius and industry. It is to him that the credit is due of having found out that the twin parts of these stars revolve round each other. He thought at first these halves or suns of a double star were only two stars in the same line, and expected that their apparent distances would alternately increase or lessen every six months, as the observer returned to the position he occupied when first looking at it. One can quite understand why the great astronomer thought this, it is just what any one might have expected to find before the structure of these stars had become known, but like many foregone conclusions it proved to be as much opposed to fact as it well could be. The component parts of the stars were found to be not in a line and not distant.

The reader may ask, "can astronomy tell us for what purpose these magnificent structures were formed?" Can the Rosse telescope teach us if they are inhabited or not, or, if they are seats of life, by what class of creatures; can it say,—

"What varied Being peoples every star"?

Some of those highly favoured people who speak as if they were admitted to the secret councils of the Deity, and who decide about such points without the useless formality of investigating matters, tell us the stars are not inhabited, and that they are of no use save to reveal the splendid nature of the universe and to light up the heavens. This last part of the supposition is not very feasible when we remember that, even seen through the Rosse telescope some of the stars show merely like faint specks, like a tiny shimmering haze,

and that if every star seen in the firmament were as bright as the Centaur or Arcturus they would not, all put together, give more than a hundredth part of the light of the moon. As to their being inhabited, wise men who reason and doubt seem as divided as ever, and even more than ever inclined to admit that neither theology nor astronomy can at present make out anything certain even in the form of conjecture. As Dr. Whewell well says, "the certainty stops just where these speculations begin." Anyhow they must be a singular race of beings that inhabit these sparklers, if we can judge by our neighbours. Earth produces some queer creatures, but astronomers tell us that the planets of our ken, from where Mercury is almost lost in the wasting blaze of the sun to where, far on the remotest confines of our system the giant Neptune rolls in lonely state, if peopled at all must be peopled by a race of creatures more like gnomes and witches than aught human. It is more than doubtful whether some of these have an atmosphere at all for human beings to breathe in, and so far as conjecture and induction can guide us we may assume that none of them would suit us very well, as will appear from the following brief summary of their physical condition.

Both Newton and Humboldt are of opinion that the stars are most probably of the same materials as the earth. Herschel the elder and Laplace shared this view to a great extent. The meteorites have been found to contain no simple body, no earth or metal not known as an element of our globe.* What is however inte-

* Wilson's Religio Chemici, p. 80.

resting is, that they have as yet been only found to contain less than a third of the known number. The metals far predominate over the non-metals in these bodies. Their composition then is such, that if the planets be like them they cannot support earthly life as we understand the phrase.

Furthermore, Mercury is nearly seven times, occasionally nearly eleven times as light as the sun, so that a human being would be struck blind instantly, while the heat is computed to be so great that his eyes would be boiled in his head. In the hottest part of this planet water would be always at boiling heat, and "most *inflammatory* substances be dissipated and destroyed."* We may therefore assume that the natives have no eyes or that they are no bigger than pin-holes. They must also be quite accustomed to extreme vicissitudes of weather, as winter succeeds autumn and summer follows spring quite four times as rapidly as with us, in consequence of the year not being quite three months in duration; a strong contrast to Jupiter whose seasons are nearly thirty times as long as ours. Venus is only twice as light as the sun, so that if a man could go about with his eyes shut he might get on; dress, we may presume, is dispensed with on this planet, as the greatest heat of Venus exceeds that of Borneo and Sumatra just as much as their summer exceeds in heat that of the Orkneys.

Again Mars, the red and sullen Mars, appears to be made of cast-iron in a state of rust, except at the poles where it is covered with snow; by some writers he

* Bonnycastle's Introduction to Astronomy.

has been compared to a globe of ochre. On this stern-looking continent winter lasts nearly a year at the poles without any change, and as a consolation to those who are interested in the fate of the inhabitants, we are told that the warmest part of the climate is not much colder than many parts of Norway or Lapland in the spring. However Mars may still possess a vegetation of its kind, as some of the french botanists have I believe shown that seeds will germinate pretty well upon a fly-wheel. As for the moon, all the water with which she was partially covered in ancient times seems to have boiled out of her, so that there is nothing to drink there. There is no air to breathe, and therefore only a person capable of living quite at ease in the vacuum of an air-pump could manage at all. Perhaps a few beetles or salamanders may pick up a precarious livelihood, but they must have rather an uneasy time of it, as there is not a vestige of anything for them to eat so far as we can see. Moreover one side of their abode is so cold as instantly to freeze brandy, or about a hundred degrees below zero, while the other is about the heat of boiling water. As a residence for astronomers she certainly presents the immense advantage of enabling them to watch a planet three hundred and fifty-four hours at a stretch, the night at the equator being of this length, but for persons who don't care about looking at the stars, her annular mountains, "fresh from the mould, and formed, as it were, of frosted silver," her endless hills and chasms, her ridiculous seas of nectar, tranquillity and the like, after all mean simply that she is a hideous, hopeless waste, full of holes like great beetle-traps, and the reader will most

likely forgive Hooke for trying to show that she is very like a boiled alabaster pudding.

Pallas and Vesta have so little gravity that a man might easily jump from fifty to a hundred feet on them, and an "India-rubber Voltigeur" or "Bounding Brother of the Wild Prairie" would leap over St. Paul's, if indeed St. Paul's would stand steady there, which is rather doubtful. Giants too, like those of which Pliny and Horace Walpole wrote, and lizards of the most fabulous dimensions, might there live comfortably on land, and whales like those on which the ancient mariners cast anchor might bask on the ocean, which is more than they could do here. Jupiter, on the contrary, could only be inhabited by pigmies or goblins like Gylpin Horner. A traveller from this world, Mr. Coxwell or Mr. Glaisher in his balloon, alighting on Jupiter would take root at once, and if he were to make his way to the sun instead, he would be as instantly crushed to the shape of a jelly-fish by his own weight as if he were put into a hydraulic press. While some of the planets seem almost as hard as flint, Saturn appears to be only like a great piece of cork; an earthquake must make the whole globe ring like a drum or crack from one end to the other. Jupiter himself is almost like water, and Uranus is even lighter than water itself, so that an enterprizing miner, if he penetrated too far into either, might drop through with all his gear into space, unless he had the good luck to stick fast in the central nucleus which is thought to be as stiff as clay. To live in comfort on the surface of Jupiter, a man's brain would have to be made of something as hard as

bone or cast-iron, in order to defy the giddiness arising from the terrific rate at which the planet revolves, especially as from water being as heavy there as quicksilver is here, people would have to drink hydrogen gas or something of that kind. Bathing of any kind must be hazardous work, and local knowledge highly advantageous to those who must bathe, as even a young lady would weigh nearly two stone heavier at the poles than at the equator, and people in Saturn are even worse off in this respect.

Persons who are continually grumbling at the weather, especially of England which has one of the finest climates in the world, should go to some of these planets for a change. Jupiter besides being badly lighted, so that a man would want eyes as big as cricket-balls, never has a clear sky throughout by far the greatest part of his vast surface. It is about nine hundred times as cold there as it is here, which means that it is at least ninety times as bad as a residence in January on the topmost peaks of Spitsbergen, with the north wind roaring round their awful chasms and desolate heights. If the motion of the spots on this planet be really due, as has been surmised, to the action of winds, they must travel at such a rate as to nearly rival sound itself, and rage with quite ten times the force and speed of our most furious tornadoes. There is a shrewd suspicion that much of the land of Saturn which lies under his belts is entirely without light, a state which must make these parts of the planet at least as cheerful and salubrious a residence as the polar regions in the dark months, or Terra del Fuego when it rains ice.

"A frozen continent
Lies dark and wild, beat with perpetual storms
Of whirlwind and dire hail, which on firm land
Thaws not but gathers heap."

Herschel also mentions another pleasant contingency dependent on a residence on Saturn, namely the possibility of a ring giving way and burying everything below it.

So much for the planets. Some of the fixed stars present as great difficulties, being liable to temporary or permanent extinction. An occurrence of this nature is said to have determined Hipparchus to draw up the first catalogue of the stars, and ever since that time, wellnigh two thousand years ago, such phenomena have been frequently noticed. A remarkable apparition of this kind happened in 1572, and was seen by that singular mortal but justly renowned astronomer, Tycho Brahe, as he was returning from his watch-tower at Knudsthorp. He would very probably not have noticed its first appearance, had not his attention been drawn by seeing a number of country people gazing at it. It was near Cassiopea and was already as bright as Sirius, though he knew it was not there half an hour before. It grew in beauty till it outshone Jupiter in his greatest splendour, and was at one time visible at mid-day. In about a month its lustre began to wane, and in about fifteen months more it had entirely disappeared. A very brilliant star of this kind was suddenly seen at Prague in the autumn of 1604; it was almost as brilliant as Venus. It gradually decayed in lustre during the next year and has never been seen since. Mr. Hind observed

one which broke out into view in 1848, near the place where this star of 1604 was seen; some are also mentioned rather obscurely by the chinese. A few go on in a chronic fashion of this kind which is rather bewildering. One in Argus, for instance, after sometimes being of the first magnitude and again of the fourth, suddenly blazed out in 1838 with extraordinary brightness, and then after a rest of five years the fitful planet all at once acquired such brilliancy as almost to rival the glorious dogstar. The "lost Pleiad seen no more below," the immortal maid whose bosom owned a mortal flame, who was for that struck out of the roll of the stars and her place made a blank in the heavens, is now really in a very thriving condition. "What conclusion," says a writer quoted by Sir John Herschel, "are we to draw as to the comfort or habitability of a system dependent for its supply of light and heat on so uncertain a source?" Why, a very unfavourable one I should say. A residence on a planet which is apt to become suddenly girdled about by an atmosphere in a state of intense light or electric tension, and then as suddenly to be involved in cold and darkness, must be decidedly uncomfortable.

Finally we have an excellent authority for believing that since the records of astronomy began many stars have died out, a very potent argument for those who are desirous of assuring us that our earthly habitation cannot last much longer. How this extinction happens we cannot exactly understand, unless we believe that the star is shivered into atoms, or that the sun which lighted it had absolutely collapsed, for if the crust of

our earth were broken up and boiling lava poured over it, if it were honeycombed with black and smoking craters till it looked like some great pottery or iron-works laid waste, if all life were destroyed by floods of ice, it would most probably look as bright as ever to the stargazers of Venus and Mercury. Men laughed when Dr. Darwin surmised that Chaos blew up like a barrel of gunpowder and ejected the sun, on the principle perhaps that an empty house is better than a bad tenant, that the sun then blew up and ejected the earth, and so on till matters were comfortably arranged! but it seems difficult to understand how the extinction of which mention has just been made could have been effected in any other way. Lagrange calculated that it was not such a difficult thing to blow up a planet as might be supposed! only requiring about twenty times the force of a cannon-ball!! so that some day or other, when we can get near enough, we shall be able to explode a planet with one of Whitworth's guns, which also in the case of any very eccentric star, may prove a cheaper plan for solving any knotty points about its orbit than paying astronomers for making calculations about the matter. The explosion theory is however really still believed in. Kirkwood has actually calculated the exact size of the parent star which was shivered into all the pretty little planets lately discovered—Juno, Pallas, and the rest. How the inhabitants of the star fared on this occasion we are left to conjecture.

Besides these instances, there are stars which undergo a similar change, but occupy a very much shorter time about it, their cycle of changes being

performed in days or hours instead of years. Argelander has reckoned the number of these variable stars at twenty-four, but there are several besides in which this change is not so well marked.

And now, gentle reader, you have reached the end of

THE STREAM OF LIFE.

APPENDIX.

I.—P. 5.

"Faint traces of animal remains make their appearance in strata of as early a date as any in which impressions of plants have been detected."—Lyell, Principles of Geology, Fifth Edition, vol. i., p. 234.

II.—P. 12.

Sir Charles Lyell has expressed very strong doubts as to whether more violent disturbances occurred in very remote times than now. "There can be no doubt," he says, "that periods of disturbance and repose have followed each other in succession in every region of the globe; but it may be equally true, that the energy of subterranean movements has always been uniform as *regards the whole earth.*"

III.—P. 16.

Hugh Miller, in his "Footprints of the Creator," says that vegetable remains are much more numerous in the lower than the upper old red sandstone.—P. 185.

IV.—P. 28.

Miller, in his "Footprints of the Creator," beautifully refers to some of these scenes; "the land of the Wealden, with its gigantic iguanodon rustling amid its tree ferns and cycadeæ, comes next; then comes the green land of the Oolite, with its little pouched

insectivorous quadrupeds, its flying reptiles, its vast jungles of the Broora equisetum, and its forests of the Helmsdale pine.—P. 197.

V.—P. 45.

"More than forty of these Eocene mammifers are referable to a particular division of the order Pachydermata, which has now only four living representatives on the globe,—namely, three tapirs and the Daman of the Cape."—Lyell, Principles of Geology, Fifth Edition, vol. ii., p. 379.

VI.—P. 51.

The "crag" is chiefly developed in Norfolk and Suffolk, but extends into Essex; Lyell, in his "Principles," refers it to the older pliocene period. It is divided into the lower or coralline crag, and the upper or red crag. The coralline crag rests on the London clay. Lyell does not think they belong to distinct tertiary periods. The remains of mammals are generally found in the red crag, those of corals and zoophytes in the coralline. Recently the mammaliferous crag has been added. "The oldest of these, the coralline crag of Suffolk, contains among its marine shells 51 per cent. of existing species. Of these, however, about a sixth part are no longer found in British seas, and of this sixth part fourteen out of fifteen are confined to more southern latitudes. The next in order of antiquity—the red crag—contains 57 per cent. of existing species, several of which likewise are no longer found in our waters. But of these the southern species constitute only two-thirds. The Norwich, or 'mammaliferous' crag, which is the most recent of the three formations, contains 85 per cent. of existing species, among those found in it which are no longer living in British seas there is not a single southern species."

VII.—P. 52.

"One rhinoceros (the Rhinoceros leptorrhinus) was associated with the great hippopotamus in fresh-water *pliocene* deposits; another (the tichorine rhinoceros) with the mammoth in *pleistocene* beds and drift."—Owen's Palæontology. This tichorine rhinoceros, like the mammoth, had a covering of wool and hair. Both kinds were two-horned, and had been preceded in the pliocene and miocene times by a hornless rhinoceros.

VIII.—P. 52.

"There existed in Britain a very large species of bison (Bison priscus) and a larger species of ox (Bos antiquus) from *pliocene* fresh-water beds; while a somewhat smaller, but still stupendous wild ox (Bos primigenius) has left its remains in *pleistocene* marls of England and Scotland. With this was associated an aboriginal British ox of much smaller stature, and with short horns and long-fronted head (Bos longifrons)—[Its remains have been found in the burying-places of our ancestors.]—which continued to exist till the historical period, and was probably the source of the domesticated cattle of the Celtic races before the Roman invasion. A buffalo, not distinguishable from the musk kind (Bubalus moschatus), now confined to the northern latitudes of northern America, roamed over similar latitudes of Europe and Asia in company with the hair-clad elephants and rhinoceroses."—Owen, p. 370.

IX.—P. 55.

"The machairodus, or great British tiger, is not believed to have lived down to the post-pliocene age."—(Mackie, Popular Science Review, No. 7.) Ansted, however, says that a *great* cavern tiger ranged over England, accompanied by another species of tiger of smaller size, a leopard and a wild cat, and speaks of these animals as quite distinct from the sabretooth (machairodus). He says that the cavern tiger seems to have resembled the jaguar in its proportions, whilst the sabretooth had something of the bear in it.—Geological Gossip, p. 241.

X.—P. 56.

The pleistocene lion. "The finest examples of the large pleistocene lion have been discovered in bone caves, *e. g.*, in those of Banwell, Somersetshire. It roamed over pliocene and pleistocene Europe, and has left its remains in many stratified deposits of the *former* period in *Britain*."—Owen, Palæontology, 1860, p. 384.

XI.—P. 58.

The old chronicler Holinshed, in his chapter "Of Sauage Beasts and Vermines," speaks of beavers as still existing in his time in England, though few in number, but as being more plentiful in Wales;

the passage is rather obscurely worded. He also alludes to the *maned lion* having been known in Scotland, but at what date he does not tell us.

XII.—P. 66.

"Araucariæ and cycadaceous plants, like those found fossil in oolitic beds, flourish on the Australian continent, where marsupial quadrupeds still abound, and thus appear to complete a picture of an ancient condition of the earth's surface, which has been superseded in our hemisphere by other strata and a higher type of mammalian organization."—Owen, Palæontology, p. 308.

XIII.—P. 85.

"In the tertiary division of geological time, the ganoid order rapidly diminishes, and its place is taken by fishes with better ossified internal skeletons, and with thinner, more flexible, and usually soluble scales." The gills are supported on bony arches, and are protected by a gill cover. The aortic bulb has but two valves, and the optic nerves decussate.—Owen, Palæontology p. 145.

XIV.—P. 159.

I believe only three species of the Araucaria have been discovered. The excelsa, which will not live in England, and the absence of which is in no way to be regretted, is the best known species, being the famous Norfolk Island pine. It is this form which most resembles the kinds found in the lias of Dorsetshire. The nuts and pith of the spiral and the bread-tree Zamia furnish food to the natives of New Holland, and the Caffirs and Hottentots.

XV.—P. 203.

The reader will find an engraving of the characters on this stone in the first volume of Pinkerton's Voyages, p. 254. If what M. Brunniers states be correct, it must be considered an artificial work.

XVI.—P. 221.

Pritchard says—that judging from the skulls found in the old burial-places in Britain, the ancient inhabitants must have differed considerably from the moderns, having less space for the anterior lobes of the cerebrum.—Researches into the Physical History of Mankind, 1841, vol. i., p. 305.

XVII.—P. 355.

See Miller's "Footprints of the Creator," p. 197; Sir Charles Lyell's "Principles of Geology," fifth edition, vol. i., p. 237; Owen's "Palæontology," &c.

XVIII.—P. 356.

"It is a very remarkable fact," as Professor Adolphe Brongniart justly observes, "that the exogens, which comprise four-fifths of living plants, a division to which all our native European trees, except the Coniferæ, belong, and which embrace all the Compositæ, Leguminosæ, Umbelliferæ, Cruciferæ, Heaths, and so many other families, are wholly unrepresented by any fossils discovered in the primary and secondary formations, from the Silurian to the Oolitic inclusive. It is not till we arrive at the Cretaceous period that they begin to appear, sparingly at first, and only playing a conspicuous part together with the palms and the endogens in the tertiary epoch."

XIX.—P. 560.

Poisson strongly opposed the idea of central heat, Cosmos, b. i., s. 425. Lyell also contends against it, "Principles of Geology," fifth edition, vol. ii., p. 330, &c.

XX.—P. 577.

The lowest temperature in the great frost of 1789 (1709?), as given by Dr. Derham, is $1\frac{1}{2}^{\circ}$ Fahr. In 1716 the cold seems never to have been more intense than 11° Fahr.; in 1739 and 40 never lower than 10° Fahr. In the great frost of 1762-3, the lowest tempera-

ture was 10½° Fahr.; in 1767 it fell to 7°, and the year after is said to have reached in Scoland—2°. In 1795 it is said, in Rees's Cyclopædia, to have fallen to—6°; but the names of the place and of the person who recorded this are not given. In 1798 the thermometer fell to 11° Fahr. In 1814 the lowest cold was 3° Fahr.; in 1838 it was—3° Fahr.; in 1845 it sank to—2°, and it is said to—5° Fahr. In December 1860 it fell to—10°, and even according to one account—13° Fahr.—"All the Year Round," vol. iv., p. 398.

CORRECTIONS AND OMISSIONS.

P. 39, line 2. Mantell, however, in his Wonders of Geology, puts down the number of shells contained in the white chalk at upwards of a million.

P. 203, line 18, after "races," read "or disposed to cultivate similar arts."

P. 204, line 6, for "northern Asia in Siberia," read "along the border of Western Asia to Siberia we find ruins of buildings, fortresses, and sepulchral hillocks."

P. 427, line 24, after "image," read "as slumber is of death."

P. 551, line 8, after "grandson," read "named as if of male descent."



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