Tracts relating to natural history / by James Edward Smith ...

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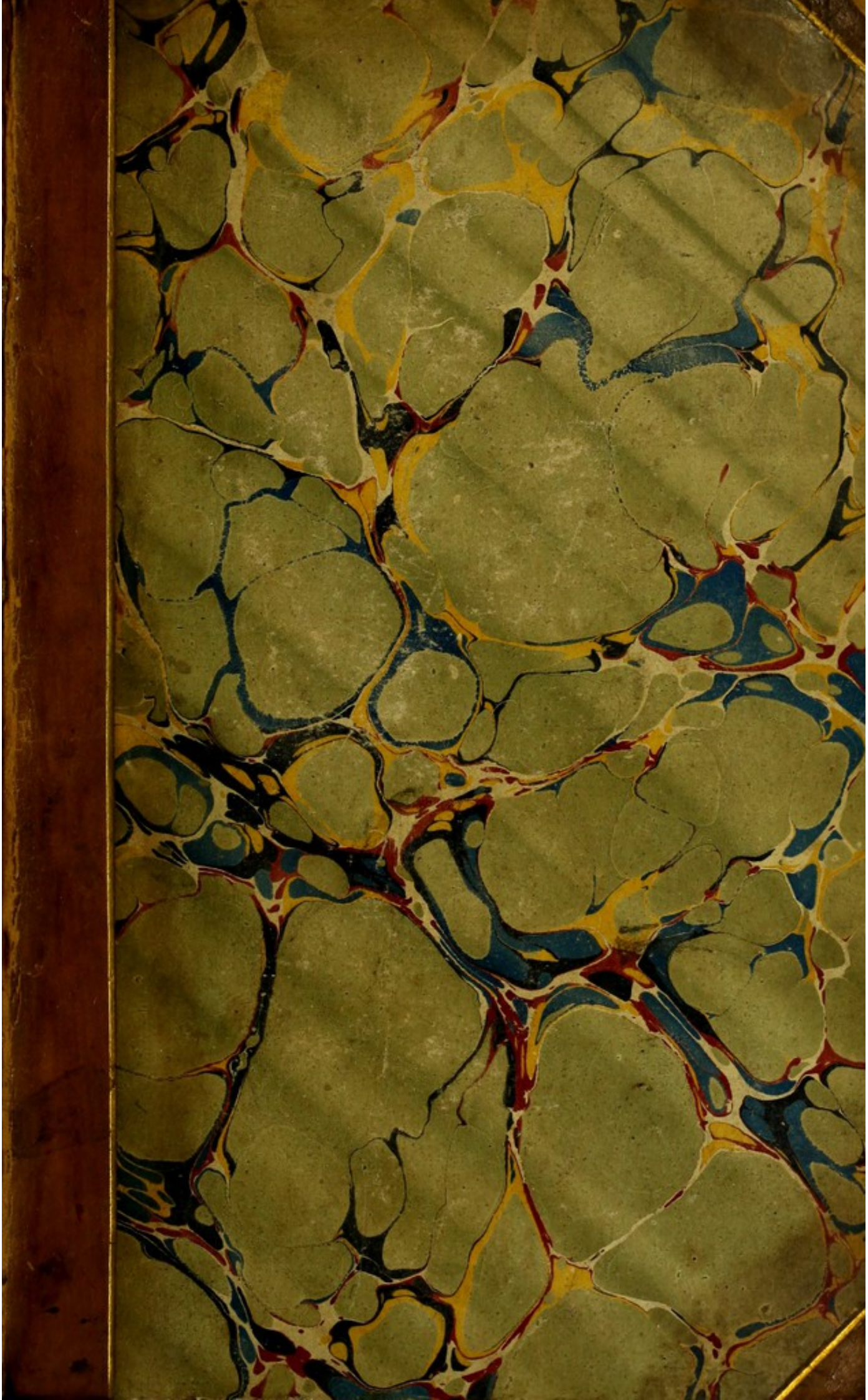

TRACTS

RELATING TO

NATURAL HISTORY.

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NATURAL HISTORY.

BY

JAMES EDWARD SMITH, *M.D. F.R.S.*
ETC. ETC.
PRESIDENT OF THE LINNÆAN SOCIETY.

"Still let me various Nature scan:
The world's my Home, my brother Man,
And God is every where."

PETRIE.

LONDON:
PRINTED FOR THE AUTHOR, BY J. DAVIS, AND SOLD BY
J. WHITE, FLEET-STREET.

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1798.

To JAMES CROWE, Esq.

FELLOW OF THE LINNÆAN SOCIETY.

DEAR SIR,

IN reviewing ſome of my firſt literary attempts, I cannot help recurring to that ſtill more early period, when your partial encouragement and aſſiſtance led me on in the purſuit of our favourite Science, and when it was as improbable that my endeavours ſhould ever be of uſe to the world, as that I ſhould write a book worth dedicating to you. While with pleaſure I now reviſit the haunts of my youth, and remark many a wild flower from which I

have formerly derived inſtruction or delight; while I cultivate and enjoy your conſtant unabated friendſhip; it is with double ſatisfaction I recollect, and gratefully acknowledge, how much of my earlieſt progreſs is to be attributed to you. May we for a long time to come enjoy together the ſame purſuits, which afford equal and certain gratification at every period of life, to inexperienced curioſity, and to ripened judgment and knowledge.

Believe me ever,

My dear Sir,

Your obliged and

Faithful ſervant,

J. E. SMITH.

NORWICH,
Jan. 1, 1798.

PREFACE.

ABOVE twelve years have now elapſed ſince the firſt piece in this Volume, a beautiful recommendation of the Study of Natural Hiſtory prefixed by Linnæus to his *Muſeum Regis*, was originally printed in Engliſh. This, my firſt literary undertaking, was favourably received, as ſeveral more arduous ones have ſince been; and a ſecond edition of the tranſlation has often been deſired. It is now given, with the original Introduction and Notes, and ſome trifling corrections.

The ſecond article in the preſent Volume is a Diſcourſe on the Riſe and Progreſs of Natural Hiſtory, delivered at the opening of the Linnæan Society in 1788, and printed in the Firſt Volume of that

Society's Tranſactions. I have been induced to reprint this Eſſay by the perſuaſion of ſeveral perſons, who may be deemed Admirers rather than Students of Nature, and who therefore have declined purchaſing ſo large a work as the Tranſactions themſelves. I have the more readily acceded to this requeſt, as it gives me an opportunity of enriching the original with the Notes of Father Fontana, the celebrated mathematical profeſſor of Pavia, who publiſhed an Italian tranſlation of this Diſcourſe, which has gone through two editions.

The paper on the Irritability of Vegetables, from the Philoſophical Tranſactions for 1788, was reprinted by the editors of the New Annual Regiſter, and appeared alſo in Roſier's Journal the ſame year. It chiefly regards the mode of impregnation in the Barberry, about which ſome Naturaliſts are ſtill miſinformed. The great M. de Juſſieu for inſtance, in his *Genera Plantarum*, publiſhed at Paris in 1789, p. 287, attributes

butes the motion of the ſtamina in this plant, to their being held between the two glands at the baſe of each petal, and delivering themſelves by their elaſticity; an hypotheſis which the ſlighteſt examination of the flower will ſet aſide.

The fourth, fifth, ſixth, and ſeventh articles of the preſent Volume conſiſt of criticiſms upon ſome publications in Natural Hiſtory, which were written for the Analytical Review. They are now reprinted merely to ſhew all I have compoſed, or ever mean to publiſh, in this way. It appears to me that an Author who is known ſhould never publiſh anonymouſly upon ſcientific ſubjects. It is waſting his information and his authority. For matters of fact, the world has a right to know whom it may truſt; and as to matters of opinion, a man ought to advance none that he cannot or dares not defend; at leaſt upon ſubjects where, happily for truth, there is nothing to be got by oppoſing him. Indeed even theſe Reviews would never have been written,

had

had it not been apprehended that ſome of the books in queſtion were not likely to be noticed as they deſerved; particularly Mr. Curtis's Magazine, a moſt pleaſing and uſeful work, to which the Public has ſince done juſtice. The remarks upon Dr. Berkenhout's publication were compoſed from a ſimilar motive, though it was not poſſible to avoid intermixing ſome cenſure with the praiſe this work generally merited. It appears by the Preface of the ſame author's Letters to his Son, that my criticiſms gave him high offence. They perhaps led him to re-peruſe his book, and then he would eaſily diſcover how much greater ſeverity it deſerved upon all the points to which they alluded; and though he corrected himſelf by them in a ſubſequent edition, he could never pardon the critic; for I have had occaſion elſewhere to obſerve, that "the greateſt offence is that of being in the right;" and this is another reaſon why a perſon who wiſhes to avoid a hornet's neſt, can ſcarcely be an honeſt reviewer.

The

The eighth article in this Volume is indeed a ſufficiently unreſtrained compoſition of the ſame kind, but at this time of day it can hurt nobody. It has never before been printed, having been written on an emergency, in want of more ſolid matter, for the entertainment of the Linnæan Society, without any intention of publication. The only apology I can offer for printing it now is its curioſity, for the ſubject is uſeleſs.

This paper is followed by three botanical ones, which having never appeared in Engliſh, and containing, it is hoped, uſeful practical information, are now with the moſt ſatisfaction laid before the Public. The beſt occupation of a Naturaliſt is the actual obſervation of Nature. This will always reward his care, and improve his judgment. He may indeed learn much from the labours of others, and may but too often have occaſion to congratulate himſelf on the detection of errors, from which the greateſt men are not exempt; for what genius is

equal

equal to the wiſdom of Nature? But the beſt uſe to be made of the miſtakes of others, is to learn circumſpection ourſelves.

It is proper to obſerve, that an elegant plate of the *Sprengelia incarnata* has been publiſhed by Mr. Andrews, in a work he has lately commenced, to which I ſhould gladly have referred, had it come to my knowledge before the ſheet in which I have deſcribed that plant had been printed. I have alſo learned by a letter from Sweden, that the paper on *Weſtringia* is now actually printed in the Stockholm Tranſactions.

The concluding paper in this Volume is on a ſubject ſimilar to the three preceding, but has not hitherto been any where publiſhed. Its contents are too miſcellaneous for any purely botanical publication, though they may not prove unintereſting to readers on whoſe hearts the Study of Nature has had its proper and natural effect.

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I.

REFLECTIONS

ON THE

STUDY OF NATURE.

Tranſlated from the Latin of the Celebrated

LINNÆUS.

"*— look thro' Nature up to Nature's* GOD."

TRANSLATOR's PREFACE

TO THE FIRST EDITION.

THE little Tract now offered to the Public, is the Preface to the *Muſeum Regis Adolphi Friderici* of Linnæus; a work containing deſcriptions of the various natural productions in the Muſeum of the late King of Sweden, printed in 1754, at his Majeſty's expence.

The Linnæan Library coming into the poſſeſſion of the Tranſlator, this publication particularly engaged his attention; as containing one of the beſt general views of the œconomy of Nature that he has met with, as well as the moſt candid and rational recommendation of the ſtudy of Natural Hiſtory.

A deſire of giving others the ſame pleaſure which he experienced, has made him attempt putting this Preface into an Engliſh dreſs; eſpecially as the book to which it belongs, one of the moſt ſuperb and expenſive of all Linnæus's works, is very

little known in this country. The name of its Author, as Mr. Stillingfleet formerly remarked, is in every body's mouth; but probably many people have heard of him without preciſely knowing how much the ſcience of Natural Hiſtory, and many uſeful arts, are indebted to him; and not a few have criticiſed his publications, without knowing any thing of him, or underſtanding his works: time and experience, however, have eſtabliſhed his merit, and nearly ſilenced all his opponents.

The dignity and importance of a philoſophical enquiry into the works of Nature, are ſufficiently proved in the following pages. At the ſame time, every attempt, however feeble, to add to the general ſtock of knowledge, ſhould be encouraged; eſpecially in a ſcience founded, as this is, on obſervation. Even collectors of natural productions, who have little or no ſcientific knowledge, deſerve commendation, as their labours are of uſe to thoſe who have not the means of collecting for themſelves.

All perſons, however, who follow any particular

particular purſuit, are often expoſed to very mortifying queſtions reſpecting the uſe of their enquiries. And it muſt be confeſſed, that the community has a right of examining every man's employment, in order to give him his juſt degree of eſtimation as a member of ſociety.

Queſtions of this nature coming from the generality of mankind, may be eaſily anſwered, by telling them ſome ſtriking fact, in which their health, ſafety, or profit is concerned; or by giving the more ſenſible and ingenuous a view of ſomething that may intereſt more amiable feelings. For the latter this little work is principally intended: thoſe who have not time or inclination to look farther into the ſtudy which it treats of, may get ſome information from it, and may at leaſt learn that this ſcience richly deſerves the attention of ſome part of mankind.

One fact, which all may learn from it, is, that the ſtudy of Nature does not neceſſarily tend to make a man irreligious, as ſome weak people have been made to

believe. A number of illuſtrious examples might be produced to the contrary; none more eminent than the excellent Author of this work, whoſe unaffected chearfulneſs and uniform benevolence gave, in his lifetime, the moſt unequivocal proofs of the goodneſs of his heart, as his various publications do of his genuine piety.

Indeed it is difficult to conceive how an opinion ſo abſurd as the above could gain any ground: it muſt ſurely have been ſtrengthened by the conduct of thoſe triflers in philoſophy, who miſtake whim and affectation for genius; aim at, and imagine they attain, every ſcience, by new paths untried before; and have a great facility at reſolving every thing, which they cannot comprehend, into abſurdity and impoſition. Or it muſt have been countenanced by thoſe pretenders to ſcience, who having entered on a profeſſion, the foundation of which ought to be the obſervation of Nature, think it neceſſary to affect univerſal knowledge. What theſe people

cannot attain they treat with contempt; they pollute the holy fountain of truth with their crude and often malicious effuſions; and are only preſerved from general ſcorn by the intricacy of Nature, and the ſhort-ſightedneſs of mankind.

Such critics as theſe frequently moleſt the patient traveller in the path of ſcience, as well as the honeſt inveſtigator of moral truth, with queſtions tending only to perplex, and with remarks leſs calculated to aſſiſt than to confound. Unprofitable indeed may that purſuit be eſteemed, the proſecution of which is not preferable to a controverſy with ſuch men! He whoſe good-nature ſhould induce him to try to enlighten them, would probably find them as incapable of improvement as of candour; as unſkilful perhaps in what they ought to know, as illiberal in their cenſures of what they do not even profeſs to underſtand.

But nothing affords a more humiliating view of human wiſdom, than when we ſee men of real learning and ſkill in particular

branches, treating the ſcientific purſuits of others with contempt. How much ſoever ſuch men may excel in their own ſcience, and how lofty and important ſoever that ſcience may be, they can neither be eſteemed true philoſophers, nor friends of mankind. A certain portion of enthuſiaſm in our favourite purſuits is natural; it is even neceſſary to the attainment of an eminent degree of ſucceſs in them: but when it becomes inordinate, it is always ridiculous, and often guilty; it gives the world reaſon to ſuſpect that its poſſeſſor has attached himſelf to a ſingle branch or knowledge, at the expence of all wiſdom and virtue beſides.

The editor of this little work has taken the liberty of making the names of the animals mentioned in it agree with Linnæus's laſt edition of his Syſtema Naturæ; in other reſpects the tranſlation is in general pretty near the original: if it be found intelligible, the Tranſlator's principal end will be anſwered.

June, 1785.

REFLECTIONS

ON THE

STUDY OF NATURE.

THOSE who viſit muſeums of natural productions, generally paſs them over with a careleſs eye, and immediately take the liberty of giving a decided opinion upon them. The indefatigable collectors of theſe things ſometimes have the fate of being reckoned monſters: many people wonder at their great but uſeleſs labours; and thoſe who judge moſt tenderly, exclaim, that ſuch things ſerve to amuſe perſons of great leiſure, but are of no real uſe to the community. It ſhall therefore be the buſineſs of this diſcourſe to examine the deſign and end of ſuch collections.

The knowledge of one's ſelf is the firſt ſtep towards wiſdom: this was the favorite precept of the wiſe Solon, and was written

written in letters of gold on the entrance of the temple of Diana.

A man ſurely cannot be ſaid to have attained this ſelf-knowledge, unleſs he has at leaſt made himſelf acquainted with his origin, and the duties that are incumbent upon him.

Men, and all animals, increaſe and multiply in ſuch a manner, that, however few at firſt, their numbers are continually and gradually increaſing. If we trace them backwards, from a greater to a leſſer number, we at length arrive at one original pair. Now mankind, as well as all other creatures, being formed with ſuch exquiſite and wonderful ſkill, that human wiſdom is utterly inſufficient to imitate the moſt ſimple fibre, vein, or nerve, much leſs a finger, or other contriving or executive organ; it is perfectly evident, that all theſe things muſt originally have been made by an omnipotent and omniſcient Being; for "he who formed the ear, ſhall he not hear? and he who made the eye, ſhall he not ſee?"

Moreover,

Moreover, if we conſider the *generation* of Animals, we find that each produces an offſpring after its own kind, as well as Plants, *Tænias*, and Corallines; that all are propagated by their branches, by buds, or by ſeed; and that from each proceeds a germ of the ſame nature with its parent; ſo that all living things, plants, animals, and even mankind themſelves, form one "chain of univerſal Being," from the beginning to the end of the world: in this ſenſe truly may it be ſaid, that there is nothing new under the ſun.

If we next turn our thoughts to the place we inhabit, we find ourſelves ſituated on a vaſt globe of land and water, which muſt neceſſarily owe its origin to the ſame Almighty Being; for it is altogether made up of wonders, and diſplays ſuch a degree of contrivance and perfection, as mortals can neither deſcribe nor comprehend. This globe may therefore be conſidered as a muſeum, furniſhed with the works of the Supreme Creator, diſpoſed in three grand claſſes.

If,

If, in the firſt place, we conſider the Foſſil Kingdom, we ſhall ſee the manner in which *water* depoſits *clay*; how it is cryſtallized into *ſand* near the ſhore*; how it wears down *ſhells* into *chalk*, dead *plants* into *vegetable mould*, and *metals* into *ochre*; from all which ſubſtances, according to the laws of Nature, *ſtones* are formed: thus from ſand originates *whetſtone*, from mould *ſlate*, from chalk *flint*, from ſhells and earth *marble*, and from clay *talc*. In the cavities of theſe, concrete beautiful pellucid *cryſtals*, which conſiſting of various ſides oppoſed to each other, form a number of regular figures, which the moſt ingenious mathematician could ſcarcely have invented, and among which the glittering *gems* and brilliant *adamant* find a place.

Here the ponderous and ſhining *metals* are conſtantly forming; the ductile *gold*†,

* This opinion of the cryſtallization of ſand from water is diſputed by the mineralogiſts of the preſent day.

† *Lentum aurum.*

which

which eludes the violence of fire, and which can be extended in length and breadth to an almoſt incredible degree: here is found the wonderful *magnet*, of which no mortal has hitherto been able to learn the ſecret law of its mutual attraction with iron, or of its conſtant inclination towards the poles.

The various ſtrata of ſtones often concealed in the higheſt ſummits of the Alps, are moſt ancient monuments, which place before our eyes the many changes of the old globe, and proclaim them to us, whilſt all other things are ſilent on the ſubject.

The innumerable *petrifactions* of foreign animals, and of animals never ſeen by any mortal in our days, which often lie hid among ſtones under the moſt lofty mountains, are the only remaining fragments of the ancient world, and reach far beyond the memory of any hiſtory whatever.

So large a quantity of theſe and other ſtones covers the globe, that no man has hitherto been able to break through them,

and

and penetrate to the originally created earth.

In the ſecond place, the Vegetable Kingdom offers itſelf to our contemplation. Of all its productions, the firſt covering of the earth was furniſhed by the wintry *moſſes*; of ſuch variety in their forms, that they ſcarcely yield to herbs in number; and although extremely minute, yet of ſo admirable a ſtructure, that they undoubtedly excel the ſtately Palms of India. Theſe moſſes are dried up in ſummer, but in winter they revive, and in the early ſpring guard the roots of other plants from cold, as they afterwards do from the injuries of ſummer ſuns.

For the gratification of our eyes, the earth is every where covered with verdure: there is no ſoil ſo rich or ſo barren, none ſo dry or ſo boggy, mountainous or marſhy, expoſed or ſhady, that ſome peculiar ſpecies of graſs does not freely grow there, and fill up the interſtices between other plants.

The widely diſſeminated *herbs*, diſtinguiſhed

guiſhed by the various forms of their leaves, flowers, and fruits, decorate the earth in the moſt agreeable manner; not one of them but has its end and office aſſigned it by the Supreme Governor of the world: numerous as they are, they moſt of them differ from one another in taſte and ſmell, form and colour, powers and properties; but eſpecially in their flowers, which attract our notice by their elegant variety; and in them we diſcover the amours of plants, by which, although unattended with ſenſation, they develope their internal ſtructure*, and overſpread the globe.

Trees, whoſe roots being raiſed high above the earth, conſtitute what we call a ſtem, weave their branches into an agreeable ſhade, to defend the ground from exceſſive heat and cold, and to ſhelter men from the injuries of the weather.

* This refers to a theory of the Author's, the ſolidity of which may be doubted. Thoſe who wiſh to ſee more of it, may conſult the Amœnitates Academicæ, Vol. vi. Diſſertation 1.

The

The third diviſion contains the Animal Kingdom, where the various kinds of *worms* ſilently occupy the bottom of the ſea; ſome of which, united in a manner by ſocial compact, build *corals*, others lead a ſolitary life concealed in their horny ſhells, which are conſtructed with ſuch beauty and variety in their figures, that no human wiſdom can trace them out or comprehend their numbers.

Such numberleſs ſwarms of armed *inſects* fly about the earth, that their ſpecies are more numerous than all that the ground produces. Theſe, in their infancy, are diſguiſed in the form of *caterpillars*, in which ſtate each has its proper plant aſſigned it, which it is appointed to inhabit and to feed upon, that the inordinate increaſe of any one may be prevented. Hence thoſe vegetables whoſe luxuriant branches other animals cannot touch, either on account of prickles or height, or of a certain fœtor or acrimony peculiarly obnoxious to their ſenſes, are obliged to afford entertainment to a number of inſects:

ſo

ſo that while many plants are deſtined to feed a very few ſpecies of theſe animals, the nettle affords ſubſiſtence to ſeveral different kinds; and trees, being out of the reach of quadrupeds, frequently ſupport innumerable legions.

The dumb *fiſhes* which glitter at the bottom of the waters, and which ſurpaſs birds in number, find an ample repaſt prepared for them in the numberleſs worms which have their dwelling there: and at the ſummons of Venus they in their turns annually approach the ſhore in duly divided troops.

The winged inhabitants of the air, which excel all other animals in the beauty of their forms, find in the loftieſt trees a rich proviſion of inſects for their ſuſtenance: here they modulate their harmonious throats to the tender melody of love, preparatory to their producing new tribes for the ornament of future ſeaſons. Moſt birds migrate every year from the northern ſhores to countries nearer the ſun; and, having reached their appointed diſ-

tance, return for the purpoſe of diſſeminating plants and fiſhes*.

Quadrupeds, which wander and ſport in the fields, convert all other things to their uſe: by their joint endeavours they purge the earth from putrefying carcaſes; by their voracious appetites they fix bounds to the number of living creatures; they join in the contracts of love; and, when urged by hunger, unite in purſuit of their prey. Thus, whilſt all things are purified, all things are renewed, and an equilibrium is maintained; ſo that of all the ſpecies originally formed by the Deity, not one is deſtroyed.

While we turn our minds to the con-

* Pulpy fruits are in general the food of a variety of birds as well as of quadrupeds; but the ſeeds which are contained in theſe fruits are of ſuch a nature, that they almoſt always paſs through the animal unhurt, and rather more fit for vegetation than before: thus they are tranſported to places far from their native ſoil. The ſpawn of fiſhes often ſhares the ſame fate.—See Linnæus's Oratio de Telluris Incremento, Amœn. Acad. vol. ii. publiſhed in Engliſh by the Rev. Mr. Brand, among his Select Diſſertations from the Amœnitates Academicæ.

templation of the beauties which ſurround us, we are alſo permitted to employ them for our benefit: For to what uſe would the ſun diſplay its beams? for what end would the ſpacious world be furniſhed by the great and bountiful Author of nature, were there no rational beings capable of admiring and turning it to their profit? The Creator has given us *eyes*, by the aſſiſtance of which we diſcern the works of creation. He has, moreover, endowed us with the power of *taſting*, by which we perceive the parts entering into the compoſition of bodies; of *ſmelling*, that we may catch their ſubtile exhalations; of *hearing*, that we may receive the ſound of bodies around us; and of *touching*, that we may examine their ſurfaces; and all for the purpoſe of our comprehending, in ſome meaſure, the wiſdom of his works. The ſame inſtruments of ſenſation are beſtowed on many other animals, who ſee, hear, ſmell, taſte, and feel; but they want the faculty which is granted us, of combining theſe ſenſations, and from thence

drawing univerſal concluſions. When we ſubject the human body to the knife of the anatomiſt, in order to find in the ſtructure of its internal organs ſomething which we do not obſerve in other animals, to account for this operation; we are obliged to own the vanity of our reſearches: we muſt therefore neceſſarily aſcribe this prerogative to ſomething altogether *immaterial*, which the Creator has given to man alone, and which we call *ſoul*.

If therefore the Maker of all things, who has done nothing without deſign, has furniſhed this earthly globe, like a muſeum, with the moſt admirable proofs of his wiſdom and power; if, moreover, this ſplendid theatre would be adorned in vain without a ſpectator; and if he has placed in it Man, the chief and moſt perfect of all his works, who is alone capable of duly conſidering the wonderful œconomy of the whole; it follows, that Man is made for the purpoſe of ſtudying the Creator's works, that he may obſerve in them the evident marks of divine wiſdom.

Thus we learn, not only from the opinions of moraliſts and divines, but alſo from the teſtimony of Nature herſelf, that this world is deſtined to the celebration of the Creator's glory, and that man is placed in it to be the publiſher and interpreter of the wiſdom of God: and indeed he who does not make himſelf acquainted with God from the conſideration of nature, will ſcarcely acquire knowledge of him from any other ſource; for, "if we have "no faith in the things which are ſeen, "how ſhould we believe thoſe things "which are not ſeen?"

The brute creation, although furniſhed with external ſenſes, all reſemble thoſe animals which, wandering in the woods, are fattened with acorns, but never look upwards to the tree that affords them food; much leſs have they any idea of the beneficent Author of the tree and its fruit.

If our probation had been the only object of Divine Wiſdom in forming the world, it would have been ſufficient for

that wiſdom, which does nothing in vain, to have produced an indigeſted chaos, in which, like worms in cheeſe, we might have indulged in eating and ſleeping: food and reſt would then have been the only things for which we ſhould have had an inclination; and our lives would have paſſed like thoſe of the flocks, whoſe only care is the gratification of their appetite. But our condition is far otherwiſe.

For the Author of eternal ſalvation is alſo the Lord of nature. He who has deſtined us for future joys, has at preſent placed us in this world. Whoever therefore ſhall regard with contempt the œconomy of the Creator here, is as truly impious as the man who takes no thought of futurity. And in order to lead us toward our duty, the Deity has ſo cloſely connected the ſtudy of his works with our general convenience and happineſs, that the more we examine them, the more we diſcover for our uſe and gratification. There is no land ſo barren and dreary, that any one who ſhould come there need periſh

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with hunger, if he knew the bodies which it produces, and how to uſe them properly; and we ſee conſtantly, that all rural and domeſtic œconomy, founded on the knowledge of nature, riſes to the higheſt perfection, whilſt other undertakings, not deduced from this ſcience, are involved in inſurmountable difficulties.

The magnificence and beauty, the regularity, convenience, and utility of the works of creation, cannot fail to afford man the higheſt degree of pleaſure; ſo that he who has ſeen and examined moſt of theſe, muſt the more perfectly admire and love the world as the work of the great Creator, and muſt the more readily acquieſce in his wiſe government. To be an interpreter of the perfect wiſdom of an infinite God, will by him be eſteemed the higheſt honour that mortals can attain. Can any work be imagined more forcibly to proclaim the majeſty of its author, than a little inactive earth rendered capable of contemplating itſelf as animated by the hand of God? of ſtudying the dimenſions

and revolutions of the celeſtial bodies, rolling at an almoſt infinite diſtance, as well as the innumerable wonders diſperſed by the Creator over this globe? in all which appear manifeſt traces of divine wiſdom and power, and the conſideration of which affords ſo much delight, that a man who has taſted it would cheerfully prefer it to all other enjoyments.

Nature always proceeds in her accuſtomed order, for her laws are unchangeable; the omniſcient God has inſtituted them, and they admit of no improvement.

It is ſo evident that the continent is gradually and continually increaſing by the decreaſe of the waters, that we want no other information of it than what nature gives us: mountains and valleys, petrifactions and the ſtrata of the earth, the depths of the ocean and all the various kinds of ſtones, proclaim it aloud. As the dry land increaſes at this day, ſo it is probable that it has all along gradually extended itſelf from the beginning: if we therefore enquire into the original appear-

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ance of the earth, we ſhall find reaſon to conclude, that inſtead of the preſent wide-extended regions, one ſmall iſland only was in the beginning raiſed above the ſurface of the waters.

If we trace back the multiplication of all plants and animals, as we did that of mankind, we muſt ſtop at one original pair of each ſpecies. There muſt therefore have been in this iſland a kind of living muſeum, ſo furniſhed with plants and animals, that nothing was wanting of all the preſent produce of the earth. Whatever nature yields for the uſe or pleaſure of mankind was here preſented to our firſt parents; they were therefore completely happy. If that favoured man was obliged to acquire the knowledge of all theſe things in the ſame order, and according to the ſame laws of nature to which we are ſubject, that is, by means of the external ſenſes; he muſt have taken a view of the nature, form, and qualities of each animal, in order to diſtinguiſh it by a ſuitable name and character: ſo that the chief employ-

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ment of the firſt man, in this garden or muſeum of delights, was to examine the admirable works of his Creator.

Among the luxuries therefore of the preſent age, the moſt pure and unmixed is that afforded by collections of natural productions. In them we behold offerings as it were from all the inhabitants of the earth; and the productions of the moſt diſtant ſhores of the world are preſented to our ſight and conſideration: openly and without reſerve they exhibit the various arms which they carry for their defence, and the inſtruments with which they go about their various employments; and whilſt every one of them celebrates its Maker's praiſe in a different manner, can any thing afford us a more innocent pleaſure, a more noble or refined luxury, or one that charms us with greater variety?

To man, made for labour, due intervals of relaxation are no leſs neceſſary, than ſleep is to the body when exhauſted by watching; and truly unhappy may that mortal be reckoned, to whom nothing affords

fords amuſement. He who is exhauſted by the more weighty labours, has the greateſt need of reſt: but reſt, not tempered with pleaſure, becomes torpid inſenſibility. The principal reward of labour, which the Creator has granted to man, is leiſure with enjoyment; and mortals generally exert their utmoſt efforts to obtain it.

Almoſt all princes have had their favourite amuſements to refreſh them when fatigued with buſineſs. Some of them, in early times, when men had ſcarcely left off eating acorns, employed their leiſure hours in feaſting and dancing, in games and uſeleſs ſports, wreſtlings, or other public exhibitions, in hunting parties, or in the ſeraglios of women: but when the fields began to glow with the riches of Ceres, theſe lords of the earth ſought for more refined gratifications; and at length ſome of them have employed their leiſure hours in collecting Nature's productions. Fame has long celebrated the muſeum of the Grand Duke of Tuſcany. The Queen

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of Portugal is at preſent engaged in making a collection. The Kings of Spain have beſtowed more attention and expence in this way than any other princes; by their means the rich ſtores of America have been ſought out and examined. The muſeum of the King of France has ſcarcely its equal in the world. The Empreſs Queen of Hungary has ordered all kinds of natural curioſities to be bought for her. The Parliament of England has purchaſed the excellent collection of Sir Hans Sloane, and dedicated it to public uſe. The Stadtholder of the United Provinces, a little before his death, fitted up a muſeum at Leyden; and Peter I. Emperor of Muſcovy, has taken care to buy up all the collections of this kind that he could meet with, in order to enrich a muſeum with them at Peterſburg.

In this manner, the pleaſure which reſults from contemplating the wiſdom of the Creator in his works, has been diffuſed over the globe, and has entered the palaces of princes.

Our

Our auguſt Monarch, with his Royal Conſort, are the firſt Swediſh ſovereigns who have foſtered theſe ſciences. His Majeſty has adorned his ſplendid muſeum, in the palace of Ulricſdahl, with a variety of quadrupeds preſerved in ſpirits of wine, a great number of ſtuffed birds, an innumerable quantity of inſects and ſhells arranged in cabinets: not to mention the valuable Herbarium, and the beautiful Menagerie in which living beaſts and birds are kept.

The Queen has taken delight in collecting inſects and ſhells, as well as corals and cryſtals, from all parts of the world; and has ornamented her palace of Drottningholm with them ſo ſucceſsfully, that I doubt whether any other collection of the kind can be compared to it. Thus does this royal pair take pleaſure in contemplating the wonderful works of the Creator; and daily behold in them, as in a glaſs, the ſigns of his wiſdom and goodneſs.

As the manners and cuſtoms which prevail in the world always take their riſe in the

the courts of Princes, as from a never-failing ſpring; whatever magnificence or vanity, whatever luxuries or amuſements, whatever converſation and opinions reign there, are for the moſt part diffuſed through the whole kingdom: happy is that people who may learn from their ſuperiors to love the works of nature; inaſmuch as they beget a veneration for the Deity, and lay the foundation of all œconomy and public felicity.

I know not what to think of thoſe people who can, without emotion, hear or read the accounts of the many wonderful animals which inhabit foreign countries.

What principally ſtrikes us agreeably at firſt ſight is *colour*; of which the good and great Creator has given to ſome animals a rich variety, far beyond the reach of human art. Scarcely any thing can equal the beauty of birds in general; particularly the brilliant ſplendour of the Peacock. India, indeed, boaſts a number of fiſhes, whoſe painted ſcales almoſt equal the plumage of birds in beauty; not to mention

mention the Indian fiſhes, *Trichiurus Lepturus* (Sword-fiſh of Brown's Jamaica) and *Zeus Vomer*, whoſe brilliant white colour excels the pureſt and moſt poliſhed ſilver: or the Gold-fiſh *(Cyprinus aureus)* of the Chineſe, which ſhines with ſuch golden ſplendour, that the metal itſelf is by no means comparable to it. People of rank in India keep the laſt-mentioned fiſh alive in their apartments in earthen veſſels, as in fiſh-ponds, and feed them with their own hands, that they may have ſomething to excite admiration perpetually before their eyes. The Author of nature has frequently decorated even the minuteſt inſects, and worms themſelves, which inhabit the bottom of the ſea, in ſo exquiſite a manner, that the moſt poliſhed metal looks dull beſide them. The great Golden Beetle *(Buprestis gigantea)* of the Indies has its head ſtudded with ornaments like precious ſtones, brilliant as the fineſt gold*: and

* This deſcription is not ſo applicable to the *Buprestis gigantea* as to the *Buprestis ſternicornis*; for the head of the

and the *Aphrodita aculeata*, reflecting the ſun-beams from the depths of the ſea, exhibits as vivid colours as the Peacock itſelf ſpreading its jewelled train.

The difference of ſize in different animals muſt ſtrike us with no leſs aſtoniſhment: eſpecially if we compare the huge Whale with the almoſt inviſible Mite; the former, whilſt it ſhakes the largeſt ſhips with its bulky body, is itſelf a prey to the diminutive *Oniſci*, and is obliged to have recourſe to marine birds, who, ſitting on its back, free it from theſe vermin.

We are as much amazed at the prodigious ſtrength of the Elephant and Rhinoceros, as we are pleaſed with the ſlender Deer of Guinea (*Moſchus pygmæus*), which is, in all its parts, like our Deer, but ſcarcely ſo large as the ſmalleſt Lap-dog: Nature has, however, in the nimbleneſs of

the former is not remarkably brilliant, while both the head and thorax of the latter may juſtly be compared to gold ſtudded with jewels: but even this animal muſt yield the palm to ſome other ſpecies of the ſame ſplendid family.

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its feet, abundantly compenſated this animal for the ſmallneſs of its ſize.

The great Oſtriches of Arabia, whoſe wings are inſufficient to raiſe their bulky bodies from the ground, excite no leſs admiration than the little Humming-birds of India, hardly bigger than Beetles, which feed on the honey of flowers, like bees and flies, and, like thoſe animals, are the prey of ordinary Spiders; between which and the large Spider of Braſil (*Aranea avicularis*) there is as much difference in ſize as between the Humming-bird and the Oſtrich. This great Spider often attacks the largeſt birds, dropping on their backs, by means of its web, from the branches of trees; and while they vainly ſeek for ſecurity in flight, it bites them, and ſucks their juices in ſuch a manner, that they not unfrequently fall lifeleſs to the ground.

The ſingular figures of ſome animals cannot fail to attract our notice. We wonder, with reaſon, at the angular appendage to the noſe of the American Bat: nor is the ſhort and ſlender upper man-

dible of the Indian Woodpecker *(Picus ſemiroſtris)* leſs remarkable; the form of the latter being as unuſual among birds as is among fiſhes the figure of the American Fiſhing Frog *(Lophius Hiſtrio)*, which is furniſhed with feet, but cannot walk; while another kind of fiſh *(Silurus Callichthys)*, when the rivulet which it inhabits becomes dry, has a power of travelling over land till it finds more copious ſtreams.

The Plaiſe, the Sole, and many other fiſhes which conſtitute the *genus* of *Pleuronectes*, although the only animals which have both eyes on the ſame ſide of the head, do not, perhaps, aſtoniſh us ſo much, being common fiſhes, as the Horned Frog of Virginia *(Rana cornuta)*, whoſe head is furniſhed with a pair of horns, at the extremities of which its eyes are placed: its ſtern aſpect cannot fail to ſtrike with horror all who behold it. This frog is unable, however, to move its eyes in different directions at the ſame time, like the Chamæleon, which appears to have a power of contemplating at once many

diſtant objects, and of attending equally to all: for this laſt animal certainly does not live upon air, as many have reported, but on flies, which it follows with its piercing and ſparkling eyes, till it has got ſo near them, that by darting forth its long tongue they are inſtantly caught and ſwallowed. While the ſlender Ant Bear *(Myrmecophaga)*, which has no teeth, and which the Creator has appointed to live upon ants alone, by coiling up its tongue like a ſerpent, and laying it near an ant-hill, collects the little animals, and devours them entire.

He who has given life to animals, has given to them all different means of ſupporting it: for if all birds were to fly in the ſame manner, all fiſhes to ſwim with the ſame velocity, and all quadrupeds to run with equal ſwiftneſs, there would ſoon be an end of the weaker ones.

That wiſdom which deliberates on all future events, has covered the Porcupine-fiſh *(Diodon Hyſtrix)*, like the Hedgehog, on every ſide with a ſtrong guard of thorns;

has beſtowed on the Armadillo *(Daſypus)*, as on the Tortoiſe, a hard ſhell, in which it rolls itſelf up, and bids defiance to its enemies; and has enveloped the *Loricaria*, like the Canada Pike *(Eſox oſſeus)*, with a coat of mail.

The ſame Almighty Artiſt has given the Flying Squirrel *(Sciurus volans)* a power of extending the ſkin on each ſide of its body in ſuch a manner, that, being enabled to deſcend by a precipitate flight from one branch to another, it eaſily avoids its enemies. He has affixed wings to the ſides of the little Dragon *(Draco volans)*, with which, by the help of its feet, it ſupports itſelf in the air in the manner of a Bat. Thus alſo has he lengthened out the fins on the breaſt of the Flying Fiſh, that it might ſeek for ſafety in the air, when purſued by its enemies in the water: and he has likewiſe formed an appendage to the tail of the great Cuttle-fiſh *(Sepia Loligo)*, by means of which it ſprings out of the ſea; at the ſame time being furniſhed with a bladder, full of a ſort of ink, with

which it darkens the water, and eludes the ſight of its purſuers.

Other animals are preſerved by means of their diſmal cries, as the Capuchin Monkey *(Simia Capucina)*, whoſe horrid yellings are intolerable to the ears; and the Sloth *(Bradypus)*, whoſe piercing voice puts all the wild beaſts to flight, like horſes at the ſound of a rattle. The ſlow-paced Maucauco *(Lemur tardigradus)* is ſupplied with double ears, that he may betake himſelf to the trees in time to avoid danger; there he gathers the fruit in ſafety, always firſt taſting what he preſents to his mate. The Creator has indulged the Opoſſum with a retreat for her young in her own body, to which they betake themſelves in caſe of an alarm; and, leſt cruel hunger ſhould force them from this aſylum, it is furniſhed with internal nipples, affording them a welcome nouriſhment. The Torpedo, of all animals the moſt tender and ſlow-paced, and therefore moſt obnoxious to the attacks of others, has received from its Maker a power

denied to other creatures, of giving thoſe who approach it a ſhock, of ſuch a nature, that none of its enemies can bear it.

Truly formidable are the arms which the Lord of nature has given to ſome animals. Though he has left ſerpents deſtitute of feet, wings, and fins, like naked fiſhes, and has ordered them to crawl on the ground expoſed to all kinds of injuries, yet he has armed them with dreadful envenomed weapons: but, that they may not do immoderate miſchief, he has only given theſe arms to about a tenth part of the various ſpecies; at the ſame time arraying them in ſuch habits that they are not eaſily diſtinguiſhable from one another, as the reſt of animals are; ſo that men and other creatures, while they cannot well diſtinguiſh the noxious ones from thoſe which are innocent, ſhun them all with equal care. We ſhudder with horror when we think of theſe cruel weapons. Whoever is wounded by the Hooded Serpent *(Coluber Naja)* expires in a few minutes; nor can he eſcape with life who

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is bitten by the Rattle-ſnake *(Crotalus horridus)* in any part near a great vein. But the merciful God has diſtinguiſhed theſe peſts by peculiar ſigns, and has created them moſt inveterate enemies; for, as he has appointed cats to deſtroy mice, ſo has he provided the Ichneumon *(Viverra Ichneumon)*, againſt the former ſerpent, and the Hog to perſecute the latter. He has moreover given the *Crotalus* a very ſlow motion, and has annexed a kind of rattle to its tail, by the ſhaking of which it gives notice of its approach: but, leſt this ſlowneſs ſhould be too great a diſadvantage to the animal itſelf, he has favoured it with a certain power of faſcinating ſquirrels from high trees, and birds from the air into its throat, in the ſame manner as flies are precipitated into the jaws of the lazy toad *.

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* This opinion of the faſcinating power of the Toad has been refuted, and the appearance which gave riſe to it fully accounted for, by Mr. Pennant, in his Britiſh Zoology. Probably the ſtory of the Rattle-ſnake's having a ſimilar power might be found equally falſe, if

On account of theſe and various other poiſonous ſerpents and worms of India, which crawl upon the ground, ſwim in the waters, or twine among the branches of trees, we prefer our barren and craggy woods to the ever-blooming meadows and fruitful groves of Indian climes; and we had rather ſuffer the inconveniences of our northern ſnows, than enjoy their enviable luxuries. We fear no threatening ſcorpions, which diſturb the peace and reſt of thoſe who inhabit a warmer climate; nor is our ſweet ſleep interrupted by the *Scolopendræ*, to guard againſt which fires are obliged to be carefully kept up all night in India. Our waters are not infeſted, like thoſe of ſome other countries; nor do they produce fiſh whoſe fleſh is poiſonous, like the Hare Globe-fiſh *(Tetrodon lagocephalus)* of the Chineſe; nor any whoſe

enquired into with the ſame degree of accuracy.—See a "Memoir concerning the faſcinating faculty which has been aſcribed to the Rattle-ſnake and other American Serpents." By B. S. Barton, M. D. Philadelphia, 1796. 8vo. 70 pages.

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bite is venomous, except the *Muræna Helena*, a very rare fiſh; neither have we any that wounds with poiſonous prickles, except the Weever *(Trachinus Draco)*, which we can eaſily avoid. Sharks, which diſmember the inhabitants of the eaſtern world, and devour them in the water, are almoſt unknown on our ſhores; as are Crocodiles, which aſcend the ſides of veſſels and take away men for their prey. The ravages of the laſt-mentioned animal, however, the Creator has reſtrained within very narrow limits; not only by means of the cruelty with which it devours its own young, and of the bird which deſtroys its eggs; but alſo by the Striped Lizard *(Lacerta Monitor)*, which informs men of the approach of the Crocodile, as the Great Butcher-bird *(Lanius Excubitor)* warns leſſer birds of that of the Hawk. Juſt in the ſame manner the human race are preſerved from Lions and Tigers, by means of the Little Lizard, called *Gecko*; which being alarmed for its own ſafety, runs haſtily to man, as its guardian angel,

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and acquaints him with his danger: thus alſo the Storm Finch warns mariners of an approaching tempeſt.

But the curious properties of exotic animals are ſo many, that we have only room to mention a few more of the moſt remarkable. For example; the Surinam Toad *(Rana Pipa)* nouriſhes its young on its back, as cattle do the Gadfly. And this is more truly worthy of our admiration than the Salamander, which was believed by the ancients to live in the fire; or the Frog-fiſh *(Rana paradoxa)*, which was till very lately ſuppoſed to be tranſformed from a toad to a fiſh. The Black Tortoiſes always leave the receſſes of the ſea, to ſeek out the ſhores of deſert and deſolate iſlands, in the ſand of which they depoſit their eggs: thus they fall a prey to ſailors, who refreſh their ſick with the delicate fleſh of theſe animals; which is much more wholeſome, although leſs delicious, than that of the Guana *(Lacerta Iguana)*, the latter being prudently avoided by thoſe who have been too incautious

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in their ſacrifices to Venus. Any one who happens to ſee, in the Indian woods, the falling leaves of trees apparently become alive, and creep upon the ground *, probably beholds them with no leſs pleaſure than he would the phoſphoreſcent Sea Pens, which cover the bottom of the ocean,

* The appearance here alluded to is cauſed by the different ſpecies of *Mantis*, a kind of inſects, whoſe wings ſo exactly reſemble the leaves of many trees, both in texture and colour, that inaccurate obſervers, ſeeing them fall from the branches, and immediately afterwards creep or fly away, conceived the idea of the wonderful and indeed impoſſible transformation of a leaf into an animal; an idea which is ſtill ſtrenuouſly ſupported by many perſons who are more uſed to ſee, than to reflect on what they behold. Such ſtriking appearances as the above were ſurely deſigned to excite our curioſity, and they cannot fail to awaken that of the moſt inattentive. Many operations of nature, however, which are conſtantly going on before our eyes, although leſs ſtriking, are no leſs curious; nor ought we to ſuffer our attention to be ſo far engaged by the wonders of foreign countries, as to neglect the productions of our own; which, beſides being more eaſily examined, are probably more likely to be ſerviceable in the improvement of our domeſtic and rural œconomy.

and

and there caſt ſo ſtrong a light, that it is eaſy to count the fiſhes and worms of various kinds ſporting among them. The Sucking-fiſh *(Echeneis Remora)*, which of itſelf could not without great difficulty ſwim faſt enough to ſupply itſelf with food, has obtained from its Creator an inſtrument not much unlike a ſaw, with which it affixes itſelf to ſhips, and the larger kinds of fiſhes, and in this manner is tranſported *gratis* from one ſhore of the world to another. The ſame Divine Artificer has given the ſluggiſh Fiſhing Frog *(Lophius piſcatorius)* a kind of rod, furniſhed with a bait, by which it beguiles little fiſhes into its jaws *.

Thus he who views only the produce of his own country, may be ſaid to inhabit a ſingle world; while thoſe who ſee and conſider the productions of other climes, bring many worlds, as it were, in review before them.

Of theſe wonderful animals travellers

* See Pennant's Britiſh Zoology.

have

have told us much; all accounts of voyages mention them. We may gather knowledge from the accounts of others; but it is much more pleaſant to ſee things with our own eyes. In this Royal Muſeum theſe aſtoniſhing creatures are preſerved, exhibiting, as nearly as poſſible, the appearance which they made when living on the theatre of the world; a moſt magnificent ſpectacle to an admirer of the Divine Wiſdom!

Man, ever deſirous of knowledge, has already explored many things; but more and greater ſtill remain concealed; perhaps reſerved for far diſtant generations, who ſhall proſecute the examination of their Creator's works in remote countries, and make many diſcoveries for the pleaſure and convenience of life. Poſterity ſhall ſee its increaſing Muſeums, and the knowledge of the Divine Wiſdom, flouriſh together; and at the ſame time all the practical ſciences, antiquities, hiſtory, geography, natural philoſophy, natural hiſtory, botany, mineralogy, dietetics, pathology,

thology, medicine, materia medica, œconomy, and the manual arts, ſhall be enriched: for we cannot avoid thinking, that thoſe which we know of the Divine works are much fewer than thoſe of which we are ignorant.

II.

DISCOURSE

ON THE

RISE AND PROGRESS

OF

NATURAL HISTORY,

Read at the Opening of the Linnæan Society,

APRIL 8, 1788.

A

DISCOURSE

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Read at the Olympic Pyle Linnean Society,

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Read at the Opening of the LINNÆAN SOCIETY, *April* 8, 1788.

THE Study of Nature, that is, an attention to the ground on which we tread, the vegetables which clothe and adorn it, and the boundleſs variety of living creatures preſenting themſelves to our notice on every ſide, muſt have been one of the firſt occupations of man in a ſtate of nature. In no country hitherto diſcovered, however barbarous and unenlightened, is the human race found ſo negligent and helpleſs as not to have inveſtigated the natural

bodies around them, ſo far at leaſt as from thence to ſupply their neceſſary wants, and even to obtain conveniences and luxuries. In the more hoſpitable climes in which probably mankind were firſt eſtabliſhed, this taſk was the more eaſy. The calls of nature would there be readily ſatisfied; and while the ſenſes were gratified with all they were capable of enjoying, the mind, ever prone to curioſity, would be continually exerciſed and delighted in inveſtigating the creation around it. Then, as the human race multiplied, would the ſpirit of competition ariſe for the diſcovery of hitherto untaſted luxuries or unknown conveniences; and he who firſt climbed the lofty palm-tree, and, while its leafy honours were waving above his head, ſcattered the golden ſhower of plenty upon his admiring companions, would deſerve and enjoy more real glory, than any deſtroyer of his fellow creatures ever enjoyed, after thoſe very boughs became proſtituted to proclaim the triumph of deſolation and war.

By degrees mankind became ſo numerous and ſo adventurous as not only to occupy all that part of the world in which they were firſt ſettled, but alſo to migrate into far diſtant countries, where ruder ſkies and leſs fruitful plains taught them new wants, and put their ingenuity to greater trials. In ſhort, by means and accidents which moſt likely will long remain a problem for philoſophers, the human race became in proceſs of time diſperſed over almoſt every part of the globe where art and labour could find them protection and ſubſiſtence. Their various acquirements, in the courſe of their long laborious progreſs, muſt have been all founded on the knowledge and obſervation of nature; and with ſo much accuracy have they ſtudied this ſubject, ſo intereſting to them all, that even in the moſt advanced ſtate of ſociety, as well as in the loweſt, mankind are perfectly agreed upon the uſes of moſt of the neceſſaries with which nature furniſhes them; they have all alike learned preciſely to what purpoſe each is fit, and all ſupply

the ordinary wants of life, all remove its ordinary inconveniences, much in the ſame way.

If on the preſent occaſion my principal object were to amuſe the fancy, I ſhould dwell long on this early period of the hiſtory of the human race. The firſt probable wants and inventions of mankind; their progreſs from a ſtate of nature, peace and innocence, to one more turbulent and active, but leſs natural and happy; the ſimple origin of each art and ſcience, and eſpecially the ſource of all human knowledge, in the obſervation of nature, with the different degrees of cultivation which each ſcience may be ſuppoſed to have received according to the various circumſtances in which mankind have been—all theſe things might form a very amuſing ſubject for ſpeculation: but as ſuch diſquiſitions muſt be chiefly guided by the imagination, and after all could be only conſidered in the light of a romance, I muſt not at preſent enter upon them. My review of thoſe much later periods, although ſtill

far

far remote from us, in which the progreſs of ſcience begins to be marked, muſt be even more ſlight than the traces of its foot-ſteps in the page of hiſtory; and we ſhall eaſily conſole ourſelves for our ignorance of what former ages have thought and known, when we find how little real advantage is to be derived from the knowledge of thoſe much nearer to us.

In a very early ſtate of ſociety the ſum of human knowledge would become too much for every individual to acquire; of courſe ſome muſt neceſſarily purſue particular arts or enquiries in preference to the reſt; and this difference is obſervable not only among individuals, but alſo between different nations and bodies of men. In infant ſtates, warlike accompliſhments more than any others engage the generality of the citizens, and, becauſe moſt evidently neceſſary to the ſafety of the whole, are held in the higheſt eſteem. But when external danger is kept at a diſtance, the internal regulations of the ſtate, and the ſofter arts of peace, become more intereſt-

ing to thoſe who have talents for cultivating them. A part of the community being ſufficient to ſupply the whole with the neceſſaries of life, the occupations of the reſt becoming voluntary, are as various as the virtues and vices, taſtes, genius and abilities of mankind; and the more a people are refined and enlightened, the more various and the more diſtinctly marked are the purſuits of individuals.

The early hiſtory of ſcience informs us rather of peculiar acquirements by which certain nations diſtinguiſhed themſelves from the reſt, than of the general ſtock of knowledge then in the world. Thus we are told of the ſkill of the Egyptians in aſtronomy, to which they were peculiarly led by their manner of repoſing on open terraces under a cloudleſs ſky. But we are not to conclude that this ſcience had never been cultivated by any people before, nor that the Egyptians, and all the reſt of the world, had lived totally void of curioſity, and blind to every thing around them, till their attention was excited by the trivial

vial circumſtance above mentioned. We learn from the Old Teſtament, which, if it were merely an human work, would be the moſt venerable monument in the world, that Natural Hiſtory was very early one of the ſciences in the higheſt eſtimation. Without examining what was the preciſe degree of Solomon's ſkill in this ſcience, the manner in which his botanical knowledge is mentioned in the Bible, proves that to have been in thoſe days the moſt eſteemed perhaps of all learning whatever. Yet where are the records of its progreſs? How totally is the knowledge of thoſe ages and of numberleſs others loſt to us!

As botany and aſtronomy have been among the earlieſt purſuits of mankind, ſo they have been prepoſterouſly combined together, and connections frequently imagined between certain ſtars and particular plants. This is one of thoſe inſtances, but too numerous in the hiſtory of the human mind, of theory, like an ignis fatuus, having led men aſtray, and made them pay

dear for a little real inſtruction, by bewildering them in endleſs errors and abſurdities. And ſo hard is it to overcome prejudices, ſanctified in a manner by antiquity, that this idea of a connexion between ſtars and plants is only juſt got rid of in the moſt enlightened parts of the world.

But to conſole ourſelves under the contemplation of ſuch humiliating inſtances of human weakneſs, let us turn our attention to the father of philoſophy, at leaſt of our philoſophy, riſing ſo ſuperior to the darkneſs in which he lived, darting his penetrating glance through all nature, and eſtabliſhing principles which a long courſe of ages of enquiry have but confirmed. With Ariſtotle begins the real hiſtory of ſcience; and how much ſoever he may have erred on particular points, the greatneſs of his conceptions, and the juſtneſs of his ideas on the whole, entitle him to our high veneration, and we ſhould correct his miſtakes with awe. His labours in the inveſtigation of the animal kingdom have laid the foundation

dation of the knowledge we now poſſeſs, and it cannot ſufficiently be regretted that we have only an imperfect account of his diſcoveries.—Theophraſtus, the worthy diſciple of Ariſtotle, has given us the firſt ſcientific views of the vegetable and mineral kingdoms. His works are indeed ſhort and imperfect ſketches, but they are by the hand of a maſter. Theſe two great men ſtand unrivalled as the only philoſophical naturaliſts of antiquity of whom we have any ſatisfactory knowledge.

Several ages afterwards came Pliny, that laborious compiler, whoſe mind, too much occupied by a variety of purſuits, could properly cultivate none. He has tranſmitted to us, as far as he was able, all that was known of Natural Hiſtory, or rather all that had been imagined, at the time in which he lived. Whether Dioſcorides lived before or after him, and which borrowed from the other, the learned are not agreed, nor is it of much conſequence to the reputation of either. Dioſcorides has had perhaps no great injuſtice done him

him by a celebrated modern writer *, who ſtyles him "a great compiler of receipts." In fact his works are nothing elſe than a materia medica, in which he has enumerated all the natural bodies known at that time to have been uſed in medicine, with their imaginary virtues, but with ſo little judgment, that it were charitable to ſuppoſe he meant only to collect the opinions of others, without ever attempting to exerciſe that faculty. How he came to be called the father of botany is wonderful to me. It is leſs extraordinary that he ſhould, after the revival of learning, have had innumerable commentators, becauſe his ſhort and imperfect deſcriptions would afford ample ſcope to thoſe who imagined all human wiſdom to be contained in the obſcure works of men who had lived in the world a few ages before themſelves.

That age of commentators we muſt now conſider. I purpoſely paſs over thoſe times of darkneſs which followed the ruin of the Roman Empire, during which, if there

* Rouſſeau.

were

were any ſhadow of ſcience in the world, it was among the Arabians, and they cultivated Natural Hiſtory only as a branch of medicine. Thoſe who wiſh to ſtudy this part of the hiſtory of botany, will find ample ſatisfaction in Haller's Bibliotheca Botanica, where they may alſo ſee an account of all the Greek and Roman authors who have at all touched on this branch of Natural Hiſtory; and whom I have avoided mentioning, not only that I might keep within the bounds I had preſcribed to myſelf, but becauſe the labours of thoſe writers do not appear to have contributed to the knowledge we now poſſeſs.

When learning began to raiſe its drooping head in the fifteenth century, thoſe ſciences of which moſt traces were found in the writings of the ancients began firſt to be cultivated. Botany was more eſpecially attended to very early, as medicine, which, however it might have been degraded in the ages of barbariſm, could never have been totally neglected, ſtood in immediate need of its aſſiſtance. The

works

works of the ancients, and particularly thoſe of Dioſcorides, were then ſtudied with the moſt pertinacious aſſiduity; remedies which this writer had recommended were deemed infallible, and virtues which he had attributed to any plant, indiſputable. The chief difficulty in almoſt every caſe was to find out the plant he meant; and this difficulty becoming at length ſo great as to be abſolutely inſurmountable, his commentators were loſt in the mazes of their own conjectures. It was happy for the credit of Dioſcorides that this was the caſe, and that the world were ſo occupied by this kind of criticiſm, as ſeldom to have examined the truth of his aſſertions.

Of theſe commentators ſome few had great original merit in giving figures of the plants of which they treated, and thoſe figures are many of them executed with ſuch perfection as to excite our aſtoniſhment; they have rarely been excelled at any following period. The firſt of theſe is Brunfelſius, whoſe figures, although only wooden outlines, often expreſs the plant intended

intended better than many fine modern engravings, and were evidently drawn by a firſt-rate painter. Matthiolus, the moſt celebrated of all the commentators on Dioſcorides, has likewiſe given excellent figures of all the natural ſubſtances mentioned in his book; thoſe of the large Venetian editions of this work are ſtill the admiration of botaniſts, and make thoſe editions much ſought after by collectors.

The large figures of Fuchſius are no leſs celebrated, nor with leſs reaſon; although only outlines, they repreſent the plants extremely well.

The example of theſe authors was ſoon followed by others, who publiſhed figures of plants from their own obſervation; and ever ſince the middle of the ſixteenth century the preſs throughout Europe has teemed with ſimilar publications; certainly to the great advancement of botany, although the merit of theſe works has been very various.

For

For almoſt two centuries after the revival of letters in Europe, the attention of naturaliſts was chiefly confined to the vegetable creation; and although ſince that time the animal and mineral kingdoms have received an eminent degree of cultivation, ſtill botany has always kept its ground. The infinitely varied beauties of the vegetable tribe have, in every country, engaged ſome ingenuous minds in the contemplation of this branch of the great family of nature, and excited them to inveſtigate the laws by which it is governed. Whether their labours have been crowned with the ſmile of princes, rewarded with worldly honours and emoluments, or only deſtined to enliven the ſcenes of rural retirement, to relieve the mind amid the buſy purſuits of active life, or add new charms to ſocial intercourſe; they have never failed to carry with them their own reward, in that ſweet and innocent pleaſure which riſes under the ſteps of the botaniſt wherever he goes, in thoſe ſublime

lime and delightful ideas of the Author of nature to which ſuch enquiries lead, and the complacency they always excite in the mind.

The inſtitution of public botanic gardens is a memorable æra in the hiſtory of botany. The firſt of theſe was, I believe, at Padua in 1533*, where it ſtill continues to make a tolerable figure, although now ſurpaſſed by ſeveral others, which have had more powerful protectors. The gardens of Florence, Piſa, Bologna and Leyden were ſoon after eſtabliſhed, and all ſtill exiſt. Nor muſt I forget to mention that we had at London a tolerable collection of plants in the garden of Gerarde, a catalogue of which, printed in 1596, exiſts in the Britiſh Muſeum, but is elſewhere rarely to be met with. The ſucceſs of botanic gardens has pretty much kept pace with the commerce of the countries in which they were eſtabliſhed; nor is this to be wondered at.

* The eſtabliſhment of a *botanic* garden at Rome about the year 1450 ſeems not ſufficiently authenticated. See Sabbati Hortus Romanus.

The intercourſe of the Dutch with the Eaſt Indies, and their poſſeſſion of the Cape, long gave their collections, in all the different branches of Natural Hiſtory, a decided ſuperiority over thoſe of other nations. The Engliſh have now enriched their gardens far beyond any others by the ſupplies obtained from the Eaſt and Weſt Indies, and eſpecially from America.

I find myſelf obliged to paſs over a number of naturaliſts who flouriſhed from the middle to the end of the ſixteenth century. Thoſe whoſe works are the moſt known, and have been of the moſt ſervice to the world, are Tragus, L. Fuchſius, Dodonæus and Dalechampius in Botany, Bellonius in Ornithology, and Rondeletius in Ichthyology. But there are a few great names which ought not to be ſo ſlightly mentioned; I muſt be allowed to enlarge a little on the merits of Geſner, Aldrovandus, Cluſius and Cæſalpinus.

Conrad Geſner, the greateſt naturaliſt the world had ſeen ſince Ariſtotle, was born at Zurich in 1516, and died of the plague

plague in 1565. Notwithſtanding his conſtitution was feeble and ſickly, and his life by no means a long one, he applied himſelf to the ſtudy of nature with ſuch aſſiduity, that he not only made more new obſervations than had been made by any modern writer, but alſo firſt reſtored the ſcience he cultivated to the dignity of philoſophy, of which it had almoſt loſt ſight ſince the days of Ariſtotle and Theophraſtus. Geſner cultivated medicine with equal ſucceſs, proceeding always on the ſure ground of obſervation and experience. His health, naturally weak, is ſaid to have frequently ſuffered by the experiments he made on himſelf. But his infirmities did not deter him from taking frequent and laborious alpine journeys, any more than his very confined circumſtances prevented his being at conſiderable, and at that time very uncommon, expences, in the advancement of his darling purſuits. He founded and ſupported a botanic garden, kept a painter and engraver in his ſervice, had a very conſiderable library, and, according

to Haller, was the firſt who ever formed a muſeum of Natural Hiſtory. But his greateſt honour is his having firſt ſuggeſted the idea of a methodical arrangement of plants according to claſſes, orders and genera, from the different ſtructure of the flowers; an idea which all true botaniſts ſince his time have purſued, and to which the very exiſtence of botany as a ſcience is owing.

Aldrovandus reſembled Geſner in his indefatigable induſtry and zeal for the advancement of Natural Hiſtory. Like him he devoted his life to travelling and ſtudy, and like him eſtabliſhed a muſeum and undertook works whoſe immenſity aſtoniſhes as much as their erudition. But he did not poſſeſs the ſyſtematic genius of Geſner, nor had he the prudence along with the liberality of his great contemporary. Although he had a fortune of his own, and was aſſiſted by many of the rich and powerful of his time, he was reduced to indigence towards the end of life. He lived to the age of 80, dying in 1605. His memory

memory has been always much honoured at Bologna. The great zoological work which he left imperfect, was finiſhed after his death, and his muſeum laid the foundation of that which at preſent is one of the ornaments of that univerſity. Many ſpecimens ſtill exiſt there marked with the venerable hand-writing of their firſt poſſeſſor *.

Neither had Cluſius that genius for arrangement for which Geſner was remarkable.

* "The collection of the works on Natural Hiſtory of this indefatigable man, conſiſts of 13 volumes in folio; three of them upon birds, one upon inſects, one upon animals which have no red blood, one upon fiſhes, three upon quadrupeds, one upon ſerpents, one upon monſters, one upon metals, and one upon trees.

"He is himſelf however the author of the firſt ſix volumes only; the reſt having been compiled by various literati, penſioned by the Senate of Bologna, who laboured upon his plan, and with the materials which he had collected. This immenſe collection abounds with ſuperfluous matter and things foreign to its object, and is at the ſame time deficient in choice and method; but in ſpite of ſuch defects, Natural Hiſtory will always have the higheſt obligations to Aldrovandus, and his

able. Botany is however very much indebted to him for the publication of a vaſt number of new plants, with excellent figures which atone for the imperfections of his deſcriptions. His amiable diſpoſition, ſays Haller, procured him a great number of friends, whoſe diſcoveries enriched his own works. He always acknowledged their favours, and gave to every body their due praiſe. A number of the plants diſcovered by Geſner were firſt publiſhed

work muſt always be conſidered as the dunghill of Ennius, where Virgil went to ſeek for pearls.

" It is common with writers to make Aldrovandus die of poverty in the hoſpital. Certainly the long journeys he undertook for the ſake of Natural Hiſtory, and the conſiderable ſums paid by him to the moſt celebrated artiſts, in order to procure exact figures of different productions of the three kingdoms of nature, ſo far ruined his fortune, that though ſupported in theſe expences by ſome ſovereigns zealous for the advancement of ſcience, as well as by the Senate of Bologna, he found himſelf towards the end of life reduced to a kind of indigence. After his death he was honoured with a magnificent funeral, which is ſufficient to refute the ſtory of his extreme beggary; neither is it credible that thoſe

liſhed by Cluſius. This illuſtrious botaniſt died in 1609, at the great age of 84. He was profeſſor of botany at Leyden, where a palm tree (*Rhapis flabelliformis*, of the Hortus Kewenſis) planted by him, ſtill exiſts in great perfection.

I am now to ſpeak of Cæſalpinus; but if I ſhould enter into a full diſcuſſion of his character and merits, it would lead me a great deal too far. His ardent attachment to Ariſtotle led him into the depths of me-

thoſe ſovereigns who had contributed to his undertaking, or the Senate of his own country, to which he had left his rich muſeum as a legacy, could have let him die of hunger. The anonymous author of the *Mélanges d'Hiſtoire Naturelle*, printed at Lyons in 1763, adopting this fable, and ſaying that Urban VIII. made an epigram in honour of Aldrovandus and of his beautiful plates, which finiſhes with this elegant diſtich,

Obſtupet ipſa ſimul rerum fœcunda creatrix,
Et cupit eſſe ſuum quod videt artis opus,

ſeems to wiſh to imply that this Pope was contented with rewarding the labours of the philoſopher with verſes only. But it is a certain fact that Urban VIII. did not obtain the pontificate till eighteen years after the death of Aldrovandus." *Fontana.*

taphyſics, and into many errors relating to the nature of man, and the firſt cauſe of all things, which the dogmas of the court of Rome where he lived were not likely to correct, in a philoſophical mind like his. He has left evident proofs of his knowing the circulation of the blood at leaſt through the lungs, and the ſervices he has rendered to botany entitle him to be ranked among its moſt able promoters. I need not enter into the particulars of his method, which is chiefly founded on the fruit. He has made ſome miſtakes, which Haller has taken care to point out; but it muſt not be forgotten that Cæſalpinus has thrown more light on the ſtructure and affinities of vegetables than any one before his time, and has diſtinctly mentioned the ſexes of plants. He died in 1603.

While theſe great men were flouriſhing on the continent, botany began to be attended to in our own country. Turner publiſhed his Herbal in 1551; ſoon after Lyte gave a tranſlation of Dodonæus; and in 1597 was printed the firſt edition of

Gerarde's

Gerarde's Herbal. It is ſufficient that I mention the names of theſe authors. Lobel, who began to publiſh in London in 1570, and who is the author of many good obſervations, has been often miſtaken for an Engliſhman; but although he ſpent the greater part of his life here, he was born in Flanders.

It would be unpardonable if I were to finiſh this period of the hiſtory of our ſcience without mentioning Fabius Columna, who firſt gave copper plates of plants; and thoſe of an almoſt unrivalled degree of accuracy, drawn and engraved by his own hand. In his Phytobaſanos, publiſhed at Naples in 1592, and again at Florence in 1744, he has taken infinite pains, and ſhewn great ſagacity, in determining ſome plants of the ancients, and has detected innumerable errors in Pliny and other authors. His Ecphraſis publiſhed ſeveral years afterwards is a larger work, and contains a large number of new plants, diſtinguiſhed and figured with the greateſt accuracy. He is likewiſe the author of a curious and

learned work on the Purpura of the ancients. All theſe books, eſpecially the firſt, are very rare. Columna, an able critic himſelf, was criticiſed in his turn by one far inferior, Aldinus in his Hortus Farneſianus, printed at Rome 1625; a work in which however there are ſome good figures of rare plants, and which is not commonly to be met with.

The inſtitution of the academy of the Lyncæi at Rome in 1603 deſerves to be remarked, as that ſociety was the firſt of the kind, and has been in ſome meaſure the model of all the preſent literary ſocieties in Europe. Its chief promoter and perpetual preſident was Frederick Caeſius, a young Roman nobleman of great ſcience. Among the names of thoſe who compoſed it we find Fabius Columna and the great Galileo, a circumſtance perhaps more likely to immortalize its memory than the medals which were ſtruck upon its eſtabliſhment. This inſtitution died with its noble founder in 1630.

The number of authors who had written

on plants without any ſyſtem or method in the ſixteenth century, and the confuſion of names which had been introduced, ſeemed to render it at length neceſſary for the preſervation of the ſcience that ſome great ſyſtematic genius ſhould undertake to digeſt the confuſed maſs, and, profiting of the hints of Geſner and Cæſalpinus, reduce into order the vaſt materials, with which botany was in a manner overwhelmed, rather than enriched. But this event, ſo much to be deſired, was not yet to take place in its full extent. An eminent ſervice was however rendered to botany by the two illuſtrious brothers John and Caſpar Bauhin, with whom I ſhall cloſe the hiſtory of the ſixteenth century, and enter on that of the ſeventeenth.

John Bauhin was in a great meaſure formed as a botaniſt under Geſner; but not having a turn for ſyſtem, he did not in that reſpect learn much from his great teacher. He devoted a life of more than 70 years to a critical inveſtigation of all that had been written before him, and made

made many valuable obſervations as well as many original diſcoveries. But he opened no new path in botany. His labours were conducted on the ſame plan as thoſe of his predeceſſors. The fruit of his ſtudies is nothing leſs than an Univerſal Hiſtory of Plants, which being left in MS. at his death in 1613, was not publiſhed till 1650, when it appeared in three volumes folio. Like all poſthumous works it has defects, which probably it would not have had if publiſhed by its author. It is a monument of labour and erudition, and contains ſo much information and ſo many elucidations of preceding authors, as to be ſtill in great eſtimation, notwithſtanding its want of order and the rudeneſs of the figures.— This work paved the way for Caſpar Bauhin in the much more important and original one which he undertook and happily perfected, the publication of which forms one of the moſt remarkable æras in botany, and which was firſt printed in 1623, under the title of Pinax Theatri Botanici. This was meant, as its name imports, as

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an index to all the botanical knowledge then in the world, and its author exultingly ſtyles it the labour of 40 years. In this work about 6000 plants are arranged in twelve books, with ſome ſlight traces of ſyſtem, and each plant is diſtinguiſhed by a kind of deſcriptive name, under which are placed the names given it by every preceding author. Ray has very juſtly remarked, that beſides errors and repetitions incident to the moſt wary in ſo vaſt an undertaking, Bauhin's Pinax contains ſome hundreds of plants there mentioned as ſpecies, which have ſince been found to be only varieties; and if this was true in the time of Ray, it is much more ſo at preſent. Notwithſtanding ſuch imperfections, this work has been found ſo uſeful, and indeed ſo neceſſary, that it continued the general dictionary of botaniſts, till ſuperſeded by the publications of Tournefort and Linnæus, and is even now the only reſource of thoſe who wiſh to ſtudy the authors whoſe works are prior to it. But this is not all which the active mind

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of Caſpar Bauhin undertook. He publiſhed an excellent edition of Matthiolus with many additions; and has illuſtrated about 600 new or heretofore miſtaken plants in his Prodromus, publiſhed firſt in 1620, and afterwards with an improved edition of his Pinax in 1671, which is that moſt in uſe. He likewiſe meditated a complete hiſtory of all the plants mentioned in his Pinax, and finiſhed, as it is ſaid, three books, of which the firſt only was publiſhed by his ſon in 1658, with figures. It contains graſſes and ſome liliaceous plants. Beſides all theſe botanical labours, Caſpar Bauhin practiſed medicine with great ſucceſs, and was ſo eminently ſkilled in anatomy as to have been ſtyled in his time the prince of anatomiſts. He died in 1624, aged 64, being about 20 years younger than his brother. I have ſeen a great part of his herbarium at Baſil, in the hands of Mr. De Lachenal, profeſſor of botany there. This herbarium is ineſtimable on account of the difficulty of determining many of Bauhin's plants by his

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deſcriptions alone, and its worthy poſſeſſor devotes it to the purpoſes of public utility, to which indeed all treaſures of ſcience ought to be devoted.

We muſt now make a pauſe in the hiſtory of botany. Notwithſtanding the labours of the Bauhins ſeemed to promiſe new vigour to this lovely ſcience, it languiſhed for nearly half a century after the time in which they lived. Not that there were no botanical writers, nor any collectors of plants in all that period, for there were a conſiderable number of both, as well as ſeveral writers on the materia medica. Hernandez was ſent to South America by Philip II. at a vaſt expence, but the fruit of his labours is one of the worſt books in botany. The Italians puzzled themſelves and their readers about opobalſamum and the ingredients of the mithridate; and a number of inferior writers appeared in different parts of Europe, eſpecially in Germany, whoſe names and merits I might be excuſed mentioning, even

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if on this occaſion I had much more time allowed me.

I muſt only except Jungius, who in his Doxoſcopiæ Phyſicæ Minores has given great proofs of botanical ſagacity, and has thrown out ſome hints, of which following botaniſts, and among them Linnæus himſelf, have profited with great advantage. Jungius died in 1657.

Our countryman Parkinſon was alſo an author of great originality and obſervation, much ſuperior in this reſpect to Gerarde, or his commentator Johnſon, although his figures are inferior to theirs.

I ſhall profit of this interval to review the progreſs of zoology from the middle of the ſixteenth to the end of the ſeventeenth century.

It is remarkable that a part of natural hiſtory, ſo evidently the moſt important and the moſt intereſting to man, who is himſelf at the head of the animal creation, ſhould have lain ſo long uncultivated. From the time of Ariſtotle to Geſner

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and Aldrovandus, few or no improvements were made in the knowledge of animals, nor with reſpect to claſſification was any alteration attempted till the time of Ray. The Ariſtotelian diviſion of animals into viviparous and oviparous is well known. In the former claſs were arranged all quadrupeds, and in the latter birds, fiſhes, and inſects. Ariſtotle was himſelf ſenſible that this ſyſtem muſt be taken with ſome latitude, there being ſeveral quadrupeds, as lizards, which are not viviparous, and ſome inſects and fiſhes viviparous, although not quadrupeds. By inſects he and all other naturaliſts down to Linnæus underſtood ſuch of the ſmaller kinds of animals as have the body divided into ſegments, ſo that many worms and even fiſhes were included in this diviſion.

Geſner arranged his voluminous hiſtory of animals upon the principles of Ariſtotle, ſeparating the oviparous from the viviparous quadrupeds; and Aldrovandus collected all that others had written, indeed without ſufficient diſcrimination of truth from

from fiction, and diſpoſed it much in the ſame order. With reſpect to Ornithology, Geſner cultivated that ſcience with peculiar ſucceſs, and is the author of many very valuable obſervations. Aldrovandus copied him in many things, and Johnſton is hardly worth mentioning, as he has done little elſe than copy both. Beſides what the authors above mentioned have given us relating to fiſhes, that branch of natural hiſtory was ably handled by Paul Jovius, an Italian phyſician of great taſte and learning in the beginning of the ſixteenth century; afterwards by the accurate Bellonius, who wrote alſo on birds; by Salvianus in his ſuperb book on aquatic animals, printed at Rome in 1554; and by Rondeletius, profeſſor at Montpellier, who publiſhed the ſame year. Inſects were alſo particularly treated of in a work the joint labour of ſeveral able men, among whom was the indefatigable Geſner; this book was publiſhed by Dr. Mouffet, an Engliſh phyſician, in 1634.

This was the ſtate of Zoology when our

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own immortal Harvey firſt dared to controvert one of the doctrines of Ariſtotle, which, although really unworthy of ſo great a philoſopher, nobody had hitherto oppoſed, I mean that of equivocal generation. The metaphyſical quibbles which had ſo long diſgraced the ſchools, began now to give way to a ſpirit of enquiry and obſervation; but not in the ſchools themſelves, for from thence light ſeldom ſprings. The propoſition of Harvey, "*omnia ex ovo*," was not received without oppoſition; but this was forgotten in the much more furious oppoſition given to his other more important and intereſting doctrine, of the circulation of the blood. No ſooner was this publiſhed than a crowd of adverſaries beſet him. After in vain endeavouring to refute his opinion, they had recourſe to the common ſubterfuge of denying its originality; taking upon themſelves the greater reproach, of having been blind to the evidences already exiſting of ſo indiſputable a truth, rather than allow their illuſtrious contemporary any merit in the diſcovery.

With Harvey begins what may be called the phyſiological period of Natural Hiſtory. His hypotheſis of generation was confirmed by the experiments of Redi and Malpighi, two very philoſophical naturaliſts, who have diſencumbered ſcience from many prejudices, and thrown much light on ſome of the moſt abſtruſe parts of phyſiology. The experiments of Redi to diſprove equivocal generation, are truly admirable; and Malpighi's inveſtigations, relating to the anatomy and transformation of ſilkworms, and the development of the chick in the egg, are too celebrated to need any freſh eulogium. About the middle of the ſeventeenth century a new and very intereſting propoſition in phyſiology was ſtarted, that of the ſexes of plants, the honour of which is given to our countryman Sir Thomas Millington. It is to be wiſhed however that he had written ſomething himſelf upon the ſubject, or that we knew whether the idea were really originally his own. Nearly about the ſame time the diſcovery of the lymphatic veſſels

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in animals was made, either by Rudbeck or Thomas Bartholin, or rather by both at once. All which I think juſtifies me in calling the period of which I am ſpeaking, a phyſiological age. In it was laid the foundation of almoſt every doctrine which has ſince been cultivated and enlarged upon, and on which all following medical and phyſiological ſyſtems have been built.

It is no wonder that ſyſtematic Zoology ſhould derive advantage from all theſe diſcoveries. Towards the end of the laſt century appeared two great naturaliſts, amply qualified to profit by them, and to whom the ſcience is infinitely indebted, our countrymen Willughby and Ray. Theſe illuſtrious friends laboured together with uncommon ardour in the ſtudy of nature, and left ſcarcely any of her tribes unexplored. But death, which ſo often diſappoints the faireſt hopes, cut off the former in the prime of life, before he had digeſted the materials to the acquiſition of which he had devoted his youth; and they might all have been loſt to the world and

his name have periſhed with them, but for the faithful friendſhip and truly ſcientific ardour of Ray. So cloſe was the intercourſe between theſe two naturaliſts, that it is not eaſy to aſſign each his due ſhare of merit. Indeed Ray has been ſo partial to the fame of his departed friend, and has cheriſhed his memory with ſuch affectionate care, that we are in danger of attributing too much to Mr. Willughby, and too little to himſelf. Certainly however it is by no means a fair ſtatement of the caſe to ſay with Dr. Derham, that Mr. Willughby had taken the animal kingdom for his taſk, as Mr. Ray had the vegetable one. The Ornithology and Ichthyology ſufficiently ſhew that Ray was not a mere editor of thoſe noble works, and the Synopſes Avium & Piſcium, publiſhed ſome time after, in which he has made many improvements, and ſome important changes as to arrangement, prove with how much attention he had ſtudied thoſe two branches of Zoology. I need not add that the Synopſis of Quadrupeds

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is, as to method, entirely his own, although Willughby is there often quoted for many excellent obſervations; and the ſame may be ſaid of the Hiſtoria Inſectorum, publiſhed in 1710, after the death of Ray. All theſe works are excellent in their kind, admirably methodized, and exhibit ſuch proofs of accurate obſervation, ſuch a candid love of truth, and ſuch penetration in diſcovering it, as muſt ever rank their authors among the firſt and moſt philoſophical naturaliſts.

Ray, being diſſatisfied with Ariſtotle's claſſification of animals, was the inventor of a new one, founded on the ſtructure of the heart. The Harveian experiments and doctrine of the circulation had called the peculiar attention of philoſophers to every organ which has a ſhare in that phænomenon, and to this cauſe probably we owe the method of Ray. Taking therefore the diviſion of animals into Sanguinea and Exanguia, which was a very ancient one, he ſubdivides the firſt claſs into ſuch as are furniſhed with lungs and ſuch as breathe

by gills; and the former of theſe he again ſeparates into thoſe which have an heart with two ventricles, and thoſe whoſe heart has only a ſingle ventricle. The latter diviſion contains Reptiles, the former viviparous Quadrupeds, Whales and Birds. The Animalia branchiis reſpirantia include all Fiſhes properly ſo called, the Whale kind and all the Exanguia being of courſe excluded. The Animalia Exanguia are divided into greater and leſſer. The latter diviſion contains Inſects; the former is again ſubdivided into three genera, the firſt of which includes the Mollia, or Molluſca, as Cuttle-fiſh and Polypi; the ſecond Cruſtacea, as Crabs and Lobſters, which are properly Inſects; and the third Teſtacea, or Shell-fiſh. This ſyſtem, although liable to a great many objections, which I ſhall not now ſtay to enumerate, is deſerving in many reſpects of great praiſe: its author has ſhewn eminent ſkill in the characters by which he has choſen to diſcriminate the ſubordinate diviſions, and in ſhort the Linnæan ſyſtem of Quadrupeds

drupeds is little more than a reformation of that of Ray. I ſhall ſoon ſpeak of the botanical merit of this great man; but before we take leave of this period of Zoology, it may be expected I ſhould ſay ſomething of Leeuwenhoek, and his theory of generation, which has made ſo much noiſe; nor may it be uſeleſs to mention him, if only as a *memento* to future theoriſts. What a pity it is, that ſo excellent an obſerver, to whom the world is indebted for ſo much ſolid phyſiological information, ſhould have produced an hypotheſis, whoſe celebrity ſeems but to have haſtened its refutation, and conſigned it to more abſolute neglect! The ſpermatic worms of Leeuwenhoek may perhaps be the jeſt of philoſophers many ages to come, while others ſhall profit of his genuine diſcoveries, without knowing to whom they are obliged.

Let us now take a general view of the ſtate of Natural Hiſtory at the end of the laſt century.

In England the flattering aſpect which this ſcience had worn under the auſpices

of Charles I. was blaſted by the turbulent times which followed; but in the peaceful days of Charles II. natural hiſtory, as well as all the different branches of philoſophy, received a degree of cultivation and advancement hitherto unknown in this country; and this led on to the golden age of ſcience in England, which was crowned by the poſſeſſion of a Newton.

The Royal Society, which, from a ſmall beginning at Oxford about the year 1645, made rapid advances when removed to the metropolis, was eſtabliſhed under the protection of the king in 1662, very ſoon after his reſtoration. This learned body beſtowed great attention from the beginning, as they have ever ſince done, upon the phyſiological part of natural hiſtory. The names of Boyle, Evelyn, Hook and Needham, are among the firſt members of this ſociety; and how much they have laboured in the advancement of natural ſcience is well known. Mr. Willughby was one of the original fellows of the Royal Society, although his friend Ray was not admitted

admitted till the year 1667. Dr. Liſter, the great conchologiſt, was very early aſſociated with it, as well as that admirable vegetable phyſiologiſt Dr. Grew.

Nor was France behind-hand with England in attention to the ſciences, and among the reſt natural hiſtory. Henry IV. that great name which ſcience delights in joining with humanity to bleſs, had endeavoured long ago to promote literature and uſeful knowledge throughout his dominions. Among other inſtitutions the botanic gardens of Paris and Montpellier are owing to his munificence. But his untimely death, and the ſubſequent diſturbances, for a while put a ſtop to all farther cultivation of the arts of peace. About twenty years afterwards, by the indefatigable perſeverance of De la Broſſe, ſuperintendant of the Paris garden, the Cardinal de Richlieu was induced to grant it his protection; but this garden firſt roſe to any conſiderable degree of eminence towards the end of the laſt century under

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Louis XIV. This munificent prince encouraged learning with that ſplendid liberality which diſtinguiſhed all his actions. For the purpoſe of promoting botany, and enriching the royal garden, the illuſtrious Tournefort was ſent to the Levant, and the accurate and indefatigable Plumier made three voyages to America, and died as he was about undertaking a fourth. An Academy of Sciences was inſtituted at Paris in 1666, and another ſome years after at Montpellier, very ſimilar to the Royal Society of London, with which the greateſt men in Europe have always been proud to be aſſociated.

Many ſimilar inſtitutions were ſet on foot throughout Europe, as the Imperial Academy Naturæ Curioſorum, begun in 1652. A number of botanic gardens were alſo eſtabliſhed in Germany; but Linnæus has truly obſerved that they have never been rich in exotic plants, on account of the ſmall intercourſe of that country with the Indies; whereas the gardens of Holland

land were at this time overflowing with riches from the moſt diſtant parts of the globe.

The Amſterdam garden under the care of the Commelins was now one of the firſt in Europe, and that of Leyden was rendered celebrated by the catalogue publiſhed by Herman. Holland had moreover the glory of producing at this time that moſt ſumptuous and excellent work, the Hortus Malabaricus; by which a new world was in a manner laid open to the botaniſts of Europe, and from which they learned with ſurpriſe, that the knowledge of plants had made almoſt as much progreſs in the remote regions of Aſia, as in their own part of the world.

But the ſtudy of nature was no where making ſuch an uniformly ſteady progreſs as in Sweden. At Upſal, under the auſpices of the great Rudbeck, was laid the foundation of what Mr. Stillingfleet has juſtly called an unrivalled ſchool of natural hiſtory, and which was deſtined afterwards to give laws to the reſt of the world. Rarely has

has ſuch a variety of profound and extenſive learning been united as in Rudbeck. I have already mentioned his anatomical merit in diſcovering the lymphatics. In antiquities, eſpecially thoſe of the northern nations, and in the learned languages, his knowledge was unbounded *. In botany he had erected to himſelf what might reaſonably have been thought a " monumen-

* " The moſt curious, ſingular, and in every reſpect moſt extravagant work of this extraordinary man is his *Atlantica, ſive Manhein, vera Japheti poſterorum ſedes ac patria*, printed in 1679, 1689, and 1698, in three folio volumes. Another volume was intended to have been publiſhed, which remains in manuſcript, and in its place is given as a fourth volume, an Atlas of 43 maps, with two chronological tables. This rare work is full of immenſe erudition; but, as uſual in the North, this erudition, poured forth by wholeſale, without diſcrimination or taſte, tends to confound and overwhelm the reader rather than to inform him. The author maintains the ſtrangeſt and moſt unbounded paradoxes. He pretends that Sweden, his own country, was the abode of the ancient Pagan deities, and of our firſt parents, the terreſtrial paradiſe, the true Atlantis of Plato; and that it was the origin of the Engliſh, the Danes, the Greeks, the Romans, and of all the reſt of the world." *Fontana.*

tum ære perennius," in one of the greateſt undertakings of the kind, a collection of fine wooden cuts of all the plants then known. They were to have been arranged and named according to Bauhin's Pinax, in 12 large volumes folio. But two volumes were ſcarcely printed, when in 1702 a dreadful fire reduced almoſt all Upſal to aſhes, and with it the work of Rudbeck, and many thouſand wooden blocks already cut, beſides almoſt all the materials of an hiſtory of Lapland compoſed by his ſon, who indeed had a principal hand in the great work of which I am ſpeaking. It can ſcarcely be thought an impeachment of the venerable old man's philoſophy, that ſo cruel a diſappointment ſoon brought him with ſorrow to the grave.

All that remains of this work are a few copies of the ſecond volume, and three only of the firſt, one of which is in the Sherardian library at Oxford. Linnæus was poſſeſſed of about 120 of the wooden blocks of this firſt volume, as well as 8 or 10 unpubliſhed blocks belonging to ſome intended

intended one; all which came with his collection into my hands: they are for the moſt part admirable figures of graſſes*.

Having been now inſenſibly led back to Botany, I ſhall take a comprehenſive view of the ſyſtematic æra of that ſcience, when ſo many new methods of claſſification were invented, moſt of which were ſtrenuouſly ſupported by their reſpective authors, who little thought that in the ſpace of half a century, oblivion would nearly level all diſtinctions between them.

The firſt who revived the idea of a claſſical arrangement of plants, ſince the time of Cæſalpinus, was Moriſon, who has been juſtly cenſured for neglecting to acknowledge how much he owed to his ingenious predeceſſor, and who has in his turn received ſimilar treatment from his followers. His method was founded chiefly on the fruit, to which, as well as the external habits of plants, he paid too much regard, and too little to the other parts of fructifi-

* Publiſhed under the title of Reliquiæ Rudbeckianæ, folio, 1789.

cation.

cation. The only work claſſed according to the method of Moriſon is his own Hiſtoria Univerſalis Plantarum, an uſeful compilation, which is daily uſed as a book of reference, by thoſe who never think of his ſyſtem.

But the three principal ſyſtematic authors were Ray, Tournefort and Rivinus, between whom was much warm controverſy on the ſubject; and it muſt have been an intereſting matter indeed that could ſo agitate the candid peaceable ſpirits of Ray and Tournefort. Of Ray it may be ſaid, that his method was the moſt abſtruſe and ſcientific, while that of Rivinus was at firſt ſight more ſimple, but liable to as great difficulties in the execution. The former was principally founded on the fruit, the latter on the corolla, and in both were the other parts of fructification too much neglected. The ſyſtem of Tournefort, which was likewiſe formed chiefly upon the corolla, was undoubtedly far ſuperior to all the reſt then extant; yet I doubt whether that alone would have procured its author

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his extenſive reputation, had he not inveſtigated and diſcriminated the *genera* of plants in ſo maſterly a manner, that this alone is ſufficient to rank him above all preceding botaniſts. It is true he did not invent a mode of ſyſtematically defining theſe genera by words; this was reſerved for Linnæus: but it has been well obſerved by Monſieur Delamarck, that Tournefort was no leſs ſenſible of the diſtinctions of his genera, and he has cauſed them to be figured in ſo able a manner that they cannot be miſtaken.

This great botaniſt, chiefly unfortunate in having had ſome injudicious advocates, is the glory of the French nation. His countrymen are with reaſon proud of him, and his merits as a botaniſt and a traveller are ſo well known, that no commendation of mine can add to his fame. Yet I muſt not omit to do juſtice to his ſucceſſor Vaillant, whoſe merit I think is hardly ſufficiently known. In profiting of the indulgence granted me when at Paris of conſulting the Herbariums of theſe two eminent

nent botaniſts, I was aſtoniſhed at the inſtances of profound knowledge and acuteneſs of judgment which I met with in that of Vaillant, both with reſpect to the genera, ſpecies, and ſynonyma of plants; whereas it is well known that Tournefort was leſs ſolicitous about the ſcientific diſtinctions of ſpecies. Vaillant is alſo one of the firſt who was well acquainted with the ſexes of plants. His academical oration on that ſubject is full of good obſervations, though not without ſome errors. In this work he laughs without reſerve at Leeuwenhoek's peculiar theory of generation, and ſpeaks rather too diſreſpectfully of Tournefort: for this he has never been forgiven.

There were at this time ſeveral botanical ſyſtems invented beſides thoſe above mentioned; but few being remarkable for originality or uſe, I cannot dwell long upon them. Herman's was one of the beſt. It was entirely founded on the fruit, and not very different from thoſe of Ray and Moriſon. Boerhaave's had great merit, in

being founded more or leſs on all the parts of fructification. The method of Chriſtopher Knaut is an alteration of that of Ray, without any improvement. The paradoxical Chriſtian Knaut, who thought the eſſence of a flower conſiſted in its corolla, was never very famous, and would now probably make no proſelytes at all.

A ſingular ſyſtem was invented by Profeſſor Magnol of Montpellier, founded on the calyx, to which Linnæus was very partial, and he even formed a ſimilar method of claſſification himſelf: happily, however, this was not the only one he ever invented.

Nor was this æra of botany merely a ſyſtematic one. Linnæus has not ſcrupled to aſſert, that within the ſpace of twenty years, at the end of the laſt century, twice as many plants were diſcovered as had been made known by the joint labours of all preceding botaniſts. Beſides thoſe which were collected by Tournefort, Plumier and Ray, a noble collection was brought from Jamaica by Dr. Sloane, afterwards

terwards Sir Hans, of which the hiſtory in two volumes folio is well known. Mr. Sherard conſul at Smyrna, who cultivated botany with princely munificence and with the ardour and diſcernment of a true philoſopher, has been the means of making known a very great number of plants. His vaſt herbarium and library are now among the literary treaſures of Oxford. The indefatigable Plukenet procured and publiſhed an immenſe number from all parts of the world, many of them very rare. His book is in every body's hands, and it would be ſuperfluous here to ſay any thing of its utility. Petiver was no leſs perſevering in making collections, not only of plants, but of all kinds of natural objects. His works are of a very peculiar character, and exhibit more zeal than genius or accuracy. His rough criticiſms of his contemporary Plukenet have hurt nobody but their author. The acquiſitions of Dr. Herman in Ceylon were very conſiderable. They lay a while dormant, only to appear with greater celebrity from the

pen of Linnæus. In ſo brilliant a period of the hiſtory of this ſcience I am obliged to paſs over many leſs illuſtrious, although great names; and ſhall only mention Rumphius, whoſe ardour was not to be damped even by the greateſt misfortune which can befal a naturaliſt, the loſs of ſight. The rich treaſures of Amboina were made known to us by this laborious man. His book on ſhells is in high eſtimation; and his Herbarium Amboinenſe might vie with the Hortus Malabaricus, if all concerned in the publication of it had performed their parts as well as he has done his: but the figures are by no means comparable to thoſe of that ſtupendous work. The courage of Rumphius in purſuing natural hiſtory after he had loſt his ſight, reminds me of a ſimilar inſtance, I believe very little known, of a Provençal phyſician named Reboul, who undertook a manuſcript hiſtory of plants in ſeveral large folio volumes, and, becoming blind, actually completed many of the unfiniſhed chapters with his own hand after that accident.

This curious manuſcript was ſhewn me in the public library at Parma.

While Botany was making this great progreſs, Entomology began to be cultivated with an aſſiduity, which was amply repaid by the curious and aſtoniſhing facts it brought to light. The notion of equivocal generation having been refuted by Harvey, Redi and Malpighi, the propagation and metamorphoſes of inſects became an intereſting object of enquiry with ſeveral able men, among the firſt of whom were Goedart and Swammerdam. The diſcoveries of Goedart were received with laudable caution by his contemporaries, eſpecially what relates to the hiſtory of Ichneumones; but following obſervers have confirmed the accuracy of his relations. The works of Swammerdam are full of curious information, and will ſufficiently reward thoſe whoſe patience is not to be exhauſted by his tedious heavy ſtyle. Nor muſt I forget Madam Merian, whoſe excellent work on the Surinam Inſects, one of the moſt ſplendid in natural hiſtory,

is a monument of female perſeverance and enthuſiaſm.

Other admirers of nature have turned their attention to ſhells and marine productions; and the facility with which theſe bodies are preſerved in cabinets, has made the collecting them very general. A few authors had written on ſhells about the beginning of the laſt century, as Aldrovandus, Columna, Imperati, &c. but about the end of the century two very eminent writers were particularly diſtinguiſhed in Conchology, Bonanni and Liſter. Their works are in daily uſe. In the different publications of the latter are many curious anatomical obſervations, and Bonanni has treated the formation of ſhells in a very philoſophical manner. Some intereſting hints on the ſame ſubject are to be found in Steno's "De Solido intra Solidum Diſſertationis Prodromus," printed at Florence in 1669.

Of all the parts of Natural Hiſtory, Mineralogy for a long time made the ſloweſt progreſs. From the time of Theophraſtus

to

to the end of the ſeventeenth century few improvements were made in the knowledge of Foſſils. What little was written in all that time contained only repetitions of old erroneous ſuperſtitious opinions. Even at the period of which I am ſpeaking, a ſtriking idea of the darkneſs of this ſcience may be formed, from Tournefort's having maintained the vegetation of ſtones, and Liſter's having poſitively aſſerted that all extraneous foſſils, as petrified ſhells, &c. are only luſus naturæ, and never were the real ſhells they repreſent. Afterwards Mineralogy was cultivated with a little more care, but ſtill on wrong principles, the external figure of foſſils being principally attended to, and not their component parts; nor was it till very lately that the ſcience was eſtabliſhed on its true foundation, that of chemical analyſis.

For about fifteen years after the beginning of the preſent century nothing very conſiderable was printed in botany. But the year 1718 is remarkable for the publication of Ruppius's excellent Flora Je-

nenſis, and the following for the appearance of Scheuchzer's inimitable Agroſtographia and Dillenius's Flora Giſſenſis. Ruppius being cut off early in life, diſappointed the hopes which were formed of him. Dillenius is one of the moſt illuſtrious names in botany; not ſo much indeed for ſyſtematic or phyſiological merit, as for accuracy of obſervation and judicious criticiſm. About this time alſo flouriſhed Pontedera at Padua, who although a great Tournefortian, and ſtrangely prejudiced againſt the ſexes of plants, was a ſcientific botaniſt, and is very liberally praiſed by Linnæus, againſt whom he is ſaid nevertheleſs to have written ſomething, which was never publiſhed *.

The

* This criticiſm has however been lately publiſhed in a poſthumous work entitled *Julii Pontederæ Epiſtolæ ac Diſſertationes*, printed at Padoua in 1791 in 2 volumes 4to.—On the ſubject in queſtion the editor and commentator of the work, Mr. Bonati, keeper of the library at Padoua, in his elegant preface has the following remark: *Enimvero cum in quædam horumce voluminum loca lector inciderit, ſentiet oratorias excurſiones in Linnæum tamquam*

The removal of Dillenius to England, who publiſhed here his excellent edition of Ray's Synopſis Stirpium Britannicarum in 1724; the aſſiſtance and encouragement given to the ſcience by thoſe two diſtinguiſhed brothers William and James Sherard, as well as by Sir Hans Sloane, ſeemed to promiſe the eſtabliſhment of the botanic ſceptre in this country; eſpecially as the inſufficiency of Tournefort's ſyſtem became every day more obvious, and Boerhaave

quam Botanices perturbatorem ac hoſtem Catilinariis fere aut Philippicis Orationibus æquiparari; ac ſibi videbitur Scholaſticum aliquem Galilæo aut Carteſio obtrectantem audire.

Moreover, although the Linnæan Syſtem be wonderfully ingenious as well as new, it neither is nor can be exempt from defects and inconveniences, which will never be avoided in any ſyſtem that can be imagined. The celebrated Mr. De Lamarck, after having given it the moſt ſplendid eulogium in his fine preliminary diſcourſe to the Botany of the *Encyclopédie Méthodique*, concludes thus: "It is not however to be denied, that this ſyſtem, which does ſo much honour to the ſagacity and ingenuity of its illuſtrious author, is not ſo happy in its application to practice as it ſeemed to promiſe, and as it might be wiſhed; ſince it not only breaks a conſiderable

haave was too much occupied by medicine, to devote any conſiderable ſhare of his powers to any other purſuit. The phyſic garden at Chelſea was in a very flouriſhing ſtate under the care of the celebrated Miller, and that of Mr. Sherard at Eltham contained one of the choiceſt collections in Europe. But botaniſts were almoſt at a ſtand about arrangement. All the different ſyſtems which had been propoſed, however ſpecious in univerſity lectures,

conſiderable number of natural affinities, ſeparating plants which the moſt reſemble each other, and dividing families which are the moſt generally acknowledged, but its manifeſt inſufficiency in a great number of caſes, deprives it of the principal and even ſole merit of an artificial ſyſtem, which conſiſts in helping us eaſily and certainly to make out the name of any plant that we want to aſcertain."

But what does this mean? That a method perfect in all its parts has never yet been, nor ever will be. See what Pontedera himſelf ſays in the work above quoted, vol. ii. diſſ. 11. *that there is no perfect botanical ſyſtem.* And where is there any thing human which is complete and faultleſs? *He that has feweſt faults,* ſays Horace, *is the beſt man;* and ſo it is with ſcientific ſyſtems."

Fontana.

having

having been found very inſufficient for the purpoſes of practical botany, the ſcience was again in danger of relapſing into anarchy and confuſion, and botaniſts were almoſt overwhelmed with the riches which daily flowed in upon them.

In this ſtate of things a new turn was given to the ſcience of botany, and indeed to all natural hiſtory, by the publication of the Syſtema Naturæ and Fundamenta Botanica of Linnæus in 1735. Nor were the learned world determined how they ſhould receive theſe extraordinary productions, when in 1737 the ſame author, without any other ſupport than his own tranſcendent merit, fixed the attention of all Europe, by his Critica Botanica, Genera Plantarum, Hortus Cliffortianus, Flora Lapponica and Methodus Sexualis; five works, the produce of one year, each of which would alone have been ſufficient to have immortalized its author, and in the compoſition of which a man's whole life might have been thought uſefully employed!

Having

Having by a number of original obſervations, added to thoſe of former writers, demonſtrated the ſexes of plants, and conſequently the importance of their ſtamina and piſtilla; Linnæus founded his ſexual ſyſtem on the differences in number, ſituation and proportion of theſe organs: a ſyſtem which, although profeſſedly merely *artificial*, is really in many reſpects more agreeable to nature than many which had preceded it, and which, for facility and univerſality, has a decided ſuperiority over all hitherto invented. But this was only a part of the praiſe of this riſing genius. Having new modelled and ſyſtematically defined all the known genera of plants, he endeavoured in like manner to define the ſpecies upon philoſophical principles; a thing hitherto unknown, or at leaſt but faintly attempted by ſome old botaniſts. Of the ſucceſs of Linnæus in this undertaking, as well as his judgment and accuracy in collecting ſynonyms, the Hortus Cliffortianus and Flora Lapponica afford ſufficient proofs. In them may be ſeen the dawn-

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ing of thoſe talents which afterwards produced the Species Plantarum; while the didactic preciſion and critical acuteneſs of the Fundamenta and Critica, gave a foretaſte of that perfection which was hereafter to appear in the Philoſophia Botanica.

Nor were the abilities of Linnæus leſs conſpicuous in his diſtribution of the animal kingdom. Of this the firſt edition of the Syſtema Naturæ was but a ſketch, which was afterwards corrected and much enlarged. It is unneceſſary here to enter upon the particulars of his ſyſtem, which has been familiar to all naturaliſts for theſe fifty years. I ſhall only ſay, that what in my opinion are the beſt parts of it, the claſſes of birds and inſects, were altogether original. For the detection of the eſſential character of the latter in their antennæ, we are entirely obliged to Linnæus; and his ſubordinate diſtinctions were not only the firſt, but long experience has proved them the beſt, that have ever been invented.

His

His arrangement of foſſils, the beſt at the time it was firſt publiſhed, is now generally neglected. Although in ſome inſtances founded on chemical principles, in others the moſt obvious laws of chemiſtry were ſacrificed to external figure; and the ſcience having been of late years ſo totally reformed, it is no wonder that Linnæus's Regnum Lapideum is become obſolete.

This illuſtrious man, returning in 1739 to Sweden his native country, there fixed the throne of Natural Hiſtory. Soon after his arrival he helped to lay the foundation of the Academy of Sciences at Stockholm, of which he was the firſt preſident. His diſtinguiſhed merit and amiable manners procured him the favour of the rich and powerful, as well as the attention and admiration of the ſcientific; and his medical and botanical lectures at Upſal ſoon attracted a number of ſtudents from all parts of the world, and exalted that univerſity to a degree of fame hitherto unknown.

It is true, he did not eſcape the attacks of envy and jealouſy; nor can any exalted character,

character, however inoffenſive and prudent, hope to eſcape them. But they never put him ſo much off his guard as to waſte his time in controverſy, nor would he give his adverſaries immortality, by tranſmitting their names to poſterity with his own. I ſhall on the preſent occaſion follow his example; nor drag from obſcurity works long ſince forgotten, or authors who never were noticed. I cannot but obſerve, however, that profeſſor Siegeſbeck, notwithſtanding his intemperate zeal in attacking the ſexes of plants and Linnæus's ſyſtem with all the arms he could muſter, both ſacred and profane, was by no means the moſt contemptible of all the authors on that ſide the queſtion. He has been unfortunate enough to be always held forth as the botanic Zoilus; but I think there have been ſome critics, even in our own country, who for futility, ignorance and malevolence, would have much greater claims to that title, if they were of conſequence enough to claim any title at all.

We muſt now conſider ſome of the moſt eminent

eminent naturaliſts who were contemporaries with Linnæus in the beginning of his literary career, and whoſe labours tended eſſentially to the advancement of the ſcience. It would be endleſs to enumerate all who have cultivated or written upon natural hiſtory during this golden age; we can only notice a few of the moſt diſtinguiſhed.

His moſt intimate companions at this time were Artedi and Gronovius; the former of whom has in his Ichthyology diſcovered ſuch talents for natural hiſtory, that his premature death cannot be ſufficiently regretted. Gronovius has contributed in various ways to the advancement of the ſcience. His Flora Virginica and his zoological works are conſtructed upon Linnæan principles. He was always in amicable correſpondence with Linnæus; as conſtant in the offices of friendſhip as deaf to the impulſes of envy and jealouſy. It was Gronovius who had the honour of naming the Linnæa after his illuſtrious friend.

One

One of the greateſt and moſt extenſive geniuſes of this or any age was Haller, that great phyſiologiſt and unwearied obſerver, who, though at firſt the friend, afterwards became the rival, and the only reſpectable rival, of Linnæus, compared with whom all his other critics ſink into nothing. What a pity it is theſe illuſtrious men were not always friends! What a pity the memory of Haller ſhould have been diſgraced by the publication of thoſe confidential letters, the reviſal of which one would have thought ſufficient to diſarm the moſt inveterate mind!

——"Tantæne animis cœleſtibus iræ?"

I muſt however reſcue the name of Haller as much as poſſible from this foul ſtain. On a careful enquiry among thoſe who alone could ſatisfy me on the ſubject, I am inclined to think his powers of body and mind were ſo enfeebled that he may be ſaid to have been not himſelf at the time theſe letters were publiſhed, and probably never reviſed them. Elſe can

we ſuppoſe a character like his would ſo groſsly have violated, not only the confidence of friendſhip, but even the laws of paternal affection? for in that collection are letters of one of his ſons, then no more, which no father ought to have made public. Perhaps the temptation of producing ſuch teſtimonies of his own celebrity was, in the weakneſs of old age, too flattering to that vanity from which Haller is acknowledged not to have been free. Neither was Linnæus himſelf without his ſhare of it; and if vanity were never found but with ſuch pretenſions, who would not almoſt forget that it were a weakneſs?

I cannot attempt to enumerate all the works of Haller, much leſs to diſplay their merits. His hiſtory of the Switzerland plants is one of the moſt excellent and complete Floras the world ever ſaw, and is only deprived of the general applauſe it deſerves, by the author's unconquerable diſlike to the Linnæan claſſification and nomenclature, by which his work is rendered extremely unfit for common uſe.

His

His Phyſiology, Bibliotheca Anatomica and Bibliotheca Botanica, are among the moſt ſtupendous monuments of human knowledge as well as of human labour. They defy imitation, and ſtrike criticiſm dumb.

Another diſtinguiſhed name alſo claims our attention, that of Reaumur. I know none more worthy to ſtand next to Haller. Beſides the various diſcoveries of this great French naturaliſt which were of immediate uſe in improving the arts and manufactures of his own country, the philoſophical world at large will ever be indebted to him for his inveſtigations of ſome of the moſt intricate parts of natural hiſtory. His experiments on digeſtion, on the fructification of marine plants and on corals, are all celebrated, although with reſpect to the latter he was miſtaken in denying their animal nature; but his immortal work is his "Mémoires pour ſervir à l'Hiſtoire des Inſectes," in 6 volumes, quarto; and he has publiſhed a variety of detached pieces relating to the ſame ſubject.

The Italians poſſeſſed a ſimilar genius to Reaumur in Valliſneri, whoſe experiments relating to generation, and his candour in giving up his firſt opinion on that ſubject, merit great commendation, as well as his inveſtigations of inteſtinal animalcula. Valliſneri was profeſſor of the practice of medicine at Padua, and died in 1730. His works, being only in Italian, are not ſo much read as they deſerve to be.

The ſame country had the honour of producing another moſt excellent obſerver in Micheli of Florence, whoſe Nova Genera Plantarum, publiſhed in 1729, is a fundamental book in botany; it has the rare merit of being a work of original and accurate obſervation in the moſt difficult of all plants, graſſes, moſſes and fungi. If Dillenius and Linnæus had paid due regard to his obſervations, they would not have ſo totally miſunderſtood the fructification of moſſes as to take the capſule for the anthera. The world may ſtill hope for more information from this excellent man,

on the publication of his manuſcripts, now in the hands of Mr. Targioni Tozzetti, the worthy poſſeſſor of all his remains.

This leads me to mention the Hiſtoria Muſcorum, publiſhed by Dillenius in 1741, that matchleſs work which, for the accurate delineation and determination of ſpecies, has never been rivalled in any department of botany, much leſs in that which it illuſtrates. This author has made the intricate tribe of moſſes and algæ comparatively eaſy; without ſuch a writer they would all probably have continued the opprobrium of botany, as fungi and confervæ are ſtill.

A work worthy to be compared with this of Dillenius, for the more than Herculean labour which was employed in its compoſition, is the Hierobotanicon of Olaus Celſius, profeſſor of divinity at Upſal, and one of the firſt and warmeſt patrons of Linnæus. He travelled to the Eaſt on purpoſe to enquire into the plants of Scripture, the determination of which was his darling object for more than fifty years. His book was not eſteemed as it deſerved

till its author was no more. There having been but 200 copies printed, it is now very rare, and is one of thoſe works which are oftener talked of than read.

I ſhall only at preſent mention the names of two more writers, who chiefly diſtinguiſhed themſelves in vegetable phyſiology, Du Hamel and Hales *. One of them was the ornament of France, and the other of our own country, about the period of which I have been ſpeaking, and both have rendered great ſervices to philoſophical botany.

In the mean while Linnæus was daily advancing in ſcience and reputation. His Fauna Suecica appeared in 1746, and his Materia Medica in 1749; the former is a model of deſcriptive zoology, as the latter of methodical arrangement and conciſe-

* Father Fontana informs us that the works of Dr. Hales have been tranſlated into Italian at Naples, by a very accompliſhed lady, Signora Maria Angela Ardinghelli, who took the pains to examine all his calculations, corrected ſome errors in them, and has added notes of her own. There is a plant in Commerſon's herbarium named *Ardinghelia*, probably from this lady.

-neſs,

neſs. They were both afterwards very much improved and enlarged, but the Materia Medica was never republiſhed by Linnæus; all the new editions of it are by Profeſſor Schreber, and the alterations are his own.

In 1751 appeared the Philoſophia Botanica, and two years afterwards the firſt edition of the Species Plantarum; two works which it were equally vain and ſuperfluous to attempt to praiſe as they deſerve. I ſhall only remark that the introduction of *trivial names*, which firſt took place in the Species Plantarum, was one of the moſt happy inventions of Linnæus, and I am perſuaded it has contributed more than any thing elſe to make his works of general uſe. Even thoſe botaniſts who from envy would never openly adopt them, have given the moſt convincing proofs of the importance of which they thought them, in labouring to deprive Linnæus of the honour of their invention; and I could mention inſtances of people, who have written againſt theſe trivial

names, being obliged to recur to them daily in ſpeaking and writing of plants.

The fame of Linnæus was now ſo widely diffuſed that, as his excellent biographer Dr. Pulteney has obſerved, he began ſcarcely to feel the diſadvantages of his northern ſituation. He had diſciples in every part of the world who vied with each other in ſending him all the objects of natural hiſtory they could procure, ſo that his cabinet and his garden were equally enriched. At the ſame time moſt of the learned ſocieties in Europe were proud to enrol him among their members, and even kings contended for the poſſeſſion of him. He was amply indemnified for declining the generous offers of the Spaniſh monarch, by the honours and advantages heaped upon him by his own ſovereign. He received the rank of nobility, which in Sweden is neither a trifling nor a barren honour, and was made a knight of the Polar Star. This was the firſt inſtance of that order having been conferred upon literary merit; certainly it could never

have been beſtowed with greater propriety on any one than on Linnæus, who was himſelf that bright polar ſtar to which the ſcientific world looked up for aſſiſtance and direction.

This then may be reckoned the moſt flouriſhing period of Natural Hiſtory, when diſputes about methods and ſyſtems being for the moſt part laid aſide, every admirer of Nature's works was employed in practical obſervations and diſcoveries; while Linnæus, whom nothing eſcaped, and to whoſe deciſion all doubts and difficulties were referred, ſuperviſed and methodized the whole. His improvements had ſo much facilitated the ſtudy of botany, that it was no longer an abſtruſe ſcience confined to the ſchools, but became an agreeable amuſement to perſons of leiſure in all ranks and ſituations.

About this time ſome moſt ſuperb works in natural hiſtory were given to the public, which, although not very ſyſtematic, were of uſe to the ſcience; as Seba's Theſaurus Rerum Naturalium, the firſt volume of which

which appeared in 1734, and the ſecond in 1735, the two following ones not having been publiſhed till many years after; Cateſby's Natural Hiſtory of Carolina, Florida, &c. of which the firſt volume was printed in 1731 and the ſecond in 1743; Edwards's Hiſtory of Birds, begun in 1743; and ſome others of leſs note. A work of a ſuperior kind was publiſhed at Florence in 1742, entitled Gualtieri Index Teſtarum Conchyliorum, which is remarkable for the perfection of its ſpecific differences of ſhells, in which the author ſeems cloſely to have imitated the ſtyle of the botanical works of his countryman Micheli. This is one of the moſt uſeful books of reference that we have in conchology, and in my opinion is far preferable to the work of d'Argenville printed the ſame year, although perhaps leſs complete than the new and enlarged edition of that book lately publiſhed.

In England horticulture ſeems now to have made great progreſs. Few have improved that art ſo much as the celebrated Miller;

Miller; and it is hardly fair to reproach him with not having perfected it. Bartram was ſent to America for the purpoſe of ſupplying our gardens with plants; and we are much indebted to him, as well as to Houſtoun, who diſcovered many rare vegetables in South America and the Weſt Indies, and whoſe remains, long neglected, are now reſcued from oblivion.

In Holland botany was ably ſupported by the labours of the two profeſſors Van Royen at Leyden, and the aſſiduous Burman profeſſor at Amſterdam. The Theſaurus Zeylanicus and Decades Plant. Africanarum of the latter are excellent books: ſome of the figures in this laſt which I find Linnæus ſuſpected to be erroneous, or even fictitious, have ſince been found faithful. Burman had alſo the honour of publiſhing a large volume of the figures of Plumier, from copies of the original drawings, which had long lain buried at Paris, as the greater part of that admirable author's works ſtill do, eclipſed by more ſplendid productions.

In Germany Profeſſor Ludwig of Leipſic

was

was now in great reputation; and he has ſhewn himſelf an able phyſiologiſt and accurate obſerver. He profeſſed to differ in many points from Linnæus, but oppoſed him with decency; and indeed it appears, as a noble author of our own country has lately remarked, that Ludwig, as well as Haller, were only "Linnæans in diſguiſe;" they profited of the lights they had received from him to build ſyſtems to rival his own.

No where have the Linnæan improvements been more ſlowly received than in France, which is to be attributed not only to the jealouſy of that nation for the fame of her immortal Tournefort, but alſo to her poſſeſſing ſome conſummate botaniſts, of ſufficient conſequence to ſupport for a time any ſyſtem they ſhould chooſe to eſpouſe. Among theſe the family of the Juſſieus claim the firſt place, and eſpecially Bernard de Juſſieu, a name never mentioned without reſpect. Even at Paris however Linnæus had early an illuſtrious protector in the Duke d'Ayen, now Marechal de Noailles, who correſponded with him long,

procured

procured him the notice and favour of the late king, and occaſioned his majeſty to ſend him a preſent of ſeeds from his own garden at Trianon. The work of Adanſon has alſo done ſervice to the Linnæan cauſe, although certainly that was what its author leaſt intended; but this is one of thoſe books every reader of which muſt diſſent from the author's opinions. In the ſouth of France Linnæus had more admirers. Profeſſor Gouan of Montpellier has adopted his principles both in his ichthyological and botanical works; and the excellent Gerard in his Flora Galloprovincialis, although he has not followed the ſyſtem of Linnæus, is every where cloſely attached to his principles, and has ever been an enthuſiaſtic admirer of his merit. Nor muſt I forget Profeſſor Sauvages of Montpellier, who generouſly preſented Linnæus with his whole herbarium, rich in the plants of that delightful country; nor his friend Monſieur Le Monnier, one of the warmeſt admirers of the illuſtrious Swede. This gentleman was ſent to the ſouth of France

as a botaniſt in 1740, with ſome other philoſophers who went there for aſtronomical purpoſes. Afterwards he became firſt phyſician to Louis XV. and now enjoys his "*otium cum dignitate*" in a delightful retirement near Verſailles, where he pays particular attention to the cultivation of trees and ſhrubs, and poſſeſſes one of the richeſt herbariums in France.

At Berlin botany and Linnæus had long a noble ſupport in Profeſſor Gleditſch, who firſt principally diſtinguiſhed himſelf by anſwering Siegeſbeck's criticiſm of the Linnæan ſyſtem; and his victory was decided indeed when Siegeſbeck publiſhed his *Vaniloquentiæ Gleditſchianæ Specimen*, in the firſt paragraph of which that writer gives him what may almoſt be called "the lie direct." But Gleditſch was better employed than in returning it. He applied himſelf to the inveſtigation of the obſcure phyſiology of Fungi and other orders of the Cryptogamia, and in 1753 publiſhed an able and elaborate work, entitled Methodus Fungorum. The Memoirs of the Ber-

lin Society abound with excellent treatiſes of this author relating to agriculture and rural œconomy. Nor did he neglect ſyſtematic botany. By no means a ſervile follower of Linnæus, he publiſhed in 1764 a ſyſtem founded on the ſituation of the ſtamina, the principle of which is good, and muſt always be kept in view by all botaniſts; but the claſſes of Gleditſch being ſolely founded on this circumſtance, are neceſſarily too few: his orders are borrowed from the claſſes of Linnæus.

Botanical works were daily multiplying in various parts of Europe. In 1745 appeared Leche's Primitiæ Floræ Scanicæ, and Seguier's rich catalogue of the Plantæ Veronenſes. It has been alleged by ſome faſtidious people, that the preſent century, and eſpecially the Linnæan age, has been overburthened with ſuch kind of catalogues, which require no abilities in their compoſition, and anſwer no purpoſe when done. A French writer, whom I am tired of naming, has declared himſelf of this opinion; and his own practice has been ſo conform-

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able to it, that he has never favoured the world with an account of the plants of Senegal, a country which he went purpoſely to inveſtigate. Happily all good botaniſts have not imitated him, or we ſhould never have ſeen Scopoli's ineſtimable Flora Carniolica, the various Floras of Allioni, De Gorter, Gunner, Hudſon, Gouan, Leers, Pollich, Weis and many others, which have been of great uſe to local, and indeed general botany; and even if every one of the valuable works juſt mentioned had been uſeleſs, who would not have thought them ſufficiently atoned for by the Flora Lapponica and Flora Suecica of Linnæus?

I am now led to conſider the ſervices rendered to natural hiſtory by the various diſciples of this eminent man, and others, who have undertaken hazardous and laborious journeys, on purpoſe to examine the productions of countries hitherto not at all or but ſlightly inveſtigated. And what praiſe does not the ardour of ſuch active promoters of ſcience deſerve? As no one ever felt more of this ardour than Linnæus,

næus, when the humble attractions of an arctic flora incited him to undertake his painful Lapland tour; ſo I think none has been ſo ſucceſsful as this great man in exciting the ſame ſpirit in others. Before I ſpeak of his pupils, however, the order of time obliges me to mention Buxbaum and Gmelin. The former may be ſlightly paſſed over. He was ſent by the Peterſburg Academy to collect plants in the Levant. The fruits of his labours are publiſhed in five Centuriæ, with wretched plates and very indifferent deſcriptions. The ſame ſociety were much more fortunate in their choice of Gmelin to undertake the examination of Siberia. That country had before been viſited by Gerber and ſome other botaniſts, but their acquiſitions were trifling compared with thoſe of Gmelin, who ſpent ten years, viz. from 1733 to 43, in Siberia. His Flora Sibirica, now increaſed to four volumes quarto, with an immenſe number of figures, and excellent deſcriptions and ſynonyms, is one of the beſt works of the kind, and contains many

very rare plants. Philip Frederick, the brother of this author, has written *Otia Botanica* and ſome other things. Samuel Gottlieb Gmelin, ſon of the laſt mentioned, is celebrated for his hiſtory of the genus Fucus, printed at Peterſburg in 1768.

The expedition of Ternſtroem, one of the firſt of Linnæus's diſciples whom the ſpirit of curioſity led to viſit countries far remote from his own, was an unfortunate one. This young man undertook a voyage to China in 1745, but died at Poulicandor. We have no hiſtory of his voyage. His memory is honoured with a plant in the Supplementum Plantarum at the inſtigation of Mutis, for Linnæus himſelf had not an high opinion of his merit.

Kalm, who viſited North America in 1747, was more fortunate. His travels are ſo well known, from the account of them tranſlated into Engliſh, that I need ſay little about them. His botanical diſcoveries very materially enriched the Species Plantarum of his great maſter, and the Linnæan Herbarium abounds with ſpecimens

mens brought home by him, diſtinguiſhed by the letter K. His own collection of dried plants is ſaid to be mouldering away in Sweden, in

" The lumber garret of his *wiſer* heir."

Haſſelquiſt viſited Egypt and the Holy Land in 1749. No one has ſhewn greater zeal or activity than this ingenious young man, whoſe premature death cannot be too much regretted. He was alike ſkilful in zoology and botany, as the account of his travels publiſhed by Linnæus, and ſince tranſlated into Engliſh, ſufficiently ſhews. In vain has an invidious author, who has himſelf long enjoyed an unſubſtantial reputation, endeavoured to blaſt the memory of Haſſelquiſt. His calumnies have been refuted by Dr. Sparrman, who has juſtly defended his countryman.

Oſbeck, another traveller well known in England from the tranſlation of his voyage, went to the Eaſt Indies in 1750, as chaplain to a Swediſh ſhip. He ſpent ſome time in China, of the natural hiſtory

of which he has told us much, and has made known many new plants, among which is the Oſbeckia.

Loefling, a favourite diſciple of Linnæus and an excellent botaniſt, undertook the examination of Spain in 1751, where he found many new and rare plants, and probably would have made many more diſcoveries, had his ſtay been longer in that rich, and hitherto almoſt unexplored country: but he left it for one ſtill more intereſting, South America, where he would, no doubt, have made a rich harveſt, had his life and health been continued; but he was ſoon cut off, at the age of 27. His letters and botanical deſcriptions have been publiſhed by his illuſtrious maſter, who, in this inſtance, as well as on every other occaſion, has given proofs of that ſenſibility which muſt ever make him as dear to humanity as to ſcience.

I forbear to enlarge upon other expeditions of leſs note, as thoſe of Montin and Solander to Lapland, Bergius and Falk to Gothland, &c. although each contributed

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to the general ſtock of natural knowledge very much. It is to be regretted we have not had more information from Rolander, who viſited Surinam and St. Euſtatia in 1755. He ſent home indeed ſeveral curious inſects, mentioned in the Syſtema Naturæ; but I find, by a letter of Linnæus to Gerard, that he eſteemed Rolander the firſt entomologiſt after Reaumur. A pupil of Linnæus, named Martin, viſited Spitzbergen in 1758: he muſt not be confounded with Martens, who went to the ſame country in 1671, and whoſe rude figures are quoted by Linnæus. I muſt not omit Toren, who went twice to the Eaſt Indies, and deſcribed his whole voyage in letters to Linnæus, enriched with many obſervations relating to natural hiſtory, all which were publiſhed with Oſbeck's voyage, and tranſlated into Engliſh by Dr. Forſter.

I am led to conſider ſome of the moſt illuſtrious naturaliſts of the preſent age, whoſe works and whoſe diſcoveries have been long ſo generally known as almoſt to preclude the neceſſity of mentioning them,

were it not neceſſary to the uniformity of my plan. Of theſe Profeſſor Jacquin claims the firſt place. He was firſt known by his Hiſtoria Plantarum Americanarum, publiſhed in 1763, in folio, with many figures, and which contains deſcriptions of a vaſt number of plants of South America, ſcarcely ever ſeen by any body elſe. This book has lately been republiſhed, without any material addition, except that the plates are coloured; for its illuſtrious author has of late years applied himſelf to the improvement of botanical ichnography in the moſt eminent manner. Who has not ſeen and admired his Hortus Vindobonenſis and Flora Auſtriaca? And we have now no longer to regret the want of *differentia ſpecifica* in the works of Jacquin; for, with a degree of candour which does him the higheſt honour, he has deigned to liſten to the remonſtrance of the younger Linnæus on this ſubject, and has given the eſſential characters of all the plants figured in his Icones Plantarum rariorum.

Another celebrated work is Brown's Hiſ-

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tory of Jamaica, publiſhed in 1756, and now very rare, as the copies remaining at the bookſeller's, after the firſt ſale of the book, were burnt. Its elegant plates were drawn by Ehret, the beſt botanical draftſman of his time. The herbarium of Dr. Browne, who is ſtill living in Ireland, was bought by Dr. Solander many years ago, and ſent to Linnæus: the ſpecimens are not ſplendid, but important for the determination of many obſcure plants.

Two ſuperb publications were ſet on foot by royal munificence in Denmark, Regenfuſs's Hiſtory of ſhells, and the Flora Danica. The former has, I think, the ſuperiority in point of execution over moſt works in natural hiſtory, except, perhaps, Baron Born's account of the ſhells in the Imperial Muſeum at Vienna. The Flora Danica, while under the direction of Oeder, was equally well executed; but Profeſſor Muller, more of a zoologiſt than a botaniſt, continued it with leſs care and perfection. Its reputation will, I doubt not, ſoon be abundantly reſtored by the

abilities of Profeſſor Vahl, to whoſe care it is now entruſted.

We muſt now look back a little to endeavour to do juſtice to ſome great names in zoology. The age of Linnæus has been no leſs brilliant in this branch of natural hiſtory than in botany: but before I enter upon the works of his immediate diſciples or followers, I muſt ſpeak of his adverſary Klein, who objected to ſeveral of his alterations in zoology, with more reaſon on his ſide than any of the botanical opponents of Linnæus ever had; ſtill his remarks have not been much attended to. He alſo, like all the other adverſaries of our great teacher, laboured to find out contradictions in his works; as if the irregularities of Nature were to be laid to the charge of him, whoſe works and whoſe ſyſtem are often obſcure, merely from their conſonancy with Nature. Klein deſerves great praiſe for his multifarious works in zoology; he has left ſcarcely any part of the ſcience untouched, and has treated it both ſyſtematically and phyſiologically.

I haſten

I haſten to a bright ornament of our own country, the ingenious, accurate and patient Ellis, whoſe diſcoveries relating to corallines form one of the moſt intereſting events in the natural hiſtory of the preſent century, and whoſe name will ever be revered while ſcientific or perſonal merit are held in eſteem. Nor is it poſſible for me, in paying this tribute to the memory of Mr. Ellis, to forget his friend and very counterpart Dr. Garden, to whom Linnæus was ſo much obliged in his laſt edition of the Syſtema Naturæ that I think no name occurs there more frequently. This gentleman, long reſident in Carolina, is celebrated for his diſcovery of the Siren lacertina, that ſingular animal, for which Linnæus was obliged to form a new order in his ſyſtem. Dr. Garden is now returned to this country. Long may it be before I am at liberty to pay that unreſerved tribute to his merit which I have given to the departed Ellis*!

It

* That period is now arrived. A pulmonary conſumption,

It is well known that Mr. Ellis was one of the firſt who clearly made out the animal nature of corallines, and his opinion on the ſubject is now univerſally adopted. In the beginning, however, he had an opponent in Dr. Baſter, a Dutch naturaliſt, who maintained a contrary opinion, and argued with great ingenuity for the vegetable nature of theſe bodies, aſſerting that the polypes were merely accidental inhabitants of them, and not a part of their ſubſtance. The ſame author has publiſhed ſeveral other works on different marine inſects, worms and plants, under the title of *Opuſcula Subſeciva*, which are elaborate

ſumption, under which Dr. Garden laboured when this diſcourſe was firſt publiſhed, has ſince terminated his valuable life. Few characters could be more juſtly beloved in private, nor were ſenſibility and cheerfulneſs ever more happily combined. He was an American loyaliſt free from party bigotry. In ſcientific purſuits he fought only truth and nature for their own ſakes, ever unaſſuming and unambitious, while his name gave authority throughout Europe wherever it appeared. The elegant and fragrant *Gardenia*, dedicated to him by his friend Ellis, is worthy to perpetuate his name.

and

and curious: they are the performances of a real obſerver.

This intricate part of natural hiſtory has been inveſtigated by ſeveral other writers, as Bohadſch and Muller; but by none more ably than the celebrated Pallas, whoſe ſyſtematic work on Zoophyta is neceſſary to all who apply themſelves to this ſtudy.

No branch of natural hiſtory, after botany, has for ſome years paſt had more attention paid to it than entomology. Nor is this to be wondered at. Botany neceſſarily leads to the ſtudy of inſects; for it is impoſſible to inveſtigate plants in their native ſituations, without having our attention perpetually awakened by the infinite variety of thoſe active little beings, employed in a thouſand different ways in ſupplying themſelves with food and lodging, in repulſing the attacks of their enemies, or in exerciſing a more than Aſiatic deſpotiſm over myriads below them. Thus many of the moſt ſyſtematic botaniſts of the preſent age, as Scopoli, Hudſon, Allioni, have been led to the ſtudy of entomology.

Another

Another claſs of authors have undertaken to publiſh figures of inſects, as Sultzer and Friſch, ſometimes accompanied with their hiſtory at large, as in the excellent works of Roeſel and Sepp. I doubt whether the coloured plates of the latter have ever been excelled in any department of natural hiſtory. A moſt elaborate work, conſiſting only of coloured plates of inſects, was undertaken under the inſpection of Linnæus, by Clerck, the author of which dying ſoon after it was publiſhed, had time to colour a very few copies only, and theſe are much valued by the curious. In my opinion this work is more remarkable for labour than ſkill, and is far excelled by that of our countryman Mr. Drury, which I hope I may, without being accuſed of partiality, rank among the very firſt of its kind. I need ſay nothing of Albin and Wilkes, whoſe plates were admired in their time, but are now eclipſed by many. The Entomologia of Schæffer, the celebrated naturaliſt of Ratiſbon, ſo well known by his figures of Fungi, and other works, are very

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ably and carefully executed. I have only two more entomological writers to mention at preſent, but thoſe are very illuſtrious ones, Geoffroy and De Geer. The work of the former is an hiſtory, in French, of the inſects found about Paris, with a few excellent plates, chiefly as examples of the different genera. This with the Entomologia Carniolica of Scopoli, and the works of Linnæus, are the claſſical books indiſpenſably neceſſary to every ſyſtematic ſtudent of European inſects. Thoſe who wiſh to ſtudy their hiſtory and metamorphoſes more fully, will find ample ſatisfaction in the ineſtimable work of De Geer, which is a counterpart of that of Reaumur, and equally extenſive and accurate. Its author, a Swediſh nobleman, deſerves to be ranked among the moſt able promoters of the ſcience which he cultivated.

I have before mentioned that the botanical ſyſtem of Linnæus was not readily received in France. Still leſs regard was paid there to his zoological works; and this is principally to be attributed to the ſucceſs of his great opponent the Count

de Buffon, whoſe ſplendid publications and captivating ſtyle of writing, ſo well calculated to dazzle the multitude and to charm the people among whom he lived, engroſſed all the attention of his countrymen, and have been admired throughout Europe. Indeed, thoſe who are leaſt partial to this celebrated writer muſt allow that he has contributed much to encourage and promote the ſtudy of Nature, has made many valuable obſervations, and collected a variety of intereſting facts. We muſt remember however that the facts of ſo theoretical a writer are always to be received with caution: not that I would ſuſpect any philoſopher of wilful miſrepreſentations, but a prudent theoriſt will ſcarcely truſt his own eyes; and the world are pretty well agreed that the hypotheſes of Buffon are, for the moſt part, the very eſſence of futility: though ſeveral have laughed at them, few have taken the pains to refute them*.

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* The capricious and precarious hypotheſes, with which Buffon has deformed his very eloquent work

on

The French have long poſſeſſed a more ſyſtematic writer in Briſſon, whoſe *Regne Animal* on Natural Hiſtory, have ſhocked all true naturaliſts and exact obſervers, who are uſed in the ſtudy of Nature to ſeek facts and reaſons, not whimſies and chimeras. But this incorrigible inclination to wander in the regions of fancy, which ſeems to have been the reigning malady of Buffon, has never been better juſtified, or rather excuſed, than by Condorcet in his beautiful eulogium of this painter and coloriſt, rather than delineator, of Nature (Hiſt. de l'Acad. Royale des Sciences, année 1788, p. 56.). I ſhall here quote the words of that eminent philoſopher and profound geometrician, who, by the ſagacity and acuteneſs of his remarks, his wonderful art in combining the moſt remote analogies, his talent for making trifles intereſting, the juſt and philoſophical ſpirit which always accompanies his ideas, and for the grace and elegance with which he adorns every ſubject, will always be read with extreme pleaſure by every perſon of taſte.

" M. de Buffon knew (ſays he) that Deſcartes had drawn the attention of mankind to philoſophy only by the boldneſs of his ſyſtems; that he had reſcued them from the yoke of authority and from their own indifference for truth, only by acquiring the command of their imagination and indulging their indolence; till freed at length from their chains, and excited by a thirſt for knowledge, they had themſelves become capable of chooſing the true path. He had moreover

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Animal has great merit, and whoſe excellent and elaborate hiſtory of birds, none

ſeen in the hiſtory of the ſciences, that the epocha of their conſiderable progreſs had almoſt always been that of celebrated ſyſtems, becauſe, thoſe ſyſtems exciting at the ſame time the activity of their adverſaries and that of their defenders, every object comes to an accurate ſcrutiny, in which each party is ſo faſtidious about the proofs of its opponents, that thoſe proofs are multiplied on both ſides as much as poſſible. Then every diſputant reſting upon all acknowledged facts, they are all ſubmitted to a rigorous examination; till having exhauſted all their arms, they are forced to look about for new facts, which may be uſed with more force and ſucceſs.

"Thus the moſt auſtere philoſophy may pardon a naturaliſt for having given way to his imagination, provided that his errors have contributed to the progreſs of knowledge, though merely by occaſioning a neceſſary oppoſition to them; and if the hypotheſes of M. de Buffon upon the formation of the planets be contrary to the laws of that very ſyſtem of the world of which he had been one of the firſt and moſt zealous defenders among the French, rigid truth, while it condemns thoſe hypotheſes, may ſtill applaud the ingenuity with which their author has brought them forward. p. 62.—In his diſcourſes upon animals, ideas which ſeem to come forth accidentally, mark the ſenſibility and loftineſs of his ſoul, which however is always

none who purſue that part of zoology can be without.

England

ways viſibly governed by a ſuperior reaſon: we ſeem as it were converſing with a pure intelligence, endowed with ſo much human ſenſibility only as was neceſſary to make him intelligible and intereſting to our weakneſs."

M. de Condorcet afterwards draws an ingenious compariſon between thoſe three great men, Ariſtotle, Pliny and Buffon; and concludes with the following words: "Ariſtotle has often been miſled by the vain metaphyſics of words, the bane of Grecian philoſophy, from which even the ſuperiority of his mind could not entirely ſecure him. The credulity of Pliny has filled his work with fables, which render doubtful the facts which he records, even when they are not in themſelves incredible. Nothing has been laid to the charge of M. de Buffon but his hypotheſes: theſe are alſo a kind of fables; but they are fables produced by an active imagination under the neceſſity of creating, and not by a paſſive one yielding to extraneous impreſſions. The genius of philoſophy will ever be admired in Ariſtotle; the arts and the ingenuity of the ancients will ever be ſtudied in Pliny, and in him are to be found thoſe touches which affect the mind with deep and ſolemn thoughts; but M. de Buffon will always be read for amuſement as well as inſtruction; he will ſtill be the means of exciting uſeful enthuſiaſm for natural knowledge, and mankind will be long in-

England too has produced a genius, at leaſt equal to the latter, in Mr. Pennant, who has almoſt exhauſted the three firſt

debted to him for thoſe ſweet ſenſations which a young mind experiences from the firſt contemplation of Nature, as well as for the conſolations to be derived by a mind fatigued with the ſtorms of life, in repoſing itſelf upon the contemplation of the immenſity of beings, peaceably ſubmitting to eternal and neceſſary laws."

Another vigorous and characteriſtic paſſage of M. de Condorcet, upon this ſame ſubject, may be found in the very intereſting Life of Voltaire which he has lately publiſhed, a work written with that philoſophical liberty, of which there are ſcarcely any examples anterior to this epoch. "It is pretended (ſays he) that Voltaire was jealous, and it has been anſwercd with this line of Tancred,

"*De qui dans l'univers peut-il être jaloux ?*
Of whom in the world could he ever be jealous ?"

But he was jealous, they ſay, of Buffon. How ? The man whoſe mighty arm had ſhaken the ancient columns of Superſtition's temple, and who aimed at transforming into men thoſe vile herds who had ſo long groaned under the enchanter's rod ? Could he be jealous of the brilliant and ſucceſsful delineation of the manners of a few animals, or of the more or leſs ingenious combination of vain ſyſtems, belied by facts ?"——FONTANA.

claſſes

claſſes of the zoology of Great Britain, and whoſe name and works are too celebrated to need my commendation here.

Before I return to Linnæus I muſt mention the illuſtrious Mr. Bonnet of Geneva, an enthuſiaſtic admirer of the works of Nature, whoſe candour and ingenuity cannot but obtain our eſteem, whether we adopt his theories or not. This author is ſo remarkably inattentive to nomenclature and ſyſtematic arrangement, that an acrimonious enemy of Linnæus has quoted him as aſſenting to his own illiberal ſentiments of that great man; but I am ſure nothing could be more unjuſt than to make Bonnet a partiſan of ſuch animoſity. Happy are thoſe true philoſophers, who, by an attention to the works of the Creator, are led, like this amiable man, to make themſelves better as well as wiſer, and to diffuſe not only knowledge but happineſs on all around them!

Linnæus, whoſe powers were beginning to decline, publiſhed in 1771 the

Mantiſſa altera, which may be conſidered as his botanical teſtament. It is partly a collection of remarks and corrections made at different times, and contains, beſides, deſcriptions of a number of new plants, of which the rich communications of Dr. Mutis, from the continent of South America, make a conſiderable part. This gentleman, and ſome other Spaniſh botaniſts his friends, have had the good fortune of inveſtigating the countries of Mexico and New Granada, hitherto little known to botaniſts; and the fruits of their induſtry were all ſent to Linnæus. Among them, the great variety of beautiful and very extraordinary new plants of the claſs Syngeneſia are remarkable. The fineſt of all was honoured with the name of Mutiſia, and publiſhed by the younger Linnæus in his Supplementum Plantarum, a work the foundation of which was laid by his illuſtrious father not long before his death. I forbear to enlarge upon this melancholy period of the hiſtory of our ſcience, which deprived it of its brighteſt ornament.

ornament. The circumſtances of the death of Linnæus, with the honours paid to his memory, are known to all; nor need I on the preſent occaſion make any artificial diſplay of his merits, or of the loſs which ſcience ſuſtained by his death. I am convinced none of my hearers has any thing to learn on this ſubject, and I would rather prefer the more cheerful taſk of tracing the ſucceſs of his labours, and the effect of the ſpirit he had raiſed, in the enterpriſes and diſcoveries of many eminent naturaliſts, ſeveral of them his immediate pupils, whoſe deſerved fame reflected ſuch diſtinguiſhed honour on the laſt years of their great teacher.

Here however a new difficulty preſents itſelf. In the former part of this diſcourſe, having principally had occaſion to ſpeak of authors no longer living, and known to us chiefly by their works, I have, to the beſt of my judgment, given an impartial and unreſerved account of their merits. Glaring defects have been generally pointed out, but I have more

frequently indulged in the more agreeable office of praiſing merit of all kinds wherever it occurred. In ſo doing I have not been actuated by a ſenſeleſs veneration for former times, nor have I prepoſterouſly aimed by a vain and uſeleſs homage to

——" ſoothe the dull cold ear of death."

To excite laudable emulation has been my only intention. But now that I find myſelf either treading (to uſe Dr. Johnſon's words) on aſhes not yet cold, or am to ſpeak of naturaliſts with whom I am perſonally connected, and of others whoſe approbation and eſteem I cannot but be anxious to obtain, even the juſt tribute of applauſe might appear like ſervile adulation. This conſideration, added to my having already extended my diſcourſe to an immoderate length, will I hope juſtify me in touching now but ſlightly on many great names and many arduous undertakings, eſpecially as I could but repeat facts and circumſtances familiar to all, and ſhould run the riſque of exhauſting the patience

of

of my hearers without giving them any information. I am perſuaded no one whom I have now the honour of addreſſing needs to be informed of the merits of a Thunberg, Sparrman, Pallas, Fabricius, Swartz, or Hedwig, of the vaſt phyſiological diſcoveries of a Camper or Hunter, much leſs of the liberality and extenſive knowledge of a Banks, or the genius and worth of the ever to be lamented Solander. Who is not acquainted with every circumſtance of that celebrated voyage round the world, which has enriched every branch of natural knowledge in ſo eminent a degree? Who has not obſerved with pleaſure the laudable emulation of a neighbouring country in promoting ſimilar undertakings, to which we are indebted for the botanical acquiſitions of Commerſon, Sonnerat, Aublet and Dombey? When I conſider all theſe, added to the diſcoveries of Pallas in Siberia, of Sparrmann, Maſſon and Thunberg at the Cape, and eſpecially the acquiſitions which the latter, undiſmayed by the moſt formida-

ble difficulties, made in Japan; when I contemplate the diſtinguiſhed abilities of many other living naturaliſts, the excellent publications of Schreber, Rottboll, Retzius, Allioni, Scopoli, Brouſſonet, L'Heritier, the philoſophical Herman, and many others, not to mention ſome in our own country which may vie with any of theſe, I am induced to conſider the preſent age as one of the moſt propitious to the ſtudy of Nature on the moſt ſolid and philoſophical principles; and when I look around me at home, and ſee how very much the love of botany in particular, and the cultivation of plants, is increaſing among perſons of rank and fortune, as well as the treaſures which are daily enriching our gardens and cabinets, I cannot help indulging the moſt flattering hopes that my own country will ſoon in an eminent manner be diſtinguiſhed above the reſt of Europe in theſe uſeful and pleaſing purſuits. But the degree of credit we have already acquired muſt not lull us into a torpid ſecurity. We muſt keep

keep in mind that France, our rival in power, is alſo our rival in ſcience; and even at Paris Linnæus has now his followers, who, deſpiſing all national prejudices, dare to admire truth and genius wherever they find them. Let this excite in us a laudable ſpirit of emulation; not the narrow jealouſy which diſtinguiſhes thoſe, who, conſcious of their own weakneſs or undeſerved reputation, dread every approach towards perfection in others. All who purſue the ſame ſtudies ſhould labour together for the common good: every degree of aſſiſtance, every deſerved commendation which they give to each other, is the moſt probable means of advancing their own fame; while every atom of uſurped honour, if it does not immediately cover its vain poſſeſſor with opprobrium, is almoſt certain to be deducted with intereſt from his character by a diſcerning and impartial poſterity.

It now only remains for me to point out what I conceive to be the peculiar objects of our preſent inſtitution. I need

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not enforce the propriety of each of us endeavouring to promote as much as poſſible the main ends of our undertaking, and to contribute all in our power to the general ſtock of knowledge. Theſe are indiſpenſable obligations upon all who aſſociate themſelves with any literary ſociety. Thoſe who do not comply with them incur diſgrace inſtead of honour, for a title is but a reproach to thoſe who do not deſerve it; nor can they have a ſhare in the reputation of a ſociety, who never in any manner contributed to its advancement.

Beſides an attention to natural hiſtory in general, a peculiar regard to the productions of our own country may be expected from us. We have yet much to learn concerning many plants, which authors copy from one another as the produce of Great Britain, but which few have ſeen; and our animal productions are ſtill leſs underſtood. Whatever relates to the hiſtory of theſe, their œconomy in the general plan of Nature, or their uſe to man

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in particular, is a proper object for our enquiries. Of the productions of our own country we ought to make ourſelves perfectly maſters, as no natural object can any where be ſtudied half ſo well as in its native ſoil. This however not being always practicable, botanic gardens and cabinets of natural hiſtory have been invented, in which the productions of the moſt diſtant climes are brought at once before us. No country that I know of can bear a compariſon with England in this reſpect. The royal garden at Kew is undoubtedly the firſt in the world, and we have a number of others, both public and private, each of which may vie with the moſt celebrated gardens of other countries. Nor have we a leſs decided ſuperiority in cabinets. That of the Britiſh Muſeum, which contains among other things the original herbariums of Sloane, Plukenet, Petiver, Kæmpfer, Boerhaave, of many of the diſciples of Ray, and ſeveral others, beſides innumerable treaſures of zoology, claims the firſt place. That of the

the late Sir Aſhton Lever ſtands I believe unrivalled in birds and quadrupeds; not to mention many others. But is it not a reproach to the naturaliſts of Great Britain that ſo many rarities ſhould remain in their hands undeſcribed? that foreigners ſhould eagerly catch at one or two plants obtained from our gardens, which we for years have been trampling under foot unnoticed? Yet how, till now, could ſuch nondeſcripts have been made public? Large works in natural hiſtory are expenſive, and of hazardous ſale; few private people can undertake them; nor has there hitherto been any ſociety to which detached deſcriptions could be communicated. It is altogether incompatible with the plan of the Royal Society, engaged as it is in all the branches of philoſophy, to enter into the minutiæ of natural hiſtory; ſuch an inſtitution therefore as ours is abſolutely neceſſary, to prevent all the pains and expence of collectors, all the experience of cultivators, all the remarks of real obſervers, from being loſt

to

to the world. The ſlighteſt piece of information which may tend to the advancement of the ſcience we ſhould thankfully receive. However trifling in itſelf, yet combined with other facts, it may become important. Whatever relates to the determination of ſpecies, even in the loweſt and ſeemingly unimportant tribes of Nature's works, ought never to be neglected. Nor let the humble and patient ſtudent of this very difficult part of natural hiſtory be diſcouraged by the ſneers of the ſupercilious coxcomb, or of the ignorant vulgar. He who determines with certainty a ſingle ſpecies of the minuteſt moſs or meaneſt inſect, adds ſo far to the general ſtock of human knowledge, which is more than can be ſaid of many a celebrated name: no one can tell of what importance that ſimple fact may be to future ages; and when we conſider how many millions of our fellow creatures paſs through life without furniſhing a ſingle atom to augment this ſtock, we ſhall learn to

to think with more reſpect of thoſe who do.

But nothing will be with more reaſon expected from the members of this ſociety than a ſtrict attention to the laws and principles of Linnæus, ſo far as they have been found to be good. No where have his works been more ſtudied and applied to practice than in this country, nor can any other be ſo competent to eſtimate his merits or correct his defects. I am perſuaded nothing can be done more uſeful to the ſcience of natural hiſtory than, working on the publications of this illuſtrious man as a foundation, to endeavour to give them that perfection of which they are capable, and to incorporate with them all new diſcoveries. We who have it in our power to give real information, ſhould deſpiſe the ſilly vanity of making new ſyſtems or arrangements, merely for the ſake of being talked of. An artificial method like that of Linnæus may be changed a thouſand different ways, and each

each ſeem beſt to its inventor. If any one, deſpairing of getting immortality by any other means, ſhould pleaſe to name Cryptogamia the firſt claſs and Monandria the laſt, I ſhould rank him but with Chriſtopher Knaut, who made about as wiſe an attempt upon the method of Ray.

Whatever we may think of the ſyſtem of Linnæus, there are certain great principles laid down by him, the excellence of which is now ſo well known, and ſo generally admitted, that none who pretends to the name of a naturaliſt can avoid conforming to them. The laws, for inſtance, according to which he conſtructed his *generic names* and *ſpecific differences*, which we ſhould do well to imitate, although leſs ſtrictly, in the application of *trivial names*. I hope never to ſee any deſcriptions ſent into the world by this ſociety without ſpecific differences: they are what diſtinguiſh a true ſcientific naturaliſt from an empiric, and nothing but incapacity in an author can make us pardon the want of them. Without a ſtrict attention to this

maxim,

maxim, the ſcience will ſoon relapſe into its original barbariſm, nor can any thing but another Linnæus reſtore it. Let not the excellent work of my friend Mr. Latham be here cited againſt me; for that ingenious author is too judicious to have neglected this material point; he is poſſeſſed of the eſſential characters of all his birds, and means to publiſh them in a ſyſtematic form as a ſupplement to his great work. I wiſh I could make the ſame apology for ſome other eminent writers. But how would their works ſhrink if reduced to Linnæan conciſeneſs and preciſion!

A kind of knowledge which naturaliſts have a right to expect from us in a ſuperior degree, is the accurate determination of the ſpecies deſcribed by Linnæus, and indeed thoſe of many other authors. Our acceſs to the ſeveral original collections I have mentioned, to the immenſe herbarium of Sir Joſeph Banks, which contains the entire collections of ſeveral celebrated botaniſts, but more eſpecially to the very

herbarium

herbarium and muſeum of Linnæus himſelf, muſt give us means of knowledge not to be had elſewhere. This is a ſubject on which I ſpeak with peculiar pleaſure, as in this reſpect I may hope to be infinitely more uſeful to the preſent inſtitution, than could have been expected from any abilities of my own. A train of events, which I cannot help calling moſt fortunate, having brought into my hands every thing which Linnæus poſſeſſed relating to natural hiſtory or medicine, his entire library, manuſcripts, and the correſpondence of his whole life, as well as all the acquiſitions made by the younger Linnæus in his tour through Europe, after his father's deceaſe, but which his own premature death prevented him from communicating to the world; all theſe will be a never-failing reſource to us in every difficulty, as well as a fund of information not eaſily to be exhauſted. For my own part I conſider myſelf as a truſtee of the public. I hold theſe treaſures only for the purpoſe of making them

uſeful to the world and natural hiſtory in general, and particularly, to this ſociety, of which I glory in having contributed to lay the foundation, and to the ſervice of which I ſhall joyfully conſecrate my labours, ſo long as it continues to anſwer the purpoſes for which it is deſigned.

III. OB-

III.

OBSERVATIONS

ON THE

IRRITABILITY OF VEGETABLES.

From the PHILOSOPHICAL TRANSACTIONS *for* 1788.

OBSERVATIONS *

ON THE

IRRITABILITY OF VEGETABLES.

Read at the ROYAL SOCIETY,
Feb. 14, 1788.

HAVING often heard that the ſtamina of the Barberry, *Berberis communis*, were endued with a conſiderable degree of irritability, I made the experiment in Chelſea Garden, May 25, 1786, on a buſh then in full flower. It was about one o'clock P. M. the day bright and warm, with little wind.

The ſtamina of ſuch of the flowers as were open were bent backwards to each petal, and ſheltered themſelves under their

* A French tranſlation of this Paper by M. de la Metherie was printed in Roſier's Journal for July 1788, vol. 33.

concave tips. No ſhaking of the branch appeared to have any effect upon them. With a very ſmall bit of ſtick I gently touched the inſide of one of the filaments, which inſtantly ſprung from the petal with conſiderable force, ſtriking its anthera againſt the ſtigma. I repeated the experiment a great number of times; in each flower touching one filament after another, till the tips of all ſix were brought together in the centre over the ſtigma.

I took home with me three branches laden with flowers, and placed them in a jar of water, and in the evening tried the experiment on ſome of theſe flowers, then ſtanding in my room, with the ſame ſucceſs.

In order to diſcover in what particular part of the filaments this irritability reſided, I cut off one of the petals with a very fine pair of ſciſſars, ſo carefully as not to touch the ſtamen which ſtood next it: then, with an extremely ſlender piece of quill I touched the outſide of the filament which had been next the petal, ſtroking

ſtroking it from top to bottom; but it remained perfectly immoveable. With the ſame inſtrument I then touched the back of the anthera, then its top, its edges, and at laſt its inſide; ſtill without any effect. But the quill being carried from the anthera down the inſide of the filament, it no ſooner touched that part than the ſtamen ſprung forwards with great vigour to the ſtigma. This was often repeated with a blunt needle, a fine briſtle, a feather, and ſeveral other things, which could not poſſibly injure the ſtructure of the part, and always with the ſame effect.

To ſome of the antheræ I applied a pair of ſciſſars, ſo as to bend their reſpective filaments with ſufficient force to make them touch the ſtigma; but this did not produce the proper contraction of the filament. The incurvation remained only ſo long as the inſtrument was applied; on its being removed, the ſtamen returned to the petal by its natural elaſticity. But on the ſciſſars being applied to the irritable part, the anthera immediately flew to

the ſtigma, and remained there. A very ſudden and ſmart ſhock given to any part of a ſtamen would, however, ſometimes have the ſame effect as touching the irritable part.

Hence it was evident, that the motion above deſcribed was owing to an high degree of irritability in the ſide of each filament, next the germen, by which, when touched, it contracts, that ſide becomes ſhorter than the other, and conſequently the filament is bent towards the germen. I could not diſcover any thing particular in the ſtructure of that or any other part of the filament.

This irritability is perceptible in ſtamina of all ages, and not merely in thoſe which are juſt about diſcharging their pollen. In ſome flowers, which were only ſo far expanded that they would barely admit a briſtle, and whoſe antheræ were not near burſting, the filaments appeared almoſt as irritable as in flowers fully opened; and in ſeveral old flowers, ſome of whoſe petals with the ſtamina adhering

to them were falling off, the remaining filaments, and even thoſe which were already fallen to the ground, proved full as irritable as any I had examined.

From ſome flowers I carefully removed the germen, without touching the filaments, and then applied a briſtle to one of them, which immediately contracted, and the ſtigma being out of its way, it was bent quite over to the oppoſite ſide of the flower.

Obſerving the ſtamina in ſome flowers which had been irritated returning to their original ſituations in the hollows of the petals, I found the ſame thing happened to all of them ſooner or later. I then touched ſome filaments which had perfectly reſumed their former ſtations, and found them contract with as much facility as before. This was repeated three or four times on the ſame filament. I attempted to ſtimulate, in the midſt of their progreſs, ſome which were returning, but not always with ſucceſs; a few of

of them only were ſlightly affected by the touch.

The purpoſe which this curious contrivance of Nature anſwers in the private œconomy of the plant, ſeems not hard to be diſcovered. When the ſtamina ſtand in their original poſition, their antheræ are effectually ſheltered from rain by the concavity of the petals. Thus probably they remain till ſome inſect, coming to extract honey from the baſe of the flower, thruſts itſelf between their filaments, and almoſt unavoidably touches them in the moſt irritable part: thus the impregnation of the germen is performed; and as it is chiefly in fine ſunny weather that inſects are on the wing, the pollen is alſo in ſuch weather moſt fit for the purpoſe of impregnation. It would be worth while to place a branch of the Barberry flower in ſuch a ſituation, as that no inſect, or other irritating cauſe, could have acceſs to it; to watch whether in that caſe the antheræ would ever approach

proach the ſtigma, and whether the ſeeds would be prolific.

I have been the more particular in theſe obſervations upon the Barberry, becauſe although ſeveral authors mention the irritability of its ſtamina, none, that I can find, have related in what part of the ſtamina this property reſides, or the purpoſe it ſerves; at leaſt they have not purſued their inquiries with any great degree of accuracy, but ſeem moſtly to have copied one another. GMELIN, who has written a diſſertation expreſſly on the irritability of vegetables, has ſcarcely any thing new on the ſubject; the chief part of his work is a catalogue of plants which he found *not* to be irritable.

The Barberry is not the only plant which exhibits this phænomenon. The ſtamina of *Cactus Tuna*, a kind of Indian Fig, are likewiſe very irritable. Theſe ſtamina are long and ſlender, ſtanding in great numbers round the inſide of the flower. If a quill or feather be drawn through them, they begin in the ſpace of

two

two or three ſeconds to lie down gently on one ſide, and in a ſhort time they are all recumbent at the bottom of the flower. The motions in *Dionæa muſcipula*, *Mimoſa ſenſitiva* and *pudica*, are too well known to be mentioned here. A ſimilar phænomenon has been obſerved, where indeed an obvious botanical analogy would lead one to expect it, in the *Droſera*. See Dr. WITHERING's Botanical Arrangement of Britiſh Plants. All theſe movements are, I think, certainly to be attributed to irritability. We muſt be careful not to confound them with other movements, which, however wonderful at firſt ſight, are to be explained merely on mechanical principles. The ſtamina of the *Parietaria*, for inſtance, are held in ſuch a conſtrained curved poſition by the leaves of the calyx, that as ſoon as the latter become fully expanded, or are by any means removed, the ſtamina, being very elaſtic, fly up, and throw their pollen about with great force. I have lately obſerved a ſimilar circumſtance in the flowers

flowers of *Medicago falcata.* In this plant the organs of generation are held in a ſtraight poſition by the carina of the flower, notwithſtanding the ſtrong tendency of the infant germen to aſſume its proper falcated form. At length, when the germen becomes ſtronger, and the carina more open, it obtains its liberty by a ſudden ſpring, in conſequence of which the pollen is plentifully ſcattered about the ſtigma. The germen may at pleaſure be ſet at liberty by nipping the flower ſo as gently to open the carina, and the ſame effect will be produced.

As the foregoing experiments ſhew vegetables to poſſeſs irritability in common with animals, ſo there are plants which ſeem to be endued with a kind of ſpontaneous motion. LINNÆUS having obſerved that the Rue moves one of its ſtamina every day to the piſtillum, I examined the *Ruta chalepenſis*, which differs very little from the common Rue, and found many of the ſtamina in the poſition which he deſcribes, holding their antheræ

over

over the ſtigma; while thoſe which had not yet come to the ſtigma were lying back upon the petals, as well as thoſe which, having already performed their office, had returned to their original ſituation. Trying with a quill to ſtimulate the ſtamina, I found them all quite devoid of irritability. They are ſtout, ſtrong, conical bodies, and cannot, without breaking, be forced out of the poſition in which they happen to be. The ſame phænomenon has been obſerved in ſeveral other flowers; but it is no where more ſtriking or more eaſily examined than in the Rue.

I could wiſh to find an inſtance of this ſpontaneous motion combined with irritability in one and the ſame plant; but, I confeſs, I do not know one. From analogy I ſhould think it not impoſſible that the *Dionæa muſcipula*, and perhaps the *Droſeræ*, may have the ſame motion in their ſtamina as the *Ruta*, *Parnaſſia*, and *Saxifraga*, while their leaves poſſeſs irritability. But if this be the caſe, the ſeats of theſe two properties, being ſo different

and

and remote from each other, ſhould ſeem to have as little connexion as if in two different plants. There ſtill remains then this difference between animals and vegetables, that although ſome of the latter poſſeſs irritability, and others ſpontaneous motion, even in a ſuperior degree to many of the former, yet thoſe properties have hitherto in animals only been found combined in one and the ſame part. Even *Sertulariæ* are not an exception to this obſervation. The greater part of their ſubſtance, indeed, reſembles that of plants in being indefinitely extended, and in wanting irritability and ſpontaneous motion. But their animated flowers or polypes, in which the eſſence of their being reſides, are endued with both theſe properties in an high degree.

I know it is the opinion of ſome philoſophers, that a certain degree of irritability muſt pervade every part of vegetables, as the propulſion of their fluids cannot well be conceived to be accompliſhed by any other means. In a converſation on this

ſubject

ſubject with the celebrated M. BONNET, of Geneva, he informed me that he is ſtrongly of this opinion; and that he ſhould not deſpair, by throwing acid or other ſtimulating injections into the veſſels of ſome plants, of ſeeing with a microſcope at once the propulſion of the ſap, and the contractions by which it is performed. He urged me, with that amiable enthuſiaſm for which he is remarkable, to purſue the inquiry. Whether I do ſo or not, I think the idea too intereſting to be kept to myſelf, and ſhould be glad to ſee it realized by any one who has time and abilities for ſuch inveſtigations, who has accuracy and coolneſs in making his experiments, as well as fidelity and impartiality in recording them.

I cannot conclude this Paper without taking notice of another very curious property which vegetables ſeem to poſſeſs in common with animals, although certainly in a very inferior degree: I mean, that property, to uſe the words of Mr. HUNTER, who has ſtudied this principle to a

vaſt

vaſt extent in the animal œconomy, by which their conſtitution is capable only of a certain degree of action conſiſtently with health; when that degree is exceeded, diſeaſe or death is the conſequence. It is only by the help of this principle that I can explain why many plants reſiſt a great degree of cold for ſeveral winters before flowering; but after that critical event, they periſh at the firſt approach of cold, and can by no art be preſerved ſo as to ſurvive the winter. But a more curious inſtance is that mentioned by LINNÆUS, without an explanation, in his Diſſertation on the Sexes of Plants, of the long duration of the piſtilla in the female hemp, while unexpoſed to the male pollen; whereas thoſe to which the pollen had acceſs immediately faded and withered away. In this caſe, I cannot help thinking, that in thoſe piſtilla on which the pollen had acted, and which conſequently had performed the function for which they were deſigned, the vital principle was much ſooner exhauſted than

in thoſe which had known no ſuch ſtimulus. It is, perhaps, for the ſame reaſon that double flowers, in which, the organs of generation being obliterated, no impregnation can take place, laſt much longer in perfection than ſingle ones of the ſame ſpecies, as is notoriouſly the caſe with Poppies, Anemonies, &c. In ſingle Poppies the corolla falls off in a few hours; but in double ones it laſts ſeveral days: and this may poſſibly, combined with other obſervations, lead to a diſcovery of the real uſe of the corolla of plants, and the ſhare it has in the impregnation, about which there has yet been no probable conjecture.

IV. RE-

IV.

REVIEW

OF

MR. CURTIS's BOTANICAL MAGAZINE,

OR

FLOWER-GARDEN DISPLAYED.

From the ANALYTICAL REVIEW, *Vol.* 3, *for January* 1789.

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REVIEW

OF

MR. CURTIS's BOTANICAL MAGAZINE.

THE ingenious author of the Flora Londinenſis, having, by that work, ſufficiently eſtabliſhed his reputation among the moſt enlightened botaniſts of Europe condeſcends, in the preſent more humble publication, to inſtruct and entertain thoſe who are not always able or willing to conſult the more abſtruſe and ſcientific ſources of information, or, to uſe his own words, "ladies, gentlemen, and gardeners." The plan of the work will be beſt underſtood from the Preface to the Firſt Volume, given with No. 12.

"The preſent periodical publication owes its commencement to the repeated ſolicitations of ſeveral ladies and gentlemen,

ſubſcribers to the author's botanic garden, who were frequently lamenting the want of a work, which might enable them not only to acquire a ſyſtematic knowledge of the foreign plants growing in their gardens, but which might at the ſame time afford them the beſt information reſpecting their culture; in fact, a work, in which botany and gardening, (ſo far as relates to the culture of ornamental plants,) or the labours of Linnæus and Miller, might be happily combined.

"In compliance with their wiſhes, he has endeavoured to preſent them with the united information of both authors, and to illuſtrate each by a ſet of new figures, drawn always from the living plant, and coloured as near to Nature as the imperfection of colouring will admit.

"He does not mean, however, to confine himſelf ſolely to the plants contained in the highly eſteemed works of thoſe luminaries of botany and gardening, but ſhall occaſionally introduce new ones, as they may flower in his own garden, or

thoſe

thoſe of the curious in any part of Great Britain.

" At the commencement of this publication, he had no deſign of entering on the province of the floriſt, by giving figures of double or improved flowers, which ſometimes owe their origin to culture, more frequently to the ſportings of Nature; but the earneſt entreaties of many of his ſubſcribers have induced him ſo far to deviate from his original intention, as to promiſe them one at leaſt of the flowers moſt eſteemed by floriſts.

" The encouragement given to this work, great beyond the author's warmeſt expectations, demands his moſt grateful acknowledgments, and will excite him to perſevere in his humble endeavours to render botany a laſting ſource of rational amuſement and public utility.

" Botanic Garden, Lambeth Marſh,
1787."

As a ſpecimen of the ſtyle of the work, we ſhall ſelect the account given of the

black Hellebore, or Chriſtmas roſe, No. 3, fig. 8.

" HELLEBORUS niger.

" Black Hellebore, or Chriſtmas roſe.

" *Claſs and Order.*

" POLYANDRIA POLYGYNIA.

" *Generic Character.*

" Calyx nullus. Petala 5, ſive plura. Nectaria bilabiata, tubulata. Capſulæ polyſpermæ, erectiuſculæ.

" *Specific Character and Synonyms.*

" HELLEBORUS *niger*, ſcapo ſub-bifloro ſub-nudo, foliis pedatis. *Linn. Syſt. Vegetab. p.* 431. *Sp. Pl. p.* 783.

" Helleborus niger, flore roſeo. *Bauh. Pin.* 186.

" The true black Hellebore, or Chriſtmas flower. *Parkinſon's Parad. p.* 344.

" As our publication ſeems likely to fall into the hands of ſuch as are totally

unacquainted with botany or botanical writings, it muſt plead as an apology for our often explaining many circumſtances relative to plants, which may be well known to adepts in the ſcience.

" This plant derives its firſt name from the black colour of its roots; its ſecond from its early flowering, and the colour of its petals, which, though generally milk-white on their firſt appearance, yet frequently have a tint of red in them, which increaſes with the age of the bloſſom, and finally changes to green; in ſome ſpecies of hellebore, particularly the *viridis*, the flower is green from firſt to laſt.

" Black hellebore grows wild on the Apennine and other mountains, preferring ſuch as are rocky.

" If the weather be unuſually mild, it will flower in our gardens, in the open borders, as early as December and January; it may indeed be conſidered as the herald of approaching ſpring.

" Like moſt other Alpine plants, it loves a pure

a pure air, a ſituation moderately moiſt, and a ſoil unmanured: as the beauty of its flowers is apt to be deſtroyed by ſevere froſts, it ſhould be covered during the winter with a hand-glaſs; or if it be treated in the manner recommended for the round-leaved cyclamen, it may be had to flower in ſtill greater perfection.

"It is propagated by parting its roots in autumn. Neither this ſpecies, nor the *hyemalis*, thrive very near London."

Each Number, price One ſhilling, contains deſcriptions ſimilar to the above, of three plants, accompanied by a ſeparate coloured plate of each. As each deſcription is on a ſeparate leaf, they may be arranged according to any method or order the purchaſer may chooſe. A Number is publiſhed every month, and Twelve Numbers make a Volume, with which alphabetical indexes, &c. are given.

With reſpect to the execution of the figures, we cannot too ſtrongly expreſs our approbation. Although afforded at ſo cheap

cheap a rate, they would do credit to the moſt ſplendid works; indeed, we know no coloured plates, not even thoſe of Jacquin, that excel them in beauty or truth. They are as much ſuperior in elegance to the tawdry oſtentatious works of Trew, as they are to thoſe of Miller or Cateſby in accuracy. We are aware that many of the plants, particularly the Alpine ones, are much altered by culture; and that the repreſentations of ſuch, in a work of this kind, muſt be leſs natural than if done from wild ſpecimens. But that could not be avoided; nor, perhaps, may it be amiſs that we ſhould be furniſhed with repreſentations of plants *avowedly* in a cultivated ſtate, that they may be compared with thoſe copied from ſpecimens undoubtedly wild. We are aware likewiſe that the want of botanical diſſections of the flowers may be objected to in theſe figures. But thoſe who ſhould be inclined to make ſuch an objection, ought to conſider how very much ſuch an addition would have added to the labour and time neceſſary to make

the deſigns; and, indeed, the excellent artiſt has, in moſt caſes, diſpoſed the flowers with ſo much judgment, and under ſuch a variety of appearances, that a diſcerning eye can generally diſcover in them all that is neceſſary to be examined.

The figures which appear to us to have the greateſt ſhare of merit, are many of the Iris's (a genus of plants to which the author ſeems partial), Helleborus niger, Cactus flagelliformis, Geranium Reichardi and peltatum (the leaves of the latter excellent), Viburnum Tinus, Trillium ſeſſile, the lovely Camellia japonica, Gentiana acaulis, and Lathyrus odoratus; but, above all, Tropæolum majus, and the new Paſſiflora alata. The repreſentation of the Moſs Roſe, in the 23d Number, although evidently meant to attract the eyes of the multitude, we think leſs happy. The expanded flower is ill drawn, and too uniform in colour, and the ſtalk of much too high a pink hue. We regret likewiſe that metallic whites ſhould ever be uſed, being ſo liable to turn black, as has already

ready happened in the figure of the Jaſmine, in No. 11.

We cannot help thinking that a work which keeps ſo cloſely to the elegance of Nature as this does, and which, we are happy to learn, has ſo extenſive a ſale, is likely to be uſeful, independently of the knowledge it conveys, in improving the taſte of the nation. The productions of Mr. Wedgwood have already done ſo in another line. And indeed we begin to ſee, even in boarding-ſchool embroidery, Nature *meant* to be imitated, inſtead of thoſe flaring nothings with which the miſplaced induſtry of our aunts and grandmothers uſed to deform their furniture. It is not improbable that ſuch improvements may lead to a ſimilar good taſte and ſimplicity in mental qualifications.

We muſt not take leave of this work without obſerving, that it diſplays the critical knowledge of the author, wherever that can be done with propriety; and therefore, beſides the new plants which it contains, becomes valuable to profeſſed botaniſts,

niſts, by the obſervations relating to many known ones. The culture of every one is particularly mentioned, and ſome difficult ſpecies are well diſcriminated, as Hemerocallis flava and fulva. We cannot, however, agree with Mr. Curtis in thinking the Erica herbacea a variety of the mediterranea, nor are we quite convinced of his Narciſſus major being a good ſpecies. We wiſh him alſo never to let his ſtyle "outſtep the modeſty" of that Nature which he otherwiſe ſo cloſely imitates. We perceive ſome ſlight ſymptoms of it in the obſervations on Mignonette; but ſhould ſcarcely have thought ſo trifling a blemiſh worth pointing out, had his work been leſs perfect in other reſpects.

V. RE-

V.

REVIEW

OF

A Synopſis of the Natural Hiſtory of Great Britain and Ireland, containing a Syſtematic Arrangement and Conciſe Deſcription of all the Animals, Vegetables, and Foſſils which have hitherto been diſcovered in theſe Kingdoms. *By* John Berkenhout, *M. D.* 2 vols. *crown* 8vo. 10*s.* 6*d. boards*, 1789.

From the ANALYTICAL REVIEW, *Vol.* 3, *for March* 1789.

THIS work firſt appeared in three volumes ſmaller than the preſent, about twenty years ago, under the modeſt title of Outlines of the Natural Hiſtory of Great Britain and Ireland. It is now in many parts conſiderably enlarged.

The

The firſt Volume contains the Animal and Foſſil Kingdoms. In his arrangement of the Animals Dr. Berkenhout follows Linnæus; but in his deſcriptions he has very properly derived aſſiſtance from all quarters, but eſpecially from Mr. Pennant, whoſe works our author has principally relied on in determining what animals are indigenous to this country. He even thinks the ſyſtem of this author preferable to that of Linnæus, and his only excuſes for not adopting it are indolence and "a predilection," which muſt here mean prejudice, for that of his old maſter. We are ſorry he could find no better reaſons, and ſuppoſe after ſuch a declaration his authority will not be of much weight in favour of either.

What we find moſt to admire in this work are the ſtyle and language, in which we think the author has greater merit than is commonly attributed to him. His deſcriptions are very conciſe, conſiſting of rarely more than four or five lines; but they are equally clear, eaſy and ſatisfac-

tory.

tory. His language is profeſſedly Engliſh, but he has retained all the Latin technical terms with their proper terminations; and we cannot but think this method far better than ſearching for obſolete uncouth terms, and uſing them becauſe they are, or rather *once were*, Engliſh, in preference to elegant words far better underſtood, only becauſe the latter belong to the learned languages. Is not this widening the breach between the learned and unlearned, and rendering them ſtill more unable to converſe together? Whereas by gradually making the unlettered ſtudent adopt ſcientific terms, which by the by he may as eaſily learn at firſt as the others, he is led on perhaps inſenſibly towards a knowledge of the languages from whence they are derived; at leaſt he acquires an idea of the different conſtructions and inflexions of words in different languages, which will open his mind to further improvement. Thus for inſtance, why ſhould *chives* and *pointals* be preferred to *ſtamina* and *piſtilla*, *rundle* to *umbel*, *empalement*

to *calyx*, *threads* to *filaments*, or *tips* to *antheræ?* There is ſtill leſs reaſon why the vile word *anther* and *anthers*, which is no language at all, ſhould be ſubſtituted for the elegant termination of *anthēra*, or *anthēræ*, for ſo it ſhould be pronounced, and not *anthĕræ*.——The Genus *Roſa* may ſerve as a ſpecimen of the author's ſtyle.

"ROSA. Calyx urn-faſhioned, fleſhy, quinquefid; ſegments long, narrow. Petals five, inſerted in the neck of the calyx. Stamina and piſtilla very ſhort. Seeds numerous, downy, adhering to the inſide of the calyx."

Then follow the deſcriptions of the ſpecies.

"1. Rubiginoſa. *Sweet Briar* or *Eglantine*. Firm, erect, ſpinous. Leaves roundiſh, generally five together, ruſty on the under-ſide and clammy at the ends. Flowers ſmall, pale. The whole plant ſmells like apples. May, June. * *Ger.* 1269. 1.

* Gerarde's Herbal.

"2. Vil-

" 2. Villoſa. *Apple Roſe.* Spinous. Leaves downy on both ſides, oval. Fruit ſpherical, large, ſpinous. Flowers deep red. June.

" 3. Spinoſiſſima. *Burnet Roſe.* Stem firm, but low, much branched and very prickly. Leaves pinnated. Footſtalks ſpinous. Flowers white. Fruit round and ſmooth. June. On heaths, &c. *Ger.* 1270. 4.

" 4. Canina. *Dog Roſe* or *Common Briar.* Stem eight or ten feet high, with hooked ſpines. Leaves five or ſeven together, oval, ſmooth. Flowers pale red, odoriferous. Fruit large, ſmooth, oval, red. May, June. Hedges. *Curtis*, v. 34.

" 5. Alba. *White Dog Roſe.* Differs from the laſt in being a leſs ſhrub, with rounder fruit, and white flowers."

With reſpect to the additions and improvements in this new edition, the author tells us nothing has been done to the entomological part; ſtill, although it con-

tains not a quarter of the inſects known to be found in Britain, and is the weakeſt part of the work, it is the moſt complete we *yet* have on the ſubject. In the vegetable kingdom the author juſtly acknowledges the aſſiſtance he has had from the works of Hudſon, Lightfoot, Curtis and Withering, moſt of whoſe plants he has adopted rather too implicitly; for not one of their errors, even the moſt notorious, is corrected. We were alſo much diſappointed at finding no notice taken of the publication of the accurate and faithful Dickſon, which is a profeſſed ſupplement to the Floras of Hudſon and Lightfoot, and contains new plants of the claſs Cryptogamia omitted by thoſe authors. Indeed Dr. Berkenhout has not given all the plants of this claſs which even they have deſcribed.

In the mineralogical part he has made good uſe of Cronſted, but, we think, ſcarcely enough of Kirwan.

We cannot but obſerve that the work abounds with typographical errors, and

that the words *Lithophyton* and *Zoophyton* are erroneouſly derived from φύσις nature, inſtead of φυτον a plant.

On the whole we think this a valuable and uſeful work; extremely well calculated for thoſe who, with a turn for ſyſtem and an habit of obſervation, but without the leſſer qualification of claſſical learning, are deſirous of getting acquainted with thoſe works of Nature which, being conſtantly before us, we are but too apt to overlook and deſpiſe.

VI.

REVIEW

OF

An Eaſy Introduction to Drawing Flowers according to Nature. *By* James Sowerby. *Small quarto, ſewed.* 2s. *plain,* 4s. *coloured.*

From the ANALYTICAL REVIEW, *Vol.* 3, *for March* 1789.

THIS little work conſiſts of ſix plates, in which a very great variety of forms of the ſeven parts of fructification of plants are delineated from nature with great accuracy, and made as clear as poſſible to the ſtudent by full explanations. It would be ſuperfluous to commend the execution of theſe figures, as we have ſo lately done juſtice to the abilities of Mr. Sowerby as a draughtſman, in ſpeaking of Curtis's Botanical Magazine. In the publication

tion now before us he ſhews himſelf to be ſcientifically acquainted with the parts of plants, without which indeed no botanical draughtſman can attain any degree of perfection.

In his language, although he has adopted terms which we have reprobated in ſpeaking of Dr. Berkenhout's work, we cannot blame him, as he has followed authority which ought not to have miſled him.

VII.

REVIEW

OF

Thoughts on the different Kinds of Food given to young Silkworms, and the Poſſibility of their being brought to Perfection in the Climate of England; founded on Experiments made near the Metropolis. By S. Bertezen, 8vo. p. 47. pr. 1s. 1789.

From the ANALYTICAL REVIEW, *Vol.* 3, *for May* 1789.

THE two principal objects of this pamphlet are, to diſcountenance the opinion that young ſilkworms may be nouriſhed with dried mulberry leaves, and to prove that the leaf of the black mulberry is preferable to that of the white, for the food of theſe uſeful and delicate little animals.

In

In the firſt inſtance, the author differs in opinion from ſeveral projectors abroad, among whom is Dr. Bellardi of Turin, who in a diſſertation laid before the Society of Agriculture of that place, May 16, 1787*, propoſes a method of drying and powdering the leaves in ſuch a manner, as that they may be kept through the winter in ſufficient preſervation to feed the early worms, which are frequently hatched before young leaves appear; and the nouriſhment of which is a principal *deſideratum* with the keepers of ſilkworms†. Our author's reaſons againſt this practice are altogether hypothetical, as well as Dr. Bellardi's for recommending it; we ſhall therefore only obſerve, that we think his third objection the moſt forcible, and indeed nearly deciſive, viz. the danger that

* Mezzo facile ed economico per nodrire i Bachi da Seta in mancanza della foglia recente dei Mori, dal Dottore Ludovico Bellardi. Torino 1787. 8vo.

† We have found from experience that the young worm will eat lettuce leaves, and thrive very well, before it has taſted the mulberry leaf.

the

the powder in queſtion ſhould enter into a ſtate of fermentation when moiſtened, as it muſt be, and placed in the heat neceſſary for ſilkworms, 70 degrees of Fahrenheit's thermometer.

With reſpect to the preference of the black mulberry, as he judges from experience, we think him worthy of attention, how much ſoever he may differ from the generally received opinion. That the leaves of the white are, as he admits, the more early of the two, is however ſtrongly in their favour; nor is there any obſtacle to this kind being cultivated in England, as it grows very well here, and even in Sweden. Our author ſeems partial to the black, becauſe he has it ready to his hands. Whether he is likely to prevail with all the owners of theſe trees to let him ſtrip them, we cannot tell.

VIII. RE-

VIII.

REVIEW

OF

A Dutch Edition of the Syſtema Naturæ of Linnæus.

Read before the LINNÆAN SOCIETY, *March* 3, 1789.

OF all the various impoſitions upon the public in the book-making way, to which the prevailing taſte for Natural Hiſtory and the celebrity of Linnæus have given birth in the preſent age, one of the moſt impudent and ridiculous is a folio edition of the *Syſtema Naturæ*, in Dutch, French, and Engliſh, publiſhed at the Hague in 1765, by a bookſeller named Staatman. I have often contemplated this production with equal wonder and contempt, and have amuſed myſelf in conjecturing how the ignorant compiler of it could fall into

ſuch

ſuch ſtrange errors as he has done. Sometimes I think I have traced his ſteps through the miry labyrinth; and if this Society will pardon me for preſenting them with ſuch traſh, I will lay before them ſome of the fruits of my enquiries, for want of better matter for their entertainment. If they learn nothing elſe, they will at leaſt be prevented from ever buying the book; for, though not ſo ſerious a robbery of the public as if it conſiſted of twenty-five folio volumes, any money which it might coſt would certainly be equally thrown away with that laid out in the purchaſe of ſome ſuch ſplendid publications.

That my opinion is not ſingular, will appear from Haller's *Bibl. Bot.* vol. ii. page 552, where the book I have undertaken to illuſtrate is diſtinguiſhed by the title of *Syſtematis Linnæi corruptor*, and the character given of it is, that "it is by "no means the work of Linnæus, but a "mere bookſeller's impoſition; the figures "being bad, and their names totally erro-"neous, accompanied with ſuch ignorance

"as

"as in the preſent age one would hardly "expect to meet with."

The ſcheme of this curious work is no leſs than to illuſtrate all nature; ſo that, in the extenſiveneſs of its plan at leaſt, it may vie with the greateſt attempts of the human mind. It profeſſes to treat of Animals, Vegetables, Minerals, and Waters, in the two firſt claſſes following Linnæus, and in the two laſt Wallerius: ſo far then the plan was good; we have nothing to complain of but the bad execution of it.

With reſpect to the three languages of this learned book, of the Dutch I am no judge, but I hope it is the beſt of the three. The French is like Dutch French, and for the Engliſh I can find no epithet too bad. It might ſeem invidious however to criticiſe this department, as every nation ought to think itſelf honoured by any attempt of a foreigner to ſpeak or write its language, and I believe all but my countrymen do think ſo. A few obſervations, however, will be neceſſary to prevent errors.

By

By the *Night Men*, which our author ſays have only the appearance of an human body, we are not to underſtand thoſe valuable members of ſociety ſo called, whoſe ſervices are ſo well known in every great town, however applicable the deſcription may be; but it is the Ourang Outang which is meant: and if in this inſtance our author has been obſcure, he is abundantly explicit in his deſcriptions of the Monkeys, where his language could not be miſtaken even by any night-man whatever; the ſtyle indeed being more ſuited to what may be imagined, that of their uſual diſcourſe, than to any I ſhould think fit to uſe before this company.

With reſpect to the explanation of the vegetable part of the ſyſtem, a young ſtudent might be much miſled by this work, and an old one puzzled in no ſmall degree. The editor having turned to a dictionary for every word, with that perſeverance for which his countrymen deſerve great praiſe, has not always taken the right ſenſe; for perſeverance without judgment

may

may often go very far out of the way. Thus he tranſlates *filamenta* ſtrings, *ſtigmata* ſtamps; and he commits errors in the characters of the claſſes which I confeſs myſelf incapable of unravelling. In *Syngeneſia* he ſays "the Males and Fructifyers are monſtrous." In *Gynandria*, "The Males and Females have the members monſtrous." In *Monœcia*, "the Males and Females live in the ſame place, but in different *piſtes*."

I now come to the moſt curious part of this Natural or rather *Un*natural Hiſtory, the figures of plants, of which there are 126, and of thoſe more than half, viz. near 70, are erroneouſly named; not that one obſcure or ill underſtood ſpecies is merely put for another, as may happen in the beſt works; but *genera* the beſt known, and moſt common, are repreſented by figures which have no reſemblance to them, but which repreſent plants equally well known; inſomuch that one would ſuppoſe the names had been applied by lottery, for it is abſolutely impoſſible that any one in the leaſt

leaſt acquainted with plants could make ſuch ſtupid blunders. That I do not exaggerate, will appear from the following account. It muſt be obſerved, that the plan of the work is to give a figure of one ſpecies of every genus in the Linnæan Syſtem, at the time this book was publiſhed; and the firſt part, which is all I have ſeen, and, I ſhould hope, all that ever did or will appear, contains a ſpecimen of each genus, or at leaſt intended to be ſo, from *Canna* as far as *Mitchella*. But what would be the ſentiments of the poor diſappointed ſtudent, who ſhould hope for information from this wretched farrago, when for *Thalia* he ſhould find a diminiſhed figure of *Kæmpferia*, actually a copy of one which ſtands next it? for *Boerhaavia*, a common *Equiſetum?* for *Hippuris*, which the author is pleaſed to write *Hiſpurus*, another *Equiſetum?* for *Coriſpermum*, *Alſine media* or ſome ſuch plant? and for *Callitriche*, here written *Calitiſche*, a vile figure of *Androſace maxima?* From equal ignorance, for *Nyctanthes* is put

Anagallis

Anagallis arvenſis, with a flower by it which I cannot make out.

For *Chionanthus*, an *Olea*.

For *Cinna*, an *Amaranthus*.

For *Eranthemum*, a thing like an *Adonis*.

For *Juſticia*, *Capraria biflora*.

For *Pinguicula*, *Gentiana cruciata*.

For *Utricularia*, an apparent *Verbena*.

For *Monarda*, *Thymus Maſtichina*.

For *Morina*, *Salvia glutinoſa*, with a ſeparate flower of the true *Morina*.

For *Buffonia*, a figure totally unlike that and every thing elſe.

For *Hirtella*, *Valeriana rubra*, and the author has the confidence to tell us that *Hirtella* is ſometimes called Red Valerian.

For *Olax* is put *Polemonium cæruleum*.

For *Cneorum*, *Daphne Mezereum*.

For *Loeflingia*, *Statice Limonium*.

For *Polycnemum*, *Daphne Mezereum* again, if I am not miſtaken.

For *Commelina*, a *Crocus*.

For *Bobartia* is given a figure ſo execrably bad one can hardly gueſs at its genus,

but I verily believe it is *Cytiſus Laburnum.*

For *Cornucopia* is a figure ſtill leſs intelligible.

For *Uniola*, a common *Poa.*

For *Feſtuca*, *Ægilops ovata.*

For *Ariſtida*, *Typha.*

For *Apluda*, *Juncus effuſus.*

For *Eriocaulon*, *Herniaria.*

For *Montia*, I know not what.

For *Proſerpinaca*, another kind of *Equiſetum*, a genus of which the author has made good uſe.

For *Queria*, *Aſperula adorata.*

For *Lechea*, *Aſperula arvenſis.*

For *Cephalanthus*, *Carlina.*

For *Globularia*, *Bellis perennis.*

For *Hedyotis*, a *Mentha.*

For *Knoxia*, *Lychnis dioica* with a double flower.

For *Siphonanthus*, *Imperatoria* I believe.

For *Cateſbæa*, *Ægopodium podagraria.*

And for *Ixora*, *Mirabilis.*

Under the name of *Scurrula*, by which I do not know what is meant unleſs it

be

be *Loranthus*, is put *Hedyſarum coronarium*; and, to crown all at the laſt, for *Mitchella* is put *Nyctanthes Sambac*.

So large a liſt of blunders, in ſo ſmall a compaſs, I believe ſcarcely any book in any ſcience can afford. It is quite a phænomenon in literature.

Theſe errors which I have enumerated ſeem totally unaccountable; they are like the ravings of a Maniac, whoſe origin or connection cannot be traced. But I ſhall now mention ſome others in which our author ſeems to have blundered with ſome ingenuity, or, as Polonius ſays of Hamlet, "to have method in his madneſs."

In the firſt page is a figure named *Alpinia*, but which is nothing elſe than *Eryngium alpinum*; the trivial name of which it ſhould appear made the ignorant compiler miſtake it for *Alpinia*. A ſimilar error made him exhibit *Amaranthus Blitum* for the genus *Blitum*. For *Lycopus*, he ſome how or other ſtumbled upon *Lycopſis arvenſis*. For *Amethyſtea* he has pre-

ſented us with a fine double *Aquilegia*, becauſe (I ſuppoſe) of its purple flower. And for *Anthoxanthum* he has given an *Hypericum*; very learnedly diſcovering that the word *Anthoxanthum* meant a yellow flower, he thought any plant of that colour would do. I muſt acknowledge he has not diſplayed his learning with equal ſucceſs in giving *Valeriana hortenſis* of the old authors (or *V. Phu* of Linnæus) for the genus *Ortegia*; though he has ſpelt *Ortegia* with an *H*, in order to make it more like *hortenſis*. With reſpect to *Caſſytha* he ſeems to have taken great pains, but with little ſucceſs. He gives for it a figure of *Cuſcuta*, and a flower of *Caſſida*, or *Scutellaria*; ſo that in this caſe it was certainly pure ignorance that miſled him, and not want of ſtudy.

After the miſtakes already noticed, it will not ſeem wonderful that he gives *Carex pſeudo-cyperus* for *Scirpus*, *Valeriana celtica* for *Nardus*, *Galium Mollugo* for *Mollugo*, or *Valantia Cruciata* for *Crucianella maritima*. In theſe caſes he may

claim

claim our pity at leaſt for having in ſome degree tried to be in the right; though that unhappy fatality which ſeems to have doomed him to be always in the wrong, made all his endeavours ineffectual. Certainly nothing but the moſt perverſe deſtiny in the world could have made him publiſh *Lychnis dioica* for the *Diodia*: it is ſcarcely credible that ſo obſcure a reſemblance between the trivial name of that, and the generic name of the plant he meant to repreſent, could make him take one for the other; but I preſume my hearers are by this time ſo well acquainted with this ingenious author as not to wonder at any thing he does, and moſt probably are heartily tired of him. I ſhall therefore, before I take leave of him, only mention one inſtance more, in which all evil ſtars ſeem to have combined to lead him into one of the moſt complicated blunders that even himſelf has ever committed; in making him give a figure of *Ferraria Pavonia* for *Eriophorum*. Being at a loſs for a repreſentation of the latter, it appears

that he turned to ſome index or other for a word ſomething like it, and by miſchance met with *Bulbus Eriophorus* in *Dodonæus*: in the ſame chapter with which, by no leſs miſchance, he found, along with a figure of the *Bulbus Eriophorus*, one of *Ferraria Pavonia* (the *flos Tigridis* of the old authors), and unluckily copied the one for the other.

IX.

A

BOTANICAL ESSAY

ON

THE GENERA OF

DORSIFEROUS FERNS.

TRANSLATED FROM THE LATIN.

Published in the Fifth Volume of the Memoirs of the Royal Academy of Sciences at Turin, in 1793.

A BOTANICAL ESSAY ON THE GENERA OF DORSIFEROUS FERNS.

THE Genera of Ferns, entirely neglected by the older botaniſts, and but ſlightly or ſuperficially touched upon by ſyſtematic writers of the laſt century, were firſt attempted to be reduced to fixed principles by Linnæus. As no one mind can attend alike to every ſubject, Ray ſeems thoughtleſſly to have retained the names, for I cannot call them opinions, of preceding botaniſts. Tournefort, ſomewhat more attentive to this part of botany, in order

to

to perfect his own great undertaking, aimed at referring ferns, as well as all other known vegetables, to their proper genera: but he unfortunately deduced his marks of discrimination from the figure of the frond, which is for the most part of no importance. His steps were implicitly followed by Plumier, who made known to the botanists of Europe a vast collection of American ferns, which he accommodated to the nomenclature of Tournefort. It is needless to mention any other writers of that period.

Linnæus, ever anxious to obtain generic characters of plants from their fructification alone, pursued this idea, truly worthy of so able a man, in the first edition of his *Genera Plantarum*, printed in 1737, in which he has arranged, according to this principle, many vegetable tribes, which no botanist had before supposed to be endowed with any such parts; among others, the *dorsiferous ferns* are here for the first time presented to us in a well digested systematic form.

But

But indeed as in theſe plants the ſtructure of the parts of fructification is leſs clear than in many others, thoſe eſſential organs of their flowers, the *ſtamina* and *piſtilla*, being altogether, as they ſtill are, unknown, the great author of the Sexual Syſtem could by no means form his characters from thence. It was ſo far however ſufficient for his purpoſe, that he could abſolutely tell where thoſe parts, if they did exiſt (and that they did he preſumed from the moſt promiſing analogy), reſided; and with reſpect to the fruit, the formation of which is the only end of the other parts of fructification, its ſtructure was already clearly aſcertained. But even this was uſeleſs for the purpoſe of which I am ſpeaking, the fruit of almoſt all the dorſiferous ferns being nearly the ſame, ſo that the moſt intelligent obſerver could not from thence derive any generic diſtinctions. Linnæus was therefore in a manner obliged to have recourſe to principles which in the arrangement of other claſſes of plants he had rejected as unphiloſophical,

cal, the ſituation of the fructifications, and their aggregate figure. On theſe are founded the ſix genera of dorſiferous ferns which he has given in the firſt edition of his *Genera Plantarum*, as follows:

Pteris. Fructifications diſpoſed in a line running along the margin of the leaf on its under ſide.

Lonchitis. Fructif. arranged in little creſcent-ſhaped lines, under the ſinuſes of the leaf.

Adiantum. Fructif. in oval ſpots, collected together under the reflexed ſummits of the leaves.

Aſplenium. Fructif. in ſtraight lines, arranged on the under ſide of the leaf.

Polypodium. Fructif. in roundiſh ſpots, diſperſed over the back of the leaf.

Acroſticum. Fructif. accumulated into one maſs, entirely covering the back of the leaf.

In the ſecond edition of the ſame work (Leyden 1742) two other genera are added to the above, namely,

Hemi-

Hemionitis. Fructifications in lines running into or interfecting each other, or branched.

Trichomanes. Calyx turbinated, ſolitary, erect, from the margin of the leaf itſelf. Style briſtle-ſhaped, terminating the capſule.

In the latter deſcription the illuſtrious writer varies his phraſeology a little; and yet, if I may ſay ſo, not for the better, he having no ſufficient authority in this caſe for uſing the words ſtyle and capſule.

The fifth edition of the ſame publication (Stockholm 1754) contains one more genus of ferns.

Blechnum. Fructifications diſpoſed in lines, parallel with and near to the rib of the leaf.

The arrangement of the other genera is alſo a little altered.

In the ſixth edition, the laſt to which Linnæus himſelf lent any aſſiſtance, nothing new occurs relative to the ſubject before

before us, nor have I yet diſcovered any thing illuſtrative of it among his manuſcripts.

All the editors and imitators of this great man's works, not knowing how to improve the genera of ferns, have left them as they were. The celebrated Schreber alone, in his new edition of the *Genera Plantarum* (Frankfort 1791, in two volumes), has given two new genera taken from other authors, *Marattia* and *Cænopteris*; adding moreover one of his own, which appeared to him to be new, named *Meniſcium*. All theſe genera we ſhall preſently notice.

It is proper, however, that we ſhould here take notice of what has been done by ſome of the contemporaries of Linnæus, towards obtaining generic characters of ferns.

In the firſt place, Adanſon, in his work entitled *Familles des Plantes* (Paris 1763), vol. 2. p. 20, has noticed the involucrum of ferns, as has Gleditſch in his Syſtema Plantarum (Berlin 1764); but they have detected

detected this part in very few genera, and have erred in ſeveral of their remarks upon it; for inſtance, in the *Pteris* of Linnæus (*Thelypteris* of Adanſon, *Circinalis* of Gleditſch), the former well deſcribes the involucrum as of one valve, and in the form of a penthouſe; while the latter denies its exiſtence altogether. They both juſtly obſerve that in *Aſplenium Scolopendrium* the involucrum conſiſts of two valves, but do not ſay a word of the form of this membrane in *Blechnum*, *Hemionitis*, or *Lonchitis*. They have totally deranged the Linnæan genera, but being ignorant of any true principles, have made every thing worſe than they found it; and as to nomenclature, they have gone counter to every maxim and all ſorts of authority. Both theſe writers have obſerved the elaſtic ring which binds together the capſular valves of ferns, but they have alike both equally erred in denying the exiſtence of any ſuch part in *Polypodium vulgare*. They have fallen into this miſtake in blindly following Tournefort, for it might eaſily

have been avoided if they had but looked at the capſule themſelves. Scopoli, in his *Flora Carniolica*, has made uſe of theſe authors remarks. The illuſtrious Haller, and moſt other writers, have adopted the Linnæan characters, with ſome occaſional variations of no great moment, either with reſpect to the arrangement of ſpecies or nomenclature.

Nor indeed were any of the laſt-mentioned botaniſts under the neceſſity of going farther than Linnæus had done. Thoſe however, who have had an opportunity of ſeeing many new exotic ferns, have long ago perceived the difficulty of referring them all to the Linnæan genera, and at the ſame time have found it equally difficult to fabricate new ones upon certain principles. In the year 1786, Sir Joſeph Banks, at my perſuaſion, ſent many ſpecimens of rare and curious ferns, in full fructification, to the celebrated Dr. Hedwig at Leipſic, in hope that this ingenious man, who has thrown ſo much light upon other obſcure parts of the claſs *Cryptogamia*, might alſo illuſtrate

illuſtrate this order. I have not heard that he has undertaken their examination.

Having become poſſeſſed of a vaſt collection of ferns in the ample herbarium of the younger Linnæus, as well as by the favour of Sir Joſeph Banks and ſome other friends, I have found it abſolutely neceſſary to ſtudy the ſubject, in order to find out ſome method by which I might reduce my acquiſitions into order. That I might proceed on as ſure grounds as poſſible, I have made it a rule to examine every ſpecies that came in my way, before I would venture to lay down any fundamental principles. I have alſo conſulted with ſome friends who had likewiſe paid attention to the ſubject, chiefly Mr. Dryander, and Mr. T. F. Forſter jun.

It appears to me, that the involucrum or covering of the fructification is of the utmoſt importance in determining the genera of theſe plants, and it is eſpecially to be noted on what ſide and in what manner this covering burſts.

The involucrum is of a membranous nature, and is found in almoſt every fern, covering the fructification before it arrives at maturity. It originates ſometimes from the margin of the leaf, but more commonly from ſome nerve or vein. Nor muſt we neglect to obſerve, in order to come at the knowledge of natural genera, whether the membrane, and the fructification which it covers, be, with reſpect to the nerve or vein, *terminal* or *lateral*. The involucrum adheres firmly to the frond on one ſide, and on the other is more or leſs cloſely preſſed to it; not but that even on this ſide alſo the air is altogether excluded, ſo that in whatever mode the impregnation of the flowers is accompliſhed, the operation goes on in ſecret under this covering, independent of all external communication. For the membrane cloſely conceals and embraces every part, till the ſeed-veſſels, being arrived at maturity, are ready to diſcharge their ſeeds; and that they are really ſeeds which theſe parts produce, has been

been proved by the experiments of many naturaliſts *.

The principal thing to be noted for our purpoſe, reſpecting this membranaceous involucrum, is the direction or mode in which it ſeparates; that is, whether outwards (towards the margin of the frond), or inwards (on the ſide which looks towards the rib or nerve of the frond or of its ſegment). This circumſtance no one has yet conſidered; yet it is undoubtedly of the greateſt uſe in determining natural genera, being not only conſtant in every ſpecies, but in ferns whoſe habit and other particulars agree, it is always found to be ſimilar. And ſo far is this principle from ſuperſeding or overturning the genera of Linnæus, that it rather ſtrengthens them and confirms their characters; nor ſhall we often find it neceſſary to change the diſtribution of any of the Linnæan ſpecies. Neither do I make theſe remarks to prove the cha-

* See Mr. Lindſay's paper in the 2d vol. of the Tranſ. of the Linn. Soc. p. 93.

racters given by this great author now unneceſſary; on the contrary, I retain them all, only begging leave to add to them my characters taken from the involucrum, in order that his genera may be eſtabliſhed on the more firm foundation, and that we may have certain principles on which to found new ones.

I mean at preſent to treat of ſuch ferns only as are called *dorſiferous*, that is, which bear their fructification on the back of their frond. I therefore deſignedly paſs over, not only thoſe cryptogamous plants which profeſſor Schreber in his new edition of the *Genera Plantarum* has denominated *Miſcellaneæ*, but I likewiſe omit *Ophioglo-ſum*, *Oſmunda*, and *Onoclea*. This laſt is by the learned profeſſor juſt mentioned erroneouſly referred to thoſe ferns whoſe capſules are furniſhed with a ring. To his obſervations upon *Ophioglo∫ſum* and *Oſmunda* every body muſt aſſent.

We now then proceed to the methodical diſtribution of the genera of dorſiferous ferns upon the maxims juſt propoſed.

I may

I may at ſome future period illuſtrate them more minutely, and have now to beg that what is here offered may be conſidered as a mere eſſay, entirely ſubmitted to the alterations and corrections of more able hands.

FILICES DORSIFERÆ.

Dorſiferous Ferns.

Eſſential Character. Fructificationes frondoſæ in paginâ inferiore, aliquando marginales.

Fructifications on the back of the leaf, ſometimes at the margin.

Section I.

Annulatæ, *with Annulated Capſules.*

Eſſent. Char. Capſulæ pedicellatæ, bivalves, uniloculares, annulo articulato elaſtico cinctæ. Fructificationes involucro membranaceo plerumque tectæ.

Capſules on footſtalks, with two valves and one cell, bound with a jointed elaſtic ring. Fructifications generally covered with a membranous involucrum.

1. ACROSTICHUM. Linn. *Fructificationes* maculam amorpham, continuam, diſcum fere totum occupantem, formantes.

Involucrum nullum, niſi ſquamulæ vel pili capſulis interſtincti.

Fructifications forming one continued ſpot, of no determined figure, occupying almoſt all the diſc of the leaf.

Involucrum none, except little ſcales or hairs interſperſed among the capſules.

OBS. In this genus the capſules, while young and tender, lie for the moſt part hid in a fine down; ſometimes they are intermixed with minute membranous ſcales, and perhaps

perhaps both may ſerve the purpoſes of an involucrum.

Examples of the Genus.

Acroſtichum aureum *of Linnæus.*

- - - - latifolium } *of Swartz's*
- - - - villoſum } *Prodromus.*

and Oſmunda peltata } *Prodromus.*

2. Polypodium. Linn. *Fructif.* in punctis ſubrotundis, ſparſis, non marginalibus.
Involucrum umbilicatum, undique fere dehiſcens.

Fructif. in roundiſh, ſcattered, not marginal ſpots.
Involucrum umbilicated, ſeparating on almoſt every ſide.

Obs. Polypodium vulgare, which is the original ſpecies of this genus, has no perceptible involucrum. The groups of young capſules come forth naked from the ſubſtance of the frond. As however this circumſtance ſeems peculiar to the

ſpecies in queſtion *, we ſhould ſcarcely be juſtified in ſeparating all the other reputed Polypodiums from it on that account. There might be more reaſon perhaps, conſidering the immenſity of this genus as it at preſent ſtands, for diſtinguiſhing from thoſe ſpecies which have a perfectly umbilicated and circular involucrum, ſeparating equally on every ſide, thoſe whoſe involucrum is a part of a circle, or reniform. But the limits between the two are ſo difficult to define, and to deſcribe, that it ſeems much ſafeſt, till we get more information, to preſerve the genus as it is generally underſtood.

Examples. (Involucrum obſolete)
Polypodium vulgare *Linn.*
(Invol. umbilicated)
- - - trifoliatum.

* Polypodium phymatodes ſeems to produce its fructification in the ſame manner, but I am not certain that any more ſpecies do ſo.

(Invol.

(Invol. nearly reniform)

- - Filix mas.

- - marginale.

(Invol. creſcent-ſhaped)

- - Filix fœmina.

Perhaps this laſt rather belongs to Darea, ſee below.

3. ASPLENIUM. Linn. *Fructif.* in lineolis ſparſis.

Involucrum e venâ lateraliter ortum ducens, interius (i. e. coſtam verſus) dehiſcens.

Fructif. in ſcattered lines.

Involucrum originating laterally from a vein, and ſeparating inwards, (that is, towards the nerve.)

Examples. Aſplenium Hemionitis *Linn.*

- - - monanthemum*.

4. DAREA†. Juſſ. Gen. 15. *Fructif.* in lineolis ſparſis.

Invo-

* *Plant. Ic. ex Herb. Linn. tab.* 73.

† In *Plant. Ic. tab.* 50, I retained the denomination firſt given by Bergius to this genus in his confuſed diſſertation,

Involucrum e vena lateraliter ortum ducens, exterius (i. e. marginem verſus) dehiſcens.

Fructif. in ſcattered lines.

Involucrum originating laterally from a vein, and ſeparating outwards (that is, towards the margin).

Examples. Cænopteris furcata. *Bergius in the Tranſactions of the Peterſburg Acad. for* 1782.

ſertation, being unwilling to change a printed name, however unmeaning. Indeed my mind was ſo occupied by the abſurdity of that name, *Cænopteris, (a new fern,)* that I did not then obſerve its being repugnant to the Linnæan laws as well as to good ſenſe, having been formed out of another exiſting generic name *(Pteris)*, inſomuch that I was very near giving the genus in queſtion an appellation in this reſpect equally faulty, *Clethripteris.* As it is however on all accounts neceſſary that *Cænopteris* ſhould be changed, I gladly adopt the name given to this genus in the claſſical work of Mr. de Juſſieu, in honour of Mr. Dare, an Engliſh botaniſt of the time of Ray, who firſt diſcovered the *Trichomanes tunbridgenſe.*

Mr. de Juſſieu indeed refers *Cænopteris* to his *Myriotheca (Marattia)*; but that is an accidental miſtake, as their characters have no affinity.

Cænopteris rutæfolia *ejuſd.*
- - - vivipara *ejuſd.*
- - - rhizophylla *Plant. Ic. tab.* 50. (a native of Hiſpaniola).
Aſplenium cicutarium *Swartz Prod.* 130.
- - - flaccidum *Forſter Prod.* 80.

5. *Hemionitis.* Linn. *Fructif.* in lineolis ſparſis, decuſſantibus, geminis, venæ approximatis.

Involucra e venâ ortum ducentia, utrinque exterius dehiſcentia.

Fructif. in ſcattered branching lines, each of them double, with a vein running between.

Involucra originating from the vein, and each ſeparating outwards.

See tab. 1. fig. 1.

Examples.

Hemionitis lanceolata. *Linn.*
- - - palmata.
Aſplenium plantagineum.
- - - grandifolium *Swartz Prod.* 130.
Meniſcium *Schreb. Gen. Pl.* 757 ?

6. Scolo-

6. SCOLOPENDRIUM. *Fructif.* in lineolis ſparſis, geminis, interveniis.
Involucra ſuperficiaria, ſibi invicem longitudinaliter incumbentia, futurâ longitudinali dehiſcentia.

Fructif. in ſcattered double lines, placed between two veins.
Involucra originating from the ſurface*, lying over one another longitudinally, and ſeparating by a longitudinal future.
See tab. 1. fig. 2.

OBS. The character of this genus is directly the reverſe of that of Hemionitis. Both are ſufficiently diſtinct from Aſplenium, nor ought they by any means to be confounded with it.

By the latin term *involucrum ſuperficiarium* I wiſh to expreſs an involucrum which ariſes from the ſurface or diſc of the frond, not

* Or rather from the veins.

from

from the margin, nor from a nerve, but it is generally attached to a ſmall vein.

Examples.

Aſplenium Scolopendrium *Linn.*
- - - - Ceterach ?

I have ſcarcely diſcovered any more ſpecies.

7. BLECHNUM. Linn. *Fructif.* in lineis longitudinalibus, continuis, coſtæ adjacentibus.
Involucrum ſuperficiarium, continuum, coſtam verſus dehiſcens.

Fructif. in longitudinal uninterrupted lines, cloſe to the nerve.
Involucrum originating from the ſurface, continued, ſeparating towards the nerve.

Examples.

Blechnum occidentale *Linn.*
- - - auſtrale.
Oſmunda Spicant.

8. WOOD-

8. WOODWARDIA. *Fructif.* in punctis oblongis, distinctis, serialibus, costæ adjacentibus.
Involucra superficiaria, fornicata, costam versus dehiscentia.

Fructif. in oblong separate spots, arranged in a regular series along the nerve.
Involucra originating from the surface, vaulted, separating towards the nerve.
See tab. 1. fig. 3.

OBS. My worthy friend Thomas Jenkinson Woodward Esq. L. L. B. F. L. S. well known by his various observations and dissertations relative to English plants, and no less eminent for candour than for science, has richly deserved this genus.

Examples. The following species are all that have come to my knowledge:

1. Wood-

1. Woodwardia *anguſtifolia*, fronde pinnatâ : pinnis linearibus acutis integerrimis ; *(ſterilibus ſerrulatis.)** Frond pinnated; pinnæ linear, acute and entire ; the barren ones minutely ſerrated.* * A native of Pennſylvania. I received a ſpecimen by favour of Sir *George Staunton, Bart.*

2. W. *japonica*, fronde pinnatâ : pinnis pinnatifidis nervo nudo : lobis obtuſis ſerratis, ſtipite ſquamoſo. Frond pinnated ; pinnæ pinnatifid, their main nerve deſtitute of fructification ; their lobes obtuſe and ſerrated. Stalk ſcaly.

* From Moriſon's figure.

* * Acroſtichum areolatum. *Linn. Sp. Pl.* 1526.

Oſmunda frondibus pinnatis, foliolis omnibus baſi connatis lanceolatis, margine leviter ſerratis. *Gronov. Fl. Virgin.* 4to, *p.* 164.

Lonchitis major Virginiana, folio vario, alis Polypodii in modum conjunctis. *Moriſ. Hiſt. vol.* 3. *ſect.* 14. *p.* 569. *tab.* 2. *f.* 24.

Filix Floridana, &c. *Pluk. Phyt. t.* 399, *f.* 1.

Blechnum

Blechnum japonicum. *Thunb. Flo. Jap.* 333. *tab.* 35. *Linn. Suppl.* 445.

Obs. In the ſpecimen communicated by Profeſſor Thunberg himſelf, the ſtalk is ſcaly and rough, inſtead of being ſmooth as deſcribed in the Flora Japonica.

A native of Japan. *Thunberg.*

3. W. *virginica*, fronde pinnatâ: pinnis pinnatifidis nervo utrinque fructificante: lobis obtuſis ſerrulatis, ſtipite glabro.

Frond pinnated; pinnæ pinnatifid, their main nerve with fructification along each ſide; their lobes obtuſe, minutely ſerrated. Stalk ſmooth.

Blechnum virginicum. *Linn. Mant.* 307. *Ait. Hort. Kew. v.* 3. 460. Filix mas vulgari ſimilis, pinnulis amplioribus planis, nec crenatis, virginica.

virginica. *Pluk. Phyt. t.* 179. *f.* 2. bad.

A native of Virginia.

4. W. *radicans*, fronde pinnatâ : pinnis pinnatifidis nervo nudo : lobis acutis ſerratis, ſtipite glabro.

Frond pinnated ; pinnæ pinnatifid, their main nerve deſtitute of fructification ; their lobes acute, ſerrated. Stalk ſmooth.

Blechnum radicans. *Linn. Mant.* 307. (except the ſynonym of Plukenet.) *Ait. Hort. Kew.* v. 3. 460.

Filix italica non ramoſa maxima, glabra, Polypodii folio, gallas ferens, D. Michelii. *Till. Piſ.* 62. *t.* 24.

A native of Madeira, in the deep clayey fiſſures of rocks, *Kœnig* ; in a valley between Chartaria and Ferrara, *Tilli* ; in Portugal, *Edward Whittaker Gray* M. D.

9. Pteris. Linn. *Fructif.* in lineâ marginali, continua.

Involucrum e margine ipſius frondis inflexo, continuum, interius dehiſcens.

Fructif. in an uninterrupted marginal line.

Involucrum from the margin of the frond turned in, uninterrupted, ſeparating on the inner ſide.

Examples. Pteris grandifolia *Linn.*
- - vittata.
- - cretica.
- - aquilina.

To this genus are perhaps to be referred Acroſticum ſeptentrionale and A. auſtrale of *Linn.* as well as A. auſtrale of *Vahl's Symbolæ* 1, *tab.* 25: which laſt has been better named, by *Koenig*, A. radiatum.

10. LINDSÆA. Dryander in Tr. of Linn. Soc. vol. 3. *Fructif.* in lineâ continuâ, à margine parùm remota.

Involucrum ſuperficiarium, continuum, exterius dehiſcens.

Fructif.

Fructif. in an uninterrupted line, a little removed from the margin.

Involucrum originating from the ſurface, continued; ſeparating outwards.

See tab. 1. fig. 4.

Examples.

Adiantum guianenſe *Aublet's Guiana, tab.* 365.

- - - ſagittatum *ditto, t.* 366.

- - - ſtrictum *Swartz Prod.* 135.

11. VITTARIA. *Fructif.* in lineâ marginali, continuâ.

Involucrum duplex, continuum; *alterum* ſuperficiarium, exterius dehiſcens; *aliud* e margine ipſius frondis inflexo, interius dehiſcens.

Fructif. in an uninterrupted marginal line.

Involucrum double, uninterrupted; *one* from the ſurface, ſeparating outwards; the *other* from the margin of the frond turned in, ſeparating inwards.

See tab. 1. fig. 5.

Example. Pteris lineata *Linn.*
This I believe is the only ſpecies referable to this genus, among all the ferns hitherto diſcovered *.

12. LONCHITIS. Linn. *Fructif.* in lineolis, ſinubus frondis geminatim ſubjectis, lunulatis.
Involucra e margine ipſius frondis inflexo, interius dehiſcentia.
Fructif. in ſmall lines, placed in pairs, forming a creſcent, at each ſinus of the frond.
Involucra from the margin of the frond turned in, ſeparating inwards.

OBS. This genus agrees nearly with Pteris in habit, and with Adiantum in character. Lonchitis pedata of *Linnæus* and L. adſcentionis of *Forſter* are real ſpecies of Pteris.

* Notwithſtanding which no genus can be more peculiar in habit, nor more certain in character.

Examples.

Examples. Lonchitis hirſuta *Linn.*
- - - aurita.

13. ADIANTUM. Linn. *Fructif.* in punctis ſubrotundis, marginalibus, diſtinctis.
Involucra ſquamiformia, e margine ipſius frondis inflexo, diſtincta, interius dehiſcentia.

Fructif. in roundiſh, ſeparate, marginal ſpots.
Involucra like ſcales, from the margin of the frond turned in, diſtinct, ſeparating inwards.

Examples.
Adiantum Capillus Veneris *Linn.*
- - - triphyllum *Plant. Ic. ex Herb. Linn. tab.* 74.

14. DAVALLIA. *Fructif.* in punctis ſubrotundis, ſubmarginalibus, diſtinctis.
Involucra ſquamiformia, ſuperficiaria, diſtincta, exterius dehiſcentia.

Fructif. in roundiſh, ſeparate ſpots, near the margin.

Involucra like ſcales, from the ſurface, diſtinct, ſeparating outwards. See tab. 1. fig 6.

Obs. The fructifications are, with reſpect to the veins, always terminal, by no means lateral. The habit of Davallia is firm, poliſhed, and compact, far unlike the tender, membranous, expanſive appearance of Trichomanes and Adiantum.

I have with the greateſt pleaſure dedicated this new genus to my amiable and intelligent friend Edmund Davall, Eſq, F. L. S. reſident at Orbe in Switzerland; a botaniſt no leſs indefatigable than acute.

Examples.

1. D. *canarienſis*, fronde tripartita alternatim ſupradecompoſita: lacinulis lanceolatis unifloris.
Frond in three diviſions, alternately thrice compounded; its ultimate diviſions lanceolate and ſingle-flowered.

Tricho-

Trichomanes canarienſe *Linn. Ait. H. Kew. vol.* 3. 469.

A native of the Canary iſlands; alſo of the ſides of mountains in Portugal. *Læffling in the Linn. Herb.*

2. D. *chinenſis*, fronde alternatim tripinnata: lacinulis cuneiformibus obtuſis ſub-bifloris.

Frond alternately thrice pinnated; its ultimate diviſions wedge-ſhaped, obtuſe, and generally two-flowered.

Trichomanes chinenſe *Linn.*

A native of China.

3. D. *clavata*, fronde alternatim decompoſita: lacinulis lineari-cuneiformibus obtuſis unifloris.

Frond alternately twice compounded; its ultimate diviſions narrow, wedge-ſhaped, obtuſe, ſingle-flowered.

Adiantum clavatum *Linn.*

A native of the Weſt Indian iſlands.

4. D. *aculeata*, fronde ſupradecompoſita: lacinulis cuneiformibus obtuſis palmato-lobatis multifloris, rachi flexuoſa aculeata.

Frond thrice compounded; its ultimate diviſions wedge-ſhaped, obtuſe, palmato-lobate, many-flowered. Stalk zigzag and prickly.

Adiantum aculeatum *Linn.*

A native of Jamaica and Hiſpaniola.

5. D. *pedata*, fronde quinquangula trifida pinnatifida: laciniis apice multifloris.

Frond pentagonal, three-cleft, and pinnatifid; ſegments with many flowers at the top.

Adiantum repens, *Linn. Suppl.* 446.

A native of the iſland of Mauritius.

Obſ. As almoſt every ſpecies of this genus has creeping ſcaly roots, it becomes neceſſary to change the trivial name given to this by the younger Linnæus.

6. D.

6. D. *falcata*, fronde pinnata: pinnis lanceolatis ſubfalcatis undulatis multifloris baſi inæqualiter cordatis.

Frond pinnated; pinnæ lanceolate, ſomewhat ſickle-ſhaped, undulated, many-flowered, unequally heart-ſhaped at the baſe.

Lonchitis glabra minor. *Plum. Fil.* 48. *t.* 63.

A native of the Caribbee iſlands, in woods, and about rivulets. *Plumier.* It occurs in the Linnæan herbarium without name or place of growth.

7. D. *pectinata*, fronde lanceolata pectinato-pinnatifida: laciniis obtuſis undulatis multifloris; infimis auriculatis ſemipinnatiſve.

Frond lanceolate pectinato-pinnatifid: ſegments obtuſe, undulated, many-flowered; the lowermoſt auricled and half-pinnated.

A native of the Eaſt Indies. *Mr. Hurlock*, 1786.—Specimens, which

which appear not to be ſpecifically diſtinct, were gathered in Otaheite by Mr. Nelſon. *Bankſian Herb.*

8. D. *heterophylla*, frondibus ſterilibus ſimpliciſſimis ovato-lanceolatis acutis integerrimis; fertilibus linearilanceolatis ſinuatis multifloris.

Sterile fronds very ſimple, ovato-lanceolate, acute and entire; fertile ones linear-lanceolate, ſinuated, many-flowered.

A native of the Eaſt Indies; in Nicobar and Sumatra. *Bankſian Herb.*

15. DICKSONIA. L'Heritier. *Fructif.* in punctis ſubrotundis, marginalibus, diſtinctis, prominentibus.

Involucrum duplex; *alterum* ſuperficiarium, exterius dehiſcens; *aliud* e margine ipſius frondis inflexo, alterum amplectens, interius dehiſcens.

Fructif. in roundiſh, marginal, diſtinct, prominent ſpots.

Invo-

Involucrum double; *one* from the ſurface, ſeparating outwards; the *other* from the margin of the frond turned in, embracing the former, and ſeparating inwards.
See tab. 1. fig. 7.

Obs. This genus agrees in habit with Davallia.

Examples.

Dickſonia arboreſcens *Ait. Hort. Kew. vol.* 3, 469.
- - - culcita - - *ditto.*

16. Cyathea. *Fructif.* ſparſæ, ſubrotundæ, calyci hemiſphærico, apice dehiſcenti abſque operculo, inſidentes.
Fructif. ſcattered, roundiſh, ſtanding in an hemiſpherical calyx, which burſts at the top without an operculum.
See Plumier's ferns, tab. 2.

Examples.

1. C. *horrida*, caudice aculeato; fronde bipinnata

bipinnata pinnatifida: laciniis acuminatis apice ſerratis marginem verſus floriferis baſi venis anaſtomoſantibus.

Trunk thorny: frond bipinnate and pinnatifid; its ſegments acuminated, ſerrated at the tip, flowering near the margin, and furniſhed with interramifying veins at their baſe.

Polypodium horridum *Linn. Sp. Pl.* 1554.

A native of Hiſpaniola and Jamaica.

2. C. *multiflora*, caudice ... fronde bipinnata pinnatifida: laciniis obtuſis ſerratis; rachi alata, floribus ſparſis; calyce lacero.

Trunk (unknown): frond bipinnate and pinnatifid; its ſegments obtuſe and ſerrated; ſtalk winged. Flowers ſcattered. Calyx torn.

A native of Jamaica; communicated by ſir Joſeph Banks, bart.

3. C.

3. C. *arborea*, caudice arboreo ſquamoſo; fronde bipinnata: pinnulis ſeſſilibus ſerratis baſi multifloris, calyce integerrimo.

Trunk arboreſcent, ſcaly: frond bipinnate; leaflets ſeſſile, ſerrated, with many flowers at their baſe. Calyx entire.

Polypodium arboreum *Linn.*

A native of Jamaica. *Mr. Everard Home.*

4. C. *capenſis*, fronde tripinnata: pinnulis ſeſſilibus acutis ſerratis baſi unifloris, calyce lacero.

Frond tripinnate; leaflets ſeſſile, acute, ſerrated, bearing a ſolitary flower at their baſe. Calyx torn.

Polypodium capenſe *Linn. Suppl.* 445.

Gathered at the Cape of Good Hope, by *Dr. Sparrman.*

5. C. *fragilis*, fronde bipinnata pinnatifida: laciniis obovatis inciſis; rachi alata, floribus ſparſis, calyce lacero.

Frond

Frond bipinnate and pinnatifid; its ſegments obovate, notched; ſtalk winged. Flowers ſcattered. Calyx torn.

Polypodium fragile *Linn.*

A native of Europe, upon moiſt ſhady rocks*.

6. C. *montana*, fronde trifida bipinnata pinnatifida: laciniis ſubfalcatis apice dentatis; rachi alata, floribus ſparſis, calyce lacero.

Frond in three diviſions, each bipinnate and pinnatifid; ſegments ſlightly creſcent-ſhaped, dentated at the tip; ſtalk winged. Flowers ſcattered. Calyx torn.

Polypodium montanum, *Allioni Flora Pedemont. No.* 2410.

A native of the alps of Europe.

Obs. I ſuſpect the Polypodium alpinum of Jacquin's Collectanea, *vol.* 2, 171, to belong to this genus,

* See Cyathea inciſa, *Engl. Bot. tab.* 163, a ſpecies which requires farther inveſtigation.

as

as ſpecimens received from my friend Mr. Jacquin jun. do not well agree with the deſcription given of the cover of their fructification by the celebrated Wulfen: theſe ſpecimens however are not ſufficiently perfect for me to determine the genus with certainty.

17. TRICHOMANES Linn. *Fructif.* margini frondis inſertæ, diſtinctæ.

Involucra urceolata, monophylla, exterius hiantia.

Columellæ exſertæ, piſtilliformes.

Fructif. inſerted into the margin of the frond, ſeparate.

Involucra urn-ſhaped, undivided, opening outwards.

Columns extending beyond the involucra, like ſtyles.

See Plumier's Ferns, tab. 86.

OBS. The habit is membranaceous, and ſemitranſparent.

Examples.

Trichomanes criſpum *Linn.*

Tricho-

Trichomanes ſcandens *Linn.*
- - - - puſillum *Swartz Prod.*
- - - - reptans } *ejuſd.*
- - - - lucens } *ejuſd.*
- - - - rigidum } *ejuſd.*

18. HYMENOPHYLLUM. *Fructif.* margini frondis inſertæ, diſtinctæ.
Involucra bivalvia, planiuſcula, recta, exterius hiantia.
Columellæ incluſæ.

Fructif. inſerted into the margin of the frond, ſeparate.
Involucra of two flattiſh ſtraight valves, opening outwards.
Columns ſhorter than the involucra.
See tab. 1. fig. 8.

OBS. This genus agrees in habit with Trichomanes.

Examples.

Trichomanes Tunbridgenſe *Linn.* *
- - - - aſplenoides *Swartz Prod.*

* Hymenophyllum Tunbridgenſe. *Eng. Bot. t.* 162.

Tricho-

Trichomanes fucoides
- - - ciliatum
- - - lineare
- - - undulatum
- - - polyanthos
- - - clavatum

} *Swartz Prod.*

alſo Adiantum decurrens *Jacq. Coll. v.* 2. 103. *tab.* 2. *f.* 1 & 2, but in this ſpecies the column appears to be longer than the involucrum.

19. SCHIZÆA. *Fructif.* in appendiculo frondis, ejuſdemque dorſum tegentes.

Involucra e marginibus appendiculi inflexis, continuis.

Fructif. upon an appendage to the frond, and covering its back.

Involucra from the margins of the appendage turned in, uninterrupted. See tab. 1. fig. 9.

OBS. The habit of this genus is extremely diſtinct, though the characters are not ſo clear as in ſome

others. The name is derived from σχίζω, to cleave asunder.

Examples.

Acrostichum pectinatum *Linn.*
- - - dichotomum.
- - - elegans *Vahl. Symbol.* 2. *t.* 50.

and perhaps spicatum *Linn.*—*Sm. Plant. Ic. t.* 49.

Section II.

THECATÆ. *Capsules without rings.*

Essent. Char. Capsulæ sessiles, per foramina dehiscentes, absque annulo, nudæ.

Capsules sessile, bursting by pores, destitute of a ring, and naked.

---

20. GLEICHENIA. *Capsulæ* triloculares, trivalves; *dissepimenta* e medio valvularum.

Capsules with three cells and three valves;

valves; the *partitions* originating from the middle of each valve.
See tab. 1. fig. 10.

Obs. Named in memory of William Frederick, Baron Gleichen, author of ſome microſcopic obſervations on the parts of fructification of plants.

Example.

I. Gl. *polypodioides*, the only ſpecies yet diſcovered.
Onoclea polypodioides *Linn. Mant.* 306.
A native of the Cape of Good Hope, (and of New South Wales).

21. Marattia. Swartz. *Capſulæ* ovales, ſupernè longitudinaliter dehiſcentes; *loculis* utrinque pluribus.
Capſules oval, burſting longitudinally on their upper ſide; diſcloſing ſeveral *cells* in each diviſion.

Examples.

Marattia alata *Swartz Prod.* 128. *Sm. Plant. Ic. t.* 46.

Marattia lævis *Pl. Ic. t.* 47.
- - - fraxinea *ibid. t.* 48.

22. DANÆA. *Capſulæ* uniloculares, extus poro dehiſcentes, duplici ſerie aggregatæ.
Capſules of one cell, burſting by a pore on the outſide, accumulated together in two parallel rows.
See tab. 1. fig. 11.

OBS. I have named this genus in honour of my much reſpected friend and correſpondent Dr. Peter Maria Dana of Turin, whoſe name has long ago been given, by the celebrated Profeſſor Allioni, to a plant which appears to me a ſpecies of Liguſticum.

The capſules of Danæa (and indeed of Marattia) ſtand upon ſmall veins.

Examples.

1. D. *nodoſa*, rachi ſubſimplici; foliolis acuminatis ſubintegerrimis ad marginem uſque capſuliferis, ſtipulis acutis.

Stalk ſcarcely winged; leaflets pointed, nearly entire, covered with capſules to the very edge. Stipulæ acute.

Aſplenium nodoſum *Linn.*

Lingua cervina nodoſa major. *Plum. Filices* 90, *t.* 108.

A native of Jamaica, Hiſpaniola, and Martinique, in moiſt ſhady places.

2. D. *alata*, rachi apice alata; foliolis ſerrulatis prope marginem nudis, ſtipulis obtuſis eroſis.

Stalk winged towards the top; leaflets ſerrulated, bare of fructification near the margin. Stipulæ obtuſe and jagged.

Lingua cervina nodoſa minor. *Plum. Filices* 91, *t.* 109.

A native of Martinique.

Explanation of Table I.

Fig. 1. Hemionitis plantaginea.

a. A portion of the frond, of its natural ſize.

 b. Fruc-

b. Fructification magnified.
c. Rings of the capsules.

Fig. 2. Scolopendrium vulgare.
A portion of the frond, of its natural size, with the fructification in its proper situation, the involucra being already separated.

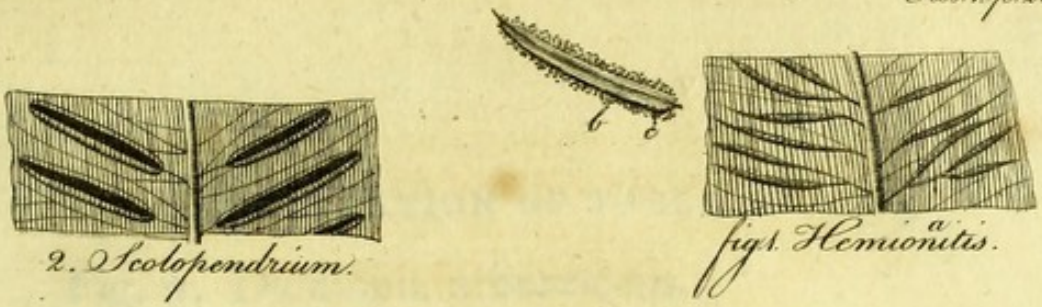
Fig. 3. Woodwardia radicans.
d. A segment of the frond.
e. Part of the same magnified.
f. Involucrum.

Fig. 4. Lindsæa, probably a new species.
g. A pinna.
h. Part of the same enlarged.
i. Involucrum.
k. Cluster of capsules.

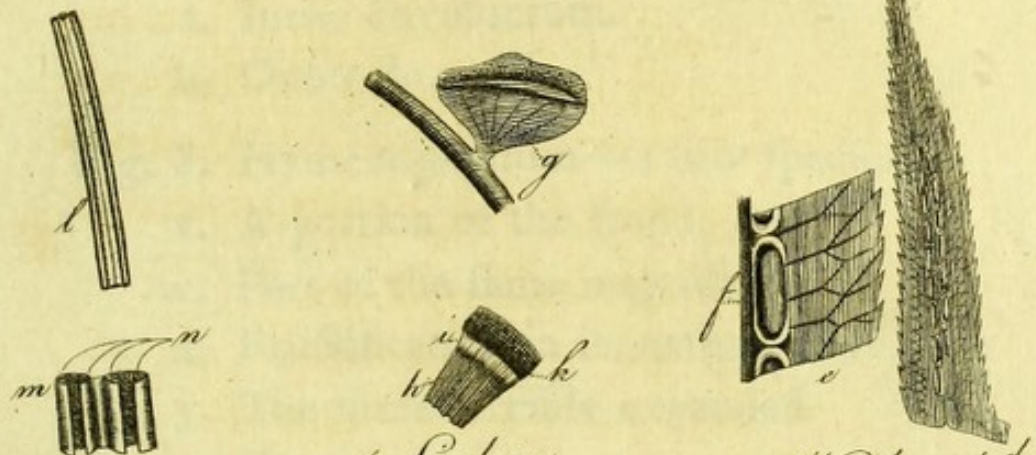
Fig. 5. Vittaria lineata.
l. Part of the frond.
m. A lesser portion magnified.
n. Involucra.

Fig. 6. Davallia canariensis.
o. A pinnula.
p. The same enlarged.
q. Involucrum.

Fig.

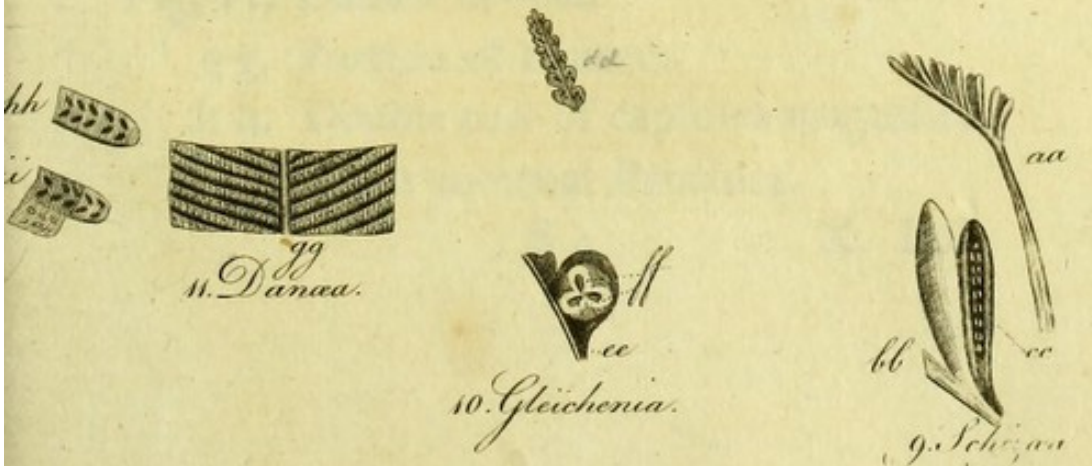


2. Scolopendrium. fig. 1. Hemionitis.



5. Vittaria. 4. Lindsæa. 3. Woodwardia.

8 Hymenophyllum. 7 Dicksonia. 6. Davallia.



11. Danæa. 10. Gleichenia. 9. Schizæa

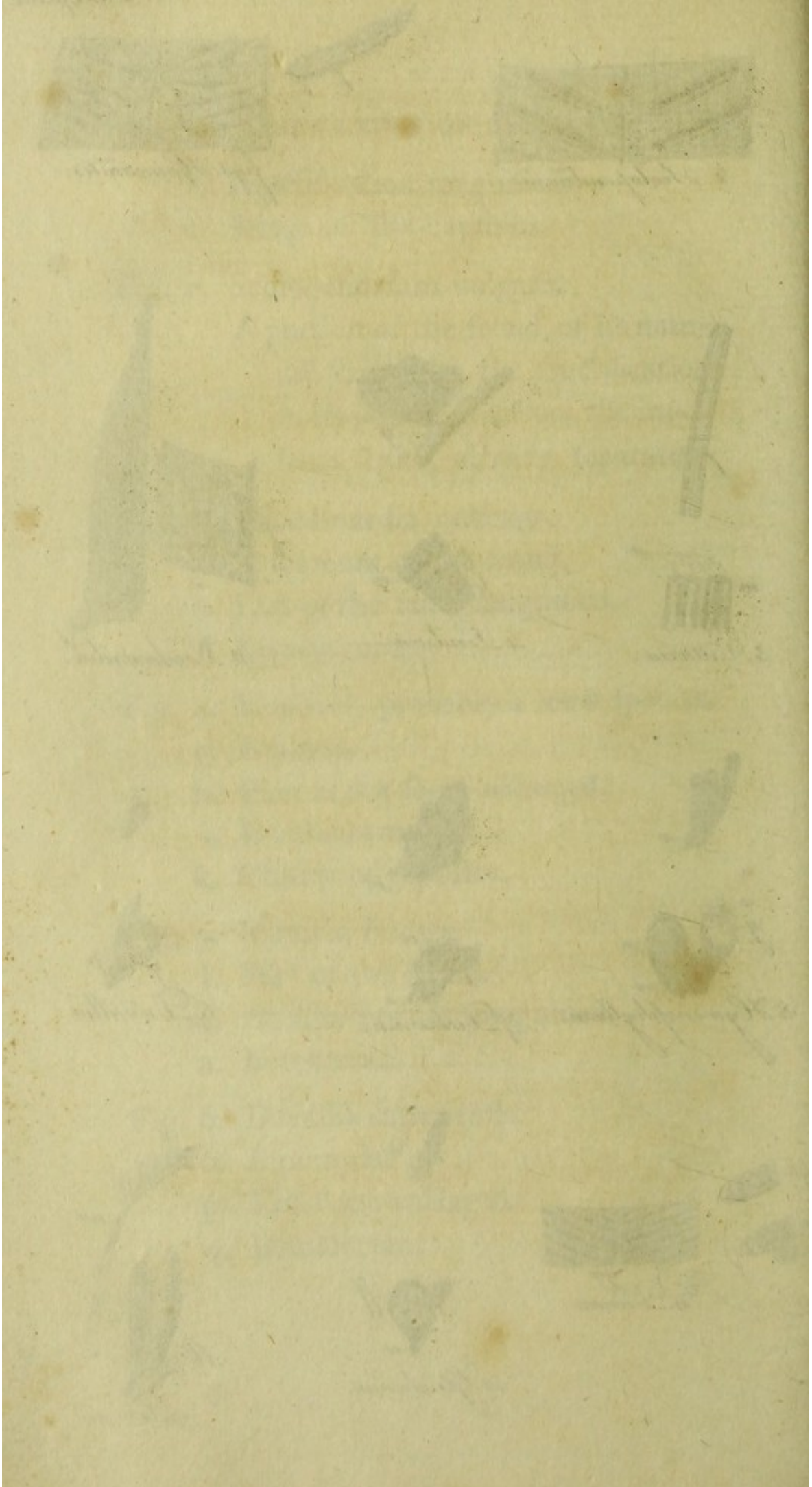


Fig. 7. Dickſonia arboreſcens.
r. A pinnula.
s. Fructification magnified.
t. Inner Involucrum.
u. Outer do.

Fig. 8. Hymenophyllum—a new ſpecies?
v. A portion of the frond.
w. Part of the ſame magnified.
x. Fructification in its natural ſtate.
y. The ſame forcibly expanded.
z. Capſules.

Fig. 9. Schizæa dichotoma.
a a. Summit of the frond, with the fructification.
b b. Part of the ſame enlarged.
c c. Involucrum.

Fig. 10. Gleichenia polypodioides.
d d. Portion of a pinna.
e e. One of its lobes magnified.
f f. Orifices of the capſules.

Fig. 11. Danæa nodoſa.
g g. Portion of a pinna.
h h. Double row of capſules magnified.
i i. Their internal ſtructure.

X.

DESCRIPTION

OF

A NEW GENUS OF PLANTS

CALLED

SPRENGELIA.

First published in Swedish in the Transactions of the Royal Academy of Sciences at Stockholm for 1794, *p.* 260, *tab.* 8.

DESCRIPTION

OF

A NEW GENUS OF PLANTS

CALLED

SPRENGELIA.

AMONG the many new genera, and even new natural orders, of vegetables, which have lately been brought from New South Wales to England, ſcarcely any is more elegant in appearance, or more numerous in ſpecies, than the tribe to which belongs the genus of *Epacris*, Linn. Suppl. 19 & 138. This genus was firſt eſtabliſhed by the celebrated Forſter; but even he, as well as the younger Linnæus, have confounded two genera under it, among the very few ſpecies they have enumerated. Theſe are

EPACRIS,

EPACRIS, *Gærtner Sem. v.* 2. 77. *t.* 94, *f.* 1.

Capſula 5-locularis, 5-valvis, diſſepimentis e medio valvularum. *Semina* aceroſa, plurima.

Capſule with five cells and five valves; partitions from the middle of the valves. *Seeds* ſeveral, chaffy.—

and ARDISIA, *Ibid.* 78, *t.* 94, *f.* 2.

Drupa 5-locularis. *Semina* bina.

Drupa with five cells. *Seeds* two in each cell.

The laſt genus however, of which I am acquainted with a conſiderable number of ſpecies, muſt not be called *Ardiſia*, as Dr. Swartz in his *Prodromus*, and the late Mr. Aiton in his *Hortus Kewenſis*, have been beforehand with Gærtner in applying that name to a very different genus. I propoſe therefore to call the *Ardiſia* of Gærtner, *Styphelia*, a name given to it originally by Dr. Solander *.

The ſubject of our preſent more immediate conſideration is a very diſtinct genus

* It is now publiſhed by that name in the 4th Number of the New Holl. Bot. *t.* 14.

from

from both the above, though of the ſame natural order. I have named it *Sprengelia*, in honour of Mr. *Chriſtian Conrad Sprengel*, maſter of a grammar ſchool (*Rector Scholæ*) at Spandow in Brandenburgh, who has richly deſerved to be commemorated as a botaniſt, by his very ingenious work on the manner in which inſects promote the impregnation of plants, printed at Berlin in 1793; and if one genus can be more proper to bear his name than another, it muſt be one marked with ſome peculiarity in the organs of impregnation. Accordingly the genus I have choſen for the purpoſe is diſtinguiſhed from all the reſt of its natural order, by having its *antheræ* united into a tube.

SPRENGELIA.

PENTANDRIA *Monogynia*.

Eſſential Character.

Calyx quinquepartitus, perſiſtens. *Petala* quinque. *Stamina* receptaculo inſerta. *Antheræ* connatæ. *Capſula* quinque-

quinquelocularis, quinquevalvis; diſſepimentis e medio valvularum.

Calyx in five diviſions, permanent. *Petals* five. *Stamina* inſerted into the receptacle. *Antheræ* united. *Capſule* with five cells, and five valves; partitions from the middle of the valves.

Natural Character.

Calyx a part of the flower, in five deep diviſions, ſo as to be almoſt compoſed of five leaves, chaffy, coloured, permanent; *ſegments* equal, lanceolate, acute, concave; after flowering erect and cloſed together.

Petals five, about as long as the calyx, lanceolate, acute, cohering a little way above the baſe, in the upper part ſpreading, and aſſuming the appearance of a wheel-ſhaped corolla; after flowering erect and cloſed together, ſoon falling off. I have diſcovered no *Nectary*.

Stamina five, the length of the petals;

filaments inſerted into the receptacle, diſtinct, linear, flat, equal, ſmooth; *antheræ* vertical, united into a tube, clothed externally with numerous yellow club-ſhaped hairs.

Piſtillum; *germen* ſuperior, roundiſh, depreſſed, with five furrows, ſmooth; *ſtyle* ſimple, about equal to the top of the *antheræ*; *ſtigma* ſimple, obtuſe.

Capſule ſomewhat cylindrical, obtuſe, with five furrows, ſeparating in the upper part into five valves; *partitions* longitudinal, ariſing from the middle of each valve; *column* a little rugged, ſhorter than the valves.

Seeds numerous, roundiſh, minute.

According to the ancient ſyſtem of Linnæus this genus ſhould be placed in his *Syngeneſia Monogamia.* But although I by no means aſſent to all the late innovations which have been made in that ſyſtem, I cannot but think the *order* juſt mentioned had better be aboliſhed, and would therefore place *Sprengelia* in *Pentandria*

tandria Monogynia, near *Azalea*, along with *Styphelia* and *Epacris*. From the laſt it is clearly diſtinguiſhed by its five petals, its connected antheræ, and the inſertion of its ſtamina into the receptacle, not into the corolla; in all which particulars it alſo differs from *Styphelia*, as well as in the ſtructure of its fruit.

One ſpecies only has hitherto come to our knowledge,

SPRENGELIA *incarnata*.

This is a *ſhrub*, about two feet high, much branched, rigid, very ſmooth, flowering copiouſly. *Wood* hard, white. *Branches* round, wavy, leafy. *Bark* brown, cracked when old.

Leaves alternate, ſometimes imbricated in three ranks, embracing the ſtem, ſpreading very much, lanceolate, acute, entire, concave, a little glaucous, without veins, rigid and projecting, remaining (though faded) through the winter, and at length being looſened

ened at the baſe, they may be turned round into any poſition.

Stipulæ none.

Flowers terminal, cluſtered, on flower-ſtalks, pale red.

Flower-ſtalks clothed with imbricated *bracteæ* like the leaves, but ſmaller, and with a membranous and ciliated margin, cluſtered under each flower.

Calyx roſe-coloured, very rarely a little downy on the outſide.

Corolla fleſh-coloured.

The dried leaves of this plant poſſeſs a ſlight degree of aſtringency, but of its uſe or properties I have no account. The tribe to which it belongs ſeems to occupy the ſame place in the ſcale of Nature at New Holland, as the genus of *Erica* does at the Cape of Good Hope; and they agree with the laſt-mentioned genus very much in habit and appearance, though eſſentially different in botanical characters. We ſcarcely know enough of them yet to decide whether Monſ. de Juſſieu has done

right in referring *Epacris* to his natural order of ERICÆ, *Juſſ. Gen. Pl.* 159, or whether the plants in queſtion ought to conſtitute a new one.

Inſtead of the uncoloured figure, drawn from a dried ſpecimen, publiſhed in the Stockholm Tranſactions, I have ſubſtituted one taken by Mr. Sowerby from a living plant, which flowered in April 1795, in the choice collection of George Hibbert Eſq. F. L. S. at Clapham. I have ſince repeatedly examined the flowers at Meſſrs. Lee and Kennedy's, Hammerſmith.

TAB. 2. fig. 1. repreſents a branch of *Sprengelia incarnata* of the natural ſize.

2. Front of a *flower*.
3. Back of the ſame.
4. *Petals* in their natural ſtate, cohering at the baſe.
5. Organs of fructification.
6. The ſame magnified.
7. *Germen* and *ſtyle*.
8. The ſame magnified.

Sprengelia incarnata.

XI.

DESCRIPTION

OF

A NEW GENUS OF PLANTS

CALLED

WESTRINGIA.

Communicated to the Royal Academy of Sciences at Stockholm.

XI.

DESCRIPTION

OF

A NEW GENUS OF PLANTS

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Communicated to the Royal Academy of Sciences at Stockholm

DESCRIPTION

OF

A NEW GENUS OF PLANTS

CALLED

WESTRINGIA.

THE order of *Didynamia Gymnoſpermia* in the Linnæan ſyſtem is almoſt perfectly a natural one, containing no plants that ought not, according to any ſyſtem, to be arranged together. It is only to be lamented that ſome genera, which naturally belong to this order, but have only two ſtamina, have neceſſarily, according to the artificial ſyſtem of Linnæus, been ſeparated from it, and placed in his claſs *Diandria*. Hence has ariſen one of thoſe vulgar objections to his ſyſtem, which any

perſon who can count from two to four might make, and which is therefore made every day. A ſufficient anſwer to ſuch is, that Linnæus intended his ſyſtem ſhould be convenient and eaſy, rather than natural; and that it is, notwithſtanding, much more natural than any ſyſtem equally eaſy that has yet been diſcovered. He by no means intended it ſhould prevent an enquiry into the true arrangement of Nature, which, on the contrary, he always held out as the great *deſideratum* of philoſophical botany.

But while I thus preſume to offer an apology for our great maſter, I muſt beg leave in ſome particulars to diſſent from him. Perhaps *Verbena*, on account of the majority of its ſpecies being truly *tetrandrous*, might be much more commodiouſly placed in *Didynamia*; as might *Cunila* alſo, if it ought to be ſuffered to remain as a genus at all, being made up of *Thymi* and *Saturejæ* chiefly, which happen to have two of their ſtamina abortive, but have few characters in common beſides.

The

The plant of which I ſhall now attempt a deſcription was, when firſt diſcovered in New Holland, called by Dr. Solander *Cunila fruticoſa*, becauſe it anſwers to the character of that genus as defined by Linnæus. Nevertheleſs, I cannot help diſſenting from this great authority, as the plant in queſtion is totally different in habit from every *Cunila*, bearing a much greater reſemblance at firſt ſight, though not on accurate examination, to *Roſmarinus*. This want of agreement in habit made me ſeduloufly examine the flower, and I flatter myſelf the following characters will clearly eſtabliſh it as a new genus.

WESTRINGIA.

DIDYNAMIA *Gymnoſpermia.*

Eſſential Character.

Calyx ſemiquinquefidus, pentagonus.

Corolla reſupinata : limbo quadrifido ; lobo longiori erecto, bipartito.

Stamina diſtantia ; duo breviora (inferiora) abortiva.

Calyx five-cleft half way down, five-ſided. *Corolla* reverſed: limb in four ſegments; the longeſt erect, cloven. *Stamina* diſtant; the two ſhorter, or lowermoſt, abortive.

Natural Character.

Calyx a part of the flower, permanent, of one leaf, of a tubular bell-ſhape, with five ſides, and five prominent angles, without any furrows or *ſtriæ*, divided about half way to the baſe into five equal, erect, lanceolate, beardleſs ſegments.

Corolla of one petal, ringent, twice as long as the calyx, reverſed: *tube* the length of the calyx, with a hairy orifice: *limb* in four lobes; the *upper lip* a little the longeſt, erect, cloven half way down; the *lower* in three deep equal ſegments, which are divaricated, of a linear oblong form.

Stamina four, about half as long as the limb, ſpreading; the two lowermoſt ſhorter than the others, and moſt frequently

quently abortive; *antheræ* roundiſh, two-lobed, incumbent.

Piſtillum: germen four-lobed; *ſtyle thread-ſhaped*, the length of the *ſtamina*; *ſtigma* cloven, ſmall.

Seeds four, naked, obovate.

I would place this genus in *Didynamia Gymnoſpermia* after *Teucrium*, rather than in *Diandria*, becauſe it has four ſtamina, two of which are ſhorter than the others; and though generally (not always) their *antheræ* are abortive, they are nevertheleſs always preſent. Theſe two ſhorter ſtamina are the lowermoſt. The flower is *reſupinate* or reverſed. It belongs to the firſt ſection of M. de Juſſieu's *Labiatæ*.

The name is given in honour of Mr. *John Peter Weſtring*, author of a Diſſertation on the *Lichen* tribe, and their uſes in dyeing, printed in the Tranſactions of the Stockholm Academy for 1794.

The only ſpecies of *Weſtringia* I have ſeen is a native of New South Wales, near Port Jackſon, and has flowered ſeveral times in the Engliſh green-houſes.

WESTRINGIA *roſmariniformis.*

A *ſhrub* very much branched; the branches either oppoſite or four together, ſquare, ſilky, leafy.

Leaves in fours, on footſtalks, ſpreading, linear-lanceolate, entire, revolute, rather pointed; of a bright ſhining green above, and almoſt naked; clothed with white ſilky down beneath.

Footſtalks very ſhort, ſilky. *Stipulæ* none.

Flowers from the upper part of the branches, axillary, ſolitary, on ſhort flower-ſtalks.

Bracteæ a pair at the baſe of the *calyx*, linear, ſhort, ſilky.

Calyx ſilky, its ſegments naked, with revolute margins.

Corolla white, with purple ſpots about the orifice.

We are not informed of any particular qualities in this ſhrub. The leaves are ſlightly

Westringia rosmariniformis.

ſlightly bitter, not aromatic; the flowers not inelegant, though without ſmell.

TAB. 3 repreſents a branch of *Weſtringia roſmariniformis*, of the natural ſize.

Fig. 1. *Calyx* accompanied by the *bracteæ*.

2. *Piſtillum*.

3. Longer *ſtamen*.

4. Shorter *ditto*.

XII.

DESCRIPTION

OF

A NEW GENUS OF PLANTS

CALLED

BORONIA.

Now first published, with some Particulars of the Death of FRANCIS BORONE.

XII.

DESCRIPTION

OF

A NEW GENUS OF PLANTS

CALLED

DORONIA.

New-York Hospital, and Jun. Professor of the Theory &
Practice of Physic.

DESCRIPTION

OF

A NEW GENUS OF PLANTS

CALLED

BORONIA.

THE country of New Holland, ſo rich in botanical novelties, has made us acquainted with ſeveral new genera of M. de Juſſieu's natural order of *Rutaceæ*, which promiſe to contribute very conſiderably to the ornament of our greenhouſes. Theſe plants are in many reſpects allied to *Dioſma*, and like that genus their flowers are beautiful, and their foliage highly aromatic, though not always pleaſantly ſo. In ſome inſtances the ſcent of the flowers is very agreeable. No genus among the whole tribe is more worthy

of notice than that to which I have given the name of *Boronia*, the characters of which are as follows:

BORONIA.

OCTANDRIA *Monogynia*. Flowers complete.

Essential Character.

Calyx quadripartitus. *Petala* 4. *Antheræ* infra apicem filamentorum pedicellatæ. *Stylus* ex apice germinis, breviſſimus. *Stigma* capitatum. *Capſulæ* 4, coalitæ. *Semina* arillata.

Calyx in four diviſions. *Petals* four. *Antheræ* on footſtalks, below the ſummits of the filaments. *Style* from the top of the germen, very ſhort. *Stigma* capitate. *Capſules* four, united. *Seeds* tunicated.

Natural Character.

Calyx in four deep equal diviſions, permanent.

Petals four, equal, alternate with the calyx and much longer, ſeſſile, permanent.

manent. *Nectary* a glandular ring, ſurrounding the baſe of the germen.

Stamina eight, permanent, ſhorter than the corolla, and four of them a little ſhorter than the reſt; *filaments* inſerted into the receptacle, flat, tapering, ciliated, terminating variouſly; *antheræ* on ſhort footſtalks, inſerted on the inſide below the ſummit of the filament, two-celled, incumbent.

Piſtillum; *germen* ſuperior, ſtanding upon the nectary, conical, with four furrows; *ſtyle* vertical, ſhort; *ſtigma* roundiſh, ſmooth, with four furrows.

Capſules four, at firſt united, but ſoon ſeparating, each of them compreſſed, of one cell and two equal valves, lined with a bivalve elaſtic *arillus*.

Seeds one or two in each capſule, compreſſed, ſmooth, ſhining.

Boronia is moſt allied to *Dictamnus* and *Dioſma*, but the leaves of every ſpecies being oppoſite, prevent its being arranged near the former, as the order is now ſub-

divided in M. de Juſſieu's work. In fact a much better diſtribution of theſe genera may probably be contrived when more of them are diſcovered and defined.

Four ſpecies only of the genus in queſtion have hitherto been detected among the dried ſpecimens collected near Port-Jackſon, by Mr. White; and only one of thoſe, the *Boronia pinnata*, has been introduced into our gardens.

I. Boronia *pinnata*.

Hawthorn-ſcented Boronia.

Foliis impari-pinnatis integerrimis, pedunculis axillaribus dichotomis, filamentis apice obtuſis glanduloſis.

Leaves abruptly pinnate, entire. Flower-ſtalks axillary, forked. Summit of the filaments obtuſe and glandular.

A ſmooth ſhrub, near two feet high, with many wand-like, roundiſh, leafy branches.

Leaves oppoſite, rarely three together, without

without *ſtipulæ*, compoſed of from three to five pair of ſeſſile, lanceolate, pointed, entire, ſmooth, ſomewhat ſucculent leaflets, with a terminal one like the reſt, though often rather ſmaller; the common leaf-ſtalk is jointed, channelled and winged.

The elegant *flowers* ariſe from the boſoms of ſeveral of the uppermoſt leaves, in ſolitary corymboſe forked cluſters, and are of a roſe colour, ſmelling like Hawthorn bloſſoms.

Stalks angular, with a pair of ſmall acute *bracteæ* at each divarication.

Calyx ſmall, reddiſh, ſmooth.

Petals four times as long as the calyx, ſpreading, darker on the outſide, ſlightly acid.

Filaments red, fringed with white hairs to the very top, which terminates in a blunt glandular protuberance, ſometimes ſlightly hairy alſo, into the baſe of which on the inſide is inſerted a ſlender ſhort ſmooth little footſtalk, bearing the *anthera*, which is oval,

ſmooth, incumbent, burſting by two longitudinal fiſſures on the under ſide.

Germen ſmall, ſmooth, four-lobed; *ſtyle* ſhort, hairy; *ſtigma* blunt, with four furrows.

Capſules ſmooth.

Seeds ſolitary, black, encloſed in a white poliſhed two-valved elaſtic caſe.

This ſpecies flowered for the firſt time in Europe at Meſſrs. Lee and Kennedy's, in the Spring of 1795. It continues there in a flouriſhing ſtate, being treated as a rather tender green-houſe plant.

TAB. 4 repreſents the *Boronia pinnata*. *Fig.* 1, Calyx. 2, Petal. 3, Stamen. 4, The ſame magnified. 5, Germen. 6, The ſame magnified, ſtanding on the nectary. 7, Capſules. 8, Arillus. 9, Seed.

II. BORONIA *ſerrulata*.

Roſe-ſcented Boronia.

Foliis trapeziformibus acutis antice inæqualiter ſerrulatis, pedunculis aggregatis

Boronia pinnata.

gatis terminalibus, filamentis apice cordatis hiſpidis.

Leaves rhomboid, acute; in the upper part minutely and unequally ſerrated. Flower-ſtalks cluſtered, terminal. Summit of the filaments heart-ſhaped and briſtly.

This is alſo a very beautiful ſhrub, riſing to the height of about four feet; the *ſtem* variouſly branched and ſubdivided, round, ſmooth, with a deciduous cuticle; the younger branches clothed with leaves, and terminated by flowers.

Leaves without *ſtipulæ*, oppoſite, nearly ſeſſile, but little ſpreading, ſomewhat oblique, rhomboid, acute, entire towards the baſe, finely, ſharply, and unequally ſerrated towards the point, without vein or nerve, punctated with reſinous dots, aromatic, with a ſmell approaching to that of turpentine. Their colour is a fine green, often with a purpliſh tinge.

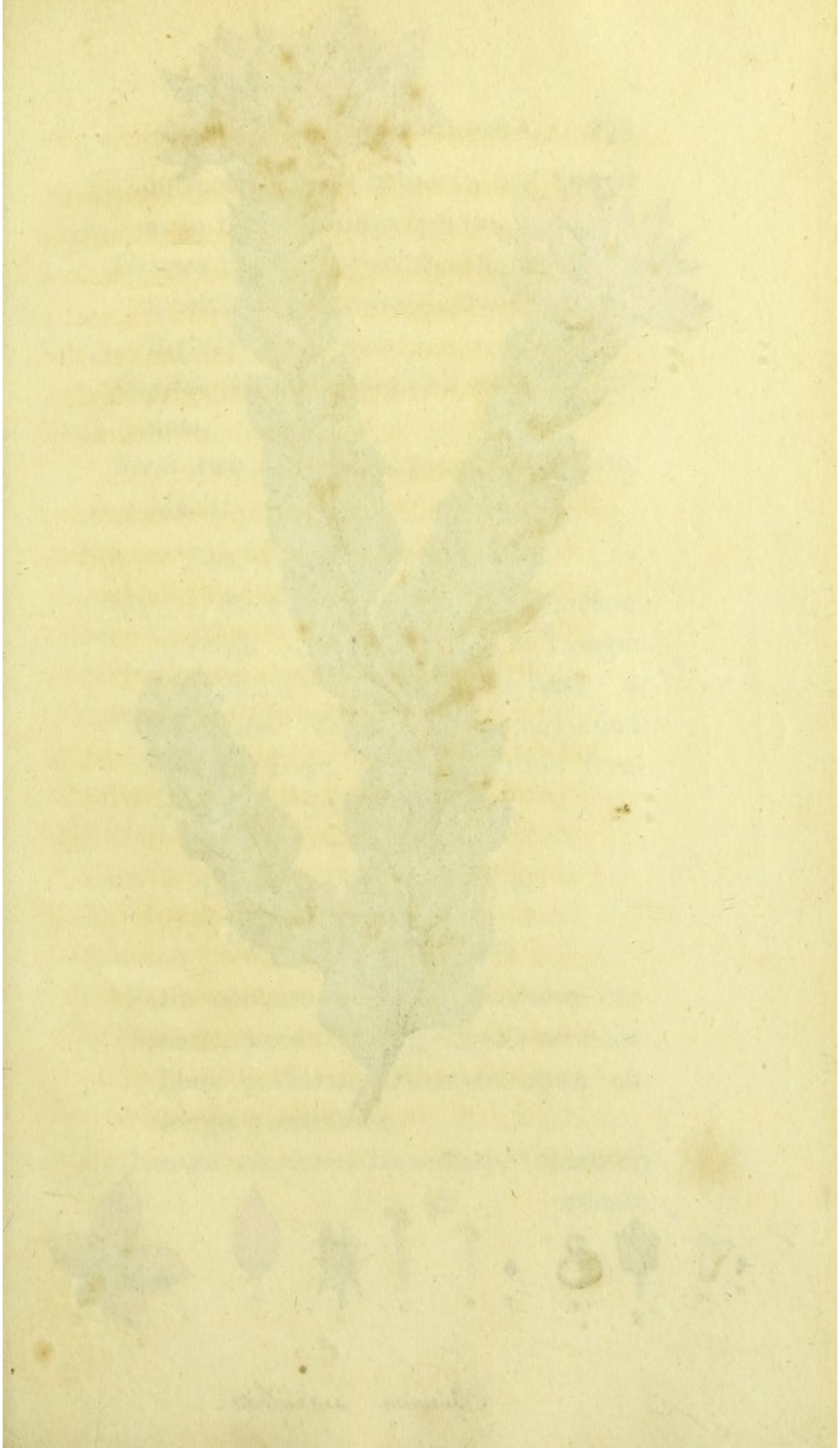
Flowers in little terminal ſomewhat corymboſe cluſters, of a beautiful red, and with the ſcent of a roſe, as we are informed by Mr. White, who mentions this ſhrub as one of the moſt admired in New South Wales. They are a little larger than thoſe of *Boronia pinnata*.

Bracteæ oppoſite, lanceolate, concave, acute, often pubeſcent in the margin.

Calyx red; its ſegments ovate, acute, ſlightly carinated and ribbed, permanent, the two oppoſite ones external, the margin of all ſlightly downy.

Petals thrice as long as the calyx, ſpreading, ovate, roſe-coloured with darker ſtripes, acid.

Filaments red, fringed with white hairs at the baſe, more naked above, but terminating in a globular notched protuberance, (leſs conſpicuous in the four ſhorter ſtamina) which is thickly covered with white projecting hairs or briſtles, the *antheræ* being inſerted on



Boronia serrulata.

on footſtalks juſt below it, and ſhaped as in the preceding ſpecies.

Germen ſmall, four-lobed; *ſtigma* nearly ſeſſile, large, conical, blunt, ſmooth, ſlightly four-lobed.

Capſules ſmooth, ſprinkled with reſinous dots.

Seeds two in each caſe, of a ſhining black.

TAB. 5. *Boronia ſerrulata.*

Fig. 1, Back of a flower. 2, Bracteæ. 3, Petal. 4, Stamina. 5, 6, Longer and ſhorter ſtamina magnified. 7, Piſtillum. 8, The ſame magnified. 9, Ripe fruit. 10, A capſule ſeparate. 11, Seed.

III. BORONIA *parviflora.*

Pale-flowered Boronia.

Foliis obovato-lanceolatis obſoletè crenatis, pedunculis aggregatis terminalibus unifloris, filamentis apice oblongis glanduloſis.

Leaves obovato-lanceolate, obſcurely

crenate. Flower-ſtalks cluſtered, ſingle-flowered, terminal. Summit of the filaments oblong and glandular.

Much ſmaller in all its parts than the preceding, and by far leſs ornamental.

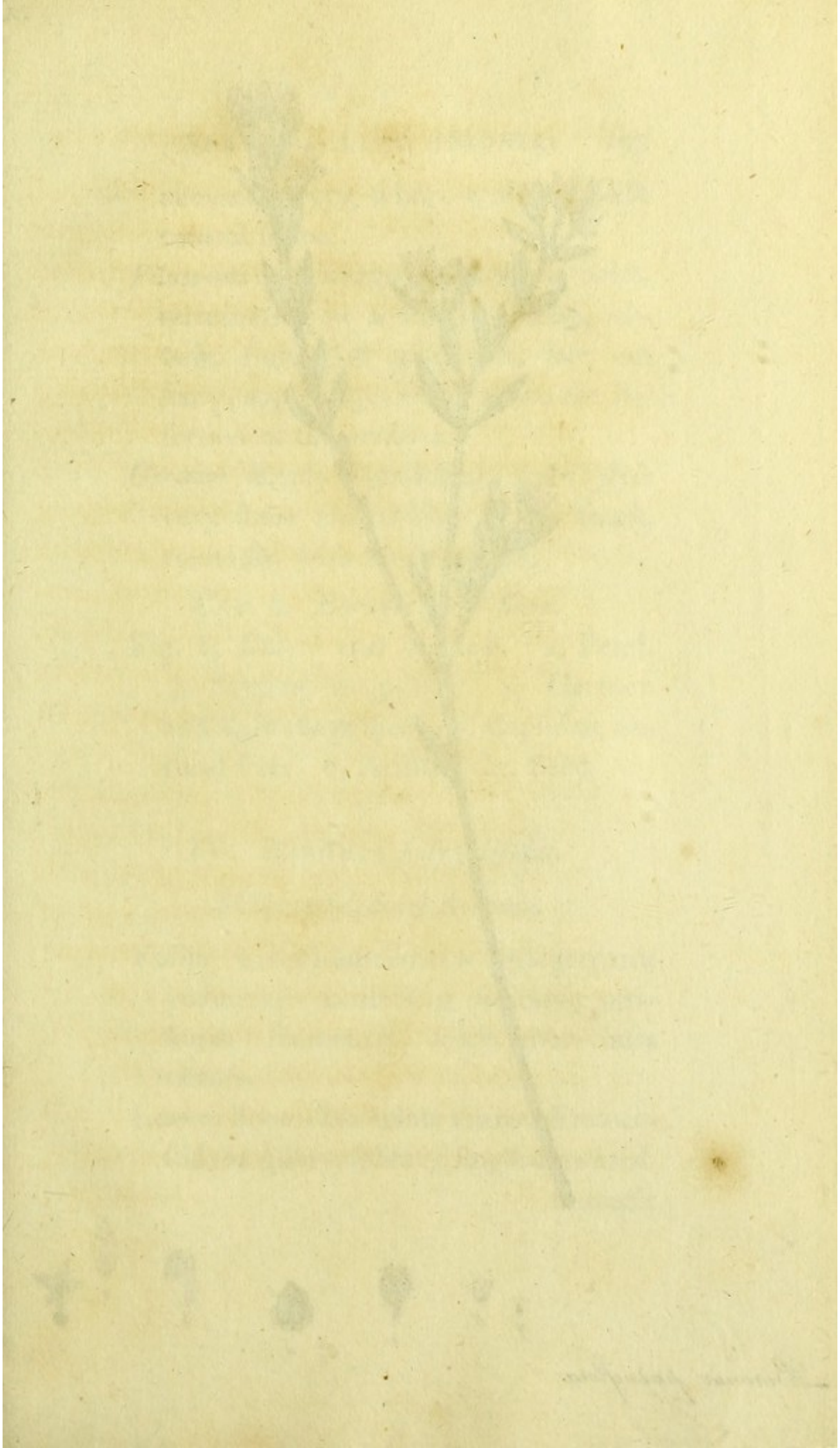
Branches round, ſmooth, naked below; the younger ones leafy, and terminated by three or five flowers.

Leaves oppoſite, nearly ſeſſile, without *ſtipulæ*, obovate, varying in breadth ſo as to be ſometimes almoſt lanceolate, acute, very ſlightly crenate, ſomewhat ſucculent, ſmooth, without veins, dotted with reſinous points, a little aromatic.

Flowers ſmall, on ſmooth, ſimple, ſingle-flowered, angular, club-ſhaped ſtalks, three together at the ſummit of each branch, and ſometimes one in each of the boſoms of the two neighbouring leaves. *Bracteæ*, two or four at the common baſe of the flower-ſtalks, ovate, concave, ſmooth.

Calyx red or purpliſh, ſmooth.

Petals hardly twice as long as the calyx, obovate,



Boronia parviflora.

obovate, acute, white, with a reddiſh central ſtripe.

Filaments red, fringed with white hairs, terminating in a ſmall, oblong, obtuſe, ſomewhat glandular, but not hairy, appendage, riſing above the inſertion of the *antheræ*.

Germen deeply four-lobed, red; *ſtyle* very ſhort and thick; *ſtigma* ſmall, roundiſh, with four furrows.

TAB. 6. *Boronia parviflora.*

Fig. 1, Calyx and bracteæ. 2, Petal. 3, Stamen magnified. 4, Germen and ſtyle magnified. 5, Capſules, natural ſize. 6, Arillus. 7, Seed.

IV. BORONIA *polygalifolia.*

Milkwort-leaved Boronia.

Foliis lineari-lanceolatis integerrimis pedunculis axillaribus ſolitariis unifloris, filamentis apice abbreviatis obtuſis.

Leaves linear-lanceolate entire. Flower-ſtalks axillary, ſolitary, ſingle-flowered.

Summit

Summit of the filaments ſhort and blunt.

The woody perennial *root* throws up many herbaceous, ſimple (rarely branched), ſmooth, ſlightly angular, leafy *ſtems*, about ſix inches high and upright.

Leaves oppoſite (ſome of them very rarely alternate, or ſometimes three together), almoſt ſeſſile, ſpreading, an inch long, linear-lanceolate, acute, entire, ſmooth, dotted, paler beneath, with one central rib. *Stipulæ* none.

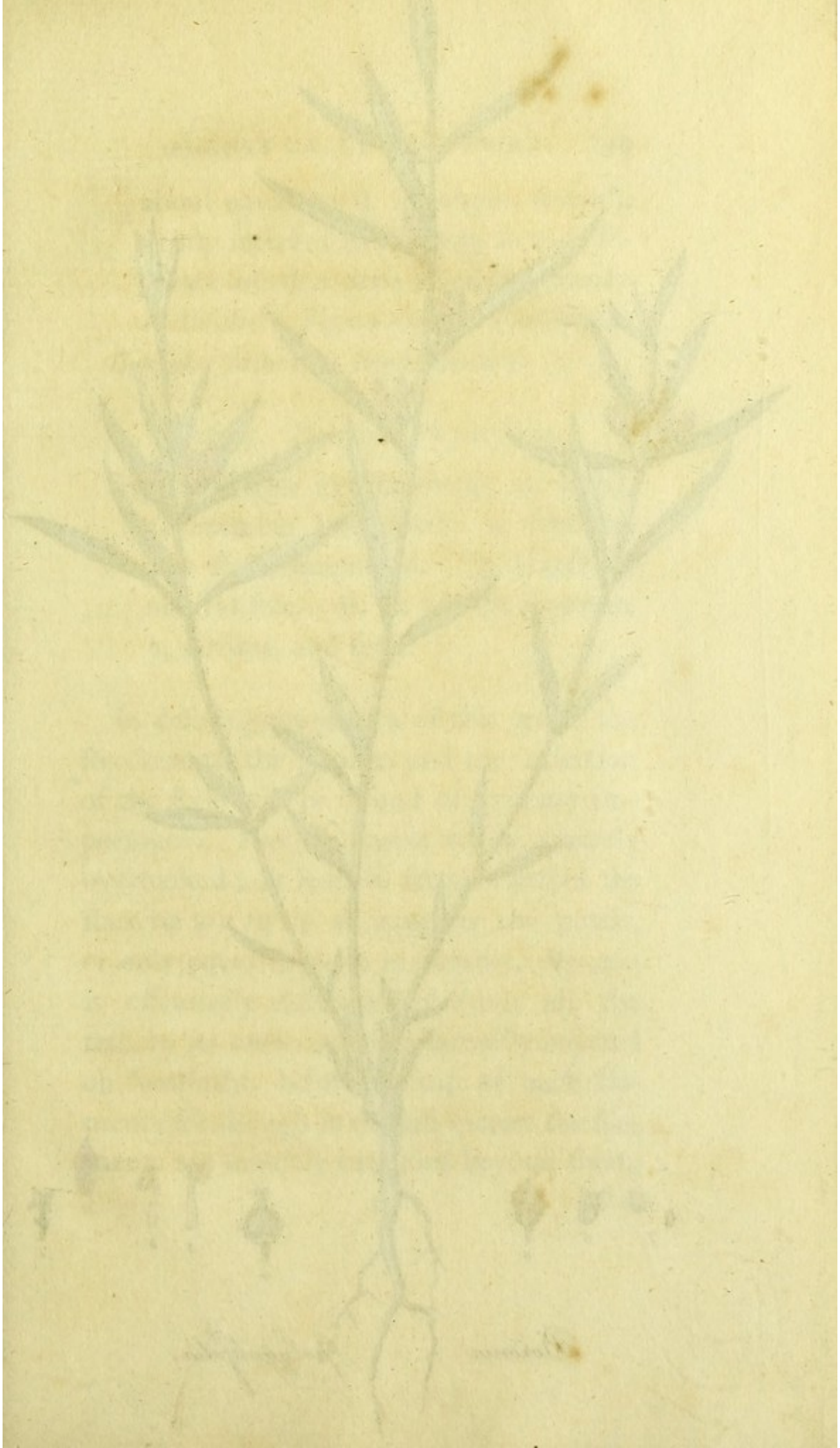
Flowers axillary, ſolitary, erect, on ſhort, club-ſhaped, angular *flower-ſtalks*, with a pair of ſmall pointed *bracteæ* in the middle.

Calyx ſmall, green.

Petals five times as long as the calyx, roſe-coloured, tipped with deep crimſon.

Filaments white, fringed to the top, obtuſe, but ſcarcely extended beyond the inſertion of the *anthera*.

Germen ſmooth, deeply four-lobed; *ſtyle* about



Boronia polygalifolia.

about equal to it in length, ſmooth, firmly inſerted into its top, ſo as to ſeparate into four parts when the germen is divided; *ſtigma* obtuſe, four-lobed. *Capſules* ſmooth. *Seeds* ſolitary.

TAB. 7. *Boronia polygalifolia.*

Fig. 1, Calyx and bracteæ. 2, Petal. 3, Stamina magnified. 4, Germen and ſtyle magnified. 5, Capſules, natural ſize. 6, A capſule ſeparate. 7, Arillus, and ſeed.

In defining the genera of this order, the ſtructure of the ſtamina and the inſertion of the ſtyle will be found of primary importance. Nor is number to be entirely overlooked; at leaſt ſo far as whether the ſtamina are twice as many as the petals, or only equal to them in number. *Boronia* is eſſentially diſtinguiſhed from all the reſt, by its *antheræ* being laterally inſerted on footſtalks, below the top of each filament; for though in the laſt ſpecies the filaments are ſcarcely extended beyond them,

ſtill their inſertiou is lateral, not terminal. There is indeed one more genus, named by me *Erioſtemon*, in which thoſe parts do ſtand on footſtalks; but in that they terminate the filaments without any appendage. The very ſhort ſtyle in *Boronia* terminates the ſummit of the combined infant capſules; in *Erioſtemon* the ſtyle grows from the centre betwéen the baſes of the capſules, and is lengthened out after impregnation; this is a very important diſtinction. *Boronia* has always four petals, eight ſtamina, and oppoſite leaves, the laſt ſpecies only having them occaſionally alternate. *Erioſtemon* has generally five petals, ten ſtamina, and alternate leaves. To this laſt-mentioned genus I believe the *Dioſma uniflora* of Linnæus belongs, having none of the proper characters of *Dioſma*, except that five of its ſtamina, being abortive, have ſome reſemblance to the five ſcales which accompany the ſtamina in that genus; but it wants the glandular crown of the germen, and in habit and inflorescence, as well as the

ſtructure

ſtructure of all its parts, altogether agrees with *Erioſtemon*.

The genus here for the firſt time deſcribed, is intended to preſerve the memory of a martyr to the ſcience, whoſe indefatigable zeal and ſingular acuteneſs would ſoon have procured him other claims to ſuch an honour, had his premature fate been poſtponed.—*Francis Borone* was born at Milan, April 6th, 1769. An active enquiring mind led him at an early age from his native country; and his talents, under the influence of a perſon he eſteemed and reſpected, were eaſily turned to natural hiſtory. His accuracy of diſcrimination, with regard not only to the appearance, but even the technical characters, of plants, has not often been exceeded. His ardour kept pace with his abilities. After overcoming difficulties apparently inſurmountable at Sierra Leone with Mr. Afzelius, he attended the late Profeſſor Sibthorp to Greece. The higheſt patronage awaited him in his own country; but he

was

was anxious to deſerve rather than to obtain it, for he never by his own fault diſappointed any expectations that were formed of his head or his heart. At length Providence in its wiſdom diſpoſed of him otherwiſe, for he died by an accidental fall at Athens, on or about the 20th of October 1794.

The following lines may ſerve for his epitaph :——

ILL-FATED Youth! on whoſe unclouded brow
Hope faithleſs gleam'd, to lure thee to thy doom;
And made thy various buſy race below
But a more ſpeedy tranſit to the tomb!

From the chill Alps to Afric's ſcorching ſtrand,
On all thy ſteps fair Flora ſmil'd benign:
And as her lovely offspring met thy hand,
Their ſpotleſs boſoms emulated thine.

Each bud to thee with fairy viſions teem'd,
Of future fame and ſkill and knowledge fair:
From thine own heart thy brighteſt proſpects beam'd,
For truth, benevolence, and joy were there.

And art thou gone?—Are all thy virtues dead?
Oh, no! for Heaven's eternal juſtice reigns!
Thy buds of hope, though pluck'd, ſhall never fade;
Their fruit ſhall ripen in celeſtial plains!

Nor

Nor can I withhold the following tributes to the merit of this unfortunate young man, as they do no leſs honour to their authors than to him :——

On the DEATH *of*

FRANCESCO BORONE,

By MRS. COBBOLD *of* IPSWICH.

WHEN great ones die, a venal train
Of Poets pour the ſorrowing ſtrain:
What elegies lugubrious flow
To ſwell the mimic tide of woe!
How grief reſounds from ſhore to ſhore!
What Sciences their loſs deplore!
The Virtues, o'er each gilded urn,
With Nature's ſelf, are feign'd to mourn.
Thus hirelings in a neighbouring land,
Around a corſe lamenting ſtand.
They beat their breaſts, they rend their hair
With ſcreams of anguiſh and deſpair.
'Tis feigning ſtill:—each knows his trade;
He howls the moſt who beſt is paid.
To humble Merit will the Muſe
A modeſt requiem then refuſe—
A lay for one to Nature dear,
The faithful ſervant, friend ſincere?
No: 'tis her pleaſure to inſpire
Wild melancholy's penſive lyre,
To breathe ſoft notes "through glade and gloom,"
And weep o'er Merit's graſſy tomb.

E'en

E'en now ſhe ſings in plaintive ſtrains,
'Mid ruin'd Athens' mould'ring fanes:
And thus, her ancient haunts among,
To Worth devotes the Fun'ral Song——

FALL ſoft, ye gentle dews of balmy eve!
Ye ſighing gales, waft night's cool fragrance here!
While laurel with the cypreſs wreath I weave,
And ſtrew with flowers Franceſco's early bier.

He loved the lonely hour, when twilight gray
Breathes her romantic ſtillneſs o'er the ſoul;
When Fancy paints her fairy viſions gay,
And the rapt boſom owns her ſoft controul.

For pamper'd Pride had ne'er miſled his youth.
Rude Poverty's invigorating rule
Taught him the lore of unaffected truth,
And train'd his ſtudious mind in Nature's ſchool.

He woo'd fair Science with unceaſing care;
With her he ſought in diſtant climes to wend:
Propitious Heav'n aſſenting heard his pray'r,
And in the Maſter gave the generous Friend.

In ſearch of knowledge, on the burning ſand
Of Afric's ſhores botanic wreaths he twined:
In vain wild fever wav'd her lurid brand,
While gratitude and friendſhip nerved his mind.

With heart elate, and ſpirits mounting light,
To Grecia's famous coaſts he bent his way:
Hope o'er his proſpects glanced her meteors bright,
And danced before him with deluſive ray.

Scarce

Scarce had he baſk'd in that deluſive ray,
Scarce ſeen thoſe meteor-gilded proſpects bloom,
When death, whoſe mandate clouds the faireſt day,
Exulting ſnatch'd him to the dreary tomb.

Wiſdom may bid his weeping friends rejoice
That he is happy, free from earthly fears.
In vain ſhall friendſhip liſten to the voice;
As vainly ſtrive to ſmile away her tears:

For Mem'ry's faithful hand ſhall fondly trace
His riſing virtues and his ſoul ſincere;
Paint Science deck'd with youth's enchanting grace;
Then place the portrait on Franceſco's bier.

Around his grave the ſweeteſt flow'rs ſhall ſpring,
Bedew'd with ſympathizing Pity's tear;
And Zephyr, from his undulating wing,
For ever ſhed delightful fragrance there.

And though no trophies proud, no ſculptur'd buſt,
Shall make his tomb to future ages known;
Immortal Athens guards his hallow'd duſt,
And conſecrates his mem'ry with her own.

SONNET,

TO DR. SMITH ON THE GENUS BORONIA,

By George Shaw, M. D. F. R. S. F. L. S.

YON Flower, mild patron of the hapleſs Youth,
To diſtant times ſhall guard Borone's name:
Thy friendſhip, guided by the voice of Truth,
Hath given to humble Worth its modeſt claim.

So Phœbus, ſkill'd in all the forms that breathe
Their balmy ſweets, in richeſt hues arrayed,
Grieved at loſt Hyacinth's diſaſtrous death,
Inſcribed a bloſſom to his gentle ſhade.

From the ſtruck lyre, in melancholy ſtrain,
All ſoftly trembled a celeſtial tone,
That, breathing rapture o'er the liſt'ning plain,
Call'd from the verdant ſoil a plant unknown;
And, ſad memorial of the fatal hour!
Raiſed, to record his name, a purple flower.

Letter from the late Dr. JOHN SIBTHORP, *Profeſſor of Botany in the Univerſity of Oxford, to* Dr. SMITH, *dated* Athens *Nov.* 1, 1794.

MY DEAR SIR,

I Should have been happy to have ſent you a pleaſant letter from Athens; but from Athens I muſt this time write you a very mournful one.—Poor Borone is no more! He was quite recovered from an intermittent fever, that had attacked him a little before his departure from Conſtantinople; and on the evening of his unhappy fate was unuſually gay, ſinging to a tune that Arakiel, Mr. Hawkins's ſervant, played upon the guitar. A little after midnight we were waked out of our ſleep by the cries of Franceſco, who had fallen into the ſtreet, out of the window of the chamber where he ſlept with Arakiel. On the ſervants going down to him, he languiſhingly groaned to Arakiel, who was the firſt that came up to him, "Ah!

povero Franceſco e morto !"—James, the other ſervant of Mr. Hawkins, then coming up, he ſaid, "Ah! James, James !" and expired.

As ſoon as Mr. Hawkins and myſelf heard that Franceſco was hurt by his fall, we immediately got up, and went down to him. On taking him by the hand, I found the pulſe gone, and no ſigns of life. We directly got him into the houſe, and attempted to bleed him, but without effect. His loins and back, on which he appeared to have fallen, were very much bruiſed; but there was not the leaſt appearance of blood, nor could I find that any bones were broken. It had rained very hard on the preceding day, ſo that the ſtreet was dirty: the night was dark, with frequent flaſhes of lightning. The opening of the window out of which he fell was extremely narrow, and appears not above eighteen feet from the ground. To get out of it, he muſt previouſly have mounted on a box that ſtood near it, and then ſqueezed himſelf through it. We have

every

every reaſon to think, all this was done in his ſleep. On the oppoſite ſide of the room to this window was another, that opened upon a terrace, on which he was accuſtomed to walk. Perhaps, if awake, which I can ſcarcely conceive, he had forgotten which of the two windows led to the terrace.

You may imagine that after this we paſſed the remainder of the night diſmally enough. The next day nothing remained but to perform the laſt offices to poor Franceſco. He was buried in the evening at the church of the Madonna, under the ſhade of a mulberry-tree. The obſequies were performed in a very decent manner by four Greek Prieſts, who chanted over him the Burial Service. Mr. Hawkins and myſelf, the Britiſh Conſul, and ſome Sclavonians who were here, with the ſervants, attended the corpſe. The Archbiſhop, who a few days before had expreſſed the ſtrongeſt obligations to the Engliſh Nation, pitifully ſent a Papas to demand fifty piaſtres (about twelve pounds) for his

per-

permiſſion to bury him. The Conſul remonſtrated with him on the impropriety and exorbitancy of the demand; when he ſent a ſecond meſſage to ſay he would take half that ſum. This produced another remonſtrance from the Conſul, when he repented, and refuſed to take any thing. He has ſince ſent us a hint that he would be glad of a preſent. We mean to ſend him a Greek Teſtament, that a Metropolitan who has four ſuffragans may read a leſſon of piety.

I regret with you moſt ſincerely the cruel end of this unfortunate youth. He had eſcaped from the thieves of Italy, and from the inhoſpitable climate of Sierra Leone. He had been with me blocked up eight days by pirates at Mount Athos. Poor fellow! he was then very anxious to hide my money, that we might have ſomething, he ſaid, to return home with.

I ſhall ſet off in two or three days for Zante, where I ſhall winter. In January I propoſe to viſit with Hawkins the Morea, and in the ſpring, or early in the ſummer,

mer, to return to England. I have made conſiderable additions to my collection of Greek plants and animals, having viſited the Bithynian Olympus, Troy, Lemnos, Mount Athos, and Negropont. During my ſtay at Athens I have procured a pretty exact knowledge of the agriculture and natural hiſtory of Attica.—Tell our friends in Soho Square, that I have all the labour, if not all the ſweets, of an Attic bee.

J. SIBTHORP.

WHILE I am collecting theſe melancholy memorials, I might, as the Poet ſays,

> " The verſe, begun to one loſt friend, prolong,
> And weep another in th' unfiniſh'd ſong."

The writer of the above letter is now no more!—A long and uncomfortable paſſage of twenty-four days from Zante to Otranto, as he himſelf expreſſed it in a ſubſequent letter, laid the foundation of a complaint in the lungs, (more eſpecially as he had

had caught a ſevere cold in an excurſion to Nicopolis near Actium,) which ſome months after his return to England proved fatal. His death was ſoon followed by that of the Hon. Mr. Wenman, one of his executors, and an excellent botaniſt; under whoſe care the publication of Dr. Sibthorp's Grecian diſcoveries might have made ſome progreſs, before the return of his other executor Mr. Hawkins, who is ſtill abroad, and whoſe eminent talents and zeal can now alone ſecure to the Public any fruits from this ill-fated expedition.

FINIS.