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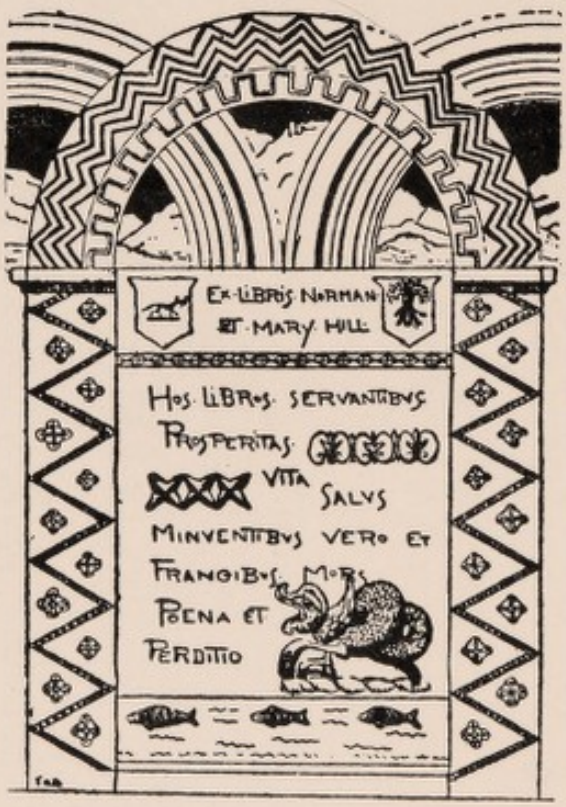
THE PHILOSOPHY OF LONG LIFE



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THE PHILOSOPHY OF LONG LIFE

THE PHILOSOPHY OF LONG LIFE

A TRANSLATION FROM THE FRENCH
OF JEAN FINOT BY HARRY ROBERTS

"THE BODY IS ALSO A DIVINE CREATION."
(*St. Augustine.*)

LONDON: JOHN LANE, THE BODLEY HEAD
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PREFACE

THE welcome given to this work on its appearance by both public and critics was a very warm one. One might almost apply to it the words of the great French historian, Michelet, who, surprised at the triumph of his *Oiseau*, said that "the most unsympathetic minds were won over and carried away by it."

As well as being translated into nearly all languages, *The Philosophy of Long Life* has, in France, gone into fourteen editions in the course of a few years. The cause of this success can only be explained by the passionate interest with which humanity follows the problem of life and death. The reader has been grateful to the author for bringing forward the many consolations with which the united sciences surround the death-bed of the modern man. The feeling of the solidarity of beings and things, as we prove later, gives us a hope of immortality to lighten our despair at the brevity of life. The possibility of the prolongation of our existence well beyond a century, the narrowing of the limits of old age, the removal of the horrors of departure, the resurrection of the body in the many forms of infinite life, are all things which tend to bring peace to our saddened and fearful minds.

We give further on, in an appendix, some extracts from the many published comments on our theories. The number as well as the diversity of their sources is a curious demonstration of the state of our consciousness when confronted with the enigma of death.

One poet, Mr. F. Bowles, has even based upon the work several fine poems, of a subtle beauty, which will appeal to lovers of life. . . .

I cannot recall without emotion certain letters, which breathed the joy of their writers at the realization of the brotherhood of organized beings. They have seen in it a new gospel of love and kindliness, making life more attractive and death itself almost seductive.

But, by the side of these enthusiastic confessions, I must also own to some despairing letters, the result of a misunderstanding which I should like to clear up. The author having been silent on the subject of the after-life of the soul, some people have taken this as a denial of it, whilst others, still more aggressive, have sought to see in it "a lack of courage to attack this vestige of the past." [1]

Now, it is not our business to deny or defend the dogma of the immortality of the soul, that of the body being our sole and exclusive goal.

In the course of our researches, which all tend to take from death all that renders it terrifying or horrible, it would indeed have been illogical to seek to destroy or diminish such a treasure of peace.

After all, the gospel of the immortality of the body may quite well harmonize with that of the immortality

[1] Quotation from an article.

of the soul. Those scientists who seem the most hostile to the latter admit it, nevertheless, in the form of a survival of our acts and our ideas. All those who oppose it seem obstinately to shut their eyes to its utilitarian advantages. True or false, it at least deserves our respectful reserve, as a cause of happiness to so many human beings.

. The author of *Irréligion de l'Avenir* has somewhere this profound saying: "Had Epicurus lived in our days, when the conception of immortality tends to become more and more smiling and celestial, he might not, perhaps, have attacked it so openly, and he might have bowed before it as he prostrated himself in the temples of the gods. . . ."

The present state of science, too, only allows us to study this problem through a thick veil. Each of us must solve it as his soul, or, if you prefer it, his temperament leads him. Now, this latter is subject to the influences of modern education. "In each of us," Pasteur says, "there are two men: the thinker, he who has washed the slate clean and, by observation, experiment, and reason, tries to find his way to the knowledge of nature; and also the emotional man, the man of tradition, of faith or doubt, who weeps for his beloved dead who are no more, who cannot, alas, prove that he will see them again, but who hopes and believes it. Evil be upon him who seeks to make the one trample upon the other, in this imperfect state of human knowledge!"

We can only respect this sacred field, reserved to the faith and happiness of faithful souls, meditative and emotional. We have done so with scrupulous piety. It has been an easy task, for our road leaves far behind

it all those paths which converge towards the salvation or after-life of the soul. . . .

Many ideas advocated in a vague fashion in the early editions—French, German, Italian and Spanish—of this volume, have since made great headway. Considered as paradoxical or fantastic, they have, some years later, been admitted by science. We may instance in this connection the principle of the life of so-called inanimate matter, together with certain data relating to the creation of living matter. The science of longevity is thus becoming wider and deeper. The author owes it to all those who have ensured the success of this effort, to bring it level with the most recent progress and discovery. It is this which justifies this English edition, thoroughly revised and considerably augmented.

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CHAPTER I

BY WAY OF INTRODUCTION

I

OUR Lady of Death hovers, pitiless, above our joys, our sorrows, our bitternesses and our hopes. The King of Terrors has not ceased to terrorize the human conscience. To-day, as in the far-back years, it is upon His altar that humanity sacrifices the greatest part of its sufferings and its misfortune. In spite of our growing intelligence, our widening science, our curiosity which dives into unfathomable mysteries, a nightmare as old as the world still troubles our thoughts, our dreams, and our joy in life. Before our eyes still floats the same shadowy kingdom, which fills us with fears and an infinite unrest. And, thinking of the call of the unknown, the average man of to-day trembles like his cave-dwelling ancestor, a prey to the same crises, the same horrors, and the same torments.

In spite of the formidable pressure of the currents of

pessimism, we cling passionately to this mortal life, which we believe the only one worthy of love and admiration. And the more we love it the more we lament its too short duration and its inevitable end. Poets, wise men, philosophers, romancers, simple shopkeepers, and leaders of the people, all think with the same tightening at the heart of the final disappearance. Auguste Comte lets slip the melancholy avowal that "Death governs all the living."

"We drive it from our minds like a disproportionate and unwelcome guest" (H. Taine).

In vain.

"Indignant revolt seizes us at the powerlessness of our efforts against death. Whatever we believe, whatever we think, whatever we attempt, we die. One feels crushed beneath the feeling of the eternal misery of all things" (Guy de Maupassant).

Terrified at the prospect, Théophile Gautier gives voice to his sorrow in these lines, which have filled a whole generation with sadness.

Belle, qui le dirait? où sont ses cheveux blonds,
. . . . . .
Cette joue aux contours ondoyants, aussi fraîche
Qu'au beau soleil d'été le duvet d'une pêche.
. . . . . .
Ces yeux bleus que l'amour, passion creuse et saine,
N'a jamais fait pleurer? Un crâne blanc et nu,
Deux trous noirs et profonds où l'œil fut contenu,
Une face sans nez, informe et grimaçante,
Du sort qui nous attend image menaçante.

Upon our calm or despairing conception of death depends at the same time our interior and our outward life. Mocked or feared, it governs the most intimate

springs of our being. The vision of it obsesses us from our earliest years and quits us only with our consciousness. The manner in which we regard our end moulds our life, our manners and our morals. As Lucretius said long ago, "The fear of death is in man the beginning of all evil passions." It is the powerful source whence spring the invisible and unsuspected roots of our tendencies and our rules of conduct.

II

The immortality of the soul, the supreme consolation of so many minds, is a matter of indifference to many others. Even those who seem most tenderly attached to its belief feel themselves invaded by poignant doubts. They feel themselves, in any case, in opposition to the demands and the logic of the psychic after-life. How otherwise can we explain the many cowardices committed by its faithful adherents for the avoidance of death, and the many absurd shifts to which they have recourse to prolong their existence?

This supreme consolation of humanity evidently loses its intoxicating charms with age.

May we not seek supplementary ways to happiness? A bold enterprise, you say, and one which has been tried a thousand times. Let us try, nevertheless, to gain our end by following another path. There are roads in which it is pleasant to stray, even if they have no outlet. Our pages will always have the merit of detaining the reader in the midst of landscapes glowing with universal animation, where, in the distance, gleams the ecstasy of limitless life.

Leaving on one side the immortal soul, as outside our subject, is it not admissible that the body is more than a contemptible covering, perishable and worthless in the economy of nature?

We are about to attempt to prove that life in its philosophic conception is an elemental force, and as such durable as nature herself.

From the point of view of our immediate interests, this force is not only more intense than is generally believed, but it also tends to increase. If man provides a vital career richer than is suspected, it further augments it with comfort and progress.

Whilst the false comprehension of life shuts it between the trivial limits of the register of Births and Deaths, its real power breaks through these superannuated ideas, and spreads, majestic and imposing, beyond the external signs of death. And, as ever, behind the little picture which we see, there is the far greater world which is unseen.

After having shown that life does not disappear with the so-called last breath, we will examine its manifestations as continued in the tomb, together with its myriad forms which bud out into the vast of nature, emancipated from the tyranny of the body.

A living being is thus eternally living.

We shall see then that the terror of death which poisons life is a meaningless and artificial sentiment. Born of the fear of the unknown, fed by legends and superstitions, by artists and writers, by religions and their priests, a product of ill-directed human thought and of false definitions lightly accepted, bound up with the horrors of hell and inseparable from the unspeak-

able terrors of departure, this fear of death, which, by a supreme irony, further shortens life, might be weakened if not rooted out.

III

Death having become in this wise a new phase of life, its continuation in forms made accessible to our understanding will hold treasures of peace. . . . A source of consolation, it will deal broadcast efficient weapons against invading pessimism. The disenchantment of our existence, cramped between its involuntary entrance and its feared and sudden exit, has much to do with the sadness of contemporary thought. Belief in the immortality of the soul steadily weakening, we find ourselves, from the sociological point of view, driven to compensate for it by belief in the immortality of the body, "which, like the soul, is a divine creation" (St. Augustine).

And whilst displaying the arguments for our contention, we will reply, on the way, to the series of questions which are for ever troubling our existence.

Does life continually diminish and its intensity weaken? Will its creation remain beyond the reach of science? Is it certain that all ends with our descent into the tomb? What is known of the peace of the grave? Does our consciousness disappear with our breath or the beating of our heart? Is death the repose of nothingness, or is not the absolute sleep rather in our erroneous conception of the End? Is the grave only the melancholy spectacle of the conquering worm,

or a new phase of being; absolute rest or source of a new life?

How many questions cluster round the maddening enigma of life and its disappearance! Above or beside the official immortality of the soul, may we not admit another possible or hypothetic mode of being? May we not try to extract some peaceful thoughts from the science of life, to bring some comfort to its dreary length which outlives our hopes, and to its continuity by opening upon it new horizons; by showing behind the withered wintry copses the spectacle of life crowned with the flowers of spring, to discover, beyond that departure which freezes us with fear, the joyful sight of the eternal return? Such is our aim.

CHAPTER II

THE MYSTERIES OF LONGEVITY

A.—The Limits of Life

I

IN the year 1245, every one was talking of a strange man. He claimed that he possessed a sovereign preservative which could conserve life for many centuries. He himself had seen the Council of Paris in 362, and been present at the birth of the Monarchy and the baptism of Clovis.

He who reports this mysterious fact is none other than the illustrious Roger Bacon. With that extreme prudence characteristic of his mind, he will only guarantee three hundred of the years passed on this earth by the eternal unknown.

To the same order of facts belongs a work published at Turin in 1613, which gives the biography of an inhabitant of Goa who was living there at the age of nearly four hundred years, overflowing with health and spirits. He enjoyed the full use of all his senses and all his intellectual faculties. Also in the seventeenth century, a Scotchman, named MacCrain, lived over two hundred years. He talked of the Wars of the Roses (1452), as we do of the Franco-Prussian War, as a spectator, with all their horrors still before his eyes.

Another work depicts the life and exploits of a certain Papalius, of German origin, who had lived for five centuries. Faria, the Portuguese, does not seem to believe in this extraordinary vitality, but he confirms the authenticity of another centenarian who had passed his third century.

It would be difficult to quote all the testimony of the contemporaries of Bacon regarding human lives prolonged beyond two centuries, just as it would be impossible to enumerate all centenarians. In all times and places, throughout the ages, civilized man stands meditatively before the longevity of his fellows. Anxious for his future, he strives to discover in the old age of his neighbours precautions for ensuring the duration of his own earthly sojourn. As the soldier carries his marshal's baton in his knapsack, so each of us, in the bottom of his heart, would like to beat the record of longevity.

Resignation to disappearance is so painful! Even those who seem to fly from life accustom themselves with difficulty to the conviction that the earth will still spin after they are gone; that everything will always be for the best, when they themselves shall be swallowed up in the eternal flow of things.

Philosopher, woman, soldier, doctor, or mere undertaker's man, it is with difficulty that we bring ourselves to the thought of our final suppression from the scene. We are all victims of the same illusion which the idea of death engenders in us; we all feel in the presence of its image the sensation of a hole, of a gulf which will open in a world of which we shall be no more. . . .

It is perhaps this altruistic sentiment, this preoccupa-

tion as to the lot of those called upon to survive us, which throws a gleam of kindness upon the hesitation of all humanity before the thought of death. And it is this which explains to us also the tenderness shown towards life in those times when all seemed the least attached to it. Without speaking of the Bible, where, while scorning human existence, we are overwhelmed by the 969 years attained by the fortunate Methuselah, grandfather of Noah, we see that even the Roman authors piously note all the cases of longevity, in a time when the most fervent cult of death was the fashion. Onomocritus the Athenian, a contemporary of Pisistratus and Pisistratides, teaches that certain men of Greece, and even entire families, enjoyed perpetual youth for centuries. Pliny and Valerius Maximus publish the fact that the King of the island of Locmians (?) expired in his 802nd year. According to Strabo, people in the Punjaub lived over 200 years. Epimenides of Crete, according to Roman writers, had seen three centuries succeed each other. When, in the reign of Vespasian, statistics were collected of all the centenarians living in that part of Italy between the Apennines and the Po, there were then discovered, always according to Pliny, more than 170 individuals of over 100 years of age out of a population of three millions. The eldest of them, Marcus Apponius, had had for his sphere of activity over 150 years of life. According to Lucian, Tiresias, thanks to the purity of his life, lived for six centuries. The same writer attributes to the inhabitants of Mount Athos the faculty of living to 130 years. He goes even further, for he records the existence of an Indian people, the Seres, for whom a temperate life and nourishment limited

to the strict needs of human nature, procured an existence prolonged to three hundred years. Pliny quotes from Alexander Cornelius the case of an Illyrian, Daudon, who had lived about five hundred years, and from Anacreon that of the King of Cyprus, Cinyras, who had outlived 160 years. Damascenus boasts of the long life of Litorius of Ætolia, who, according to the principles of that land, happy amongst mortals, had attained two hundred years.

Apollonius the Grammarian, for that matter, outdoes in his affirmations all that his predecessors have taught us on this subject, and talks of persons who had spent thousands of years of existence.

The Lives of the Saints are equally rich in statements of this kind. St. Simon, nephew of the Virgin Mary, was martyred at the age of 107 years; St. Narcissus died at 165, St. Anthony at 105, and the Hermit Paul at 113. The monks of Mount Athos often reached the age of 150. The venerable Albuna, first Bishop of Ethiopia, lived even beyond the century and a half.

Everywhere and always, in all phases of civilization and in all latitudes, we consider with infinite sympathy the spectacle of the old, who have passed what is believed to be the limit of human age. Looking on their white hairs and their peaceful eyes, we cherish golden dreams of widened boundaries to our earthly sojourn. And, nevertheless, this extreme old age which has so many lovers, has not had up to the present any historian worthy of the name. We need, even after Hufeland,[1] not only a science of longevity, which should strive to

[1] Christopher Wm. Hufeland, Professor of medicine in the University of Jena, and author of *Makrobiotik or the Art o Prolonging Life* (published 1796).

found upon the experience of centenarians of the past some rules for the future, but also an impartial study of persons who have outlived that century of time wrongly indicated as the term of our earthly existence.

II

And first of all, is it true that we cannot live more than 100 years? How hard that one of these philanthropists, who profess to love humanity, should not have thought of procuring proofs to the contrary. Whatever they may say, life being regarded by the greater part of humanity as our greatest blessing on earth, it would have been good to learn that its frontiers are wider than any one has ever led us to expect. What matters the opinion of the despisers of life, if for the simple-minded it incarnates the quintessence of earthly felicity? The happiness of crowds is almost always beyond the comprehension of philosophers. Let us leave to these latter their liberty to consider that life is a calamity, and let us offer to the greater number of minds the consolation that this supposed calamity may last far longer than is generally thought.

For the rest, our contemporaries, believing less and less in the idea of a future life, are perhaps right in attaching themselves to the present one. If nothingness awaits us with death, what is there astonishing in attachment to the reality offered by life?

Nor is this so ephemeral as is repeated in every key. Without discussing the middle period of our life, the result of numerous causes to which man bows without power or will to master them, let us rather consider its extremes.

According to the researches of Haller, one of the rare scientists who have studied the question of the limits of our existence,[1] man counts among the most long-lived animals. The limit of his earthly sojourn should not be 90 to 95 years, as it is spoken of to-day, but 200 years. He quotes in support of his theory two centenarians; of whom one, Thomas Parr, died at 152, and the other at 169, both dying by *accident*.

The first, Thomas Parr, lived for 152 years, happy in his Shropshire village, when the king expressed a desire to see him. He was summoned to Court, and there, to entertain him worthily, they gave him so much to eat that the poor old man died of indigestion. The celebrated Harvey, who dissected him, found that his body, which was admirably preserved, might have lived a great many years more.

The second example is that of Henry Jenkins, of the county of Yorkshire, a poor fisherman, who at 100 still swam across rivers, and died in the year 1670, at the age of 169, as the result of a chill. Called upon to witness to a fact dating 140 years back, he appeared before the justices accompanied by his two sons, of whom one was 102 and the other 100 years old. Humboldt assures us, for his part, that he had seen near Arequipa a peasant aged 143, whose wife was 117.

No less authentic is the famous Norwegian peasant J. Gurrington, who, dying at the age of 160 years, left by his last marriage a son of 9 years old, whose eldest brother was . . . 108.

Professor A. Weissmann, who has studied the duration of being from the zoological point of view, arrives

[1] *Elementa Physiologiæ*, Vol. VIII, Book XXX.

also at conclusions soothing to the self-respect of man, or rather to his love of life. Longevity depends, according to him, not only on the dimensions of our bodies (the elephant lives 200, the horse and bear 40 to 50, and the hare 10 years), but also on the energy of our vital elements and the interests of the race. Looked at from this point of view, the statistics of centenarians are all decidedly in favour of the privileged situation of man.

According to the comparative statistics of old age, as they stood at the beginning of the year 1897, there was then amongst the living a negro, Bruno Cotrim, of Buenos Ayres, who was over 150. In Servia alone there were three centenarians of from 135 to 140 years, 18 from 126 to 135; 123 from 115 to 125; and 290 of from 105 to 115.

In the United States there were, in 1890, 3,981 persons aged over 100 years, and London at the same time possessed 21.

In certain countries, such as Chili, where the old-age statistics for the last few years are wanting, there were known, however, in 1855 several old men who had passed the age of 120 years. We may recall amongst others a certain Juan A. Caledon, who, at 121, married again, the bride being already . . . 98.

Russia seems to be the classic country for centenarians who can boast of their 150 years. According to official Russian statistics referring to the year 1850, there lived at that time on the confines of Livonia an old man aged 168 years. He had seen seven sovereigns upon the throne of the Tzars, and spoke as an eye-witness of the Battle of Poltava, in 1709, where he had fought in the Russian ranks.

Dr. P. Foissac quotes numerous examples of persons who have lived over 150 years. Such were a Canon of Lucerne, who passed away in 1346, having accomplished his 186th year; a Hungarian archbishop named Spodisvoda; a Scotch Abbé, and a Croatian peasant, who attained their 185th year.

Mr. J. B. Bailey guarantees the authenticity of the tenth marriage contracted by John Weck at the age of 106. The same author recounts the life of John Kovin, who died at 170, and his wife, who died at 164 years of age.

Mme. Durieux (of Haute Savoie) died at the age of 118. According to Dr. C. W. Evans, Thomas Carew was, on the day of his death, fully 207 years old.

Dr. Van Oven, who has studied 231 deaths occurring at between 110 and 130 years of age, has been able to state with certainty that 91 of these centenarians died between 120 and 130, 37 at 110, 11 at 105, and 17 at over 100 years.

Prosper Lucas, too, the author of *Hérédité Naturelle*, describes several interesting centenarians.

A farmer of Temesvar (Hungary), Peter Czortan, dying in 1724 at the age of 185 years, left behind him a son of 155 years and another of 97.

The *Lancet*, the well-known London medical paper, published some time ago an interview with a centenarian of Bogota who was 180. The same paper once described an operation for strangulated hernia performed by Morris upon a woman aged 109.

Let us say finally that according to the conscientious statistics of M. Solaville, there were in Europe, in 1870, 62,503 individuals above the age of 100 years.

Dr. Emerson states that there are found among the black population of certain provinces of the United States more than 2,000 persons out of 100,000 of over 100 years of age. This assertion is indirectly confirmed by Pritchard.[1]

He mentions several surprising facts relative to the longevity of negroes.

Amongst others we may recall the very curious case of two blacks, Joseph Bon and Robert Linch, who died in Jamaica, one at the age of 145, the other of 160 years, and of two negresses, Rebecca Tury, who died at 140, and Catherine Hiatt at 150 years.

According to Lopez Casteguod, Royal Historian of Portugal (whose statement is confirmed by Maffens, the historian of the Hindoos), a certain Niemens of Cugna, born in the province of Bengal, lived 370 years. This singular centenarian was the wonder of all beholders. His hair had changed colour several times; turning grey towards the age of 100 and afterwards white, it regained its black colour when Cugna was over a century and a half old.

But if the case of Cugna seems very doubtful, that of Robert Tylor, who died in 1898, is of incontestable authenticity. This grand old man of Scarva was born in 1764, and performed the duties of postmaster under George IV and William IV. Queen Victoria, who had been told of the oldest postmaster in the world, sent him her portrait with this dedication—

"A gift from Queen Victoria to Mr. Robert Tylor, as a souvenir of his age, unprecedented within the memory of man." This souvenir of the Queen affected

[1] *Physical History of the Human Race.*

the old man so deeply that he died three months after at the age of 134.

Let us add, for the greater consolation of the celibate, that Robert Tylor was unmarried up to the age of 108 years.

In the same year which cost Tylor his life there died in England a lady famous for her sturdy and comfortable old age. This was Mrs. Ann Armstrong, deceased at the age of 117 years, having preserved up to that time her perfect health and memory. She saw well without spectacles and walked without any support.

Later, Mrs. Mary McDonald, an inmate of the home for the aged in Philadelphia, held the record for feminine longevity. At the beginning of the year 1900 this lady had attained her 130th year.

In 1776 there were in France per 100,000 inhabitants [1] 859 persons of over 80; in 1886, 1,419.

The official statistics of different European countries show, between 1869 and 1871: in Italy, 302 centenarians; in Austria, 228; in Hungary, 384; in England, 160; in Scotland, 79, etc.

It is true that the declarations made by centenarians are usually contested. Men who have reached the age of eighty are as anxious to add to their years as women of forty are to make themselves appear under thirty. But, whilst making due allowance for the insufficiency of statistical verifications, there still remain a number of cases important enough to prove the frequent existence of centenarians, a fact so passionately contested by several statisticians.

[1] See E. Levasseur, *Popul. Française*, Vol. II.

The working of certain tontines furnishes us with decisive arguments on this subject. That known by the name of the *Caisse Lafargue*, founded in 1791, which had 116,000 members up to the date of its decease in 1888, contained, nevertheless, 22 centenarians, of whom one was over 105. Let us add that *nearly half* the members do not enter into this calculation, they having disappeared without giving the least sign of their existence. Admitting the very probable fact that the 55,000 members who found themselves in this position would have contained the same proportion of centenarians, we have about 40 centenarians in 116,000 persons, making one centenarian in 2,900 persons.

An English statistician, who has had the patience to examine the 76,892 deaths announced in the *Morning Post* between 1877 and 1896, has found 10,806 deaths at over 80, 1,198 between 90 and 95, 262 between 95 and 100, and 30 between 100 and 105.

We must underline these thirty known and verified cases of centenarianism, for, in spite of the scepticism with which longevity of over 100 years is received, centenarians are more and more numerous, and constitute a statistical fact as incontestable as the heavy mortality of children under one year, or the increase in the birth-rate after every war.

Here is a curious table of *authentic* centenarians existing in Europe between 1887 and 1896, who died at the age of over 100 years. It is given by Alice Lady Glenesk in the *Nineteenth Century* (Vol. XLII, Sept. 1897, p. 398).

Dying at over 100 years	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	Total
100 . . .	1	7	5	2	10	5	8	2	5	5	50
101 . . .	2	2	2	4	7	2	3	3	3	4	32
102 . . .	0	0	2	2	8	6	4	4	1	6	33
103 . . .	2	1	3	1	7	2	2	2	1	2	23
104 . . .	0	2	1	0	5	4	2	1	4	1	20
105 . . .	1	2	2	0	2	1	2	1	2	1	14
106 . . .	0	0	1	0	5	2	3	2	0	2	15
107 . . .	2	1	0	0	0	2	1	1	0	0	7
108 . . .	0	0	0	1	1	1	0	0	0	1	4
109 . . .	3	0	0	1	1	0	0	0	1	2	8
110 . . .	0	1	0	0	2	2	1	3	0	3	12
Returned as having died at over 100	3	4	1	2	1	1	0	2	1	0	15
Total . .	14	20	17	13	49	28	26	21	18	27	233

Mr. T. E. Young, author of an interesting treatise on English centenarians (*On Centenarians*, London, 1899), gives many proofs of their authentic existence. His conclusions are based almost exclusively on incontestable documents, taken from the records of life insurance offices. We may note also that the English Institute of Actuaries, founded in 1848, whose object amongst others, is to display the special work of the English insurance societies, has at the same time brought plainly into sight the optimistic theory of the limits of human life. About 62 life insurance offices and 46 which deal with annuities have taken part in a sort of consultation, having for its end the elaboration of definite principles of insurance, in conformity with the laws of mathematics. Observations were taken of 25,000 persons insured for annuities and 800,000 who had taken out life insurances. Adding to these the notes collected by Mr. A. J. Finlaison, C.B., in his "Report on the Mortality of Government Life Annuitants" presented to the

National Debt Commissioners and Lords of the Treasury in 1883, we have before us a vast field for investigation, for the last work alone covers 10,929 men and 19,859 women, and represents a total of 430,595 years of human life.

These figures all show that life of more than 100 years is not so rare as the detractors of centenarians would have us believe. The tables in question have shown above all the existence of 22 persons of over 100 years of age.

The *Journal of the Institute of Actuaries* (Vol. XXX) gives us, besides, several other cases of centenarians. Thus Mrs. Margaret Anne Neve, a native of Guernsey, is there presented to us as a person of over 108. At the age of 91 this worthy lady made a tour on the Continent in order to refresh her memories of a visit made seventy years previously. In *English Life Tables*, published in 1864, Dr. William Farr, after proceeding to a rigorous examination of the English population deceased between 1838 and 1854, establishes the existence of numerous centenarians. According to the learned English statistician, there were, towards the year 1854, 79 centenarians who had attained their 100 years, 25 of 102, 1 of 107; while on the feminine side there were 144 of 100, 85 of 101, 49 of 102, and 1 of over 108.

At the beginning of the year 1901, several English newspapers having traced out the survivors of the eighteenth century, as many as 20 were found who had seen the dawn of their third century of life.

Amongst the number, Mrs. Elizabeth Hanbury, who saw the light in June 1793, still enjoyed in 1901 all her

mental powers. We may quote, too, Mrs. Anne Sims, born in 1797, Mesdames Stock, Alsop, Perry and Wilmot, all born in 1800, etc.

On the masculine side there were Mr. Robert Kew, born in 1796, Mr. Parr, born in 1799, etc. An illustrated London paper (the *Sphere*, January, 1901), having made inquiries about all these persons, noted with astonishment the satisfactory state of their health. A not less astonishing circumstance is that their mental faculties acted almost normally.

We may recall a no less consoling inquiry to which the celebrated English doctor, Mr. G. M. Humphrey, F.R.S., professor of Surgery in the University of Cambridge, devoted himself in 1884. The author has shown us its results in his curious work, *Old Age*, published in 1889. Always preoccupied with the problem of the limits of human life, the learned doctor sent a circular inquiry to a large number of his colleagues, requesting them to fill it up after having carefully checked all statements. Side by side with the number of years at which their venerable clients had arrived, the doctors were asked to give and verify the exact state of their health, with all its defects. Their attention was particularly directed to the state of the heart, stomach, and senses. Out of 52 duly attested cases of centenarians, almost all were in a satisfactory state of health. Let us add that, according to the reports of Dr. Humphrey's correspondents, almost all the centenarians ate little and drank still less, led out-door lives, rose early, and their average length of sleep did not exceed eight and a half hours.

Soon after the first French publication of this work,

official statistics of centenarians compiled in the state of Sao-Paulo in 1898 were kindly sent me by the Brazilian Government. Of quite recent date, verified and checked by local powers who can have had no interest in falsifying the facts, these statistics deserve to be taken into consideration. It follows, therefore, that in the State of Brazil, which has but two millions of inhabitants, there were in 1898, 72 centenarians, of whom 25 were men and 47 women. Among their number were 2 aged 101, 4 aged 103, 11 aged 105, 1 aged 106, 2 aged 107, and 4 aged 110. The age of 120 years is given here as a certain fact, being enjoyed by an inhabitant of the Commune of Ubatuba, and that of 130 years attained by an inhabitant of Mogy-Mirim.

On the occasion of the death (in 1903) of Thomas Sheehy, who had reached 110 years whilst preserving all his intellectual powers and vigorous health, the English newspapers sought out the centenarians then living in the United Kingdom. We have picked out from these lists about 36 names presenting absolute guarantees of authenticity. Beside Mr. Charles Green of Brighton, with his venerable age of 109 years, figures Miss Kate Livingstone of the Island of Mull, of over 108 years; Mr. E. Jenkins, 105 (London); Mrs. R. Berks, 104 (Doncaster), etc.

The case of Mr. William Stuart of Letterkenny leaves us, however, perplexed. His age is given as 120 years, without supporting proof. The happy possessor of so many years was carried off in 1903, after an illness.

If statements furnished by the American newspapers were to be trusted, we might find among them enough to nourish the boldest hopes on the subject of the dura-

tion of our life. I take, for example, an article in the New York *World*, Nov. 2, 1902, on American centenarians, where the authenticity of several surprising cases is certified.

Mr. John Bradley, who, according to his doctor, is only 104, persists in affirming that he is in reality over 125. Leaving on one side the numerous centenarians of between 100 and 105, we are assured of the existence of Mr. Noah Raby, who, born in 1772, would have been at that date (1902) about 130. Without wishing to corroborate this comforting enumeration, let us nevertheless state that, according to the American journalist, all the centenarians questioned by him declared that they wished to live longer still.

The same newspaper (Jan. 11, 1903) guarantees a still more incredible fact. It claims to have discovered the oldest man on earth in the person of Mr. Manuel del Valle, an inhabitant of Los Angeles, who has attained the age of 157 years. The document certifying the birth of this centenarian was signed on the 24th of November 1745 by the Chief Magistrate of Zacatecas, in Mexico. This astounding old man was already over 40 when the French Revolution broke out! He is shown as of very small stature, nearly blind, eating and drinking very moderately, never smoking, and taking no alcohol.

It is also in the Transatlantic newspapers that we find the life story of Mrs. Ramsey Wood (of Hillsboro', Oregon), who, born in 1787 at Knotaville, Knox County, Tennessee, had reached in 1904 the age of about 119. Her mother died at the age of 105, whilst she herself continued to live a peaceful life in her Hillsboro' cottage, where she was visited by her six descend-

ants of the fifth generation, eleven of the fourth, twenty-one of the third, etc.

Coming nearer home, we have seen the more authentic case of the Baron of Waldeck, who died in Paris at the age of 107, as well as numerous other strictly verified examples of persons of over 100. We may recall amongst others the case of M. Lasserre, grandfather of the Deputy, who died at St. Nicholas-de-la-Grave, at the age of 101, in complete clearness of mind; that of M. F. Michau, ex-librarian of the town of Olivet, who died at the age of 105; and of Mlle. de l'Isle de Fief, of Nantes, who died at 107. M. Camille Flammarion, who furnished us with curious details of the two latter cases, tells genially how, some months before his death, M. Michau promised him, on the flowery banks of the Loiret, to live at least until the following meeting of the Astronomical Society, of which he was one of the most faithful members.

Here are several no less significant cases. The Leblancs, husband and wife, living in the town of Louviers in France, are both over 92. They have been married 70 years. The husband, a gardener by profession, still works at his trade in spite of his advanced age.

I have several times met the celebrated Charles Bocher who died on the 15th April, 1908, in Paris. He was known by the nickname of "The oldest subscriber to the Opera." He died at the age of 92. I met him for the first time behind the scenes at the Opera, at the age of 91, distributing sweets to the little *danseuses*. Full of wit and high spirits, he told me some delightful anecdotes of life behind the scenes under the Second

Empire. He was deeply attached to life, understood it, and was convinced of its desirability.

The longevity of Mlle. Maria Josefa Nieto-Santos, who died at the age of 127 years, is most remarkable. We shall insist a little upon this exceptional limit of life. Nearer to us, it is easier to verify. She came into the world in the reign of Charles III on the 9th of October, 1781. Dr. Hernandez Briz, who has especially studied the case of this centenarian, has found her certificate of baptism at Grenada in the parish of the Augustines. She married a waiter in a *café* at the age of fifteen. Her husband dying, she went out as laundry-woman at the Palace, under Charles IV. She then married for the second time a carpenter named Gonzalez, by whom she had several children. In 1888 she obtained a bed in ward No. 13 in the Madrid Hospital. Until the last day of her life, which was over five quarters of a century, her organs acted admirably. Her half-closed eyelids did not prevent her from seeing. She had a moderate appetite, but her digestion was quite normal.

M. Manuel Garcia, the celebrated professor of singing, who died quite recently in England at his villa at Cricklewood, was also over 102. A brother of the celebrated Mme. Viardot, of whom we speak elsewhere, and of Mme. Malibran, he was born in Madrid in 1805. The scientific world owes to him the invention of the laryngoscope, the apparatus which makes it possible to examine the vocal chords.

On the occasion of his centenary the old man, who also took an active part in life, was the recipient of many distinctions. The Emperor of Germany sent him the

Grand Gold Medal of Science of Prussia, with a personal letter. He was also made a Commander of the Victorian Order and Grand Cross of the Order of Alfonso XIII.

Garcia's intimates tell me that his health began to totter after the celebrations of his jubilee. The emotions felt in such circumstances seemed to wear him out. The old man became more nervous. His life, ordinarily so peaceful, could not resist the excess of honours with which he was overwhelmed, and he died in the year following the celebration of his centenary.

All these data prove that it would be wrong to imagine that human vitality has suffered any diminution. Far from diminishing, in comparison with past centuries it seems rather to have grown with the progress of civilization! The discoveries of Pasteur, the hygienic improvements realized in our towns, the triumphs of serumtherapy, the augmentation of the general comfort, are so many factors exercising a beneficent influence on human longevity, and on the increase in the number of centenarians. For in proportion as the average of our life is lengthened these special cases of longevity become more frequent.

III

We should be wrong in believing that the generations which preceded us lived longer than those of our days. For wherever statistics permit us to examine closely comparative longevity throughout the centuries, we arrive at reassuring conclusions for the present and the future.

In France, where we are enabled to compare the average of life from 1789 to the present day, we obtain results which leave not the slightest doubt of the augmentation of the length of human life.

The vital statistics compiled by Duvillard, Demonferrand and Bertillon, as well as those of the General Statistical Department of France, are found in this respect in complete accord. It results therefrom that whilst at the beginning of the century the average life was 35½ years, between 1877 and 1881 it was over 40 (40½ for men and 42 for women). The data furnished by M. Legoyt in the *Annuaire de l'économie Politique* for 1865 are yet more significant. The life average, according to the average age at death, has progressed steadily since 1806. It has been as follows—

	Yrs.	Mths.		Yrs.	Mths.
1806–1810	31	6	1836–1840	34	11
1811–1815	31	10	1841–1845	35	0
1816–1820	31	10	1846–1850	36	0
1821–1825	31	5	1851–1855	36	8
1826–1830	32	5	1856–1860	36	4
1831–1835	33	6	1861–1865	36	5

Not less conclusive is the list compiled by E. Levasseur in his *Population Française* concerning the number of deaths per 1,000 inhabitants in the course of the decades from 1801 to 1888—

1801–1810	28·2	1841–1850	23·3
1811–1820	25·9	1851–1860	23·9
1821–1830	25·0	etc., etc.	
1831–1840	25·0	1886–1888	22·2

On comparison of the tables drawn up by Dupré de Saint-Maur of deaths before 1750 with the French mortality of to-day, we arrive at still more optimistic conclusions. At ten years old we have twenty per cent.

more children living, and, whilst in the year 1750 about half of the total number died between 10 and 50 years, in our time the number is reduced to one-third. Of 1,000 persons born into the world, say in 1700, only 246 remained in 1750; whilst, according to the calculations of the Statistical Department, of 1,000 born in 1850, about 490 should still be living in 1900.

The National Old Age Pension Fund in France has, too, corroborated the above statement at the cost of a very considerable deficit in its funds. Having taken for the basis of its calculations Deparcieux' tables, made in the sixteenth century according to the mortality in the more well-to-do classes of society, it was obliged to appeal to the State, which allowed it in 1884 a sum of eleven millions of francs, a deficit occasioned by a longevity quite unexpected, and in excess of its provisions.

Nevertheless the French people are not counted among the most privileged from the point of view of vitality. In places when life is much better balanced, where certain evils peculiar to the French population are not felt with the same destructive power, the mortality is even less, as for example in Greece, where there are but 20·8 deaths in 1,000 inhabitants; in Denmark, 19·7; in Norway, 17·02; in Sweden we find it even as low as 16·3. What a difference between the case of Norway and that of certain Slavonic countries where the number of deaths is more than double! In European Russia it is 35·7; in Croatia and Slavonia, 38·7. If we cross over to the New World we shall there acquire data which open still more reassuring prospects for the possibility of the prolongation of human life. In certain colonies of Australasia the number of deaths per 1,000 has lowered

between 1858 and 1882: in Tasmania to 15·6, in Victoria to 15·5, in South Australia to 14·9, and in New Zealand to as low as 12·2. And still more surprising, wherever official statistics allow us to make comparisons with the past, we find the same phenomenon of the increase of human life.

Let us take, for example, the Scandinavian countries, whose rigorous statistics date back for more than a hundred years, and we shall be astonished at the almost mathematical regularity of the constant diminution of deaths. Let us choose at hazard some past decades.

Denmark records between 1770 and 1779, 30·5 deaths per 1,000; between 1780 and 1789, 29·1; between 1810 and 1819, 23·4; 1840 and 1849, 22·0; 1860 and 1869, 21·3; 1870 and 1879, 20·3; 1880 and 1887, 19·7.

In Norway between 1805 and 1815, 24·9; 1826 and 1835, 19·5; 1855 and 1865, 17·7, etc.

In Sweden we find 27·6 between 1781 and 1790; 23·6 between 1821 and 1830; 20·6 between 1841 and 1850; 18·2 between 1871 and 1880; and 16·3 between 1886 and 1888.

In Holland, comparing the lists compiled by Baumhauer for the period from 1840 to 1851, and those of van Pesch for the time between 1870 and 1880, we find that of 1,000 men there were living between—

	1840–1851		1870–1880	
1.	Of 10 years	644	Of 10 years	654
2.	,, 20 ,,	630	,, 20 ,,	620
3.	,, 30 ,,	568	,, 30 ,,	566
4.	,, 40 ,,	502	,, 40 ,,	515
5.	,, 50 ,,	434	,, 50 ,,	499
6.	,, 60 ,,	310	,, 60 ,,	356
7.	,, 70 ,,	182	,, 70 ,,	224
8.	,, 80 ,,	58	,, 80 ,,	70
9.	,, 90 ,,	9	,, 90 ,,	67

Thus, whilst out of 1,000 men there were between 1840 and 1851 only 182 of 70 years of age, 58 of 80 years, and 9 of 90, thirty years later there were of the same respective ages 224, 70, and 67.

If we contrast these figures with the longevity of the Romans, the result is still singularly in favour of the men of our day. Positive statistics being wanting, we have only the approximate calculations, such as were made by Roman jurisconsults for the determination of pensions.

Thus, according to Ulpian (*Digest*, XXXV, Title II), a man below the age of 20 would benefit by 30 years of pension; from 25 to 30, by 25; from 30 to 35, by 22; from 35 to 40, by 20; from 40 to 50, by the number of years which amount to a year less than 60; from 50 to 55, by 9 years; from 55 to 60, by 7; and above 60, by 5.

According to Deparcieux, the number of years of life remaining to a man of under 20, rise to from 48 to 40 years; of 20 to 25 years, to 40–37; from 25 to 30 years, to 37–34; of 30 to 35 years, to 34–31; of 35 to 40 years, to 30–27, and so on. For men aged from 50 to 55 there remain from 20 to 17 years, instead of the 9 given them by Ulpian; for those of from 55 to 60, 17 instead of 7, and so on.

M. E. Levasseur, who has attempted to compile a table of Christian mortality in the first centuries, based upon the collection of the inscriptions found on the Christian tombs in Rome by de Rossi,[1] arrives at the same conclusion, that the average life must have been shorter than in our day.

The data collected by well-known statisticians, such

[1] *Inscriptiones christianæ urbis Romæ septimo sæculo antiquiores.*

as Süssmilch, Baumann, Halley and others, regarding the seventeenth and eighteenth centuries, tend to corroborate the progress of human longevity, which one might, strictly speaking, regard as inevitable, closely following the development of human progress and well-being.

The mortality in Italy of the last century was still more frightful. According to Professor Cam. Bozzolo (*Riforma Sociale*, Vol. IX, 1899), the population of Florence and Milan died in the proportion of 40 per 1,000, and that of Turin even of 44 per 1,000.

During the last twenty-five years the mortality of Turin has fallen 11 per 1,000. That which makes these figures still more striking is the fact that Italy, which has increased by five million inhabitants between 1872 and 1897, has seen its mortality decrease by 132,000 to the benefit of the year 1897.

Emigration towards the great centres of population has in no way paralyzed the ever-growing movement of the vital average. In London the mortality was, in about the year 1600, according to Farr, 80 in 1,000; it is to-day only 19. In Berlin it is only 22.

Infant mortality diminishes yearly, thanks to the more and more rigorous observation of the laws of hygiene. The progress of serumtherapy means, in diphtheria alone, thousands of beings saved from certain death. It is easily understood with what a weight the infantile mortality kept down the average of human life, if one considers that children under one year old died ordinarily in the proportion of 1 in 5. To appreciate the progress made in this respect we may recall the curious statistics of the town of Genoa. The marble city has

the rare privilege of possessing statistics of its infant mortality dating back for more than 400 years, and on comparing its data we find that whilst in the sixteenth century 26 infants in 100 died before reaching the age of one year, 24 in the seventeenth, 20 in the eighteenth century, at the present time their number is only 18.

Another proof of the rise in the vital average compared with the past is furnished us by the comparative statistics concerning the lives of the members of the French Institute. M. Benoiston de Châteauneuf, who has compiled tables of the mortality of the members of the Academy from 1635 to 1838, lists containing 900 names, gives them an average life of 68 years and 10 months.

Now, M. Potiquet, who, following up the work of M. Châteauneuf, has compiled tables of the members of the Institute from 1795 to 1849, has arrived at the conclusion that the average person attains the age of 71 years and 4 months, an increase of more than two years in a century and a half.

According to this statistician the members of the French Academy enjoy the average of 72 years and 8 months; those of the Academy of Moral Science 72 and 2 months; of the Fine Arts 71 and 4 months; of Science 70 and 9 months; of Records and Literature 70 and 8 months.

At the present time the Institute possesses many *savants* of quite imposing age. I will confine myself to one of its sections, the Academy of Moral and Political Science. Out of 40 members we find 6 who are over 80, and 7 over 70. Among this number are Charles Waddington, born in 1819, and therefore a nonagenarian;

Frédéric Passy, born in 1822, and at the present day aged 86; Dareste de la Chavanne, aged 84, etc. Waddington, who is 90, takes a lively part in all the discussions of the Academy and is present at all its meetings. Frédéric Passy still actively writes pamphlets, poems, and articles. He presides with vigour over Peace Societies, and makes many remarkable speeches. In spite of his advanced age, he did me the honour to climb to the second floor, where I live, to discuss with me the burning questions of the day, and to talk to me of his works, distinguished alike for the novelty and the profundity of their ideas. The Senator Bérenger, also a member of the Academy of Moral Sciences, in spite of his 80 years, shows himself one of the most redoubtable leaders of the movement directed against the pornography of Parisian stage performances, and the immorality of certain papers.

One of the foreign members of the Academy, Mr. Ernest Naville, continues, in spite of his full 92 years, to contribute to it well-constructed and most interesting papers.

If we study the lives of great poets we shall see that their creations did not hinder them from living well over 70 years. Victor Hugo died at 83; Manzoni at 89; Paul Maurice at 85; Tennyson at 83; Béranger at 77; Longfellow at 75; Browning at 77; Lamartine and Emerson at 79; Mme. Desbordes-Valmore at 72; Anderson at 70. If Heine died at 57, Byron at 37, Shelley at 30, and Mickiewicz at 47, there were in their life histories special reasons which hastened their death. The dissipated life led by the first three is well known, as, on the other hand, are known the moral sufferings

of the great Polish poet, who bore in his own heart the sorrows of all his country. Thus we need not be surprised at the early ending of these brilliant careers, so full although so short.

The same phenomenon is seen in novelists, dramatists, and historians. If J. de Goncourt died at 40, his brother Edmond, of a very robust constitution, lived to 74. Châteaubriand died at 80; Thiers at 80; Dufaure at 83; Littré at 80; Jules Simon at 82; Augier at 79; Bulwer at 70; Alex. Dumas at 67; Paul de Kock at 71; Mérimée at 67; Michelet at 76; Henri Wallon at 93; Legouvé at 93; Jokai at 79; Gaston Boissier at 82; Pailleron at 64. Tolstoy is over 85; Meredith 80; and Emile Olivier 80.

The Society of French Dramatists and Authors had, at the end of the year 1900, 303 members, and of their number 111 were over 60 years of age. The Vice-President of the Association, M. Corman, is over 92, and several of his colleagues are from 85 to 90.

W. Roscoe Thayer, after devoting himself to a series of comparisons of the chances of life in the cases of poets, painters, musicians, and novelists, has come to the following conclusion—

THE AVERAGE LENGTH OF LIFE OF

Poets	66 years	Philosophers	65 years
Painters and sculptors	66 ,,	Historians	73 ,,
Musicians	62 ,,	Inventors	72 ,,
Novelists	67 ,,	Political agitators	69 ,,
Superior officers	71 ,,	Statesmen	71 ,,

which gives us a most respectable average of 68 years and 8 months for the representatives of the thought and the life known to be feverish and destructive above all others.

It is enough to compare this average with those of preceding centuries to be convinced that the brain workers have shared, like the rest, in the lengthening of life.

IV

That which strikes us above all in the phenomena of longevity is that in the feminine sex it is nearly everywhere superior to that of men.

Thus, according to the United States census, taken in 1890, among 3,981 persons of 100 years of age there were 2,583 women and 1,398 men.

In France, in ten centenarians seven are women and three men. According to the tables arranged by the French Financial Minister, regarding the civil pensioners of the State between 1871 and 1877, the comparative figures of men and women were as follows—

Age.	Civil Pensioners.	Widows of Pensioners.
40	1000	1000
50	659	875
60	483	738
70	310	536
80	120	249
90	15	42
100	0·5	3

These calculations are confirmed by the following fact: out of the 123,435 widows of pensioned functionaries who died between 1871 and 1879, 1 died at 102, 4 at 101, 9 at 100, and so on.

In Scotland there were in 1895 out of 21 centenarians 16 women and 5 men. The proportion was the same in London.

According to the *Annals of Hygiene*, and calculations based upon the last United States census, the mortality is higher in the stronger sex up to the age of seventy years. But once over seventy the woman stands more chance of succumbing than the man. After 90, again, woman regains her advantage, and keeps it for the rest of her days.

Of 11 persons deceased in New York at the age of 90, 77 were women and 34 men.

Among 1,191 octogenarians in London there were 646 women and 545 men.

The census taken in Prussia in 1885 gives 2,081 nonagenarian men and 3,567 women; of from 95 to 100 years there are 306 men and 641 women; above 100 years, 72 men and 260 women.

Note here: 100 years once passed, the woman has five times as many chances of life as the man. To what may we attribute this privilege, of which the fair sex may justly be proud? It is known that the masculine birth-rate is almost everywhere in excess of that of the female sex. May it not be, then, that nature seeks to re-establish the equilibrium by the greater longevity of the woman? By the side of this hardly too mystical explanation we should perhaps take into consideration the nature of woman's work. In the greater number of cases she risks her life less than the man, she abstains from dangerous occupations, such as military service, and, generally speaking, work in the mines. Besides this, she is more rarely a victim of alcoholism, which affects in a most marked degree the comparative mortality of the two sexes.

All these causes have undoubtedly a propitious in-

fluence upon the longevity of women of over 16 years of age. But how, then, are we to explain their much more advantageous chances of life even below 16, that is to say, at the age when the probabilities of life for the two sexes should be identical?

If we may believe an English statistician, Mr. Holt Schooling, of two infants of different sexes born on the same day the little boy will have 17 chances of a year's life against 11 of death, whilst the little girl will have 21. From 5 to 14 years the chances become nearly equal, but from 14 years onward the girl again has the advantage.

From 15 to 19 years, that is to say the age when the respective professions adopted by the two sexes play as yet no part, the boy will have 269 chances against one of death, while the girl will have 277.

After this time the chances of survival for the woman increase more and more, becoming quite astonishing at the age of 85. A man who arrives at that respectable age has only three chances of life against one of death. According to the last Indian census, quoted by Dr. A. Haegler, there were, out of 380 centenarians, 247 women; a figure all the more worthy of attention in that the number of women in that country is inferior to that of men.

According to the data collected in the English *General Register* for 1883, there died during this year in England 89 persons aged over 100 years. In this total there were 79 women and 10 men.

Among 859 inhabitants of France, being, in 1876, over 80 years of age, there were 493 women; and among the 1,419 individuals who found themselves in the same

case in 1886, there were 977 women against 442 men.

The more one thinks of the vital inferiority of man, the more one yields to the evidence that the expression "weaker sex" applied to women has no foundation in fact. It should be rather admitted, arguing from the data furnished by embryology, that woman possesses relatively more of the elements of life than man. In the animal world it is enough to feed the mother well to increase the proportion of female births. By submitting the caterpillars of moths and butterflies to a *régime* of hunger they become male. On the other hand, it is only necessary to feed ewes well (one of Girou's experiments) for them to bear female lambs. The poorer the country the more masculine births it has. After every war the impoverishment and the vital weakening of the two sexes gives us an increase of the masculine birth-rate. The Anglo-Saxon population, reputed the strongest, has a marked excess of female births. Twins, who are forced to share their nourishment in their mother's womb, and who are by that very fact condemned to relative feebleness, are nearly always born boys. This law seems general, for it may be observed equally in the vegetable kingdom. The aphides of our rose and fruit trees have a female progeniture in summer, and when condemned to suffering and privation in autumn their offspring are male.

Howsoever it may be, if longevity is to be considered as a special blessing of Heaven, woman may find there a compensation for certain drawbacks, for which she ceaselessly reproaches Mother Nature.

V

When we pronounce the word *centenarian* or *extreme old age*, our mind immediately forms an idea of decrepitude and of sickness, accompanied by thousands of defects and vices attributed to the old. Study, however, a little closer the lives of centenarians, and you will be agreeably surprised at their presence of mind, at the quickness of their memory, the fertility of their intelligence, and the gentleness of their manners. If all these virtues are not inherent in great age, it can none the more be said that it is absolutely devoid of them. Which of us has not known octogenarians as robust as men of fifty, genial, affable, full of indulgence, wisdom, and love for their neighbour? We may even state the consoling fact for centenarians that men, after having passed the age of 90, become sturdier and of a greater power of resistance than before that epoch in their life. The destruction of certain physical and intellectual faculties serves usually as an indication of approaching death. Organisms thus attacked rarely survive the critical age of from 75 to 80 years, and pass away, leaving the stage to their robuster and more resisting rivals. Nature thus has her own tests, and usually only preserves, beyond the age of 90, exceptionally well-endowed organisms. Arrived at supreme old age, they begin, as it were, a new life, like those rare trees which flower again in the autumn for a second time.

Blandin reports the curious fact (noted besides by Haller and many others) that in the case of certain old men who have passed the critical age of 80, there has been a third dentition.

In his *Leçons de Clinique Médicale* Graves tells us, amongst other things, that Mary Hern cut new teeth at 110 years, and that her hair, which had become white, regained its original colour.

Peter Bryan (of Tynan) cut new teeth at 117. The same with Mme. Angélique Demangieux (de Noueillac), at the age of 90.

Dr. Graves equally affirms the authenticity of the case of Mme. Wathemorth, who, at the age of 80, recovered her sight, which had been enfeebled for some years, and kept this precious sense until her death, which happened in her 95th year.

The same phenomenon showed itself in a relative of the naturalist Saint-Amand, who, at the age of 90 years, recovered the gift of his sight.

As for the generative faculty, it often persists in man, even beyond 100 years. Witness François Naillé, who, at the age of 100, had so little respect for his white hairs that he had a *natural* child (the word may well be underlined) by a woman of his native village. He did not die of shame until 19 years afterwards, at the age of 119 years, duly registered. The Baron de Capelli, dying at 107, left his fourth wife pregnant with her eighth child. History abounds with examples of old men who, arrived at extreme old age, yet shone by means of their energy and their intellectual powers.

Archimedes discovered his burning glasses at 75; Epimenides, the Cretan philosopher, aged 100, continued to astonish his contemporaries by his great intellect. Theophrastus still taught, after the limit of 100 years, his memorable maxims of character. Solon, Zeno, Pythagoras, Diogenes, all distinguished them-

selves by their vivacity and their vigour of mind even after the age of 90; and Democritus at 95 still mocked at human folly, as he had done, for that matter, in his gallant youth. Plato composed several of his dialogues at 80, and Cato learnt Greek after having passed that advanced age.

Michael Angelo, Titian and Leeuwenhoeck produced pictures at 90 years of age. Hokusai, the celebrated Japanese draughtsman, gave many masterpieces to the world after the age of 80.

Alexandre de Humboldt, Chevreul, and many other scientists at 90 still astonished those around them by their memory and their intelligence, which seemed to increase with time. It was the same with certain modern statesmen, such as Gladstone (born in 1809), and Bismarck (born in 1815), who, up to the last moment of their earthly sojourn, lost nothing of their intellectual vigour, in spite of the agitations of their political life. The French Institute, with its famous correspondents, presents at the present time a most interesting example for the student of longevity. Its most celebrated *doyens* shine not only by a notable number of years, but also by their youthfulness of thought, still flourishing and productive.

At their head still marched, a few years ago, M. Legouvé, who published, in spite of his full 90 years, many sparklingly witty books; while beside him M. Janssen, of the Academy of Science, who, aged 86, was still working for the cause of scientific discovery. The Institute mustered at the end of the year 1900, 1 nonagenarian, 21 members of over 80 (amongst their number Verdi, the great Italian composer, born in 1813), and 69 septuagenarians.

It is not rare to find centenarians who have kept not

only all their lucidity of mind and unassailable health, but also their humour of other days.

We may recall the curious example of the *doyen* of the French army, a man named Delpeuch (of the village of Mazze, in Cantal), who, in 1856 (the year of his death), at the age of 130, played a joke on the Military Commission by presenting himself for the drawing of lots. Let us say, besides, that Delpeuch was present at the Battle of Fontenoy, and was one of the glorious band who, under the command of Auteroche, drew the first English shots.

Until quite lately there still lived at Auberive-en-Royen (Isère) a certain Mme. Durand, known under the name of "Mère Girard," aged 135 years. Her birth-certificate, registered in the parish of Saint-Just-de-Clast, bears the date of September 22, 1740. In 1864 she solemnly celebrated the hundredth anniversary of her marriage. An ex-"Cantinière," she had led a slightly stormy life before settling peacefully down in her native district. She was only known to have had one little love-affair, and that was a very innocent one, and never carried too far: it was a weakness for old brandy. Dr. Schaertlin, author of an interesting work entitled, *Mesures de prévoyance en faveur des fonctionnaires et employés fédéraux* (Berne, 1889), gives the following figures, which prove that the aged are generally more vigorous than is thought. Out of 67,630 men of over twenty there were at sixty years of age 29,751 still vigorous and enjoying full activity of all their organs, only 6,403 being invalided; at 70, 7,944 healthy and 12,806 invalided; at 80, 17 healthy against 5,990 invalids.

But let us pass to ideas of a wider order.

B.—Comparative Longevity

Is it possible to deduce any positive indications from the examples of longevity offered us by history and compared statistics? It may be from the insufficient quantity of data, it may be the defective method employed in the very rare works devoted to the question, the fact remains; at the present time it is not possible to formulate any law whatever on the subject of longevity. To live long it suffices merely—not to die. Here is the supreme philosophy of all the theories of longevity.

Like happiness, it delights to favour those who least deserve it. We may, however, state that moderation in the expenditure of vital energy and an appropriate dietary *régime* seem to be necessary conditions of extreme old age.

But here are some examples which prove the contrary—

Romilius Pollio, the Roman centenarian, attributed his vitality to rubbings with oil, and to the bread soaked in wine which was his only food.

Marie Priou, who died at the age of 158 years (in 1838), in the neighbourhood of Saint-Beit (Haute Garonne), lived for the last few years of her life on cheese and goats' milk only.

An ascetic life, withdrawn from the world, in the midst of privations of all kinds, secured to St. Anthony 105 years of life, to his companion Macarius 110, and to Paul the Hermit 113 years.

On the other hand, Gladstone and Bismarck enjoyed a green old age in spite of their full lives—lives feverish,

full of mortifications, successes, triumphs and disappointments. Sometimes it is the simple-minded who attains his 120 years, sometimes philosophers and thinkers like Socrates or Humboldt who approach their century. Some live long after years of wild orgies; others, having led sober lives and practised the most exemplary temperance.

According to William Kinnear, who has recently studied the statistics of American centenarians, the same obstacles which impede the rich in their entrance to the Kingdom of Heaven equally prevent them from becoming centenarians. To sum it up, to live long you must live poor. The author proves his case by emphasizing data which seem to us inconclusive. The *General Register* of Scotland for 1894 comes to his rescue, however, and seems to justify him.

The three *doyennes* of the sixteen Scottish centenarians, deceased in the course of that year, were aged 105. Two of them, fallen into poverty, lived by public charity; the third was the widow of a poor gardener; the thirteen other centenarians belonged to the poorest classes of society. They were old servants, or the wives of poor artisans.

In 1894, too, the Scottish statistics show the deaths of five men of over 100 years of age. Here are the professions to which these old men belonged: one market-gardener, one weaver, one shepherd, one navvy, and one labourer. Not one paid any tax whatever to the revenue, for the simple reason that not one of them had the little fortune necessary in order to figure on the lists of rate-payers.

Let us note, besides, that statisticians seem as a rule

hostile to this theory. The list compiled on this subject by Casper seems, indeed, most discouraging to the poor. According to him, of 1,000 rich people and 1,000 poor there are still living

At the age of	Poor.	Rich.
5 years	655	943
10 ,,	598	938
20 ,,	566	886
30 ,,	527	796
40 ,,	446	693
50 ,,	338	357
60 ,,	226	398
70 ,,	117	235
80 ,,	71	57
90 ,,	4	15
100 ,,	0	0

The rich have, in consequence, three times fewer chances than the poor of attaining 80 years of age, and four times more of reaching 90.

The truth is always found in the middle. If riches spare us certain privations which decimate the poorer classes, they deaden, on the other hand, our powers of resistance. The maladies which so constantly menace us, with the exception of the contagious diseases, have more hold on the richer classes than on the poor. The rich only enjoy long life in the Anglo-Saxon countries, where they try to develop their vital energy by means of different sports. But riches more often exercise a deadly influence upon the health by the abuses of all kinds which they invite. Without speaking of alcoholism, which, in its more elegant forms, invades the privileged classes, there is above all the abuse of food, often more hurtful than privation. As Professor Charles Richet judiciously remarks, we all eat nearly three times

as much as our organisms demand. Hence the innumerable diseases which shorten human life before its time.

An American statistician, Mr. French, who has published in the *Annals of Hygiene* his studies of the relation of occupation to longevity, draws from them this conclusive lesson : to live long it is above all things necessary to devote oneself to work in the open air. His researches cover a period of 43 years, in the course of which he has noted all deaths, with ages and professions, which have occurred in the State of Massachusetts. On examining a list of 238,792 individuals, aged at least 20 and having a settled occupation, French arrives at the conclusion that, as a general rule, those who work in the open air and devote themselves to manual occupation live longer than others.

Whilst the clerks, the quill-drivers of Massachusetts, do not live, on an average, more than 49 years, the financiers, accountants, and bankers attain their 49·6; professors, priests and doctors, 52·16; shoemakers, barbers, and jewellers, 45·5; cultivators, agriculturists and farmers enjoy an average of 66·3 years.

A circumstance which corroborates Mr. French's data is that the young ladies of the telephone exchange, who lead sedentary lives *par excellence*, have an average of only 39 years.

When one thinks of the gulf which separates the limits of the life of the official from that of the tiller of the soil, one feels a twinge of pity for these unlucky money-worms, on whom such merciless war is waged on both sides of the Ocean.

A just Providence poisons for them the delights of

their peaceful toil by taking from them nearly sixteen years of their life in favour of the agriculturists, rewarded for their harder labour by a longer vitality.

What a supreme lesson is contained in these statistics of "professional" longevity. "Men," they seem to cry to all of us, "leave your health-destroying labours, the life and the emotions of the town, and return to the sun, to the nursing earth, for salvation lies in the breath of the fields."

But are statistics to be trusted? This science-of-all-work herself furnishes us with material for demolishing these sentimental theories.

It is enough to recall the data given by Casper, who has arranged most trustworthy statistics of "professional" longevity.

In the opinion of the German scientist, theologians have the greatest chance of survival. Their average is 65·1 years; after them come merchants with 62·4, clerks and officials with 61·7. Agriculturists come after officials with 61·6, and soldiers with 59·6. Doctors and professors have the smallest chance of attaining extreme old age. Their average is nine years below that of the theologians.

In these conditions the lovers of existence have but to praise God or to attempt to explain His designs to live long in the land.

Certain facts taken from the lives of the higher clergy seem to justify this privileged situation of the ecclesiastics. At the Council of Rome, in 1870, statistics were taken of 766 bishops and archbishops who were present. Amongst the number there were 3 bishops aged 96; 2 of 90; 20 of from 80 to 85; 46 of from 75 to

80; 79 of from 70 to 75; 164 of from 60 to 65; 133 of from 55 to 60, etc., etc.

And scientists and men of letters? Judging by the works of Benoiston de Châteauneuf and M. Potiquet quoted above, the average life of academicians is 68 years and 10 months in the eighteenth, and 71 years and 1 month in the nineteenth century.

The works concerning the longevity of men of letters are, moreover, so slight that it is difficult to draw from them any conclusion whatever.

Politicians enjoy a favourable situation in the fight for long life. When public affairs flow on peacefully and normally, without those violent agitations, those polemics which react in a manner so disastrous to the longevity of the elect, there is nothing to place them in an inferior position.

In England, when Queen Victoria celebrated, in 1897, the sixtieth year of her reign, there were still politicians who had served the State for nearly 70 years. Such, for example, was Lord Mansfield, aged 92, who for 11 years had sat in the House of Commons, and was afterwards a member of the House of Lords, for 57 years, giving a total of 68 years.

Mr. Charles Pelham-Villiers, born in 1802, had represented Wolverhampton since 1835.

In France, where the masters of the country change from minute to minute, one must rather go to the Senate, and even there to its "permanent members," to persuade oneself of the same consoling fact, to wit, that an active life is not incompatible with a long one.

The sixteen permanent Senators whom France possessed towards the end of the year 1900 represented a

total of 1,200 years, say 75 years on an average. Their *doyen* was M. Wallon, then aged 88, perpetual secretary of the Academy of Records and Letters. He had passed his parliamentary demi-centenary (he was elected for the first time in 1849 as representative of the North at the Legislative Assembly), and he celebrated in 1900 the demi-centenary of his entrance to the Institute. Following him came MM. Gouin, 82; Emile Deschanel and Dumon, 79; Cazot and Denormandie, 78; Magnin, 75; Berthelot and Clamargeran, 72; General Billot and de Marcère, 71; Bérenger, 70.

An American statistician, William Roscoe Thayer, already quoted above, has attempted to compile statistics of the longevity of statesmen of the nineteenth century (*Forum*, February 1899). According to him, their average life is 71 years. The author quotes in support of his theory only 112 celebrities, belonging mostly to the Anglo-Saxon race. Here, for example, are the names of the greater part of the Presidents of the United States, and against them the ages which they had reached at the time of their death.

J. A. Adams	died at	81	Johnson	died at	67
Van Buren	,,	80	Taylor	,,	66
Jackson	,,	78	Pierce	,,	65
Buchanan	,,	77	Grant	,,	63
Filmore	,,	74	McKinley	,,	58
Tyler	,,	72	Lincoln	,,	54
Hayes	,,	71	Arthur	,,	54
W. H. Harrison	,,	68	Polk	,,	54
Washington	,,	67	Garfield	,,	50

which gives an average of 67 years to be claimed by Presidents of the United States.

The British "Premiers" are, from this account, even more fairly divided. Their average reaches about 77 years; thus—

Gladstone	died at	89		Goderich	died at	77	
Wellington	,,	83		Aberdeen	,,	76	
Palmerston	,,	81		Salisbury	,,	73	
Grey	,,	81		Derby	,,	70	
Russell	,,	80		Melbourne	,,	69	
Disraeli	,,	77		Peel	,,	62	

The late Premier, Sir Henry Campbell-Bannerman died in April 1908, at the age of 74.

Curiously enough, in comparing the lives of eminent Continental statesmen, we end by striking an average resembling in all points that of Anglo-Saxon statesmen. Here are the names of those who have had the honour of directing at different periods the fate of the European peoples—

Leo XIII	died at	93		Nesselrode	died at	82	
The Emperor William I	,,	91		Palmerston	,,	81	
B. St. Hilaire	,,	90		Thiers	,,	80	
Schmerling	,,	88		Pozzo di Borgo	,,	78	
Guizot	,,	87		Louis-Philippe	,,	77	
Pius IX	,,	86		Beust	,,	77	
Metternich	,,	86		Joseph Buonaparte	,,	76	
Broglie	,,	85		Deak	,,	73	
Gortchakoff	,,	85		Jules Favre	,,	71	
Capponi	,,	84		Gramont	,,	71	
Crémieux	,,	84		Szechenyi	,,	69	
Crispi	,,	84		Minghetti	,,	68	
Bismarck	,,	83		Andrassy	,,	67	
Jules Simon	,,	82		Decazes	,,	67	

The more one studies the statistics of professions, the more persuaded one is that few of them are inimical to longevity. With the exception of wine and spirit merchants, and workers in certain factories, the profession matters little so long as it is exercised conformably with the exigencies of hygiene.

There is, however, one profession which has furnished us, from the point of view of longevity, with some sur-

prising facts. It is that of dancing. To speak truthfully, the special kind of life necessitated by the exercise of high kicking seems apparently hardly to conform with the laws laid down by hygiene for the guidance of the "macrobiotic." Nevertheless, from the venerable Ælia Catula, who danced in the Juvenilia, being aged over 80 years, down to the last Parisian census, how many glorious careers have been built up in these realms by the great *danseuses,* who so often doubled the *rôle* with that of great *cascadeuses* before the Lord.

It is enough, then, in order to live long, to do, man or woman, like St. Simeon Stylites, or like the Vestris family, father, son and wife, who, pirouetting on one toe, attained a ripe old age.

But if the prize for long life awarded to the dancers may be contested, so equally may that by which the married profit.

It is true that statistics give to these last several years more than to the celibate, but they very seldom attain them. Amongst centenarians we find almost equal numbers of celibates and married people. We have seen above that certain celibates, such as Catholic ecclesiastics, have many chances of arriving at the age of 100, and even of passing it. The same is true of nuns, several of whom have been examples of robust old age.

According to Dr. P. Foissac, the village of Villapourçon, situated in the Province of Nièvre, contained in 1852 six centenarians, three men and three women, all six of whom had, curiously enough, led single lives.

The interesting inquiry published by the British Medical Association in 1886 gives small stature as one

of the signs of longevity, the greater number of centenarians always being below the middle height. There is always one factor which exercises an undoubted influence on the duration of our life; this factor is heredity. If you wish to know approximately how many years are left to you to enjoy the blessings of life, consult the records of your ancestors. The more persons you find there who have lived to a green old age, the more chances you have of profiting in your turn. As Jeremiah has said: "The fathers have eaten a sour grape, and the children's teeth are set on edge." The heredity of long life is, besides, recognized as an axiom in the business of life insurance. Dr. Haegler, chief medical officer of the Bâloise Life Insurance Society, declares in his "Manual of Forecasts of the Duration of Life" (*Ueber die Factoren der Widerstandskraft*) that the inquiry into the hereditary longevity of the family of the candidate for insurance is much more important to the Insurance Society than the examination of the individual conditions of his life.

Centenarians are for the most part the offspring of parents who have themselves lived long. It is important to study the longevity of both the parents individually, and if one only of them reaches extreme old age the child has a better chance of survival in proportion to his resemblance to that parent.

Examples of hereditary longevity abound in all countries. Let us quote some verified cases.

General Cunningham Roberts recounts in his letters that his aunt, Miss Elizabeth Gray, died in 1888 at the age of 107 years and 11 months. Amongst the eleven brothers and sisters who survived her, two died at the

ages of 91 and 92; two at 87; two at 86; three at 77, 80, and 85; only one died at the early age of 70!

An English doctor, Dr. B. Richardson, has even attempted to formulate a sort of law of longevity based on hereditary tendencies (*Longman's Magazine*, July 1898). It is enough, according to him, to take the number of earthly years of your father and mother, of your two grandfathers and grandmothers, add them together and divide by six. The quotient of this division corresponds with the number of years which you will live in your turn. Besides this, he corrects his system by incorporating in it the influence of temperament. The sanguine live the longest (normally from 75 to 80); the nervous next (between 60 and 75); the bilious hardly ever pass these limits, while the two first quite frequently break through the bounds assigned to them by the English doctor (75–80 and 60–75).

Hereditary longevity opens a vast perspective over the vital horizons of future generations. The average of life rising with each century, the number of centenarians will proportionately increase, and, the principle of heredity still ruling, we may logically hope for a thirtieth century which, apart from any unexpected cataclysm, will hold more living centenarians than several preceding centuries put together.

There is one condition above all which seems to be neglected in calculations of longevity; it is that of the age of the parents at the time of their child's birth.

The Hungarian statistician, M. Joseph Korosi, judging from 24,000 cases examined by him, comes to the following conclusions—

Men of from 25 to 40 years of age beget children

having the greatest vital resistance; children born of fathers below 25 and over 40 generally die young. As to the mothers, the children to whom they give birth between 20 and 35 have the most chance of survival; between 35 and 40 their longevity is 8 per cent., and between 40 and 45 10 per cent. below those in the previous category.

The second, third, fourth, and fifth children of the same mother have a better chance of long life than the children born subsequently.

C.—The Means of Prolonging Life

I

What must we do, or rather not do, to attain the extreme limits of age? What are, after all, the bounds of life? These two series of questions of different kinds may together constitute a special science, *Gerocomy*. It exists as a name only. Bound up in most intimate relationship with hygiene in general, it might deal with special phenomena which distinguish it clearly from similar sciences. Whilst Hygiene gives us the information necessary for the attainment of old age, Gerocomy ought to take man at extreme old age and lead him to his utmost possible longevity. Gerocomy would have before all things a rich tradition, man having through all the ages sought, without ever finding, the supreme means of renewing his youth, and of staying or paralyzing the deadly influence of time upon the evolution of our organism.

Preceding ages have been most fertile in ingenious

discoveries for prolonging life. Scientists held themselves bound to offer to the problem of the enlarging of the limits of human existence a royal share of their labours and their intellect. There is hardly a philosopher worthy of the name who has not found some means whereby humanity may enjoy life somewhat longer. Astrology and alchemy, like medicine, followed by all the hermetical sciences, are unparalleled in the generosity of their counsels for escaping the human lot.

Let us quote first of all the most interesting work published towards the middle of the eighteenth century, by Dr. I. H. Cohausen, under the name of *Hermippus Redivivus*, of which a most luminous analysis has recently been published by Dr. A. Beauvois. The German doctor gives as an infallible remedy against senility that which was employed in other days by King David. It consists in preserving the body worn out by the fatigues of life, by placing it in immediate contact with a young and vigorous body. This remedy, it may be here remarked, was equally extolled by Galen, and afterwards adopted by numerous philosophers, amongst whom was Roger Bacon. "There escape from men," this last tells us, "spirits, as well as from animals. Men healthy and of good complexion, above all, young people, comfort and revive old men and valetudinarians by their presence alone, and that by reason of their suave emanations, of their healthy and delectable vapours, by reason of the qualities and the powers which exhale from them."

Hufeland, in his turn, gives credit to it also. His belief in the curative virtues exhaled by young creatures

is supported mainly by his curious studies in "animal medicamentation." "Since it suffices to apply a living animal to the aching part in order to give it ease," says he, "why should not the breath of vigorous creatures, that part of their very being, produce a beneficial effect?"

But let us return to King David. In the first chapter of the first book of Kings we read that the king, having reached 70 years of age, and his body being without vital warmth, his servants said to him, "Let there be sought for my lord the king a young virgin; and let her stand before the king, and let her cherish him, and let her lie in thy bosom, that my lord the king may get heat."

The beautiful Abishag the Shunammite was found, who slept by the king and served him, and the king left her virgin.

Dr. Cohausen doubtless remembered this passage of Kings when, turning over a collection of old Roman epitaphs, he came across that of one named Hermippus, running thus—

Æsculapio et sanitati
L. Clodius Hermippus,
Qui vivit annos CXV Dies V
puellarum anhellitu,
Quod etiam post mortem ejus
Non parum mirantur phisici
Iam posteri sic vitam
Ducite.

And this vivifying young girl's breath, which reanimated the drowsy senses of old Clodius, gave to human-

ity the exquisite work, "*Hermippus Resuscitated*," published at Frankfort in the year of grace 1742.

Starting from this fact, that the ancients enjoyed a longer life, Dr. Cohausen attributes this privilege to the judicious employment of the beneficent influence which young persons exercised at that time. It is admitted, so the learned doctor teaches us, that the breath of consumptives is contagious, and may provoke a malady. Logically, we must then admit equally that the healthy and perfumed breath of young girls should have a salutary effect. And he who would doubt it has but to remember how the balsamic odour of flowers revives our bodies, and sheds around us gaiety and health. Cohausen goes even further, and recalls numerous examples of men who, at the point of death, were recalled to life by the breath of those surrounding them. Borelli, Tackius, and many others quote the names of dying persons who recovered their vital forces thanks to the operation of prolonged blowing in their mouth, an operation performed by their healthy friends. Speaking of the perspiration of young persons, a perspiration which is indeed only a rejected part of the young rich blood, he attributes to it also curative virtues of great power, for the body of the old man who receives it fills itself thus with the principle of vigour.

Marriages between two persons of widely differing ages seem to speak in favour of his theory. It is not rare, Cohausen tells us, to see an old lady blossom again after her marriage with a young man. She gains precious vigour by this contact, and enjoys a return of health, whilst her unlucky husband declines visibly to the naked eye, and hastens towards a premature decrepi-

tude. For the influence of the two ages produces thus radically opposite effects. And the author of *Hermippus* goes into ecstasies before the delights which spread themselves before those professors whose mission it is to live surrounded by young creatures glowing with gaiety and health. Gorgias of Leontium lived thus to 108 years of age, Isocrates the Athenian passed his century, without speaking of Zeno, of Theophrastus, and of so many other masters whose physical vigour astonished their contemporaries. The well-known centenarian, Louis Cornaro, himself attributes his green old age to his youthful surroundings. When old, and on the point of death, he gathered round him eleven nephews of amiable appearance, and they contributed in return to renew his vital forces and his shattered health.

The celebrated doctor, de Lorme, whose exceptional health at a very advanced age was the object of so much comment, equally preached the beneficent influence which the vital heat of the body exercised on the health of old men. Only, instead of having recourse to intimacy with young girls, he contented himself with prayers to St. Lawrence, who has the rare faculty of increasing the intense heat of the body.

A passage which we borrow from *Hermippus* shows us how the scientists of other days could poetize and embellish the action of the breath exhaled by young breasts, as from the inexhaustible springs of life—

"When Thisbe, in the blooming flower of her age, decked by the Graces, taught by the Muses, converses with the old Hermippus, her youth reanimates his age, and the clear flame with which her young heart glows lends its heat to that of the old man. Each time that

the lovely virgin breathes, the sweet vapour which escapes from her breast is full of vivifying spirits which swim in her purple veins. And even as spirits attract spirits, so these same vapours mingle themselves on the instant with the blood of old Hermippus. From thence, passing through his body, they fill that same blood, so that we may say, almost without metaphor, that the spirit of Thisbe brings life to this old man."

Dr. Cohausen, a slightly sceptical philosopher, does not for that matter subscribe in so crude a manner to the belief in the vivifying breath, so widespread in past centuries. The material fact of aspiration is, according to him, completed by the force of the suggestion exercised by the mentality and the disposition of young minds on their old and out-worn surroundings. Let us add that the doctrine of the miraculous breath may be dead indeed, but behind the mountain of *débris* which it has left, nothing living remains but its element of suggestion.

For the virtue of human breath, like its curative power, is, under the influence of modern science, even transformed into most deadly forces. Far from favouring health, it produces, according to the modern scientific conceptions, only disease and death.

This change in our opinion was the result of researches made by MM. Brown-Séquard and D'Arsonval in 1887 on the evil action of expired air. According to these two scientists, the principle of the breath is in no way beneficent, but rather, a violent poison. But, although this opinion may not be accepted quite literally—for subsequent experiments to which numerous physiologists have devoted themselves have not con-

firmed this alarming theory—we should do well, in so doubtful a case, to have recourse to other means of recalling our lost health and vigour.

II

The Jewish and Roman doctors were all careful to seek out certain special and infallible means of thrusting back the limits of our existence. These remedies were most various, and their vast *répertoire* contained from the fat of the lion and the skin of the chameleon to the blood of children and adults. Now all these methods had for their supreme result only the augmentation of the interior heat of the body.

The collected mass of all these indications forms a sort of organotherapic doctrine. This, repudiated with scorn by scientists and doctors in the seventeenth and eighteenth centuries, and in the first half of the nineteenth century, has ended by triumphing in our days, thanks to the efforts of Professors Brown-Séquard, Jules Héricourt and Charles Richet. Recent organotherapy has, for that matter, very little in common with that of ancient times. Based upon a rigorous scientific method, it has rejected superstition, and has retained only the results of experiments made with animal medicamentation. They are differently used, and recourse is had to them under other conditions.

By the side of this rudimentary organotherapy, the secret of which resolves itself into the giving to persons with diseased hearts, pieces of heart taken from animals, and to persons with sick brains, the brains of cocks, there were several other doctrines which enjoyed enorm-

ous credit among our ancestors. We must quote first an entire series of Elixirs of Life, like that of Dr. Ivervex, a Swedish doctor who died at the age of 107. In the curious compilation by an anonymous author upon the *Art of Prolonging Life*, according to Hippocrates, Galen, Celsus, Arnaud de Velleneuve, Paracelsus, etc., we find a detailed analysis of this elixir, which doubtless was of great service to our forefathers. They believed in it. Suggestion aiding, this faith has worked miracles.

You had to pulverize and pass through a sieve seven drugs in the following proportions: one ounce of soccotrine aloes, one drachm of zedoary, one drachm of gentian, one drachm of the finest saffron, one drachm of fine rhubarb, one drachm of white agaric, one drachm of Venice treacle, one drachm of kina. This mixture was then placed in a bottle and a pint of good brandy added, and after placing the whole in the shade for nine days, shaking it morning and evening, the bottle was opened on the tenth day, brandy again added, after which it was filtered several times, and the elixir was ready to operate. The curative virtues of the elixir had to sustain a constant struggle with M. de Lorme's famous quack-medicine and mercury of life (this last contained 20 grains of antimony to 3 grains of mercury), with Duchesne's elixir of life, and with other medicaments belonging to the same category of infallible means for combating disease and age.

Michel de Saint-Martin, in his work published at Caen in 1683 on the *moiens faciles et éprouvez dont M. de Lorme, premier médecin de trois de nos rois s'est servi pour vivre près de cent ans*, quotes a series of other recipes equally efficacious for those who be-

lieve in them. All these fabulous elixirs and medicaments are enshrined in numerous works of poets, savants, doctors and statesmen. The most celebrated of these apologias of miraculous remedies is, incontestably, the didactic poem of Jean of Milan, composed in the eleventh century, under the name of *Schola salernitana sive de conservanda sanitate præcepta metrica.* Commentated by Arnaud de Villeneuve, the work was republished in the fifteenth century under the title of *Regimen Sanitatis*, and since then it has been offered to the general public in many hundred editions. Amongst other works which have enjoyed a certain reputation we must note first of all the *Rosa gallica* (*continens præcepta quæ ad medicam artem rectamque vivendi pertinent*), published in Paris in 1514. "How to live over 120 years" (*De vita hominis ultra CXX annos*), of Thomas of Ravenna, published in Venice, in 1553; *Tratatto della facotta e dell' effecti della polvere o elixir vitæ* of Girolamo Chiaramonte (Florence, 1620); the treatise of *Venenis eorumque alexipharmis* (Hamburg, 1679), the *disputatio de vitæ humanæ a facultate medica prorogatione* (Rome, 1589); and the *Thesaurus Sanitatis* (Paris 1577), containing a rich collection of all the remedies good for prolonging life. The curious may find in this last book the manner of using the cephalic water of Charles the Fifth, the stomachic water of Mynsicht, the capon water of Quercetan, that of Jacques le Mort, the cordial water of Hercules of Saxony, the great cardiac water of George Bates, and even the Tablets of Magnanimity which had the gift of restoring the generative power to enfeebled old men.

In the eighteenth century the alchemist Geber in-

vented a *Red Elixir*, with a basis of gold, for the rejuvenation of the old; in the sixteenth century Paracelsus had his *Alcahest*, a water of immortality, which should triumph over all the ills of humanity, old age included.

Neither the elixir nor the alcahest could do anything for their illustrious inventors, for both died, the first at the age of hardly 50 years, and Paracelsus at the age of 47.

The analyses of the greater part of these mixtures remain unknown to us. We know their names and their miraculous effects, but we are left ignorant of their method of preparation. Historical curiosity doubtless loses much by this, but the science of longevity will mourn but slightly. And yet there is something pathetic in the efforts made by so many generations to rediscover the lost way to our salvation.

We may recall, for example, the passionate researches pursued during many long years towards the discovery of the recipe of Ninon de Lenclos. The authentic letter, addressed in 1646 by the celebrated Italian doctor Fortunio Liceti to the irresistible Ninon, and recovered in the nineteenth century, set a torch to the powder-barrel. In this missive the savant advises Ninon to make use of a mysterious unguent, "The Dew of the Visage" (*Rugiada del Viso*), against wrinkles. He probably found it in one of those oriental manuscripts which hold such numerous secrets for the preservation of beauty and health.

Was it thanks to this unguent that Ninon passed through her 85 years of life always beautiful and desired, in spite of her somewhat stormy career? Who knows?

But even could one remake the prescriptions of our ancestors we could not even so resuscitate their curative virtues. They work no more, for their persuasive force, the simple faith in their efficacy, is lacking in us to-day. In vain should we keep nine-day fasts in honour of St. Gervas, the good bishop of Maëstricht, who, after having exceeded on his own account three times the age of man, disposed of his privilege in favour of pious souls. His intervention would now-a-days be fruitless. Roger Bacon marvels in his *De secretis operibus* over the miraculous recipe which permitted Papalius, a prisoner of the Saracens, to live five hundred years. Nevertheless, although knowing the mysteries of this prodigious prescription, Bacon died, having barely reached the age of 80 years. And if the recipe of Papalius was already ineffective in the thirteenth century, what could be expected of all this arsenal of still less miraculous remedies six centuries later?

III

In India, we are told by occult science, there are magicians who perform the miracle of rejuvenation, but those who practise it are almost always old men themselves. Like those ingenious authors of pamphlets showing how to make a million at Monte Carlo, who themselves have never a penny in their pockets, they omit to cure themselves, and die the simple death common to us all.

It is the same in Europe. Those who devote themselves to *spagyric* (occult) medicine, and preach rejuvenation, or the miraculous extension of life, find them-

selves bent beneath the age which carries them off in spite of their elixirs. But these same lead, in any case, a most laborious life.

In our days, just as twenty centuries ago, there is always a number of persons convinced that there exist remedies which have the hidden and beneficent power of prolonging our earthly life. A special literature is devoted to their cause, and their initiates may be counted in thousands.

Here, for example, is the "Elixir of Life" as extolled in Paris by M. F. Jollivet Castelot, one of the most brilliant representatives of the "Holy Science." In his view human health and life may be preserved unaltered so long as the three principles remain in union, and keep the desired tension and temperature. What is this holy trinity? It is sulphur, mercury, and salt, mixed in just proportion. When a division occurs between these three corporal principles, "the forces are loosened in consequence of the loss of balance." The "Wise Initiate," Sévir, has described in his *Plantes magiques* the thousand ways in which the harmony thus understood may be re-established. The first among these medicaments is the *Elixir of Long Life*, whose effects were claimed to be infallible. It is composed of potable gold, which works in a special manner on the heart, and eliminates all the impurities of our organism. It cures all diseases "by illuminating the human microcosm."

The "red powder of the philosopher's stone" is also mentioned. Projected upon impure metals, it transmutes them into pure gold, so its "adepts" tell us.

For this virtue alone the recipe deserves to be widely

known. But, alas! the "illuminated," the true Rosicrucians, claim that the "integral" secret belongs to them exclusively, a claim which does not prevent them from sharing the ignorance of others as to even the first word about it.

Poor *illuminati!* They also, in spite of their direct contact with divinity, submit to the magic spell of life. In its mysterious charm, their passion for the "beyond" loses itself irretrievably. Hypnotized by the bewitching goddess, they, like their science, are buried for ever in their fruitless researches.

But why should we marvel that men, finding themselves on the borderland of the realm of science, give themselves up to the desire to discover a panacea against death, when the most famous scientists succumb to the temptation? Each year brings us new efforts, crowned with a more or less durable success. We may recall, among others, the trials made by the London Academy of Medicine, and, above all, the memoranda read by Dr. H. Wilson, as well as the works lately published by Professor Metchnikoff, and so many other physiologists, doctors, and biologists, relating to the abolition of old age.

Recently two Chicago physicians, Professors A. C. Wiener and Joseph R. Hawley, reviving the procedure of Brown-Séquard, have attempted to rejuvenate their contemporaries by means of injections of the serum of a heifer. With that confidence which characterizes certain American savants, they announced that they were on the track of a most efficacious method of combating death. No matter—their direct precursor, Professor B. F. Robert, whose method they borrowed, died, by a

singular irony of fate, very young; a circumstance not exactly calculated to inspire too great a confidence in their theory.

For, indeed, to rid ourselves of death we must change the nature of man from his very birth. According to C. S. Minot, the celebrated American biologist, old age is a phenomenon which manifests itself from our extremest infancy. Our power of gaining weight, that sign of age, diminishes proportionately as we grow older.

How is this phenomenon produced? We know the important *rôle* played by the nucleus in our tissues and our cellules.

Now, this youthful nucleus atrophies in the adult and so continues until death. It never ceases to lose volume, while the protoplasm become ever more and more abundant. In this perishing of the nucleus, to which we are condemned from the very opening of our life, lies the reason of our old age and death.

As Bichat has said, we die by degrees from our most tender age.

If we can, however, do nothing to give immortality to our terrestrial envelope, it rests to a large extent with us to preserve it as long as possible. The paradox that man does not die—he kills himself slowly—has, in many cases, a great foundation of truth. For, in reality, we live hardly half or a third of the life which is fitting for our organization.

IV

Gerocomy might have helped us by teaching us its mysteries in a manner more negative than positive. Although it would have found it impossible to reveal

to us the secrets of longevity, it might at least have unveiled for us the evident reasons for our accelerated death. As compared with Hygiene, Gerocomy might be characterized as the science of the direct and simple causes which attract death as the loadstone attracts iron. What unsuspected discoveries might have been made! Who knows, for example, whether tobacco is more injurious to the health than immoderate indulgence in wine? E. Pflüger, the physiologist, shows in his curious pamphlet on the art of prolonging human life (*Ueber die Kunst der Verlængerung des menschlichen Lebens*, Bonn, 1890) that in the numerous lists of centenarians which he has had occasion to study, he has found only one smoker aged 107. Notwithstanding which, there were a fair number of alcohol-lovers. Thus the venerable Johanna Obst, who attained the limit of 155 years, had been in the habit of drinking, since she knew not when, two glasses of brandy a day. A surgeon of Lorraine, Politimän, was an analogous case: he had drunk continuously since his twenty-fifth year, and up to the age of 140 years got drunk almost daily. These two old people, besides several others, as Pflüger sadly remarks, would doubtless have further overshot the limits of age without the pernicious influence of alcohol, whilst smokers always slip away from life before gaining the stripes of the centenarian.

Munich beer, the use of which is becoming more and more general in France, presents almost as much danger as tobacco, according to the statistics compiled by Sendtner (*Ueber Lebensdauer und Todesursachen bei den Biergewerben, München, Mediz. Abhandlungen*, 1891).

The author based his calculations on the tables of mortality drawn up during a period of thirty years. Diseases of the heart, caused by immoderate beer-drinking, occasion more than a third of the mortality of the town of Munich. Now, in the capital of Bavaria the average annual consumption of beer is 416 litres per inhabitant. If we add that beer contributes to the formation and nourishment of other diseases, the ills produced by this so-called healthy and harmless drink may be readily comprehended. We may add that the number of cases of heart disease has greatly increased in Germany during the last fifteen years, keeping in line with the extravagant consumption of beer noted during this period.

The insurance societies, who are ranked to-day among the most trustworthy sources of supply to the future science of gerocomy (one might find in their accounts bases ready-made for theoretical generalization), are widely awake to the dangers due to the abuse of beer. Thus certain English societies will not accept as members persons employed in breweries, they being too much exposed to the temptations of excessive drinking.

In the neighbourhood of New York the very aged have formed a Longevity Club. The twelve members met together from Ozone Park to Brooklyn Bridge, head-quarters of the strange club, represent between them about 1,100 years of human life. How fine and instructive a total! The members of the club doubtless pose as eminent professionals before all amateurs of the science of longevity, for they have been able not only to extend the limits of old age, but also to free it from the multiple ills which beset it. All of them, when

questioned as to their habits of life, declared themselves to have a horror of alcohol and tobacco.

Here is a fact belonging to another order of thought, which has cost, and costs, the lives of millions of men. Numerous observations have taught us that the vitality of the animal world is in direct ratio with the duration of its adolescence. The later the period of adolescence, the longer that of maturity is enjoyed. The same is true of man. Now, the education and instruction given to children are in flagrant contradiction of the teachings of this law of gerocomy. All out efforts tend towards the rapid advance of physical and intellectual maturity. "There are no children now-a-days!" Such is the cry of parents, who, nevertheless, continually augment their efforts, that their offspring may leave as soon as possible the paths of infancy. Now, not only are these years, stolen from nature, of no use to the human being, but the latter, on the contrary, pays dearly for them in the diminution of his vitality, that fatal error of education. It would be outside our subject to attempt to study the injurious influences exercised by this state of things upon the mentality and organic constitution of man. We must limit ourselves rather to setting forth the information given us on the point by the study of longevity.

We know that breeders, led by the desire to see their capital fructify rapidly, succeed in hastening the growth and maturity of certain animals.

Now, every time that they thus advance the state of puberty they do it only at the expense of longevity.

The sheep of the Oxford and Hampshire breeds live shorter lives and lose their teeth sooner than sheep

whose natural evolution has not been interfered with. A well-known English breeder, F. W. Walker, states that it is true that the maturity of Polish rabbits may be hastened by six weeks, but, which is no less true, that these rabbits grow old and die before their due time.

It is the same in the plant world. Arthur Smith, who has pleaded with such eloquence for the existence of a cerebral faculty among plants (*The Brain Power of Plants*), tells us that every effort tending to accelerate the artificial growth of plants reacts in a very harmful manner on their physiological constitutions. Plants lit at night by electric light grow rapidly, but the following year they bear but few shoots, and many of them die a premature death.

Gerocomy would evidently preach with more success than do morality, virtue, and sobriety. What, for example, could be more encouraging than those observations of Dr. Humphrey, who devoted himself to the study from life of 66 centenarians. All had excellent digestions, the result of the moderation of their lives. Forty-nine of them might indeed have repeated, with Noël des Quersonniers, that they had never noticed that they had digestions. There were amongst the number drinkers of water and of wine, eaters of vegetables and of meat, but all used them in moderation. The five drunkards who formed part of Dr. Humphrey's collection were, thanks to their poverty, reduced to an involuntary sobriety, and only in extremely rare cases had recourse to wine.

In order to justify the use of wine and alcohol, their virtues as excitants are vaunted. We are told that without their aid we should be deprived of a number of

masterpieces in the domain of letters, of science and of the arts.

Being most desirous of sifting this dogma, which has been admitted to the world of intellectual workers, I have prosecuted an inquiry throughout France amongst the most eminent men of the present generation.[1]

The illustrious chemist, M. Berthelot, declares in his answer that alcohol has always seemed to him harmful. "I have eliminated alcohol in every form from my diet."

Emile Zola replied that he "drank water only." Victorien Sardou "that he considered alcohol a poison." To Paul Bourget, "alcohol, taken in however small a quantity, and in whatever form, is an absolute bar to work." Pierre Loti drinks neither wine nor beer. Saint Saëns states that he has never used alcohol as an aid to work. The same with Massenet and Reyer.

As to painters, the most celebrated of them show themselves equally hostile to alcohol. Benjamin Constant speaks in his letter of tea, the only drink which he uses as a stimulant to work. Raffaelli tells us that he has banished alcohol from his daily use. Leon Bonnat condemns it with the same energy, Gerôme even attributes to it the weakening of the artistic vision. "Amongst artists who are given to alcohol," he says, "one finds a general laxness, an artistic dishonesty; even among great artists one sees in such a case a slackness in all parts of the work, and weak execution." Ernest Hébert, who, in spite of his great age, still shines among the great painters of our time, never has recourse to anything but water as the divine inspirer of

[1] See *La Revue* of the 1st and 15th January 1908.

his pictures. Jules Breton, the great landscapist, writes that there is no worse excitant for writers and artists than alcohol. The celebrated E. Carrière, one of the most original painters of our day, always declared himself a resolute enemy of intoxicants. "Passing excitements are, as far as I am concerned," he declares, "sterile, and in any case short, and followed by depression. Continuity of thought alone gives us real power."

The poets consulted, such as Sully-Prudhomme, Rollinat, Mistral, and several others, have made similar declarations.

Numerous physiologists have attempted to define the quantity of food necessary for man in the different phases of his life. These formulæ naturally vary, but nearly all give us an average well below that which we impose upon our organisms.

According to Attwater an adult needs daily 123 grammes of albumen, 125 of fat, 400 of hydrocarbon; according to Ranke, 100, 100, 240; according to Moleschott, 130, 450, 350; to Foster, 131, 68, 494; etc. According to Armand Gautier, 110 grammes of albumen, added to 65 of fat and 410 of hydrocarbons, would be altogether sufficient for the ordinary needs of our organism.

Note that meat contains about 20 per cent. of its weight of albumen. It would need therefore a little over a pound of meat per diem to supply the necessary albumen. But besides meat, do we not consume a quantity of other ingredients (eggs, cheese, etc.) which give us a supplementary provision of albumen? To speak the truth, the quantities mentioned above seem still to be

very much exaggerated. According to quite recent investigations,[1] about 40 grammes of albumen would be quite sufficient. According to Chittenden, Hirschfeld, Kamagawa, etc., 5 to 7 grammes of azote contained in 30 to 45 grammes of albumen (2·25 grammes of albumen contain 1 gramme of azote) would keep the most robust man in health and vigour.

Now we can very easily obtain this quantity of azote by having recourse to vegetable substances. Mr. Chittenden has himself undergone a quantity of conclusive experiments. For several years he, together with several of his colleagues, has submitted himself to a most careful *régime*. He exactly measured the quantity of azote absorbed and excreted. As far as possible avoiding meat, he and his friends absorbed 6 to 7 grammes of azote (5 to 6 are excreted). Thanks to this moderate nourishment, he first of all lost his rheumatism, and was restored to vigorous health, the same reassuring phenomena being noted in the other cases.

Widening the field of his experiments, Mr. Chittenden placed under an analogous *régime* eight students of Yale University. These young men, devoted to sports and leading a most active life, all consented to reduce considerably the quantity of nourishment taken by them during a certain number of months. Their average ration, reduced to about fifty grammes of albumen, not only allowed them to continue their exercises, but, more essential still, the eight experimenters were all in excellent health. The diminution of nourishment only im-

[1] See, amongst others, the curious work by R. H. Chittenden: *Physiological Economy in Nutrition*, together with the researches made in France by Dr. Bardet, *But. Gen. de Thérap.*, 1902, etc.

proved the state of their health, while rendering their bodies more supple and vigorous.

One of the most distinguished practitioners of Paris, Dr. Guelpa, starting from the same principle of the dangers of the superalimentation of which we are all more or less the victims, frequently orders his patients a fasting diet. After having himself often practised this abstention from food during three or four days, he has remarked how much the organism gains in consequence, both in health and activity. His patients, having once tasted the advantages of the treatment, willingly undergo it on subsequent occasions, trying in this way to radically diminish the inconvenience of our too abundant diet.

The observations made by Dr. G. Bardet, and submitted to the inspection of the Therapeutical Society of Paris, are no less conclusive. After having shown the exaggeration into which old-fashioned physiology has fallen in its dosage of nutrients, Dr. Bardet equally concludes that our organisms are intoxicated by superalimentation, which drags behind it a whole series of diseases and chronic affections.

A number of doctors of the Faculty of Medicine of Paris have carried these suggestions still further. Dr. Albert Robin has pointed out the risks which are run by even children of the most tender age in consequence of their over-abundant nourishment.

Starting from the data acquired in the latest conquests of physiology, we may see that whilst the lower classes of society are decimated by alcoholism, the richer classes pay their sorrowful contribution to albumenism. The two extremes of poverty and riches meet thus upon the

road of suffering and disease. The privations of hunger are in any case less injurious than excess of nourishment. With the progress of scientific hygiene, that part of humanity which over-feeds itself will doubtless perceive that in giving up its superfluity to the necessitous it will be working first of all towards its own salvation. Thanks to the solidarity of the human race, this handing over, whilst profiting the poor, would have indirectly a most salutary effect upon the rich classes themselves. The science of longevity thus points out the advantages of social altruism. While appealing to the most sacred interests of the leisured classes, it proves to them the benefits they would derive from moderation and renunciation.

Have you ever noticed the state of a machine which has been made to absorb an excessive quantity of oil? There comes a moment when this superalimentation prevents its regular working. It stops, completely upset in its vital functions. When we think of the human machine, we cannot prevent a kind of admiration before its delicate and multiple machinery. Yet its strength still exceeds its complexity and ingenuity. We must not forget that we eat, drink, and work, taking no account of the needs of the body, or rather if we take account of them it is simply to do the exact contrary to that required for its normal working.

To live 100 years we must not, like the aunt of Mesdemoiselles Bessière, limit ourselves to eating two or three biscuits a week, live like a parrot, and be as dry as the wood of an old violin (Voltaire), but rather lead the life of that amiable Saint-Evremond who, at 88, wrote to Ninon de Lenclos: "I eat oysters every morning, I

dine well; I don't sup badly; people less worthy than I become heroes, provided they have wit enough to put in practice this excellent motto of the school of Salernius: '*Hæc tria: mens hilaris, requies, moderata diæta* [good humour, rest (after work), a moderate dietary].' "

V

According to Buffon, the *natural* length of human life should be from 90 to 100 years. Men outliving 100 years should be looked upon from this point of view as phenomena analogous to men of more than average height.

If there are persons who do not reach this limit it is because they let themselves be killed by the diseases engendered by their own vices. Buffon truly tells us that the greater part die rather from sorrow.

According to Haller, man is the longest-lived animal, for he may even attain to 200 years!

Dr. Flourens, the celebrated French physiologist, taking as basis the opinion expressed on the subject by Aristotle and reasserted by Buffon, believes that he can scientifically define the normal length of human life; it is the length of the period of growth (the extreme term of which would be the union of the bones and the epiphyses) multiplied by five. The growth of a guinea-pig continues for 7 months; that of a rabbit 12; of a cat 18 months; of a dog 2 years; of a lion 4 years; of a bull 4 years; of a horse 5 years; of a camel 8 years; of a man 20 years; and their ordinary life is 25 years for the horse, 40 years for the camel, 20 years for the bull, etc. Man would consequently have a normal life of 100

years, did he not do everything in his power to shorten this longevity which, nevertheless, he values so highly.

A century of normal life, which might be doubled by a century of exceptional life, otherwise called Haller's two centuries; such is the splendid limit of age of which men, attached to life and so often haunted by the apprehension of their approaching death, may fondly dream.

The prospect of living over 100 years, which at present smiles only upon an exceptional few, may become, some fine day, a general rule for humanity in the twenty-fifth or thirtieth century after Christ.

It is enough for us to study the comparative statistics of longevity through the centuries to realize, as we have shown above, that the average of existence is continually rising.

The progress of hygiene; the increased comforts of the working classes; the results obtained by serumtherapy, which has revolutionized medical science by giving it the means of fighting infectious diseases, that most important factor in human longevity, all these are so many elements which may perhaps allow us to draw near to the beautiful dream fondly imagined by the authors of *Genesis*. Methusaleh, ancestor of Noah, was, according to the latest Bible criticism, only a myth, but who knows whether, thanks to the progress shown above, this myth may not some day become a reality? When liquid air shall have destroyed the evil effects of the unhealthiness of big towns, and synthetic chemistry have delivered us from the poisons contained in adulterated food; when electricity facilitates life by reducing its labour; when universal peace rids us of

mortality on the battle-field; when humanity at last, thus freed from misery and its warlike instincts, as well as the debilitating principle of hate, shall have found its end in the life-giving domain of love and universal fraternity, then we may see longevity again drawing near to its natural limits.

Since the discoveries of Pasteur how many human lives have been saved! Longevity has indirectly progressed as much. Let us take for example typhoid fever. On comparing the figures furnished by the statistics of the Ministry of the Interior of France for the two periods from 1884 to 1890, and from 1891 to 1896, we see that, in the whole of France, the mortality caused by this scourge has fallen from 5 to 3. And the cause of this amelioration? It is, as has been justly remarked by M. Brouardel in his inaugural address to the Congrès de l'Association Française pour l'avancement des Sciences (1899), because every one is impressed with the truth that contaminated water is a danger.

The average mortality from typhoid fever in the Paris hospitals from the 1st of April 1901 to the 1st of December 1902 was 19·3 per cent. Now, out of 507 cases of typhoid fever treated by serumtherapy *in adults* at the hospital (with the antityphic serum of Professor Chantemesse), cases carefully verified, the mortality has fallen below 6 per cent.

The triumphal entry into medicine of the infinitely little has caused a revolution whose effects upon human longevity seem to be incalculable. The treatment of epidemic and contagious diseases has been freed from its baneful and uncertain methods. We may say, indeed, that the absence of all method has been replaced by

vigorously scientific principles. Antisepsis, the use of substances which kill the microbes or prevent their propagation, as well as asepsis. The obstacles opposed to the invasion of wounds by germs and microbes have already saved and will save millions of human lives.

Puerperal fever, which used to cause the death of from 15 to 20 per cent. of lying-in women, to-day only accounts for from 3 to 7 per cent.

According to the figures quoted by Valéry-Radot, in his *Life of Pasteur*, the mortality after amputation had risen in the Paris hospitals in 1868 to 60 per cent. Those who saw the wards full of the wounded in 1870 speak of them with horror. All the wounded, all those operated upon suppurated. Infectious septicemia was everywhere.

"When we decide upon an operation," said M. Denonvilliers, the celebrated surgeon of the Charité at that time, "we often sign a death-warrant." Every one knows the marvellous results obtained to-day, thanks to the Pasteur method.

How will it be when the new medicine has succeeded in diminishing the frightful mortality caused by tuberculosis and cancer? It is said that France shows 150,000 deaths annually caused by phthisis. Let us admit for the moment the elimination of tuberculosis and we have at one stroke a considerable diminution in the French mortality, and in consequence the average of longevity raised by several years.

One thing is certain in any case: the average of human life is rising instead of falling.[1]

[1] According to the *Medical Record of Philadelphia* (July 1901), the average of longevity in the United States in 1890 was 31·1, and in 1900, 35·2 years.

VI

"But," they say, "the strenuous life of to-day, and the more and more insensate preoccupations of humanity which thinks, creates, struggles, and suffers, react disastrously upon human longevity." And in making this objection we have in view chiefly the brain-workers, writers, and artists, who, according to the common belief, make a fool's bargain by exchanging the priceless years of their life for the illusion of fame.

However, when we examine closely the popular belief in the short life of brain-workers, we perceive that their works may have an ephemeral existence, but not their own earthly life. In this respect their average is not below that of other occupations.

We should then be ill-advised to alarm ourselves overmuch as to the risk to longevity caused by a more and more intense intellectual life.

Now, inert and unreflecting life has not, for us, a very high value. What we appreciate above all is life conscious of itself, the life of a thinking being. In these conditions it becomes very consoling to be able to convince oneself that intellectual life, the life of the mind with all the joys which it gives, is in no way irreconcilable with longevity.

In fact, men of intelligence have yet another means of prolonging their life which the poor in mind cannot employ. It relates to the control of life, and its rational use.

In his opusculum on *The Brevity of Life*[1] Seneca

[1] *De brevitate vitæ:* "Non exiguum temporis habemus, sed multum perdimus. . . . . Exigua pars est vitæ, quam nos vivimus."

states with reason that "we have not too little time, but that we lose much of it," and that "the smallest part of our life is that which we live." And starting from this point he combats the pessimism of Aristotle, who poured out recrimination against nature little worthy of a sage.

We know that the founder of the peripatetic school bitterly reproached "the immortal principle of things for having had care only for the animals, whose existence is prolonged for five or six centuries, whilst man, born for destinies so great and so diverse, is cut short far before these limits." But to Seneca, life, long in itself, only becomes short through our inaptitude to use it. And the philosopher makes this profound remark, which has not lost its truth in spite of the centuries which lie between us and its author—

"No man will let his field be taken from him, and for the smallest dispute over a boundary stone, the javelins fly, yet all men suffer their lives to be encroached upon. . . . You will find no one who will share his money, and every man distributes his life to all comers. All seek to husband their patrimony, but when it regards loss of time they are prodigal to excess of the only goods of which it would be well to be sparing."

It is when regarding it from this point of view that we see how cruel man shows himself to himself. We are all of one mind as to the value of life and of time, its supreme expression; but how many are there who know how to honour them in reality? Let each of us pass in review the months and years spent in those vices which shorten our existence, in a sort of moral and intellectual lethargy which ought to be deducted from

our life, and we shall easily see that we are our own executioners. We may not trust the statements of the Register of Births and Deaths, nor even the exterior signs of old age. Like the face of a clock, their business is merely to measure mechanically. The hidden truth rarely corresponds to these formal signs. This white beard or that birth certificate marking two or three quarters of a century of human life are perhaps worth no more than fifteen or twenty years. The squandering of individual life is even greater than that to which modern society devotes itself under the form of armaments and wars. Let each of us examine his conscience and he will shudder with indignation and horror before the lion's share of his life destroyed in carelessness and light-heartedness. By the side of our own faults we must place those of our defective systems of education and instruction. The maladies which must be avoided as well as the evils of the education of youth, take more years from life than it would need to make all of us centenarians. We see too that the science of life, the art of using it intelligently, would singularly prolong its limits.

All those who lament the years which, ever fleeting, bring them nearer to the fatal end, remind us a little of those improvident creatures who bewail the forced expenditure of a few pence while they throw away sovereigns with both hands.

How just is that fine saying of Charron: "It is the mark of a great minister to enclose much in a little space." It is perhaps there that we may find one of the keys of longevity.

All those who deplore the brevity of our sojourn here

below may draw from these considerations a sweet and healing balm. Life, far from being short, may become almost as infinite as the sorrows which weigh down humanity. The space of 60 years as a normal life was already long; 100 years seemed like an insuperable gulf; the possibility of living to 150 and even 200 years is enough to make our heads spin. On thinking it over, one feels driven to thank kindly Nature, who has not thought it well that we should be made to drink to the last drop the cup of vitality placed before us.

D.—Will as a Means of prolonging Life

I

The nineteenth century has the merit of having sanctioned and explained the real existence of some curious facts noted by the chroniclers and historians of so many past centuries. Facts considered heretofore as lies, have suddenly changed their aspect. The power of suggestion, demonstrated, verified, and admitted, has diminished at the same time the number of impostors and miracles in the past. The most unlikely phenomena have regained their semblance of reality. They are no longer contested, for they seem natural, possible, and genuine.

We thus admit that St. Francis of Assisi or Catherine of Siena may have, themselves, felt the pains of the Passion of Christ. Their attention held and fixed upon the legendary points where the nails and the sword transfixed the body of Christ, caused wounds there. The

blood flowed from them. These persistent wounds did, in fact, cause on St. Francis, as, much later, on the lady Louise Lataud, thickenings of the epidermis covered with blood, recalling the heads of the nails of the Cross.

Why should we deny this palpable effect of suggestion whilst so many others even more strange manifest themselves under our own eyes? Ch. Richet and Barthélemy give the case of a mother who, being very nervous, one day witnessed a terrifying spectacle. A heavy curtain-rod nearly fell upon her child kneeling at her side. Instantly upon the neck of the frightened mother appeared an erythematous circle in the exact spot on which the child would have been struck.

The influences of our sensations and ideas upon the body are as numerous as the ideas themselves. Carpenter speaks of a man who, although very weak in the muscles, one day lifted a very heavy weight, because he believed it to be trifling. Corvisart treated the Empress Josephine, and obtained satisfactory results by administering pills of bread-crumbs. In all ages faith in miracles produced the miracles themselves. Those of Lourdes are but repetitions of the votive tablets found in the Tiber, which bear witness to the extraordinary feats accomplished by the Asclepiads.

"In these latter days," we read, "a certain Gaius, who was blind, learned of the oracle that he must stand before the altar, there address his prayers, and then cross the temple from right to left, place his five fingers upon the altar, lift his hand and lay it upon his eyes. He at once recovered his sight in the presence of and amidst the acclamations of the people."

Let us take up the stories published by M. Henri Lasserre in his *Lourdes*, or those published by the Abbé Bertrin, and we shall find analogous phenomena. A lady, who had become epileptic in consequence of a great fright, was submitted to examination by several doctors. All the remedies of science proved powerless. She was taken to the grotto, and this visit, combined with nine days' prayer and fasting, restored her to health.

Here is a parallel case quoted by the ancients. A Roman soldier, Valerius Aper, recovered his sight through following the counsel of the gods. According to their will, he had compounded an ointment with the blood of a white cock and honey, and had rubbed it upon his eyes.

It is enough to re-read what Charcot, Hack Tuke, and so many others have said of cures by suggestion no longer to doubt either the miracles of Lourdes or many others contested in ancient and modern times.

P. Pomponace, even so far back, made the malicious remark that if, on the one hand, "certain cures are only the effect of imagination and faith in certain relics, it would suffice, on the other hand, to put in place of the bones of a saint those of any other skeleton without any prejudicial effect upon the sick. The cure would follow if the sick person were ignorant of the change effected." Following the method of clement tolerance inaugurated by Charcot, certain of his initiates apply to their "faithful" patients "the Grotto of Lourdes at home." They are put to sleep, and the idea suggested to them that they are in the sacred grotto. The Virgin Mary is even made to intervene. The patient is given water of

the Marne or the Loire to drink, and, salutary faith aiding, a gentle and clement cure is achieved.

The action of our psychic life upon the body thus manifests itself in all forms. The discovery of the vaso-motor nerves, made by Claude Bernard, has allowed us to reduce to some kind of order the myriad entangled effects produced by suggestion from without and from within (*auto-suggestion*). We know now-a-days the capital action of the brain, which, by way of the vaso-motor nerves, acts upon all our organs. The beat of the heart may be slowed, accelerated, or even stopped, as the effect of emotions such as anger or fear. A very great fright may even kill by syncope.

Intense attention, concentrated upon a point of our body, causes manifest changes in it. It is thus that we may cause redness or pallor of the face, or even swelling of different parts of the body. Certain religious persons have shown red marks of flagellation or the marks of the martyrdom of Jesus Christ, a result of their too-prolonged and too-often-repeated ecstasies. Charcot gives numerous cases of this kind where phenomena of burns or ecchymoses have appeared on people's bodies as a result of his suggestions to that effect.

One may thus cause, with the help of simple suggestion, functional troubles and lesions of the organism, hemorrhage as well as curative vaso-construction. The cures by suggestion of cases of spitting blood, principally those from bleeding of the nose (*epistatis*), are the most frequent. It has been especially remarked concerning loss of blood occasioned by wounds. Pricks, however deep, during the hypnotic sleep, are never accompanied by a flow of blood.

The ancients, if we may believe Homer (*Odyssey*), were already acquainted with the power of suggestion in this respect. The crafty Ulysses, wounded by a boar, has recourse to a special incantation to stop the blood which flows from his wound. It is by taking as basis the vaso-motor system of Claude Bernard that we can equally explain a number of other phenomena which we owe to suggestion. Thus the states of our mind (passions and sentiments) cause the strangest reaction in our organism. Faith will move mountains, said our ancestors. Courage overcomes the most redoubtable enemies. It is often not the medicine which cures, but faith in the physician. Laurent Joubert long ago supported the theory that "he cures the most patients in whom many trust. . . . It is a power of the soul, which strongly moves the blood and the spirits, in such manner that if it proceed with resolution and confidence the forces of nature assemble to combat the evil."

In their simplest expressions the passions cause easily-verified phenomena. Strong emotions give rise to cold sweats, diarrhœa, chlorosis, blood-poisoning and stoppage of the digestion. Hack Tuke gives this interesting note upon the curative effect of a railway collision. A rheumatic patient, afflicted with a most painful attack of rheumatism, took the train to return home. His sufferings continued to be most violent. A collision took place between two trains, killed one of his fellow-travellers in the same compartment, and suddenly stopped all his pains on the instant.

It would probably need whole volumes to relate the cases of the *material action* of the mind, that is to say, of our ideas, sensations, or sentiments, on the body. An

incontestable fact emerges, however, from the examples quoted above; psychic influences frequently produce the same effects as excitants or mechanical influences. According to Hack Tuke, the phenomena which the mind may produce in the body may be reduced to five groups, known by the names of æsthesia, hyperæsthesia, anæsthesia, paræsthesia and dyæsthesia.

Under the action of thought, sensibility appears in the desired part of the body. Herbert Spencer affirmed that at the sight of a slate rubbed with a dry sponge he felt the same sensations as if he had himself been the object. Certain people cannot listen to the grinding of teeth or the noise of finger-nails upon a window without feeling most disagreeable sensations. Cases are cited of people who have felt physical uneasiness and have even fainted at the sight of an empty bier in which they expected to see a corpse. If we fix our attention on a blow which threatens us, we feel all its effects before it is struck. By the side of these æsthesias we know of numerous cases of supersensibility (hyperæsthesia), occasioned above all by direct or indirect suggestion. It is enough to indicate to a hypnotized person that the part of his body arranged beforehand gives him excessive pain to really cause the phenomenon. The least touch brings on attacks of pain whose cause remains entirely psychic. The approach or the voice of a person who is fundamentally disagreeable to us causes us, in the same manner, sentiments of aversion amounting sometimes to acute pain. "Our ears hurt," as sensitive people often say when they have been obliged to listen to an antipathetic voice.

We know, on the other hand, how, under the influ-

ence of suggestion, a sort of insensibility (anæsthesia) is produced. A long while before the introduction of chloroform the mesmeric sleep was used for the performance of most complicated operations. We may recall, amongst others, the removal of the breast, performed by Cloquet (in 1829) during a sleep called magnetic. In these latter days recourse has been had to the hypnotic sleep in confinements, with most efficacious results.

The case of the sensation of very severe local pains under the influence of the mind (dyæsthesia) is also well enough known. One of our celebrated novelists cannot see a person with a sore throat without feeling the same pain. Lauzanus tells the story of a young man who, after having fixed his attention on a person suffering from pleurisy whilst the patient was being bled in the arm, was two hours after the operation seized with a pain in the same spot, and suffered from it for some days. It would, indeed, be difficult to place all the known cases in a category of formulæ, for the simple reason that their number is unlimited. Individual impressionability aiding, one might induce, with the help of the psychic factors, almost the entire number of phenomena which we owe to material causes.

What, for example, could be more puzzling than this item of news taken from a newspaper? In a banquet-hall containing about twenty persons one of the hosts, suddenly interrupting, cried, his voice choked with a lively terror: "We are poisoned! The cook has gone mad, and put arsenic in all the sauces!"

Upon this several persons were seized with vomiting; several others felt pains resembling those of arsenic

poisoning, whilst one woman fell fainting to the ground.

The misunderstanding was cleared up some minutes later, for the supposed arsenic was nothing but bad flour, which the drunken cook had taken for poison.

Under the influence of great sorrow the hair may change colour in the space of one night. There are emotions which act in a particular fashion on certain glands. The idea of feeling grief provokes tears, fury acts on the salivary glands, shame causes redness of the cheeks, as the emotion of fear has an effect on the action of the heart and often on the digestive organs. Joy facilitates digestion, whilst anger poisons the organism and disturbs its primordial functions. Serenity of mind causes, on the contrary, a sense of well-being easily appreciable in the organism. Under its influence all our organs act in a more normal way, more healthily and more conformably with the comfort of the body.

II

When we reflect on this undoubted repercussion of the mind on the body, we easily perceive that nature has placed at our disposal certain means by which we may facilitate our earthly happiness. We are rather in the position of the proprietor of a soil the depths of which hide rich veins of gold. What should we say of a man who, convinced of the existence of these riches, refused to work them?

Nevertheless, this is the case of nearly all human beings. We know how easy to handle, how certain in their effect are the moral instruments placed by Nature

at our disposition, and yet how many of us have recourse to them?

The forces of the mind, well utilized, may render us most important services from the point of view of the prolongation of life, as we have demonstrated elsewhere. It is suggestion ill-employed which undoubtedly shortens it. Arrived at a certain age, we drug ourselves with the idea of the approaching end. We lose faith in our powers, and they abandon us. Under the pretext of the weight of age upon our shoulders we take on sedentary habits. We cease to busy ourselves actively with our occupations. Little by little our blood, vitiated by idleness, together with our ill-renewed tissues, open the door to all kinds of diseases. Premature old age attacks us, and we succumb sooner than we need in consequence of a harmful auto-suggestion.

Now let us try to live by auto-suggestion instead of dying by it. Let us have ever before our eyes the numerous examples of robust and healthy old age. Let us accustom our minds to the possibility of living over a hundred years that it may possess us and triumph.

Goethe has somewhere said: "Man can order Nature to eliminate from his being all the foreign elements which bring him suffering and disease." Negative action, however, is not sufficient. We must proceed to positive action. We must store up in our brains healthy, serene, and comfortable suggestions.

The fundamental basis of the sect of "Christian Science," so widespread in the United States, is well known. Faced by a manifest disease, they affirm that it does not exist, and suggest the idea that prayer can vanquish all our ills. Up to the time when, blinded by

their success, the representatives of this new faith pushed their method—excellent in itself—beyond the limits of good sense, innumerable cures responded to their invocations. These alleged "miracles" have brought in thousands of adherents and millions of dollars to Mrs. Eddy, the celebrated founder of this religion, so lucrative for its priests.

III

On studying more closely the lives of centenarians, we perceive how much their optimistic belief in their powers helps them to bear the weight of the years. Baron de Waldeck, who died in Paris in 1875 at the age of 109 years, never ceased to cherish the suggestion that he had yet many years to live. At 102 he undertook for the firm of Didot, so his biographer, Pierre Giffard, tells us, an encyclopædia in three volumes dealing with Mexican archæology. A passionate supporter of his theory that Egyptian civilization was descended in a direct line from that of Mexico, he drew from his work and his advanced youth reasons for living. This man, born under Louis XV, who had travelled in the time of La Perouse, breakfasted with Laharpe and the Abbé Delille, counted among his friends Camille Desmoulins, known Bonaparte when he was an artillery officer in Egypt, and Thiers, whom he had taught to draw, who had seen a series of revolutions, passed away under MacMahon in almost the prime of his intellectual powers.

M. Rigaud, the oldest of the mayors of France, whom we met at the 1900 Exhibition, told us that at the age

of 92 he rose at four in the morning and at once began work, after having rubbed himself down with cold water. . . .

"And your 92 years?" I asked him, smiling.

"I don't see them," he answered genially.

A contractor for public works, he at that time still personally superintended his workmen.

One of my friends, a distinguished Englishman, Mr. W——, whom I should hesitate to call an old man, although he is 87 years old, leads as active a life as if he were 30.

I shall never forget a walk of several hours which we took together to visit, amongst others, on the heights of Montmartre, the studio of L. Dhurmer, one of our great painters. With a passionate curiosity Mr. W—— began to study "the secret" of the master's process. The painter, who had heard of the venerable age of his visitor, said to him respectfully—

"No more secrets for you, Admiral."

"Don't you believe it," said Mr. W——, smiling. "I've some time before me, and I may rival you yet."

And, in fact, the following year Mr. W—— renewed the lease of his London house for 99 years. . . .

Mrs. Margaret Neve, who died in 1904 in the island of Guernsey, on her Rouge Huyshe estate, at the age of 111, never lost touch, till the end of her days, with the outside world. She received visitors and questioned them about things of the day. As long as Queen Victoria lived she never failed to send her every year, on her birthday, a telegram of congratulation. The Queen answered her affectionately, and studied the portrait of old Mrs. Neve, as certain women, on the eve of be-

coming mothers, carefully study the faces of all fine children.

Mme. Viardot, the great friend of Tourgueneff, still continues, in spite of her 86 years, to give singing lessons. It is to her active life and the absence of all depressing suggestion that she owes that youthfulness of mind which makes her one of the most agreeable talkers of Paris.

I shall never forget the life-like portraits she has drawn for me of the celebrated people whom she had met on her long journey. And is not creation the typical gift of youth?

Such also was the case of the beautiful Mme. Scriwaneck, the glorious rival of Déjazet, whom we saw towards the year 1900 directing rehearsals and giving lessons at the age of about 80.

Let us lightly run over the celebrated men who, nonagenarians or centenarians, have always been noted for their indefatigable activity and their faith in their "youth."

When we reflect on their cases, we see that it is the suggestion of power, the innate conviction of possible resistance, together with the absence of depressing ideas, which have, above all, contributed to the preservation of their health and to their prolonged longevity. We see by this how important it is to shut one's heart, or rather one's brain, to all funereal ideas of the parsimonious limits of life. Nature, who has created poisons, has also created antidotes.

What, for example, can be more depressing for nearly all mortals than the mere thought of old age lying in wait for us at the decline of life? As many tears have

been shed over this necessity as over that of death itself.

For, alas, those who tremble before the darkness quickly perceive its terrors. And nevertheless, this old age, so calumniated and so feared, carries with it many unsuspected delights. All depends on the angle at which we place ourselves to study and observe it. The author of the *Letters to Lucilius* (XII) goes into raptures over its charms. "Apples are only good," he tells us, "when they begin to wither. The beauty of infancy appears at its end. . . . Those who love wine take great pleasure in the last cup which they drink. All that is most exquisite in the pleasures of man is reserved for the last. . . ."

Renan, again (*Discours de réception à l'Académie*), has found exquisite words to paint that old age so abhorred of all men. "A charming age," he tells us, "that of Ecclesiastes, the most proper for a serene gaiety, when we begin to see, after a toilsome day, that all is vanity, but also that many vain things are worthy to be relished." How fair a bouquet of delicious and fortifying plants one might gather from among the delicate thinkers who have long meditated upon old age. Try to initiate yourself there, and you shall taste, little by little, under their influence, the charm of peace in place of the troubles of terror. Evil suggestions surround us on all sides. We think too much of the diseases of our organs, of the wasting of our tissues, of fatal decrepitude. We mistrust our physical and intellectual forces, our memory, our gifts of work and of conversation. For the enemies of our happiness spy upon us on all sides. The necessity of barring their way with good sugges-

tions, and particularly by well-considered auto-suggestion, becomes thus most evident.

IV

We are more cruel to ourselves than Nature could be. The human organism which we slander so much is of marvellous solidity. There is, perhaps, not one of the mechanical inventions of which we are so proud which would resist with such impunity the multiple and foolish shocks to which we submit our bodies. When we think of our manner of life, which seems only calculated to upset, from our earliest infancy, the thousand wheels of the human machine, we are filled with wonder at its resistance. And not content with disorganizing it, we endlessly calumniate it besides.

After having used and abused our body during a certain number of years, we are pleased thereupon to declare it old, decrepit, and worn out. We then neglect it with a carelessness which completes its ruin. After having suffered for long years from our excesses and our follies, it succumbs under the weight of our gratuitous contempt. And even if the insult did not come from its immediate proprietor, be sure that our neighbours, relations, or friends would not spare to throw it in its face.

Poor human body! Source of so many joys which embellish, nourish, and sustain our life, it is none the less reduced to the post of simple whipping-boy. The reproach that our mind or our conscience is senile or worn out rouses in us a sentiment of revolt. We allow no one to doubt their power or their youthfulness. And yet how many are there who would dare to rebut the

accusation of senility unjustly addressed to them? Worse still, men who have reached a certain age bend themselves still lower under the imputation, and do all that they can to merit it.

Our superstitions have besides, here as everywhere else, their part of the responsibility. For nearly all of us suffer from that of false sensibility. We thus imagine that the age of retirement has come at 60, and even sometimes earlier. It is from that time onwards that we give up our occupations, our exercises, and our pleasures. We withdraw from life, which withdraws from us in its turn. Now physiology is there to demonstrate to us that our organism can still accomplish *all* its physiological functions of the preceding ages. And if our digestion or any other function is weakened or paralyzed, do not accuse the years of the damage, but the ill-usage which you have given it. For, after all, what is senility? It is the epoch in life when man, only possessing a worn-out organism, ought to die a natural death. Now this limit, which, theoretically, might be advanced to 150 or even 200 years, is found in practice much further away than we should *dare* to hope.

I take as a proof of this a series of curious tables of statistics of deaths from old age during 11 years in Paris, which were arranged by Dr. A. Bloch.[1] The result is that even in this city of Paris, which exercises such a harmful action on health and longevity, senility such as we have just described appears often at 80 to 85, and even some years later. The author gives the number of deaths from old age, in default of other visible causes, as follows—

[1] *Bulletin de la Société d'Anthropologie de Paris*, 1896.

Year	From 80 to 85	85 to 90	90 to 95	95 to 100	100 and over
1880	393	213	60	10	1
1881	465	177	36	9	2
1882	413	214	48	8	1
1883	454	264	64	15	0
1884	437	221	59	6	1
1885	398	238	63	15	0
1886	447	255	61	11	1
1887	387	262	58	12	0
1888	441	271	75	13	1
1889	555	293	116	32	3
1890	519	307	116	18	2

The critical period of old age is thus fixed *for Paris* between 80 and 85, for it is in these five years that there are most deaths from senile decay. On comparing his numerous data the author has come to the conclusion, seemingly paradoxical, that after the age of 80 disease has less and less hold upon man as he gets older. In other words, after having passed the critical age, man has a much greater chance of dying a natural death, that is to say, of reaching the last stage of his century. And the reason of it is perfectly simple. Man often needs eighty years of experience to know how to manage with certainty the possibilities of his organism. What is even more important to us is that death from pneumonia, heart disease, cerebral congestion, or hæmorrhage is by no means as frequent after the age of 60 as is generally believed. In other words, the respiratory and circulatory apparatus and even that of the digestion continue to act, or rather, have no special reason for not acting.

In any case it is not the natural cause, senility, which robs us of their use, but all kinds of accidental reasons. Which of us has not met men of over 70 or even 80 years

who yet digest and breathe quite well, and still enjoy all their intellectual faculties?

In continuation of an inquiry started by me in France, Mr. W. T. Stead has kindly organized another in the *Review of Reviews* of February and March 1908, relating to England. The answers which have reached him from men who enjoy general consideration as savants, writers, leaders of politics or industrial enterprise only confirm our theory.

Lord Avebury, who is now 74 and has the use of all his faculties, owns to having kept his health and mental powers thanks to his moderate *régime*. He has, besides, banished alcohol from his diet. Sir William Crookes, born in 1832, claims to have always eaten in moderation. Frederic Harrison says that in spite of his full 77 years, "he has never felt himself so mentally and physically active as at present." He attributes his robust health, "in spite of his delicate constitution and his hereditary tendency to gout," to his very sparing diet. Field-Marshal Earl Roberts, vigorous, despite his 76 years, teaches that "one should smoke little or not at all and eat and drink in moderation." William Michael Rossetti, the last survivor of that family, illustrious both in art and letters, says that his vigorous health at the age of 80 owes its virtue to moderation. "A water-drinker, I have always been a moderate eater."

Professor Alfred Russell Wallace, now aged 85, also tells us that "at the approach of old age alcohol is most harmful. As we grow old we should take the minimum quantity of nourishment chosen with care and easy of complete assimilation."

The numerous correspondents of W. T. Stead all take

the same view. And the more one reflects on this subject the more one sees that senility is deferred and will be deferred longer yet by a healthy comprehension of life. When we know how to look after our organisms we can preserve them from the dangerous onset of the years. Many examples are before us to calm our apprehension on that point. They should give courage to those who fear out of all proportion the weight of the vanished years. We will quote yet a few more fortifying examples. To strengthen human courage we can never quote enough.

Gladstone became Premier for the fourth time at the age of 83. Newton and Herbert Spencer up to their deaths at 83 gave continual proofs of their intellectual vigour. Palmerston died in power as Premier at the age of 81 years. Landor wrote his *Imaginary Conversations* at 85. He did not die till seven years later. John Wesley preached up to the age of 88. Washington Irving worked at his *Life of Washington* after passing his 75th year; Jacob Grimm, together with Browning, only ceased to write at 77. At 73 Wordsworth was made Poet Laureate, and Longfellow at 75 wrote his sublime meditation, *Hermes Trismegistus*. Grote began to write his work on Aristotle after having reached his 70th year, and Tennyson composed his *Crossing the Bar* at the age of 83; etc., etc.

All countries and all peoples furnish numerous examples of this intellectual vitality, added to physical health, and yet we have to do with persons who have passed the age wrongly considered as the limit of normal life.

Littré worked at his dictionary at the age of 74.

Victor Hugo published his most striking works after having passed his 75th birthday. He published his *Pope* at the age of 77, and his *Torquemada* at 81. His posthumous works, the greater number of which were written some months before his death, show a rare vigour of mind. Seventy-eight years old, Lamarck put the last touches to his classic work, *The Natural History of the Invertebrates*. Guizot wrote and published most remarkable studies at 86. Talleyrand at 83 astonished every one by the vivacity of his conversation and his brilliant and lively wit. Voltaire, again, at the age of 83 composed his tragedy, *Irene*. Chevreul, at the age of 102, still interested himself in the progress of science, and contributed his share to it until his death, which happened in his 103rd year.

At the age of 74 Kant wrote his *Anthropology*. At 76 Humboldt undertook the publication of his *Kosmos*, and Ranke at over 80 years worked at a monumental *History of the World*.

Pope Leo XIII launched the most resounding encyclicals and successfully held his ground against the tempests menacing the Catholic Church, after reaching the age of 90.

Rational economy in the use of our organs may preserve their action well beyond a century. It is sufficient to permeate oneself from youth up with this truth in order to bring all lovers of life as far as this last stage in their long journey.

V

But how can we fight against the deadly influences which lie in ambush for us at every instant of our lives? Let us observe ourselves in sorrow and happiness. What do we see?

It is often enough for us to be told something pleasant and happy to bring peace and serenity into our souls. More important still: often when we are the victims of a settled sorrow or a limitless despair we begin to think over our case. By dint of looking at it we find it not so desperate as we thought. Continuing our meditations we find the calmer aspects of the situation standing out with reassuring clearness. They even smile on us. We may even trustfully leave ourselves to their mercy.

Thus it is that vexatious impressions fade away, evil or depressing sentiments lose their sharpness, and as the surface of a lake, ruffled by a stone, regains its habitual calm, our consciousness recovers its balance. For in nature nothing is absolutely good nor absolutely bad. In the saddest things there is a core of peace, if not of gaiety. We must seek it, and having found it make use of it.

The prudent man will do more. Instead of having recourse in exceptional cases to the good fairy he will keep her always at his side. It is to her smiling face that he will turn in each misfortune. It is to her musical laugh that he will leave the task of banishing the wrinkles from his life. Peevish philosophers and psychologists will doubtless tell us that optimism is unworthy of a thinking man. What does it matter!

Speak what ill we will of optimism, we must nevertheless acknowledge that it seems strongly attached to the human lot. Wish as we may to substitute for it the philosophy of ill-humour, otherwise called gnawing pessimism, as the natural system of humanity; we have only to examine man more closely to see with what joy he lends himself to the smiles of the good fairy and turns from the grimaces of pessimism to realize to which side nature draws him. Look round, and see how instinctively man lets himself be carried away by his optimistic leanings. The multiplicity of games of hazard, with their chances which border on the impossible; the overcrowding of the liberal professions where successes are so rare; the belief in political panaceas and the spectacle of so many other of life's risks where unshakable faith in a happy issue always dominates the fear of ill-fortune, are there to prove it to us.

I cannot regard the vast field of international literature without a certain tenderness.

Thousands of persons who follow the profession of writing live in misery and the scorn of public and critics. Nevertheless, they still publish their works, often at the price of frightful wounds to their self-respect. In their fearless hope for the future they discount to-morrow's glory and even that which may come to them from distant generations. And yet they cannot but know that of the thousands of books and writers who have preceded them, hardly a few hundred have survived. Besides the chance we have in the lottery of literary glory, a Panama share or one of the Crédit Foncier de Paris offers almost a certainty of a prize.

What has become of the greatest poets of Greece?

Which of us has read a single line of Simonides, who was fifty-six times winner in the poetic contests, or of Philetas, whom Theocritus despaired of ever equalling?

Max Bonnet, in his *Philologie Classique*, claims that if Homer, Sophocles, and Euripides have survived it is simply because they were used as a practical object of study for youth.

On such things hang the glory of these immortal poets among all those who have had the good fortune to live at an epoch when, according to all accounts, there was as yet no overcrowding of genius and talent.

Were it not for our deep-rooted optimism, the thousands of authors who swarm all over the world would doubtless break their pens and devote themselves to labours more peaceful and, with supreme irony, more lasting.

Humanity, left to itself, as Dr. Max Nordau rightly says, accepts by instinct and by preference happy suggestions.[1] Such suggestions, therefore, have more likelihood of dominating us. It only remains to direct them to the service of our happiness.

All those, however, who feel themselves incapable of the practice of an optimistic philosophy, may have recourse to a method of an astonishing simplicity. It is none the less efficacious. The story is well known of the person who, when suffering from neuralgia, argued so well with his disease that the latter at last disappeared. It is a question of auto-suggestion in each separate case, instead of employing a general doctrine. Psychotherapy, the new branch of medicine, teaches us

[1] Max Nordau, *Paradoxes Psychologiques* (F. Alcan).

that certain diseases disappear as if by magic in consequence of constantly repeated suggestions.

Prof. Regnault tells how, while treating a hypochondriac, he advised him to write these words on his wall every evening, "I am happy," and to go to sleep looking at them. And, in fact, some weeks after, his spirits visibly rose.

Which of us, on speaking of God, does not instinctively look at the sky? Science can do nothing against the mechanical repetition of those words, contrary as they are to the most elementary notions of astronomy, "God, who art in the Heavens!" In moments of distress even astronomers may find themselves seeking their God in a hidden corner of the universe.

What an inexhaustible resource we have here against the invading years! Let us accept it with confidence, and regard it with that calmness which becomes a prudent man. Let us always keep before our eyes comforting visions of a calm old age and probable longevity. Little by little our optimistic visions will make us a kind of body-guard. They will watch that venomous apprehensions shall not poison our consciousness. Those who are insensible to the influence of this ambient atmosphere of reasoned thought may have recourse to direct and continued suggestion.

Let us repeat every day, and at all times when the apprehensions of a helpless old age knock at our doors, first that this is a long way off, and then set ourselves to remembering its attractions. This direct action upon our minds will have prodigious results. And just as the hypochondriac begins to beam with happiness by continually repeating that he is gay, so persons obsessed

by the thought of old age and death will think calmly of their approach. The unreasoning fear of them, by demoralizing our consciousness, only quickens their destroying march.

By considering them with that sense of balance worthy of a true inquirer we can defer their approach. Our fears will be lulled to sleep under the influence of thought, as are the fatal desires of love under that of the "malalis," as the Indians tell us.

Above all, let us submit to the most powerful of all suggestions, that of work. Let us keep our youth under its protecting illusions.

Occupy the mind, and do not let idleness weaken the body. In a word, do not have time to grow old.

That inevitable visit which must be paid to us by those two redoubtable sisters, old age and death, will not only be paid later, but, more essential still, it will be almost welcome. We shall await them like guests who will bring us, at some distant time, even very distant, the winning charm of a gentle and peaceful melancholy.

E.—The Cure for Old Age

I

We do not die even centenarians. Why this premature death? Why do we die? This is the eternal debate which has already given us so many explanatory treatises explaining nothing whatever. To attempt to give a *résumé* of the reasons which have been given us

by writers from theologians to biologists would be a task demanding hundreds of volumes, besides being completely useless. Humanity is above all things interested in the means of avoiding death, and not at all in the hidden motives of his existence upon earth.

Let us, then, put aside the thousand and one causes quoted by our predecessors, and let us give one which deserves more honour than is generally accorded to it. This despised cause is the fear of death. Man, arrived at a certain age, or even at a certain mental state, undergoes a sort of auto-suggestion of death. He then believes himself to have reached the end of his days, and feeds as much on the fear of death as on bodily foods. From this moment onwards death fascinates him. He hears its call with terror everywhere and always. The philosophic and salutary consciousness of a hereafter gives place to a cowardly and nervous fear of separation from life.

The victim feeds upon this fear, intoxicates himself with it, and dies of it. The man obsessed by this thought eats badly and digests even worse. His nervous system is disorganized, and his organism remains deaf to the stimulus of the outer life. Regrets for the life which he believes to be fading away make him waste the vital resources of his organism in a limitless sorrow and nameless maladies.

If one were persuaded that the seventy years one had reached were far from being the limit of life, a double span might be attained. It would often be sufficient to set back the factitious barriers of longevity, to imbue men with the conviction of a life of a century and a half

awaiting them to make them achieve it. Auto-suggestion, which goes so far as to cause ankyloses and material wounds in the human organism, would impress us in such a case all the more strongly in that its action would not fail to react on all our being. For we must not forget that the fear of death robs us of everything, not excepting the power of living.

In war those who nearly always perish before the others are those who tremble the most before death. They think of it, dream of it, watch for it, thinking to escape it, and it chooses them by preference and swoops most surely upon those who fly from it. It is perhaps this which explains the terror seen upon the faces of the dead who strew the field of battle.

If we examine the past and, above all, the present of centenarians, we shall be astonished at the indifference which they manifest to the supreme ending. This seems to be the slightest of their cares, and they most often wend their way towards the limits of life without preoccupying themselves about death.

The following sally, attributed to a man of a hundred and twenty, deserves to be accepted as one of the fundamental principles of gerocomy. Asked whether he feared death, he answered—

"As much at a hundred as at sixty, and at sixty as much as at twenty, that is to say, never. I have always thought to live well, persuaded that that would bring me death at its due time and in its most seductive form."

The scorn of death is again one of the methods of prolonging life. For life behaves to us like a woman: she gives herself above all to those who show themselves

indifferent to her, and she abandons those wooers who weary her with their extravagant attachment.

The best way not to die too soon is to cultivate the duties of life and the scorn of death.

II

After all, old age, which throws us violently into the arms of death, is by no means so cruel and inevitable a necessity as is ordinarily thought. Let us be quite clear: we may, perhaps, never discover the Fountain of Youth, of which the ancients dreamed. In their simple faith its waters would render those who bathed in them, for ever young, by giving them power to resist the destructive effects of the wearing-out of their organisms. But we must take care. That which was only a myth has certain chances of becoming a scientific reality. Less fair than the dream of those who trusted in the ancient nymph of Jupiter, it will not kill old age, but it will defer it for many years. For modern biology has conceived the heroic project of directly attacking old age itself. Biologists believe it possible to defer the date of its onset. The human organism will thus be sheltered from its menaces. It will be, as we shall see later, defended by a whole army of warriors, resolved not to allow the enemy to surprise the body committed to their care.

To understand the possibility of this revolution so ardently desired by all the human race, let us try to grasp the physiological explanation of old age, according to the most recent data of biological science.

We distinguish in the blood, besides the red globules

known by the name of phagocytes, whose function it is to supply the tissues with oxygen from the air, white globules, leucocytes, far less numerous, but nevertheless fulfilling important functions. The phagocytes and leucocytes are both unicellular beings whose mission it is to preserve our organisms from all kinds of microbes. As soon as the parasites show themselves the allied armies of phagocytes and leucocytes throw themselves upon the newcomers and devour them. This operation is not always performed with the desired promptness and efficacy. Sometimes the invading army is too strong, sometimes the defenders too weak. The struggle then becomes long and cruel, and on the result of these prolonged battles depends, on the whole, the security and even the life of our organisms. If victorious, the invading microbes take possession of the human body, and after having laid it under contribution, while weakening its resistance, hasten its decrepitude, and cause its death. These continual battles form the essential condition of our life. In the mysteries of our individuality the trained eye of a modern biologist can discern heroic combats of myriads of beings around the integrity and security of our organism.

But these incessant wars leave behind them their wounded. Upon the battlefield lie weakened cellules, incapable of fulfilling their natural functions, and even dead. It is important that this loss should be replaced as soon as possible, for in the microcosm, which is the interior of our organism, just as in battles between peoples, the dead and dying cannot with impunity lie for ever on the spot. The obsequies and the elimination of the dead from among the living must go on, cost

what it may. This duty is incumbent also upon the valiant army of phagocytes and leucocytes.

Let us pursue our comparison. Just as in a more or less ill-organized State those who are called upon to defend its territory sometimes turn against those very persons to whom they owe protection, so our unicellular guardians turn their arms against the State (the organism) which they are supposed to defend. This fratricidal war is the more easy in that the tissues of which our organs are composed become in their turn the victims of flagrant contradictions.

Our principal organs, such as the liver, the brain, and the kidneys, are composed of two kinds of tissue. There is, first, the connective tissue, a sort of common framework, and then the "special tissue;" that is to say, the cellules proper to each organ, charged with and executing each its natural function. The weakening of any one of these organs is caused by the disappearance or the weakening of these special elements. Their place is taken by the connective tissue, which, being essentially inferior, develops rapidly in every direction. The medical terms "sclerosis" and "arteriosclerosis" precisely define the process of which we speak. By losing its special cellules, which are replaced by connective tissue, the organ hardens and ceases to act normally. This is the way in which weakening of the brain or disease of the liver or kidneys shows itself.

III

To return to our good, or rather evil guardians. Perceiving the deterioration of our organs, and proportion-

ately as the special elements grow weaker and weaker, they throw themselves upon them and destroy them as if they were mere vulgar intruders. Before an internal enemy the special cellules are powerless. Sclerosis invades our organs, or, in other words, old age comes with great strides, and death, the final result of senile decay, appears, menacing and close at hand.

What, however, are these traitorous soldiers, who thus betray their sacred cause?

M. Metchnikoff tells us, as the result of his long observations,[1] that we must separate our guardians (phagocytes or leucocytes) into two categories of types: the microphages, provided with several cellular nuclei, and the macrophages, who have but one. Now, whilst the former conscientiously perform their duty of defenders of our organic patrimony, the latter, like a true Prætorian Guard, massacre the very thing which it is their mission to defend.

The solution is easily perceived; the macrophages, as real criminals, dangerous to health and the almost exclusive causes of senile decay, should be driven from our organism. We should remove the possibility of their continuing or even beginning their evil work.

Being habituated to the salutary action of different serums against the pernicious action of microbes, M. Metchnikoff wished to discover a serum capable of destroying the macrophages. What a blow would have been dealt to old age if we could succeed in stamping out its powerful allies! The serum was, if anything, too successful; its action, far from limiting itself to the

[1] See his studies, published in 1899, in the *Annales de l'Institut Pasteur* and in the *Année Biologique.*

phagocytes or leucocytes having one nucleus only, reached at the same time the beneficent microphages, the faithful army and the rebellious soldiers. It has therefore been necessary to dispense, provisionally, with the aid of the serum, whilst waiting for the discovery of one which shall act exclusively on the macrophages.

In the interval the Pasteur Institute is trying to solve the problem indirectly. If the internal enemy can so easily take possession of our cellules, it is because these latter offer no resistance to attacks of this kind. We must not forget that in our youth the higher elements of our tissues are equally exposed to the voracious appetites of the macrophages, and yet the latter do not succeed in piercing them. This is because their vigour prevents any yearnings for rebellion on the part of the faithless soldiers. Instead, then, of destroying the macrophages, would it not be better to strengthen the higher elements and place them in a position vigorously to resist the dangers which menace them? Starting with this object in view, the biologists of the Pasteur Institute are applying themselves to the discovery of special remedies, a kind of auxiliaries which should save the higher tissues from breaking down. A series of serums is needed which should strengthen the liver, the kidneys, or the brain.

These remedies once known we shall by those means alone defer the approach of senility. We shall not abolish death, for we cannot defer its attacks indefinitely. All things wear out in time, and most of all an organism so subtle and complicated as that of a living being. But the mere enabling of human beings to enjoy for a further number of years the delights of health, the diminution of the sufferings and the humiliations of

premature old age, is in itself a considerable gain which might alter the vital balance.

We may add that the experiments tried elsewhere[1] tend to confirm this theory that old age is, in fact, only an accident in our life. The optimism of certain biologists goes so far as to say an accident which it is possible to avoid.

For could the disturbed balance of the cellular elements be re-established, so says M. Metchnikoff,[2] the arrest, or, at the very least, the lessening of senile decay would be effected. Old age would then become more endurable, and that *instinct of natural death*, which in the present state of things is *almost always* missing, might perhaps develop freely.

IV

This absence of the instinct of natural death, to which allusion is made by the above-mentioned biologist, has an indisputable importance from the point of view of the conception of life and death. Each physiological function, when accomplished, causes, as we know, a feeling of satiety and lassitude. We long for sleep after a day's work, or rest after making a heavy meal or abandoning ourselves to any strong passion. Why, after having lived a more or less considerable number of years, after having tired and even worn out our organs, is it so rare or nearly impossible to find a man who goes to death, that normal rest, as one goes to bed after a tiring day's march?

Should we not see in this absence of the instinct of

[1] See the works of Loeb, Calkins, etc. [2] *Année Biologique.*

death an indirect proof of the fact that man rarely reaches the vital limit destined for him? Before this sentiment of weariness of life can change into the need for the eternal sleep man disappears, carried off by some fortuitous disease, or by senility, arrived before its time.

"But," you may answer, "this instinct, the absence of which seems to be so much regretted by certain biologists, may perhaps never show itself, for the simple reason that since certain elementary beings are immortal, it may be that man aspires unconsciously to a privilege exclusively enjoyed by protozoa."

Hence the question arises: Are there really immortal beings? According to Weissmann and several other biologists of his school, all the protozoa, which multiply by division, are in reality immortal. These rudimentary beings, they tell us, never die; for if we observe them closely we notice that each amœba, by dividing, gives birth to two amœbæ, these in their turn dividing into four, and so on *ad infinitum*. Death in this world of the infinitely little is distinguished by its absence.

The matter of the first protozoon observed, Weissmann shows us, has not ceased to exist during the successive doublings of its successors. These always remain the fragments of the same matter with which we began. The original mass has doubtless considerably increased in the course of the innumerable multiplications of its descendants, but it has never disappeared, it is still the same, and we can see no logical reason for its disappearance.

But in truth, Weissmann's immortal amœbæ are not really immortal. They enjoy the privilege of dying without leaving corpses, which is already something.

But from this to attributing to them the virtue of immortality is perhaps too long a step. The result of the minute observations which have been undertaken by M. Maupas[1] is that Weissmann's theory is exploded from the moment when it is submitted to minute examination of the fate which overtakes the successive generations of protozoa.

Let us, with M. Maupas, take an amœba, *Stylonichia pustulata*, a little oviform mass, about ten millions of which would fill one cubic centimetre. We isolate it. It divides. We isolate one product of this division successively as often as the doubling takes place. The operation will undoubtedly be tiring, as each individual divides itself five times in twenty-four hours. If we work out the little sum we find that each individual thus gives birth to ten billions of beings by about the middle of the seventh day; in other words, one *Stylonichia* can produce a kilogramme of protoplasm in six and a half days.

The molecular power of these little creatures is so considerable that it has been calculated that in the 150th generation all the individuals derived from one *Stylonichia*, massed together, would make a sphere a million times as great as the sun!

By isolating individuals we force them to give up the supreme secret of their reproduction. Do they always proceed in so chaste a fashion as is thought and believed, and have they only this doubling as a means of increase? According to M. Maupas, when an in-

[1] "Recherches expérimentales sur la multiplication des infusoires ciliés" (*Arch. de zool. expérimentale et générale*, 1888), et "le rajeunissement Karyogamique chez les ciliés" (*Idem.*, 1889).

dividual is isolated and thus prevented from any process of mating, the successive generations born by doubling become atrophied and more and more degenerate. A moment arrives when the so-called immortals die a simple death and disappear completely. This takes a certain number of generations. The *Stylonichias* disappear after the 215th generation produced by doubling, whilst amœbæ of the *Leucophrys* family only succumb at the 660th generation.

Between protozoa which die in the laboratory and protozoa which grow in an equally prodigious fashion in a state of nature, there is only this difference, that the protozoa left free never trust in their boasted immortality, in salvation by doubling, but proceed to preserve the race, like other mortals, by mating. Henceforth we have to do no longer with immortality of the race, but with immortality of the germinative plasma which lives through ages and generations just as among the other races of animated nature.

Thus the protozoa only enjoy the privilege of dying without leaving corpses, a privilege which animals of all ranks in the vital scale may allow them without overmuch envy, in consideration of the many other inconveniences of their somewhat over-simple life.

Immortality of living beings does not, so far as we know, exist in the sense attributed to it by the Weissmannists. Man being born to die, like all living beings, after a longer or shorter period of his earthly journey, we are surprised that the feeling of natural weariness of life does not in his case precede the supreme moment of death. As far as our modest knowledge of the life of animals can authorize us to think, they run a more

normal course from the point of view of longevity, and it is not rare to see them await their end with the serenity of a traveller who, after long fatigues, crosses the threshold of some hospitable mansion. The human organism, battered on all sides by the hurricane of life, arrives at its destination long before the limit appointed it by nature; a hastened and abnormal end, the effect of the ill-regulated workings of damaged organs, worn out and vitiated before their time. Death in these conditions nearly always comes like a thunderbolt. Unforeseen, fearful, it frightens us by the impossibility of foreseeing or defining its approach, and fills us with bitter feelings, like an undeserved misfortune.

In each case of death we hear the same recriminations, the same complaints, the same regrets for a life prematurely destroyed. The sufferings and humiliations of old age add still more to the disorder amongst which we humans struggle.

The new conception of old age as a special disease opens comforting perspectives before us. All leads us to hope that the method extolled by the Pasteur Institute will sooner or later yield beneficial results. Applied in the shape of a serum directed against the phagocytes who destroy our higher tissues, or as a serum which should restore the tissues themselves, the new path taken by medicine is full of rosy promises for the humanity of to-morrow.

In time we shall perhaps arrive at the conclusion that the diseases and phenomena of senility may be avoided as easily as the diseases of dentition among children. These also were formerly considered inevitable, but who to-day would dare to maintain the necessity or the

advantages of this kind of suffering? Thanks to the progress of medicine, they have been destroyed, just as some fine day we shall destroy the diseases peculiar to old age.

The curious experiments made upon old dogs by a Russian scientist, M. Matchinsky, attached to the Pasteur Institute, have shown that the atrophy of their tissues did not present parallel or uniform effects. This observation has an importance which will not escape a specialist. For if the inanition of the tissues showed itself in the entire organism, we should have been bound to admit its decrepitude without reserve. The reality, however, seems otherwise, for whilst certain nervous centres are in danger, together with those of the brain invaded by phagocytes, the cells of the spleen and those of the testicles still flourish, thus showing a possibility of vitality throughout the whole organism. We thus have to do with an analogous phenomenon which has for its end the destruction of certain organs in those diseases which do not necessarily bring about fatal decay of our bodies. It is enough to realize these kinds of dangers to render them harmless. And as an atrophy of the kidneys, the result of albuminous nephritis, or even muscular or nervous atrophy may be combated with success, there is no reason for throwing down one's arms when faced with the atrophy called senile. And the greater the progress made by the science of cytotoxins (cellular poisons), the more chances we have of definitely conquering the diseases of old age.

Already, thanks to the studies made by M. Borde in 1898, carried on in Germany with so much success by Messrs. Ehrlich and Morgenroth, and in Russia by

Messrs. Pavloff and London in 1899, we have grasped not only the action of the poisons contained in our organs and our humours, but we can even manufacture ourselves artificial *hæmotoxins* with which to act upon the cells in any desired manner.

Thus, for example, M. Delezenne has succeeded in artificially composing nervous poisons which cause epileptic fits in dogs. By injecting the emulsified nervous centres of dogs into the peritoneum of ducks,[1] he has obtained a special nervotoxin, of such powerful action that a very small quantity of it introduced into the brain of a dog causes in the latter organic troubles of exceptional gravity.

We thus find ourselves authorized to put forward the hypothesis that, thanks to the researches made in the science of cytotoxins, we shall succeed in finding various kinds of them, capable of reacting on any given organ. We could augment at will the power of action of our weakened organs, and allow them successfully to combat the attacks made upon them by senile diseases.

The explanation of the causes of senility may perhaps be modified, and the ingenious theory of Metchnikoff undergo some assaults, but the idea of giving support to the organism fighting against wear and tear seems to be definitely accepted. Thus Dr. G. Marinesco, the author of some curious studies on the death of the nervous cells, has thought it possible to combat the explanation of senility adopted by Metchnikoff. He claims especially to have found convincing proofs[2] that in the marrow and brain of persons of the age of from

[1] *Annales de l'Institute Pasteur*, 1900.

[2] *Comptes Rendus de l'Académie des Sciences* of 23rd April, 1900.

60 to 110 years, the ageing of the nervous cells does not only consist in the diminution of the cellular body, but that it is the result of numerous interior modifications, accessible to the microscope. Amongst their number Dr. Marinesco cites the accumulation in the interior of the cellule of an increasing quantity of pigmentary substance, often considerable enough to impede the functions of the cells. On the other hand, the author admits the existence of macrophages, destructive to the nervous cell, and by that very fact he believes himself to have weakened the phagocytary theory of old age. But, whilst showing himself hostile to the explanation of the intimate causes of the evil, he believes in the efficacy of the treatment suggested by Metchnikoff. He also believes that we can prevent the manifestations of senescence by having recourse to dynamo-genic substances (serum or juice of very young animals), which should combat old age and stimulate the weakened energy of the cells.

We may thus succeed, thanks to outside means, not only in prolonging the stages of life but in rendering old age more peaceful, more worthy of a human being, and the approach of death almost unfelt. The crowning act of a series of efforts to which each organ, each part of our *ego* shall have contributed within the limit of its natural means, our deliverance from life will come like sleep to a labourer dropping with weariness. The menace of our end will less and less embitter and perplex our existence. We shall resign ourselves to it with a light heart, as we resign ourselves to the life we lose in sleep, without worrying ourselves as to what precisely are the hours stolen from our conscious life.

CHAPTER III

THE IMMORTAL BODY

A.—Life in the Coffin

I

IT is admitted that the soul is immortal. The greater part of mankind believes it, religion teaches it, and sages confidently accept it. No one, however, has seen the soul, not even the celebrated Dr. Baraduc, who gave illustrated prints of it. What does it matter? We have the conviction and an intimate need of the eternity of the human soul, and that is enough for us.

We have no intention of weakening this belief, the sublime hope of the dying, the supreme consolation of those left behind. We should say of the soul as the philosopher said of God, "If it did not exist it would have been necessary to invent it for the greater happiness of man."

Besides our soul, there exists our body, visible, palpable, and admirable. In our life here below it often plays the dominant part. The source from which is derived the perpetuation of the race, it gives it, besides its vital reasons, its joys and its sorrows, its ecstasies and depressions, its heaven and its hell. The body is the absolute master of mortals, just as one of its organs,

the stomach, is at the present time the basis of all the agitations and revolutions which cover our earth with blood.

Now it happens that the body, as soon as our earthly consciousness has passed away, is given over to a contemptible oblivion. A man once dead, we put his body into a grave, a sort of box of eternal forgetfulness.

We think sometimes of the soul of the departed. We recall his thoughts, we bow to his last wishes, but we forget for ever that body which was dear to us, to which we often owe many proofs of the joys of this world.

Never has human ingratitude or thoughtlessness been more flagrant, for, whatever may be said, the body still lives under the ground. Its life, though of a different nature, does not cease to be life in the biological sense. After all, what is life but a slow death? Born at our birth, it accompanies us, watches for us, and goes with us into the infinite. That which is in our eyes the supreme climax, the leap into the unknown, is perhaps for the body only the last page of the first volume. The second begins at once to unfold its sudden and rapid evolution before our eyes.

The body placed on the bier does not cease to be a body. It has its own life, as have the myriads of plastides which are still part of it. Has it consciousness?

How many living men have? Besides, what do we know about it? Ignoring a fact does not prove its non-existence. Max Verworn is absolutely convinced that all processes are unconscious in protozoa; Luigi Luiciani says exactly the contrary. Which of them is right?

Balbiani and Binet believe, together with Ehrenberg and many other illustrious biologists, that the greater

part of the psychic faculties of superior organisms are shared by the protozoa. And it is enough to read those who, like Jennings or Le Dantec, attempt to contest the psychic life in the infinitely small[1] to conceive serious doubts on the subject. When we observe the paramecia who unite in numerous groups for the common consummation of the bacteria, and their choice of the most favourable places for their development, we feel overcome by the conviction that at the bottom of all these vital processes there is something more than an implacable determinism of reactions and movements. The fact is that we are equally ill-qualified to affirm or deny the existence of faculties which escape our observation. We are forced by analogy to attribute to these little beings certain sensations or desires which we have found in superior creatures. After all, we know nothing of our capacities *per se*, in themselves; we only see and note their outward manifestations.

What is consciousness? What is life? Do not Pascal and Claude Bernard teach us that natural things have no possible definitions?

II

Let us state first of all the obvious truth that the underground existence of our body is far more animated than that which it led above the earth in which it is wrapped. If life is movement, as the ancients said, the world of the tomb is running over with it. The coffin

[1] Le Dantec: "*Recherches sur la digestion intra-cellulaire des Protozoaires*" (Bull. Sc. de la France et de la Belgique, 1891), or Jennings: "The Psychology of a Protozoon" (*Amer. Journ. of Psychology*, 1899).

once closed, beings as dear to the principal source of things as are the human race fill our last refuge with feverish hurry and agitation.

Graves are perhaps places of forgetfulness for those who are left upon the earth, but certainly not for those who are within it. The most formidable battles of the living pale before those which take place in the depths of our planet. And their strategy is that of the laws of nature—eternal, imposing, and implacable. Generations of beings follow each other there, taking possession of our remains, sometimes disappearing in our atoms, sometimes marrying themselves to our tissues. *The fathers of some few human beings upon the earth, we become the fathers of myriads of beings within its depths.*

The pessimist will even say that this generation will give us pleasures preferable to those of this life. Let us not be pessimists.

III

Our grave-companions do not even wait for our parting from the soul to come to us. Even before the moment of death their numerous heralds introduce themselves into all the apertures of the body and accompany the funeral procession to the graveside. Once underground, they disappear to fulfil their fatal mission beside other death-beds. The corpse-loving insects, the "death-workers," come successfully to table and always in the same order. Their action, accompanied by an emission of odorous gases, shows by that very fact the state of the body, and invites successive guests. And

they flock in swarms, penetrate our dwelling and make one with our tendons, ligaments and skin, down to the gnawing insects which, the last traces of the moisture of the body having disappeared, arrive and attack the remains of the dried-up tissues and appropriate even the rags of mummified teguments.

It is the flies who begin the task of the "death-workers." Grey in colour, they resemble their sisters of the window-pane, but they are more brilliant—one might say more attractive. Once on the body, they lay upon it their microscopic oblong eggs. Usually their heads and sides are silvery. They are of different kinds. There is, for example, the pretty fly *Stabulans*, with black feet, of rural habits, met with in stables, and chiefly in pastures. Their work done, they give place to *Lucilia*, of a beautiful shining metallic green, generally emerald, or a golden green, as is the *Lucilia Cesar*, with a white head and blackish markings.

But their stage is now finished, and the *Lucilia*, together with the *Sarcophages*, which often keep them company, retire, leaving the field to the coleoptera of the genus *Dermestes*, and to the pretty lepidoptera of the genus *Aglossa*. These last are part of the *Pyralis* family, little butterflies closely allied to the ringworm, who sleep all day under the shade of green leaves, and in the dusk flutter round the lights. . . .

Then come the other flies, the *Pyophyla*, with a shining body, a little head, and naked feet, which goes majestically, followed by another series of diptera and coleoptera which accompany ammoniacal fermentation; small, with big heads, and very greedy of animal decomposition. Nor do they stay long, for the *Acaria* are

already waiting for their departure, and arrive to facilitate the complete mummification of those organic parts which have resisted the butyric, caseic, or ammoniacal fermentation.

Not a moment's respite or silence. Their place is quickly taken by the *Dermestes*, the *Attagenia*, and the *Anthrenia*, the same who gnaw our woollens, carpets, and furs during our life; little butterflies with wings of a coppery red, speckled with black, or of a light yellow without markings. . . .

And life thus succeeds to the grave, noisy life, with animation ceaselessly renewed. *They love, they procreate, they live, and disappear.* The quiet of the tombs is but a deception, like that of the dust to which our bodies should have been reduced.

M. Fumouze, in a note on the *Acaria*, gives a calculation which will doubtless much disquiet the faithful believers in the repose of the cemetery. According to him each female of the *Acaria* is capable of laying, ten or fifteen days after her birth, fifteen eggs. Work it out, and you have from these two *Acaria* 1,500,000 at the end of three months. And when we think that every square centimetre of our body can contain from 800 to 1,000 *Acaria*, we see what myriads of beings dwell in us and beside us in the world of the grave.

IV

How much more logical were the ancients in this respect. Whilst ignorant of the principles of this admirable science of the entomology of graves inaugurated by Francisco Redi, they seemed, however, to divine the

immortality of the body. Before believing in Tartarus and the Elysian fields, they were persuaded that the body of man continued to live in the grave.

With their single and powerful instincts they already seemed to foresee the dramas of life which were to be played in the sarcophagus. They ornamented these sometimes with merry scenes, sometimes with bacchanalia, symbols of the life which the marble hides from our eyes. Death, like life, was to them a dream. We may recall the beautiful statue of Night, holding in her arms her two lovely children, Sleep and Death, who, lost in tenderness, meet in a long kiss. It is a fact that the Greeks, and later the Romans, did not believe in the melancholy destruction of the body. With their quick imaginations, unconsciously truthful, they still brought food to their buried ancestors. Euripides, Æschylus, Virgil, Ovid, Lucretius, Cicero, all these beloved authors admire the beautiful and touching custom in their turn.

Time has changed its meaning and given it the debased form of feeding the departed spirit.

In the dawn of Greek antiquity, the products brought to the tomb were frankly meant for the dead. They went so far as to dig a hole to convey the food to him.

In Æschylus, Orestes, praying his dead brother to have pity on him, says: "If I live, thou shalt receive rich banquets; but if I die, thou shalt not have thy share of the repasts with which the dead are nourished."

Iphigenia (Euripides) artlessly shows us that the best way of pleasing the dead is to pour upon their graves wine, milk, and honey. Words of superb mysticism which scientists have taken thirty centuries to understand.

While reading present-day studies on the entomology of the corpse we might almost be listening to Lucian, who, with his usual common-sense, thus epitomizes the religion of the dead—

"A dead man to whom nothing is offered is condemned to 'perpetual hunger.'" The rites of burial seem themselves to show that something "living" was placed in the tombs. Achilles beneath the earth claims Polyxenes his captive. It is an unconscious anachronism, clashing with our modern ideas, which leads us still to pray beside graves. If all is ended with death, if the body is but an inert mass, and if the soul is wandering in space, what means our instinctive pilgrimage to the cemetery? Why do we bear thither our sorrows, our prayers, and our tears?

V

On All Souls' Day, throughout Europe, the living "faithful" visit those who were erstwhile dear to them. A pious and unconquerable instinct even leads there those who are rebels to the habits of faith, touching and edifying visits which bind together most strikingly past generations and the present day. We may talk of the abstract spirituality of the human soul; our relations with the dead rather betray our unconscious materialistic beliefs in respect to them. We go to cemeteries driven by the invincible desire to see, to speak, to confess, to weep, and to unburden our hearts—to those who are no more, and whom, nevertheless, we find there and nowhere else. The belief in the immortality of the soul has

become singularly materialized, says Maxime du Camp.[1] It is the body, the disaggregated remains which become the object of the real cult. It is enough to walk through the cemeteries of Paris or any large town or village in Europe to see plainly that humanity is instinctively opposed to the idea of the material destruction of the body. Graves are decked with the flowers which were loved by the living; the living even go there to share with the dead the joys and sorrows of their life. The touching pages which Maxime du Camp devotes to the cult of the dead in Paris proves that even in that city, the most versatile and sceptic in the world, the cult of the dead often assumes nearly the form of idolatry. At Père-Lachaise or the suburban cemeteries of the capital we often find weeping mothers bringing to their child's grave its favourite toys, lead soldiers, or dolls. It is not rare on Sundays to find poor working men cultivating their fathers' funereal gardens.

"One day," says Maxime du Camp, "in the cemetery of Montmartre, I was deeply moved. At some distance from the tomb at which I stood I saw a young woman kneeling. . . . She was singing in a very pure but tearful voice the air of the *Casta Diva*. I stopped, thinking that she must be mad, and wondering what might be the meaning of an invocation of the moon in such a place. The woman rose, dried her eyes, saw me, and doubtless understood my wonder. Then she nodded towards the grave where she had knelt, and said, 'It is mother, she liked that air . . .,' and walked away sobbing."

Although weakened in these latter days, the custom of

[1] Paris: *Ses Organes, ses Fonctions, et sa Vie*, T. vi.

visiting our beloved dead will find support in the progress of the science of graves. Thus reason will give its sublime sanction to our instinctive aspiration, which will henceforth draw its vitality from the findings of the science of to-morrow.

It will perhaps go further. Stealing some day the secret of the grave, it will perceive of what importance may be the intervention of the living in the intimate dramas played therein. Who knows whether the food placed in the coffin may not influence the successive evolution of the human body? Then, perhaps, the touching custom of the ancients of bringing offerings to the beings under the earth may reappear. And we shall say with the Greek philosophers that those who are beneath the earth are not yet quit of existence. . . . To help them to accomplish their evolution we shall go wittingly to bring help to those "who are no more" in the war which they still wage beyond the pale of the living.

Our walks in the cemeteries will then have a humane and intelligent end; and thus, though unable to rebuild the ancient edifice based upon the religion of the grave, we may yet recover several of its virtues. By imbuing the modern consciousness with faith in corporal immortality beyond the tomb, our social and intellectual conceptions will receive a healthy shock. Adopt this dogma, bring it home to the minds of our contemporaries, and there will result from it one of those moral revolutions which do more towards the elevation of the souls of the living than the most popular moral treatise.

B.—The Religion of the Grave

I

In our form of society, founded on the idea of property, the situation of the poor grows daily worse. Talk as we may about patriotism, it fades and vanishes from the hearts of the miserable and destitute. Their misfortunes and deceptions are too great to attach them to the soil. They become landless men, internationalists, in whom the love of humanity is often only hate of the privileged and favoured few.

We must give the sick soul of the people some comfort, some sort of palpable link with the land of their ancestors. It is in the sepulchre, which henceforward will contain the living and integral part of their forefathers and the creatures dearest to them, that we shall find one more element to attach them to their native soil.

Let us look into the past and recall how useful has been this unconscious principle in its time. Domestic religion, the religion of the grave, was at the same time the religion of patriotism, the strongest reason for the love of one's country.

We cannot, it is true, revive dead faiths, as we cannot bring back to earth those who have gone. The poetic superstition which sees in the ancestor an heroic protector of the living, would ill-accord with our refined civilization.

Herodotus tells how, for fear of Æacus, the god-ancestor of the Æginenses, the Athenians would not declare war upon them. After mature reflection they

decided to raise in their own land a temple to Æacus, and offer to him large and numerous sacrifices, and it was only after thirty years of ardent worship that they fell upon the Æginetes and won an overwhelming victory. This palm-oil offered to a foreign god makes us smile; it was considered a stroke of genius by the keen-witted Athenians.

The times are changed. No longer do tombs serve as refuges for demigods, and our modern life has no place for the antique faiths. But if we cannot possess the flower, we may at least profit by the delicate perfume which it sheds upon the earth.

The grave, though it cannot influence our political and social organization, may, however, serve it as a powerful support. We can only touch lightly on the subject, as it is impossible for us to sound its depths.

First of all, this series of transformations of the body, always following the same law of evolution, always developing along the same lines, has something consoling to the most fiercely democratic soul. King's body or proletarian's, millionaire fed on champagne and swallows' nests, or poor devil who all his life has hardly been able to buy himself raw onions, all become the dwelling-place of the same musca and curtonevra, who prepare the way for the calliphores or antomyaa. When the fermentation of the fatty matters draws to its end you may be sure that the body of the man who, living, disposed of the lives of millions of his fellows, will not detain a single lepidopter longer than the body of the outcast and the pariah.

Although the immortality of the soul will not show us a single one of its secrets, that of the body will bring,

in the meantime, some consolation to the infinitely unhappy.

II

It will also give a formal support to the immortality of the spirit. Human beings, weary of waiting for proofs, are beginning to show themselves indifferent to this, or, impiously, to deny it entirely. This partial immortality, more easily grasped and comprehended, will give added authority to the other, and intensify the sublime dream of happiness which still persists.

The strange manifestations of this new immortality frighten us; the forms of decomposition which it takes revolt us. And yet it is not the things which are ugly or repugnant in themselves, but our conception of them. In what respect are tiny creatures inferior to the great, and why is a dermiste or a loncheus, our gentle companions, or rather offspring, in the life of the grave, more hideous than a hippopotamus or tiger dwelling upon the crust of the earth?

Hermodorus, the good philosopher of Thaïs, looking upon a little Corinthian ass bearing two panniers, containing one white and the other black olives, pronounced these words, full of exquisite truth—

"Look on these olives. . . . Our sight is agreeably flattered by the contrast between their colours, and we are pleased that these should be light and those dark. But, were they gifted with speech and consciousness, the white would say, 'It is well for olives to be white, it is ill that they should be black,' and the race of black olives would hate the race of white olives."

Man ought to be above these quarrels about aspects and colours, and see always and everywhere the great harmony of nature, which includes all—men, animals, and plants—living nature and that which we think dead, in an equal embrace.

And besides, beings are only of value according to their state of consciousness. An ant is worth perhaps more than some mammal, and a mere Lucilia to which we give birth in our grave, more than an ant.

Many of us would willingly consent to become "swallows," mere "flowers," or a "cloud drifting in space," as the poets sing. And why not an Aglona or a Tyreophorus having its sphere of activity in the depths of the earth? Why fear that to which the impenetrable will has destined us in its supreme wisdom: instead of being one individual consciousness, to become an entire world, the consciousness of myriads of beings?

Death thus ceases to be a climax to be feared; it is but a displacement of atoms on a great scale. Whilst freeing the soul, it only gives a new form to the combination of molecules which constitute our bodies so as to facilitate its immortal diffusion into immortal nature.

What matter, then, that we go down into the grave young or old, hollow or rosy cheeked, golden or white haired? Before the immensity of life which lies before us, that lived upon earth disappears, as the journey which brings us to the port is nothing compared with the crossing of the ocean.

III

Our living body is only a combination of thousands and millions of *little beings or living individuals* of different kinds, *which form our tissues*, little beings, John Herschell adds, endowed with a "mentality." It is only by admitting the principle of intelligence that we can explain the mysteries of their lives, their loves, and their hates.

Human life is thus nothing more than the result of these *millions of lives*, of which the supreme significance escapes us.

A thing which may also escape us is the continuation of their life in spite of the depositions of the functionary in charge of the certificate, which state that it is completely extinct. The manifestations of contemporary science are before us, filling us with doubts on the subject.

Here is the law of the preservation of matter stated by Lavoisier, to which scientists from every camp subscribe.

According to him, the atom, in spite of its movements, its migrations, and its apparent changes, remains indestructible and unvarying.

There are in the human body thirty trillions of cells, therefore so many partial, elementary lives. Each cell is a sort of citizen attached to its little nook. It fulfils its duties as a member of the commonwealth. And when we speak of the "general life" of our organism, we must not forget that elementary one of the imposing world of the "cells."

If they are separated by the different functions which

they fulfil, they are nourished with a common food. Each of them needs the same oxygen, and the nitrogenized and ternary materials analogous to water. All are equally interested in the removal of waste, in the supply of oxygen and the elimination of carbonic acid. When any part of the general apparatus which serves to revictual and maintain all the cells (the heart, the kidneys, or the lungs) ceases to act, the social pact between the cells is broken, and the body ceases to exist as a joint organism.

The "nation" thus disappears, but what becomes of the millions of scattered citizens?

Their death is not so sudden as we suppose. When you wish to kill a unicellular being, you quickly perceive that in order to transform this infinitesimal morsel of living matter into inanimate matter, you must use very considerable force. What shall we say of the force which an organism as complex as that of an ant, a rabbit, a monkey or a man would demand, to attain the same end? We should undoubtedly need a force of several hundred thousand horse-power to kill simultaneously the trillions of cells of which the human organism is composed.

Now, death does not display this wealth of effort, and "elementary life" still persists when "general life" has disappeared.

The body of man does not contain, besides, one single atom, one single molecule which has not already been in inanimate matter, in the world which surrounds us. The molecules of corpses are identically the same as those of living bodies, of plants, and of the earth which feeds us and is our last refuge. Looked at from this

point of view, dead and living matter are but apparent forms of energy.

Its essence remains hidden from us. All that we know is that the number of molecules of which our body is composed attains to the respectable sum of trillions. They are reckoned by millionths of a millimetre, by the quintillions or the sextillions contained in each cubic millimetre of our bodies.

And what are these molecules, if not the *infinitely little* living after their fashion? Like their macrocosm, their universe—the human body—they are in a continual state of agitation, attraction, repulsion, and ebullition. Each molecule, we are told by the author of the *Analysis of Things*, ought to be considered as a separate *planetary system*.

And the molecules of corpses are the same as those of living bodies.

IV

When all is said, what is it that frightens us in the presence of a corpse? The thought of its successive changes, inevitable and almost always repugnant. Now these changes, which are summed up in the word which makes us recoil in horror, *putrefaction*, hold nothing which ought to appal us. First of all, life and death seem to meet in the heart of the same phenomenon. "I heard Mitscherlich say one day that life is but decay."[1] Another celebrated chemist, Hoppe Seyler, improving upon this idea, affirms that the vital phenomena in plants and animals have no more perfect

[1] Claude Bernard (*Leçons sur les phénomènes de la vie*).

analogy in all nature than those of putrefaction. And Claude Bernard claims in his turn that organic substances undergo the same transformation as those produced during decomposition.

After all, if the spectacle terrifies us, its essence still escapes our comprehension. What is putrefaction? The body, after death, decomposes; begins to change, and becomes reduced to various principles, certain of which give off a disagreeable putrid smell. Chemically, it is a modification of the molecular balance of the substance, with a transportation of oxygen from the hydrogen atom to the carbon atom. Its determining cause, Pasteur tells us, acts through microscopic beings (vibrions, mould fungi, bacteria) which develop in the decomposing liquids. Whence come these beings? We do not know. Their embryos were perhaps in us during our life, and made a part of our cells.

Spontaneous generation having been definitely rejected by science, this supposition seems the most likely.

These mysterious beings thus live in us and with us. May we not then admit that they carry on after the death of the body the vital principles which it contains!

For the cell has its independent existence which makes its life, for all that directly concerns it, the same wherever suitable conditions are found; but, on the other hand, these suitable conditions are only completely realized in certain places, and the cell acts differently, works differently, and undergoes a different evolution according to its place in the organism, as the author of *Leçons sur les Substances toxiques* tells us.

Life thus dwells in each cell. It is nowhere centralized, in no organ or apparatus of the body. And,

carrying on this same idea, modern science epitomizes it in the implacable law that "all physiological, pathological or toxic phenomena are at bottom only general or special cellular actions."

The evolution of the organized being teaches us besides that the principle of life descends from the simple protoplasm or plastidule. This, having come into the world with the lowering of the temperature and the formation of water, has been the starting-point of all the varieties of organic beings which people the earth. The first germ is thus essentially immortal, for it is always the same persistent life. The life which we see around us is only the consequence of an anterior life, just as that which will come after us will be the consequence of the present life which surrounds us. If death could destroy the life of the cell, life would have been interrupted, and should logically have disappeared with the extinction of the first plastidule.

The continuity of life in the immortality of the cell is the elementary law of the evolution of beings. The infinite growth of the cell is doubtless limited by a maximum dimension of possible equilibrium, but within these limits the cell lives and develops. In speaking of the immortal cell or plastidule we do not in any way identify its life with that of man. Life to us signifies consciousness and individuality; death, the disappearance of that individuality; immortality, the integral continuance of this consciousness for all time.

Now no one has yet succeeded in analyzing the consciousness of a cell, if consciousness it has. We know, however, that contrary to the conception of human life, it may exist as an elementary life into infinity.

A cell of yeast introduced into sweetened must, not only makes it ferment, but multiplies in it. We are not interested in the individuality of such a cell, its vital manifestations are enough for us.

V

Let us remember the persistence of the action of the magnetic fluid in a magnetized bar,[1] and consequently *the duration of certain anterior states in inorganic bodies.*

Let us remember, too, the patients treated by Prof. Luys and Dr. Encausse, by the help of magnetized crowns which stored up and preserved "the vibrations of living nature, the cervical vibrations."[2]

A magnetized crown was placed on the head of a woman suffering from melancholia with illusions of persecution. At the end of fifteen days this same crown, by pure chance, was placed on the head of a male hysterical subject suffering from frequent attacks of lethargy. Now this latter, as soon as the crown was placed on his head, adopted the *sex* of the preceding patient, talked in the feminine, complained of the same distresses, said that he should become "*folle*," and so on.[3] This has been the starting-point of numerous

[1] Communicated by M. d'Arsonval to the Biological Society in January 1894.

[2] Communicated by Professor Luys to the Biological Society in 1894.

[3] M. de Rochas states elsewhere that he saw on December 25, 1893, a magnetized crown placed first on the head of a cat and then on that of a subject in a receptive state; and one on the head of a cock and of a subject similarly prepared. In both cases the subjects assumed the characteristic motions and cries of the animals whose physical aspect had been thus transferred to them.

experiments which, proving the duration of a vital manifestation in *inorganic* beings, ought to make us suspect them the more in *organic* beings.

All, however, is perhaps not ended for the numerous animalculæ of which our body is composed. That same time which has rendered a tardy justice to the despised conceptions of the past will perhaps make us some day accept, with certain modifications, the axiom of Maxwell, the ingenious author of *Occult Philosophy*, that all things which proceed in whatever fashion from the bodies of men, and by that very fact considered as dead, are impregnated with the vital spirit and have a common life with that of the living body. If this holds good with regard to the secretions of the body (a theory taken up and admitted by Dr. Carl du Prel), it should be still more true with regard to the body itself. It might thus continue in the tomb the life with which it was impregnated during its sojourn on earth. We may quote on this subject a paper communicated to the Academy of Medicine by Dr. Gibier, in 1888. This scientist, who was a most audacious thinker, did his best to prove the multiplication of certain cells of the human body *when dead*, in suitable surroundings.

His courage led him perhaps rather beyond the reality, but what is not beyond it is the discovery of the epidermic graft by Dr. Reverdin of Geneva. In order to replace destroyed epidermis, pieces of skin taken from different parts of the body are transplanted. These pieces, taken from the already dead organism, are by that reputed *dead*. Now these "grafts," fixed elsewhere, continue to develop: they thus *live*, although separated from the body. According to E. Van Bene-

den,[1] detached organs may continue to live and grow if they succeed in procuring sufficient nourishment. But, more essential still, any given fragment of the body may, in relatively simple animals, regenerate the entire organism. The example of the fresh-water hydras gives us a curious proof that there exist in the world beings, in whom we even recognize a certain degree of intelligence, whom we can cut in pieces without endangering their existence. Each piece can become a complete individual, like that from which it is derived.

The curious experiments of M. Kuliako, confirmed at the Academy of Science of Paris, by a celebrated physiologist, Prof. Marey, have shown that life often persists when we believe it entirely absent. Thus M. Kuliako has succeeded, amongst other experiments, in causing pulsations in the tissues and auricles *thirty hours* after death, in spite of the formation of large clots in the heart. Here is a no less interesting experiment—

Having removed the heart from a corpse, twenty hours after death, M. Kuliako conveyed it, without even taking any special precautions, to his laboratory. There he submitted the organ to artificial circulation by Langendorff's method, thanks to the famous liquid invented by the English physiologist, Locke. The liquid was warm and saturated with oxygen. The heart remained motionless for some time, but at the end of twenty minutes feeble rhythmic contractions appeared, first in the tissues, then in the right ventricle, and finally the entire heart pulsated regularly during one hour.

According to the same observer, it is possible to restore

[1] Speech made by the Director of the Science Classes and President of the Royal Academy of Belgium (1902). See the *Bulletin de la Classe des Sciences*, Brussels, 1902.

the beating of the heart in rabbits and birds three, four, and even five days after death.

The facts related by Dr. Waller before the Royal Society of London are still more disturbing. Operating on human skin, taken from corpses, Dr. Waller demonstrated its vitality even several days after death had occurred. With a piece of skin taken from a healthy subject he obtained electric reactions ten days after the separation of the fragment from the whole organism. Pushing his investigations still farther, he found that a piece of human skin isolated in antiseptic ingredients and in a state of semi-desiccation, preserved its vitality for six months. Having made grafts with the skin thus preserved, he was successful in sixteen cases out of twenty-two. The piece of human skin still lived six months after its detachment from the body of which it had formed part. Its life was, besides, so intense that when transplanted to another body it recommenced a fresh vital period.

What do these isolated facts prove? Simply that our conceptions of the limits of life and death, of the relations between functions and organs or the vitality of cells are still uncertain. The last word is not yet said, and no one can foresee how it may transform present ideas. Let us take another example. It is an experiment with a washed liver. The liver of an animal is removed and carefully washed. All the sugar secreted by the liver is thus removed. After a certain time the purified liver again begins to secrete sugar. Here we have the case of an organ, completely dead, working outside the organism by means of its cells, which have retained their vitality.

Cicatrization in animals, as well as grafting and budding in plants, is produced on the same principle.

An entire bone is taken from the foot of a young rabbit, introduced into the back, and the displaced bone will live and grow, always by virtue of the same principle of the autonomy of the cells.

For, as Goethe has said, each living being is not an indivisible unity, but a plurality, a reunion of beings living and existing each by itself.

Death brings about the disaggregation of the cells, it destroys what physiologists call the subordination of the cells to their surroundings; but it is in no way proved that it destroys the interior and independent life of the cells.

One thing is certain in any case, which is that of the two syntheses which characterize life, chemical destruction persists after death. As Spallanzani has demonstrated, even muscles separated from the body continue to produce carbonic acid. J. Carrière affirms that in certain slugs not only the eye, but a part of the head, after being cut off, continues to grow and recover its former shape.

Thus, on the one hand, a restless life around us; on the other, a life which continues in the bosom of our own tissues, that is to say *within* us, a life subject to a series of laws, these are the foundation-stones of a science yet to be created, the science of death, which may perhaps some day explain some of the enigmas which weigh upon our consciousness.

C.—Against Cremation

I

The demands of ill-understood hygiene have been the cause of a furious propaganda in favour of cremation, which is nothing but the destruction of the body. Fascinated by a false idea of progress, independent minds have been working with ardour towards the definite triumph of incineration which destroys, against burial which perpetuates. The hate with which the established beliefs receive this reform makes it, quite wrongly, a forbidden fruit of free-thought, and for that very reason passionately dear to the modern argumentative and critical spirit.

Now, far from being a progress, cremation constitutes a harmful and irrational return to the prejudices of the past. It is, above all, in flagrant opposition to the progress of biological science and the entomology of the grave. Born of the praiseworthy but ill-founded desire of protecting the living from the contagion of corpses, it has led humanity astray by claiming to study the immediate interests of future generations. The simplicity of the ceremonies and the alleged moderation of the expenses of cremation have also added to its popularity.

Cremation is, however, far from being able to replace the old method of burial. One thing which will always oppose its success is the very impossibility of adopting it upon a sufficiently large scale. When we consider that it takes from an hour and a half to two hours to cremate one body, we cannot see how the great European capitals could ever have recourse to this process for the

destruction of all their dead. The great expense of establishing crematoria renders them, on the other hand, impracticable for small centres of population. Even admitting that the future reserves for us one of those unforeseen inventions which would permit us considerably to shorten the time required for cremation, it will be long before humanity can make use of it in a general way.

It is, in fact, only the preoccupation of the living with matters of hygiene which has rendered this attack upon the dead possible. It is generally believed that cemeteries are the privileged homes of contagion. This is an article of faith which we do not discuss, so deeply rooted is it in our minds. And yet, each time that observation and scientific experiment have attempted to verify the value of this popular belief, they have been forced to recognize its complete inanity.

The seventh International Congress of Hygiene, held in London in 1891, equally considered this problem, which will for á long time yet be a question of the day. The reports of the French scientists and doctors, MM. Brouardel, Ogier, and Du Mesnil, triumphantly demonstrated the theory that the fearful dangers of the cemetery are purely imaginary. These distinguished specialists held the opinion that corpses may, in truth, menace the living as long as they are preserved in the crypts of churches, but that modern cemeteries, in the open air, do away with any possibility of harmful action. The analysis of the air of cemeteries shows it to be inodorous and free from gases injurious to the health. The vegetation of the cemeteries totally absorbs them. We may add that the body, abandoned to itself, is very soon

chemically resolved, which prevents any fear of pernicious influence.

The case against the cemetery in all countries and in all ages consists of these three principal counts: cemeteries poison the water of wells, infect the waters of rivers, and thus become the cause of dangerous maladies. It is enough to closely consider this argument to be convinced of its want of foundation. When, in 1857, the Municipal Council of the city of Paris was called upon to pronounce upon the dangers of cemeteries among so great an agglomeration of persons, a commission composed of specialists of all kinds was charged with the examination of this question, looked upon as one of the most threatening for the future health of the capital. The newspapers and the public having been most disturbed about the question of the infection of water by the proximity of the dead, the attention of the delegates was turned in this direction. MM. Depaul, Riant, and Leclerc thought it advisable, as a preliminary, to examine the quantity of water received by our cemeteries before proceeding to the examination of its quality. They fixed, after minute calculations, the depth of rain water falling upon each square metre of the soil of Paris at 0·577 annually, that is to say at 577 litres of water. What becomes of this water when it reaches the surface? According to Delson, Delacroix, and Chernick, about two-thirds of it evaporate and hardly one-third sinks into the depths of the ground. Out of 577 litres, one square metre of the soil of our cemeteries would therefore only absorb 191 litres, or each hectare a quantity less than 2,000 cubic metres per year. But cemeteries in general, and those of Paris in particular, contain a certain

number of buildings, monuments, and paved walks, which stop the rain water and prevent it from passing into the earth. We may thus knock off 1,000 cubic metres per hectare and per year, and admit that for each hectare of the cemetery hardly 1,000 cubic metres of water penetrate into the deeper layers of the soil. The layer of water would thus be only 10 centimetres deep. This insignificant quantity can by no possible stretch of the imagination be supposed to penetrate the deep layers of the earth and contaminate the waters which are found at 20 and even 40 metres below the surface. This danger is even more imaginary inasmuch as even torrential rains, following closely upon one another, cannot penetrate the earth more than 60 to 80 centimetres. Another circumstance no less favourable to the springs found in the lower strata of the soil, is that the layer of rain water in cemeteries is not formed instantaneously. The average of 10 centimetres is graduated throughout the course of the year. In the interval between two rainy seasons the earth dries up and becomes thirsty, and the water which reaches the surface is at once lost in the soil. In these conditions we might even take an average of 20 centimetres instead of 10 without the least cause for alarm.

Human remains being at a depth of from 1 to 5 metres, we should have to admit also that the water which had passed through their resting-place had lost none of its harmful elements on the road. This hypothesis is the more ill-founded inasmuch as the most injurious principles, such as ammonia, cannot remain in the earth in a soluble state (Thompson's experiment).

II

Besides the danger of contaminated water, cemeteries threaten us by harmful and perpetual emanations. Their neighbourhood is feared, and when certain diseases appear in proximity to them, both specialists and laymen turn in their direction to seek for the cause. And, nevertheless, there exists an entire class, and a numerous one, of workers who live by death and dwell beside it. If cemeteries were a real peril to human existence all this category of professions would be its first victims. "Science has established," says M. Depaul, very truly, in his report presented to the Municipal Council of Paris, in 1874, "the existence of certain diseases peculiar to certain trades. It is alleged that lead and phosphorous workers are often victims to their work, but no one has demonstrated or proved up to the present, that grave-diggers, any more than gut-spinners, tanners, knackers, or dissecting-room porters, all these who handle matter in a state of decomposition, are subject to any professional disease."

How can the harmful gases injure the health of localities far removed from the cemetery, while they leave unhurt persons living regularly in their neighbourhood? It is claimed also that the decomposition of the body is accompanied by emanations of gases which rise from the surface of the ground. In this connection many authors, some of them chemists, and some doctors, have succeeded in impressing the popular imagination by pictures more terrifying than exact. M. A. Tardieu goes so far as to say that even burial in the deep layers of the earth does not guarantee us against emanations

of carburetted hydrogen. Dr. Playfair gives even more terrifying figures: the 52,000 corpses yearly interred in London give off, he tells us, 2,572,580 cubic metres of injurious gases.

All these theories, with the fears which they spread throughout the world, are above all based on the theory that organic decomposition is produced in the open air. It seems to have been forgotten that the most noxious gases are lost in the depths of the earth, and only reach the surface reduced both in quantity and quality. Ammonia seems to be the most feared, and yet this is a gas whose presence may be recognized at a great distance. We may add that cemeteries show hardly any traces of it. As for carbonic acid, its weight, which is greater than that of air, prevents it from spreading in the atmosphere. Even if it rose from the depths of the earth it would stop at the surface, and would thus remain imprisoned beneath the tombs within the walls of the cemetery.

The adversaries of burial wrongfully accuse cemeteries of being reservoirs of infectious disease. Were such the case, their universal use and venerable age must have furnished abundant proofs of it, but none have been found. On the contrary, the exigencies of modern life often necessitate the building of fashionable parts of large towns upon the ancient dwelling-places of the dead, and these neighbourhoods are considered amongst the most healthy.

Having been submitted to rigorous experiment, the disinfecting power of the earth has been only proved more marvellous.

The number of years necessary for the consummation

of the work of the incorporation of the human body with surrounding matter is very limited. The length of time becomes almost insignificant if the burial has taken place in the superficial strata of the earth. According to the experiments made by Sir Seymour Haden between 1886 and 1897, based on the burial of animals at depths varying between one and ten feet, at the end of a year the dissolution of a body placed one foot beneath the surface is complete. It only takes two years for a depth of from two to three feet, and three years for a depth of from three to four. Certain exceptions to these figures depend only upon artificial obstacles opposed by man to the work of nature. Thus marble vaults, coffins in wood or metal, and the vestments with which the dead are covered, retard the dissolution of their bodies.

When, in 1873, the Prussian Government, moved by the fear of contagious diseases, caused the bodies of the soldiers killed and buried in the Vosges to be disinterred, it was seen that the process of "penetration," with the exception of the bones, was completed. And yet only two years had elapsed since their hasty burial, undertaken, moreover, in conditions hardly favourable to chemical dissolution. The bodies of officers alone, wrapped in their mackintoshes, still offered some resistance to this last work of nature.

For that earth to which we return performs for the living in this respect the part of a great disinfecting agent. Even the springs of water which are found in the depths of cemeteries, as soon as they reach the surface of the earth, provide us with a limpid, healthy, and refreshing drink. In their wanderings through the

superimposed layers of soil they have left their harmful constituents in the earth, and reach us in a state of perfect purity.

Earth, like fire, has the gift of purifying. MM. Schlœsing, A. Durand-Claye, and Proust, in their report presented at the second International Congress of Hygiene, in Paris, insist, with a great array of arguments, upon this admirable quality of the earth. They show us that the latter has a power of combustion almost equal to that of fire. The phenomena of this combustion, although less visible and slower, are not, therefore, less intense. It reduces all organic impurities to carbonic acid, water, and nitrogen. Terrestrial combustion is sometimes even more perfect than that produced by fire. It will even oxydize and burn nitrogen, a thing which fire cannot do.

III

The fears which have been expressed with regard to the ever-increasing demands for space made by the cemeteries in our great modern cities is serious from another point of view.

Given the habit of municipalities of alienating in perpetuity the ground set aside for the dead, no one can foresee where the limit of the cemetery may end. But the evil is not inherent in burial, it lies in the abuse of it by the rich, seconded by the over-officious municipalities. The perpetuity of the concessions is contrary to the sentiments with which the dead inspire us, to the limit of their dissolution into the earth, and to the limited existence of human sentiment. As Benoiston de

Châteauneuf has proved, the duration of noble families, those who have the greatest interest in the maintenance of the tradition of the family name, does not exceed three hundred years. For middle-class families an average of a hundred and fifty years would be more than sufficient. But material duration is not the same as duration of sentiment, of attachment to the founder of the family. This sentiment, which fades with the passage of time and generations, is blunted in the second, becomes feeble in the third, and almost imperceptible in the fourth or fifth generation. Why then should we wish to accord eternal concessions to the dead, who have become, with the lapse of time, strangers to the thoughts and preoccupations of the living? Would it not be better to resort to concessions renewable at will, taking into account affection of exceptional intensity and persistence? Out of 50,000 persons buried in Paris, about 5,000 are buried in land conceded in perpetuity. Supposing that these latter were only ceded for fifty years, there is no doubt that at the expiration of the lease hardly a third would be renewed, and a hundred years later nearly all the land would have returned to the community. This solution is all the more necessary, in that the absolute sale of land in cemeteries offends at the same time both Christian humility and equality in death. It is also contrary to the democratic principles of modern society, by introducing privileges and differences into that last refuge of equality.

We have seen above that after a lapse of time not exceeding a few years the buried body sets free its living principles. Twenty years are more than enough for the final dissolution, and if we allow the body fifty

years for the accomplishing of this last task, we shall be well beyond the limits of necessity. And, besides, it only depends on us to accelerate this task. We know that the human body is composed of about 9 parts of mineral matter, 32·5 of combustible substances, and 58·5 of water. The thing which retards the work of decomposition is this large quantity of water which is included in the structure of our organisms. It is only necessary, and nothing is more easy, to hasten the evaporation of the water in order at the same time to accelerate the normal progress of the evolution of the corpse.

IV

The passion for revolutionizing our habits and customs accords well enough, in our intellectuality, with misoneism, that is to say, hate or fear of the new. The same people who tremble before certain philosophic or social conceptions show themselves bold in the extreme with regard to religious disturbances. Certain minds who will not hear of a "God," shudder at the advent to power of the proletariat, or fear the abolition of the three years of military service. It is with races as with individuals. France, who has had the courage to destroy the balance of the world and to overthrow secular idols, cannot tear herself from certain superstitions of education or of the relations between the sexes. Conservative in secondary things, she is often over-bold in respect of essential changes in her moral or public life. And the more the innovation seems to break away from the traditions of the past the more fervent and zealous disciples it finds. Cremation has thus taken possession of

many minds, as a new and almost revolutionary solution. Those who conceived it, as well as those who have adopted it, cherish the fond hope of endowing humanity with a novelty diametrically opposed to the habits of centuries. The French Revolution was the first seriously to advocate the innovation, which was considered at the time to be a mortal blow to the influence of Christianity. At a sitting on 21. Brumaire of the year V,[1] a report laid before the Council of the Five Hundred proposed that liberty should be allowed to every one to provide for the disposition of his body after death. In the absence of such disposition, the body was to be sent to the pyre. The project was not accepted, but it served as a starting-point for the agitation in favour of cremation. And, singularly enough, this movement, born in France, has never been successful there. The good sense of the people, and the touching instinct of piety towards the dead which is shown in every class of French society, have always opposed the passion of a few hundred advocates of cremation. At the present time we find the movement prospering most in Italy and in certain German provinces. Thanks to the propaganda instituted in its favour by Professor Collessi (1857), followed later by MM. V. Giro, P. Cassigliani, and A. Bersani, the idea of cremation has obtained the support of members influential enough to bring forward a projected Bill permitting relations to burn the bodies of members of their families. It is the same in Saxony, and above all in Switzerland, where the propaganda has succeeded in winning over several influential clergymen. In Eng-

[1] French Republican Calendar.

land, thanks to the devotion of Sir Henry Thomson and several well-known Members of Parliament, the cremationist movement seems to be gaining recruits. The United States have shown particular ardour on the subject, apparently wishing to outdistance the Old World in this respect as they have left it far behind them in many others.

At the present time cremation has been optional for several years in Germany, Italy, Switzerland, the Scandinavian Countries, the United States, England, and the Argentine Republic. In Austro-Hungary and in Holland it is still forbidden. We may note, however, that so long as governments show themselves opposed to the introduction of cremation, so long the propaganda in its favour flourish beyond all hope. Officially adopted, no longer enjoying the benefits of persecution, cremation makes slower and slower progress. It has then ceased to be a fashionable fad.

Europe and America have at the present time[1] only seventy crematoria; Germany has six; Italy twenty-seven; England five; the United States twenty; Switzerland and Sweden two; and France three.

Optional in France, assured of the loving protection of certain municipal councils who still see in it, quite wrongly, a sign of progress, cremation is a failure, killed by public indifference.

V

If from the past we may judge of the future, it would seem certain that cremation will never replace burial.

[1] Report upon the State of Cremation, presented at the tenth International Congress of Hygiene and Demography in 1900.

The struggle between the two methods of dealing with the bodies of those who are no more, is almost as old as humanity. Always and everywhere, from the earliest awakenings of intelligence, there has been the division between the sentiment of respect for the dead, and the interests of personal preservation. In the dawn of civilization the preservation of bodies in the family dwelling was the custom. The qualities of the climate favouring this usage, we find it flourishing in Egypt and in certain countries of the extreme North for many centuries in succession.

The embalming of bodies came later. In Egypt it was resorted to in order to assist the atmosphere in desiccating the corpse and to take from it all power of injury to the living.

Where the climate did not permit of the preservation of the body in the open air, it was kept, hardly covered with soil, in the house of the living. This custom, very frequent among all the races of antiquity, existed in Rome until the time of the great plague, in consequence of which it was decided to carry all dead outside the precincts of the town. It was the same in other countries in which the custom of burial is rooted in and bound up with the respect and love felt for those who have gone. Cremation only appeared as a sad necessity, an inevitable sacrifice in favour of the community. In distant wars, after terrible battles which had cost the lives of hundreds or thousands of citizens, it became necessary to employ the faggot, as the bodies could neither be brought back to their native land nor abandoned in the midst of the enemies' country. The desire to possess the remains so dear to their families

left them no choice but to burn the bodies and thus bear back to the fatherland the ashes, the material parts of the deceased. The funeral pyre was so contrary to the sentiments of the Greeks and Romans that, according to Virgil, it was only used in the case of common soldiers. Thus, after a combat between the soldiers of Æneas and the Latins, they burned upon a pyre the corpses of the common people, and carried the bodies of the members of the greater families into the neighbouring towns for burial.[1] In the cases in which burial was possible, it took place even on the battle-field, and this ceremony, accomplished under such difficult conditions, was considered as particularly flattering to the dead. A like procedure was followed in the case of the soldiers killed at Marathon (Herodotus), and all Greece applauded the demonstration as worthy of her heroic children.

Incineration was then an exceptional and inevitable measure adopted after great contagious maladies or homicidal wars. War being considered the most honourable of professions, cremation thus became eventually a sort of privilege accorded to warriors. Nevertheless, the other classes of society wishing equally to secure for their dead the benefits of this particular mark of esteem, cremation became more general. It was, it is true, employed on a vast scale, but almost exclusively amongst warlike peoples: in Greece, in Rome, and in Mexico. But sentiment, stronger than death, still showed itself in the presents brought to those who were no more. They still offered them libations and foods of all sorts, for the human consciousness will not cease

[1] Virgil (*Æneid*, XIth book).

to attribute a new existence to the body, in spite of its transformation into ashes.

Where, however, burial under its different forms persists, the idea of the continuity of the life of the corpse is shown in a manner still more solemn and impressive. The human remains are placed in conditions resembling as far as possible the surroundings of the living. Whether the body be suspended in the air or laid beneath an ancient dolmen or in a measured-off modern grave, everywhere the same unconscious thought guides us, the continuation of the life of the body. It needs air as in its lifetime. Among certain races they even, urged by the same instinct, immolate upon the husband's grave the best loved of his wives, or they kill his favourite horse. In more civilized countries the dead are treated with a pious tenderness, as if their life continued underground. We bring them flowers, pray upon their graves, share with them our sorrows, they are the object of our dreams and of our hopes.

Burial, the preservation of the body and its abandonment to the processes of natural evolution, is shown in the course of universal history, throughout all times and all countries, to be the normal rule: cremation is an exception. In the succession of many generations burial serves as a palpable link, as a dear and visible tradition. The source of the material preservation of the species, it is at the same time a great source of patriotism and of symbolic attachment to the land of our ancestors.

After having served as a dwelling-place for the dead, cemeteries may even become the residence of the living. There is nothing against it, as their unhealthiness is

merely a question of time. And if the economy of soil, so important amongst great agglomerations of human beings, is thus satisfied, so also is the kindly cult of the dead, formed of an uninterrupted chain between the dead and the living.

Only one restriction is necessary, and that only concerns the luxury which accompanies the burial of the rich. Their over-sumptuous vaults, the too great place occupied in the cemetery by their pompous tombs, only thwart and retard the work of Nature.

The more we reflect upon the benefits of the immortality of the body the more we wonder at its equalizing properties. Nature, like a tender mother, equally loving to all her children, charges herself in the same capacity with the cancelling and annulling of our temporary forms. She asks neither special offerings nor pecuniary sacrifices. All beings are equally fair and dear to her, and the powerful in this life, who would oppose to her the privileges of their riches, only hinder the regular progress of their journey towards their dissolution into immortality.

Conclusion

This new existence, in which Nature becomes the mother and the patrimony, equally beneficent to all, holds something which should cheer our departure from this life. Sad and pious souls will find in it the sorrowful complaint of Job, which has rung in our ears for so many centuries, changed to a consoling phenomenon :—

> Corruption of the grave, thou art our mother. . . .

For this corruption, the object of our terror, is in reality a living world! The grave, the refuge of solitude, is more populous and busy than the market-place of a great city.

Terrified as we are by the idea of the earth which soils our bodies, of death as Judaism and the Christianity of the Middle Ages have bequeathed it to us, we shall look at it henceforth with more tranquillity. Life in death will frighten us no more than does the duality of day and night, which is only mitigated day. The apprehension of death will touch us less from the moment when we see in it only a new form of life. And how ill-founded then will seem to us the terror of death felt by Bossuet, repeating with Tertullian that even the name of corpse can no longer be given to the human being after the departure of the soul. Death conceived as the "repugnant nothingness" is enough to spoil all our life; death looked at as a change of life kills our fear and makes us almost love it. . . .

Is it not time that we perceived that besides the immortality of the soul, to which we resign ourselves with such good grace, there is that despised one, not without its joys, which is close beside us—the immortality of the body? And should we not rather shrug our shoulders than be moved beyond measure before the "horrible infection of graves," which the poets of "Fleurs du Mal," materialists, and theologians throw at the heads of mortals?

> Étoile de mes yeux, soleil de ma nature,
> Vous, mon ange et ma passion,
> Oui, telle vous serez, Ô ma reine des grâces,
> Après les derniers Sacrements.

We shall know the immortality which awaits us beneath the "stones of oblivion," and we shall see in death only a new form of life. And the dying man, whilst commending his soul to Heaven, will salute with one of his last smiles the mysterious properties, the unknown joys, and the travelling company of his numerous descendants which await him in the tomb.

CHAPTER IV

THE LIFE OF SO-CALLED INANIMATE MATTER

I

AS the study of crude matter progresses, there arise from it facts in favour of the theory of a special life which it hides from inexperienced eyes.

The progress of modern chemistry and physics has been singularly favourable to the belief in the life of inorganic matter. Every day, too, brings a new contribution in support of the unity of matter, and the universal life which this latter seems to hide. Adaptation and then modification of inorganic matter under the influence of differing conditions and the surrounding air will probably be some day admitted with the same facility as that of animated beings. That which really differentiates the kingdoms is the intensity, the degree, and by no means the intrinsic quality of the phenomenon. It would doubtless be premature to follow too far this line of resemblance, but it would also be far from scientific to wilfully shut one's eyes to certain facts which demand the attention of chemists and physicists.

We know the curious experiment performed by Sir Robert Austen. In a bath of melted lead is placed a disc of pure gold. When solidification is complete we find this apparently bizarre phenomenon: part of the

gold, having left the disc, has travelled to the surface of the bath and become mixed with the lead. The same wandering of the molecules of gold takes place when the temperature of the lead is gradually lowered, while prolonging the duration of the experiment. Thus, even at a temperature not exceeding 100°, a small cylinder of lead in contact with a disc of pure gold will be found at the end of forty-one days to be penetrated throughout its mass by molecules of gold.

M. Ch.-Ed. Guillaume, physicist to the International Bureau of Weights and Measures in Paris, delivered on this subject at Neufchâtel (before the Swiss Society of Natural Sciences) a lecture which, in certain respects, would have greatly scandalized the naturalists of twenty or thirty years ago. The author, a great partisan of the life of matter, repeated Warburg's experiment, as follows: He placed in a glass globe mercury and sulphuric acid. The globe was then placed in an amalgam of sodium, through which an electric current was passed from the exterior to the interior. The sodium, under the influence of the electric current, passed through the glass and became dissolved in the liquid which filled the globe. If the glass itself contains sodium we may cause it to be replaced, molecule for molecule, by lithium, for example. The sodium of the glass goes first, and in proportion as it is replaced by lithium the glass is seen to take on a milky appearance. We may add that the density and consistence of the glass diminish simultaneously. We obtain the same effect whether the experiment is performed with hot or cold sodium. In the latter case a longer time is needed to produce the result.

M. Guillaume holds, with reason, that this experiment, with many others of similar import, overthrows the superannuated notion of inert matter.

We may note, on the same lines, the curious experiments made by M. Gustave le Bon with regard to the modification which traces of substances may produce in metals.[1]

Thus magnesium which has touched mercury becomes capable of decomposing water. Aluminium which has been immersed for a *fraction of a second* in mercury decomposes water, and its temperature rises suddenly to over 100°. The most insignificant traces of mercury are enough to change the properties of certain metals.

A great deal is talked about the vitality of the organism, which struggles to repair wounds or any sort of attack made upon the integrity of the living being. Now so-called inert matter also supplies us with surprising examples of this tendency towards the balance or integrity of the whole. If we submit a bar of steel to a pull strong enough to break it, we perceive, in a short while, the weak spot at which the breakage will occur. Let us cease to pull at the piece of steel, and having re-established its constant diameter, again apply the strain. When the fresh narrowing of the bar shows itself, indicating the point at which the bar would easily break, it will be situated in a different place from the first time. We stop our operations, to recommence them a third time. The breaking-point will be in a place again differing from that of the first and second experiments. It results, therefore, that the molecules of the bar have contributed to the re-establishment of the

[1] *A communication made to the Academy of Science*, 29th October, 1900.

equilibrium and to the strengthening of the weakest spot, in order to regain the compromised integrity of the whole. M. Guillaume, who has devoted himself particularly to the study of the alliances of steel and nickel, and the phenomena caused by these alliances, makes, amongst others, the interesting remark that, under the influence of great cold, bars of steel or nickel become suddenly longer, so much so that on seeing it for the first time one receives the impression that the inert matter has been suddenly vivified.

II

The cellular theory of metals has made its triumphant re-entry into science. Just as in the case of steel (proved by Osmond's experiments), it is now-a-days admitted that the other metals are also composed of elementary unities, or cells proper to each kind. The name of crystals, which is generally given to these infinitesimal particles of matter, instead of cells, in no way alters the thing itself. The cold welding of metals, too, cannot otherwise be explained. Metals feed themselves like organic bodies, and their cells sometimes even devour each other.[1] Below the surface of the seemingly inert metal, as M. Dastre tells us, moves a whole seething population of molecules, which change their place, travel and group themselves in order to take forms adapted to the surrounding conditions.

There is a pathological microscopy of metals as there is for organized bodies. The former has not yet perhaps its Virchow, but it already possesses a series of

[1] Von Schroen.

important observations. Professor E. Heyn thus believes himself authorized to speak of certain diseases of metals, as one would speak of the diseases of the vine or of wheat.

When we consider the many photographs bearing on the cellular changes arising in metals in consequence of their "indisposition," we have no longer the right to doubt their "impressionability." Modern metallurgists know not only the diseases but also certain means of fighting them. When steel, submitted to the influence of hydrogen, becomes radically attacked, and threatens, in consequence of its weakness, to deceive those who would trust to its solidity, they hasten to heat it to a high temperature, at the same time submitting it to atmospheric action. Better still, they place it in a bath of oil at a high temperature, which acts as a sort of poultice used in certain human diseases, as the picturesque simile of Professor Heyn puts it.

The therapeutics of metals thus develops on lines parallel to their pathology. These alleged inert bodies manifest visible signs of fatigue. We may recall on this subject Lord Kelvin's curious experiment, which shows that a metallic thread kept in vibration during several days ceases to move, when again caused to vibrate, sooner than a thread which has had a long preliminary rest. The term "poisoning" of inert bodies is already generally adopted. We know, for example, that brick or sand sleeps under the influence of chloroform like a sick person who is to be operated on. Most anæsthetics paralyze the emission of the N-rays.[1]

A great number of metals become literally poisoned

[1] Becquerel's experiment.

under the influence of certain bodies. We may mention in this category lead, bismuth, silicium, manganese, etc.

The form assumed by the living individual is doubtless one of its most remarkable characteristic signs. When we consider that some thirty thousand millions of cells which constitute the smallest animal succeed in grouping themselves in given places so as all to coöperate in the formation of a living being, complex as it is, we are overcome with amazement. Now the same subject of wonder awaits us when we examine the formation of inert bodies. It is not contested so far as crystals are concerned. Are they not disposed in quincunx? The parts which compose the crystal, far from being mechanically and hermetically superimposed, leave fairly large intervals between them. The crystallographic molecules take, then, a geometric form clearly traced upon a mathematical plan. The birth of a crystalline *individual*, if we may so express it, consequently presents a most complex phenomenon.

M. de Lapparent could not refrain from declaring that "crystallized matter represents the most perfect and most stable arrangement to which the particles of the body are susceptible."

Let us not forget, then: crystallized forms are universally distributed. Matter has even a decided tendency, so physicists tell us, with reason, to take on such forms whenever the physical forces which they obey evolve with order and regularity, and their action is not disturbed by accidental intercurrences.

III

Let us glance backwards. Starting from the physiological laws which govern the action of our organs, we note a sort of identity between their manifestations and certain exterior phenomena of so-called inanimate matter. All those who are acquainted with the recent progress of biological physics and chemistry have had occasion to notice certain analogies between the transformations undergone in definite cases by living organisms and inert matter. Thus our organism, put in motion, gives off heat. We easily perceive this in connection with the working of our muscles. But the same phenomenon takes place, although less plainly in connection with work accomplished by the brain. The Italian physiologist, M. Angelo Mosso, has had occasion to observe two sick persons who had lost large portions of the bony substance of the skull, and after having placed a thermometer in contact with their brains he found that the action of thinking was accompanied, in his patients, by a rise of temperature. When we study more closely the action of our muscles, we find an unexpected likeness to that of the electric battery.

According to Professor André Broca, all the known facts touching muscular contraction, that is to say all that we know of the conditions of the production of muscular physiological action, is in accord with the laws of thermodynamics, in the same way as electric phenomena. In other words, the forms of energy brought into play in the organism are identical with those of inert matter. Besides this, electricity produces the same molecular phenomena in living as in inert matter. An

electric excitement causes a modification of the molecular arrangement in a fragment of living tissue. When the action of the electricity ceases, the muscle regains its original form. And the same phenomenon takes place when the electricity acts upon an inert object.

It is true that this spectacle is not accessible to all eyes, but this detail does not detract from its reality. In his curious study on this subject, Professor Iagadis Chunder Bose[1] quotes many proofs in favour of this theory. "If a piece of yellow phosphorus," he tells us, "be subjected to very rapid electric vibrations, we find it transformed into the red variety." Thus there is a molecular change which we perceive, thanks solely to the change of colour. We may add, besides, that the other properties of the phosphorus are also modified. The same author, after having devoted himself to a series of significant experiments, states that certain single bodies, such as iron and magnesium, show, under the influence of electric waves, an increase of electrical conductivity; many others, such as arsenic and iodine, show the diminution of conductivity. This modification of conducting power disappears at once and gives place to the original conductivity as soon as the electric action ceases.

After having examined comparatively the curve of molecular reaction in inorganic and living substances, Professor Chunder Bose makes this generalization, which would have astounded the physicists of the middle of the nineteenth century: viz.—

That there is an extraordinary resemblance between

[1] On electric touch, and the molecular changes produced in matter by the action of electric waves (*Proc. Roy. Soc.* 1900).

the effect produced by excitement *upon all forms of matter*. The matter slowly returns when the limit of elasticity has been exceeded by the excitement. The fact of exceeding that limit produces *the same fatigue in inorganic matter as in the living tissues* of our own bodies, whilst vibrations suppress fatigue in both.[1]

Let us pursue this series of striking analogies. The injection of certain foreign substances may either augment the viscosity or diminish the elasticity, and thus determine a partial or total loss of reaction: *this effect is produced in living forms as well as in the inanimate forms of matter.*

And when we reflect on certain manifestations of the identity of living matter with that called dead, which after all we only know thanks to quite recent observation of science, we cannot help thinking that the differences which strike us are perhaps only hidden and misunderstood analogies.

In his work, *The Response of Matter*, Professor Bose sums up the data quoted above, and deduces from them the identity of the greater part of the vital phenomena of so-called inert matter with that which we call living. Taking as his basis a series of photographs representing the reaction of metals under the influence of chloroform and different stimulants, he proves the variation in their sensibility. Lastly, in summing up, in his lecture before the Royal Society, his many works on the subject, he used this disturbing phrase amidst the applause of the assembled scientists—

[1] See his curious note on *La généralité des phénomènes moléculaires*, amongst the reports presented at the International Congress of Physics in 1900, Vol. III, pp. 561–586.

"It was only when I perceived this unity of phenomena which lies at the root of all things, that I understood for the first time that article of faith recited by my ancestors on the banks of the Ganges thirty centuries ago. . . .

"'Eternal truth belongs only to those who see the unity of the changing phenomena of the Universe, to no one but these, to no one. . . .'"

IV

We still have left the soluble ferments or enzymes to augment the striking resemblances between dead and organized bodies. They, too, in their turn, attempt to prove that there is one common "Soul of Life" which animates the universe.

It has been agreed to consider ferments as a sort of frontier between the living world and inert bodies. There are about fifty of them. The first, isolated by Kirchhoff at the beginning of the nineteenth century, has received the name of diastasis.

Products of life, they help in its evolution and maintenance; indispensable in digestion they are equally so in respiration. These bodies, probably of an albumenoid composition, are living, with a life which is incontestable, however elementary.

We know now-a-days that inorganic ferments can fulfil the same numerous functions as do the enzymes, produced by life, and showing a sort of life themselves.

If the *micoderma aceti* transform alcohol into acetic acid, colloid solution of platinum is capable, by oxydation, of producing the same result. The examples of the

identical action of the enzymes, products of life, and the ferments, produced by bodies called dead, are innumerable.

This identity becomes yet more striking when we consider the morbid action exercised by nearly all the poisons of the enzymes on the inorganic ferments.

V

What is it that characterizes organic life, if not its evolution? We have known for a long while that even the world of the heavens is far from being incorruptible and unchangeable. The stars are born, live and die. Matter has had its beginning, as it has its successive phases which lead it towards death or disappearance. In his *Évolution de la Matière*, G. Le Bon shows how, out of the chaos of old legends, the formless clouds of ether, it has progressed as far as organization in the form of atoms. During this period of progressive formation the atoms have stored up a provision of energy which they will have to expend in different forms—heat, electricity, etc.—later on. Whilst slowly losing this energy previously accumulated by them, they have undergone diverse evolutions, and consequently taken on varied aspects. When they have given off all their energy in the form of luminous, calorific, or other vibrations, they return to their dissociation, to the primitive ether. For we must not forget that all bodies in nature possess the property of radiation. They only differ in this respect in degree.

This statement is also confirmed by J. J. Thomson, who shows us radio-active phenomena in sand, in clay,

in brick, etc. For matter, far from being an inert thing, incapable of restoring the energy borrowed by its surroundings, itself contains its own reserve of colossal energy, in a minute volume of the energy known as "inter-atomic." This energy shows itself during the dissociation of matter, which, in disaggregating, changes, evolves, and becomes ether.

Elsewhere, on more closely examining colour photography by the Becquerel process, we see that chloride of silver changes colour in conformity with the influence to which it has been subjected by the light. It becomes red when struck by a red light, green under the influence of green light. We must not forget that light tends to destroy the chloride, which, defending itself after the manner of certain living organisms, puts its aggressor off the track by assuming its colour.

Starting from researches upon the influence of heat and light upon matter, science has hit upon a series of conclusions which revolutionize accepted notions. It tells us that we should be wrong in looking on an atom of matter as something irreducible and incapable of change. Quite on the contrary, the minuscule atom has become to modern science a world animated by all sorts of forces and energies which hide in them the mysteries of universal life.

CHAPTER V

A LIVING BEING IS ALWAYS LIVING

I

BY raising ourselves above the habitual conception of death, we perceive its intimate relationship with life. We only need to study more closely the ground which they have in common to find the treasure of peace which lies in the intimate harmony of these two phenomena, opposed as they are in our minds.

That which helps most of all to make life more comprehensible and death more attractive is the immortality into which both of them are resolved. As in the domain of sociology, we must not limit ourselves to the examination of the situation of some isolated workman to obtain an exact idea of all the working classes, so it would be insufficient to dwell upon the spectacle of life in man to understand its rôle in nature. Man being only an infinitesimal part of the living being, we must look at life in its entirety to discover exactly the portion allotted to the human race. This preliminary study becomes all the more necessary inasmuch as life is also possessed by plants, and even, as we have seen above, by so-called "inanimate matter." And everywhere it manifests itself in a manner analogous, if not identical.

The intimate ties which unite the exterior world,

men, plants, animals, inert and organic matter, are shown most plainly in the phenomena of the life which is common to all. Our return to the earth is thus only a return to the universal life, to the supreme energy which binds up all things in an indissoluble chain. Beyond this life, beyond its incongruous appearances, immortality engulfs, reforms, and rejuvenates in its breast, vast as the universe, all the partial eclipses of life. All things return there, and, with indefatigable power, are reborn into the sunlight.

Every animal and every plant may be reduced to their simplest vital expression: protoplasm. Here is the starting-point of life, however varied and complicated its manifestations. The most generous tissues, the most varied nervous tissues, always find their expression in the plasma. In this granular mass, lie the mystery and power of life spreading throughout nature. Where the plasma is, life bursts forth; where life bursts forth, there is the plasma. In this more or less gelatinous mass, in this reunion of molecules more or less varied and complex, but always preserving their principal typical faculties, lies the source and the unique principle of life.

II

Animal and vegetable protoplasms are identical from every point of view. For some time they were thought to be distinct in colour. That of plants was held to be necessarily green, whilst that of animals was colourless. This distinction was purely factitious. It is known now-a-days that the two protoplasms, animal and vegetable, have, in certain circumstances, the same capacity of

impregnating themselves with a green matter (chlorophyll), and whilst certain inferior animals (*Stentor polymorphus* and many others) show in their protoplasm the existence of the green matter, the protoplasm of several plants is completely devoid of it. Whence then the alleged distinction of colour?

From the fact that animal and vegetable protoplasms are not absolutely alike we can conclude nothing. Living matter is not one, it is diverse. Biology tells us that there is an infinity of protoplasms, as many as there are individuals. The thing which matters is the identity of their essential features. That which matters is that there is a chemical unity and a morphologic unity between the two protoplasms.

In this respect, there is no doubt possible. Let us consider them first from a chemical point of view. Both of them are only one mixture of albuminoid substances. What is this substance of which so much is said? What is its definite composition? For the moment we know only this; the chemical nucleus of these albuminoid matters is composed within the two kingdoms of the hexonic bases.

Kossel's experiments are decisive upon this subject. Instead of attacking the analysis of living matter by white of egg heated in a closed vessel to 200° with hydrate of baryte, the rather crude method recommended by Schutzenberger, Kossel employed the analysis of the male generative cell. Having taken the roe of fish (salmon), a protoid matter of the simplest organization and action, he reduced it to one single element, simple and crystallizable. This albuminoid matter was baptized by the name of *protamine*. Now on examining different

other generative cells a series of protamines has been discovered, everywhere constructed upon the same type, and formed of an analogous mixture of hexonic bases: histidine, lysine, and arginine bodies resembling each other in their physical properties.

Everywhere as the basis of living matter we discover this mixture of proteic matter with a hexonic nucleus. We may add that the protoplasm in both kingdoms shows the same avidity for oxygen, which cannot exist in liberty in their neighbourhood.

The structure of protoplasm, too, is the same throughout the scale of organized beings. Everywhere, upon an identical basis of cellular organization, there are two parts, the cellular body and the nucleus.

The living matter of a philosopher who ponders in his brain the mysteries of creation, and that of a simple rabbit or a parasitic insect, as well as all that of oaks, mushrooms, or of modest lichens, shows the same chemical constituents and the same morphology.

And from the moment when the protoplasmic body, which holds all the forces and all the mysteries of our vital evolution, is found in the two kingdoms, animal and vegetable, it is natural to admit that the representatives of these two kingdoms must equally enjoy certain common properties which flow from the unique source of their life.

Now the more vegetable physiology advances the more we perceive its identity with animal physiology. The differences which separate the two kingdoms in our minds lie rather in our ignorance of the facts than in their real opposition. We are still blind to the greater number of the manifestations of vegetable life, whilst

we much more easily perceive those of the animal world. The phenomena of vegetable sensibility not only take place in the world of the infinitely little, but are at the same time so subtle that they escape the vigilance of the keenest specialist. It is thus that the secrets stolen from vegetable physiology by the nineteenth century greatly exceed in number those which have been obtained in animal physiology. With the new spectacle of vegetable sensibility before us, so imposing and so rich in unsuspected facts, we no longer dare to contest with the same certainty their physiological life. Who knows if under the sensibility of plants, a discovery of recent date in science, are not hidden the rudiments of consciousness, which the science of to-morrow may discover to their profit?

The facts given by us do not seem opposed to the faith professed on these points by many thinkers and philosophers.

The distinctive essence of life lies in these two fundamental functions, nutrition and destruction. Now both are found equally in plants and in animals. They live identically, starting from the same point to arrive at the same end, following the same parallel roads; organic creation and destruction.

The animal and the plant live in the same physico-chemical conditions. Both have equally need of water, oxygen, and heat for their existence. They feed themselves, modify the materials which they borrow from the universe, handle them and use them for the needs of their organisms in an analogous manner.

Both have the same habits of life and both depend on the same physiological laws.

At the bottom of all the variations of living matter there is always the same protoplasm, which evolves, grows, or vegetates. Whether it be vegetable or animal, protoplasm never forms except within those fourteen bodies which constitute the physical basis of life throughout the whole range of the scale of organized beings.

These bodies are the following: oxygen, nitrogen, hydrogen, carbon, phosphorus, sulphur, sodium, chlorine, fluor, calcium, potash, iron, silicium, and magnesium.

All the manifestations of life in plants and in animals have their common source in irritability. It has been wrongly sought to limit its presence in the vegetable world to certain plants, and to deny its existence in many others. According to the celebrated German botanist, W. Pfeffer, every plant is susceptible to the most varied reactions, of which the greater part certainly escape superficial observation; and this faculty of irritation is the more general in that it is indispensable in order that the plant may prosper in unequal conditions and surroundings and diverse climates. "Truly," says Pfeffer, "we may affirm that any exterior influence, any change in surrounding conditions, is followed by a reaction, whether visible or not." [1]

[1] The author quotes several striking examples. The action of weight (geotropism) is of the greatest importance to secure a suitable orientation for the plant. It is by the help of geotropism that, the plantule being placed horizontally, the stem bends itself towards the zenith, whilst the root curves in the opposite direction until both the organs have reached a vertical position. Thus the well-known orientation of the stalk is only the effect of geotropic irritation. A really remarkable fact is the impressionability, thanks to which the volubilate stems of peas, gourds, and bindweeds roll themselves round their support. To determine this

III

In studying the long scale of the effects of sensibility and irritability among plants and animals, we are struck with their constant analogy. The sensitive apparatus of the first, seems often even superior to that of the second. Certain bacteria are attracted by fragments of meat or other nutritive substances reduced to the trillionth of a milligramme, an infinitesimal quantity, refractory to the most subtle senses of the human race or of known animals. It is the same with certain antherozoids. A wound made in the plant causes a reaction in all its being, and plants become tired just as man or animals by the prolonged action of irritating causes, and cease to answer to them.

The range of diverse sensibilities is nearly as rich in plants as in many of the inferior animals. There are even special cases in which plants show phenomena of irritability, which we may seek in vain among animals (the reaction caused by the excitement of the ultra-violet rays).

The parallel study of plants and animals daily reveals most striking facts in favour of their identity. It is not

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rolling, it only needs the assistance of a thread of silk whose weight does not exceed the five-thousandth part of a milligramme, whilst the efforts of wind and rain are exercised in vain upon the same stems, and the shock of a thread of mercury capable of crushing them remains without any directing action upon them (Pfeffer, *Zur Kenntniss der Contactreize*, Untersuch a dem. bot. Inst. zu Tubingen, 1885; *idem.* 1884, Bd. I, p. 363; Bd. II, p. 582); and Pfeffer tells us that "these stems thus make a distinction between the solid and the liquid state of matter, and this is a property most useful to the plant, for the stem does not react to the hurricane and the water-spout, which could not exercise a favourable influence, whilst it rolls itself round the 'tutor' which serves it as a support."

limited to the phenomena of life, but shows the analogies resulting from their death.

Thus red matter accompanies the putrefaction of nearly all nitrogenized substances, whether of animal or vegetable origin (Prat's experiments).

The most delicate vital processes of the most complicated nature, such as respiration, are accomplished in the same way in plants and in animals. We have the curious experiments of Claude Bernard, which leave us no doubt on the subject.

In a diffused light in the laboratory a young cabbage is placed under a bell-glass; under another bell-glass is placed a white rat. A current of air is passed into the two bell-glasses by the aid of a tube which draws out the air. A tap allows of the moderation or acceleration of the gaseous current. The air, which passes into a special apparatus, and is destined for the respiration of the cabbage and the rat, is deprived of the slightest traces of carbonic acid by its passage through two of Liebig's tubes filled with baryta water; the second tube being used as a test, as its contents ought to remain perfectly clear. The provision for air is divided into two parts, one goes into the cabbage's bell-glass and the other half of the air current into that of the rat. The air breathed by the cabbage and the rat is then passed into two similar vessels of baryta water, where a disturbance is seen to begin, and a deposit of carbonate of baryta is formed, alike in both cases, and caused by carbonic acid.

The cabbage, therefore, breathes like the rat, to the greater glory of the identity of their two lives.

We may recall another order of phenomena.

It relates to the anæsthesia of movement and sensibility. If we place under a series of bell-glasses a bird, a mouse, and a sensitive mimosa, at the same time placing in the glasses sponges soaked in ether, we may watch a most interesting spectacle. The bird, whose life shows most intensity, sleeps, or rather falls insensible under the influence of the anæsthetic. Some minutes afterwards it is the mouse's turn, and last of all that of the sensitive plant, which, insensitized, no longer responds to exterior excitements, and, most curious of all, the mechanism by the means of which the phenomenon manifests itself is identical in man, animal, and plant, for always and everywhere the process of anæsthesia first of all attacks the tissues, and through the tissues the irritability of the protoplasm. It is there that we find the source of the common sensibility of the elements composing living beings. From the moment when that is attacked, reaction becomes impossible.

The capacity for reaction under the influence of anæsthetics is not the exclusive property of the mimosa in the plant kingdom. Physiologists have equally noted it in aquatic plants (*Spirogyra*, etc.) from which the faculty of exhaling oxygen in the sunlight has been taken by the help of ether.

The masterly studies of Raulin, about which Pasteur was so enthusiastic, have shown how far the sensibility of plants may go. The author proposed to seek out all the favourable conditions which contributed to the maximum development of a little microscopic plant, the *Aspergillus niger*. Now its sensibility with regard to certain elements was simply astonishing. It was only necessary to add to the liquid in which the plant was

plunged 1/1,600,000 of nitrate of silver and the vegetation was arrested. In a silver vessel the plant did not even begin to develop, and yet, in spite of the most minute researches, it was impossible to find the slightest solution of silver in the liquid sheltering the plant.

The sensibility of other plants sometimes reaches degrees unsuspected in the animal world. M. Coupin, who has worked with plantules of Bordeaux wheat placed in perfectly distilled water and subsequently submitted to the influence of injurious substances, tells us amongst other things—

That it only needs 1/700,000 of sulphate of copper to arrest the development of roots. The same deadly influence is exercised, although in different degrees, by chloride of sodium, nitrate of lead, and chloride of palladium, etc.

By plunging certain vegetables into water distilled in a copper still, we may cause poisoning in them.

It is thus that the influence upon vegetation of the metallic salts contained by the soil, however insignificant their quantity, may be explained.

Latterly, they have even discovered the means of immunizing and vaccinating plants as if they were mere animals, against certain cryptogamic diseases.

The principle, brought so ingeniously into play by Mr. J. Ray, consists in this: causing the sick vegetable to absorb a substance injurious to the development of the pathogenic parasitic fungus. This is done by means of watering or injection.

The author of this discovery, which is so important to the safety of so many plants decimated by microbes, has only followed the Pasteur method employed for

animals. Have we not here the same case of poison altering the juices of the infected beings?

We may add that his attempts in the immunization of plants against the disease known as "*la toile*" have been entirely successful. This latter is caused by the microbe known by the name of *Botrytis cinerea*, of which an artificial culture has been obtained. This has been sprinkled upon the soil of greenhouses, in which the disease usually develops. The microbe fills the soil with the products of its secretions; these latter penetrate the plant and modify the composition of its juices, rendering them resistant to the attacks of the microbic disease.

Enlarging upon these experiments Mr. Ray has succeeded in discovering means of immunizing plants against a score of other kinds of parasite, such as the "rust" of clematis, "rust" and "black rust" of cereals, etc. Here then, as in the animal world, we cause, as a last resource, the defence of the tissues themselves against microbes, their enemies from without. The identity of the results obtained gives one more proof in favour of the intimate relationship between the two kingdoms.

Without going so far as to claim, with Le Clerc[1] (of Tours), that certain plants such as *Mimosa pudica* have a brain and a cerebellum, we find that there are enough points of contact between the animal and vegetable life to enable us to conclude their identity. We may note, too, that in proportion as our observations accumulate these proofs show themselves with a more and more convincing power.

[1] George Louis le Clerc, the Comte de Buffon, Naturalist.

IV

What is there more miraculous than voluntary movement in plants, to which we refuse to allow the least trace of nerves or consciousness? Thus the male *Œdogonium*, once issued from the cell, swims in the surrounding liquid and goes straight to the female cell, throws itself upon the green matter of the Oosphere and accomplishes the act of fecundation.

We have only to watch the wanderings of zoospheres, the ingenuity with which they seem to avoid all obstacles, and their varied travels round the same point before they succeed in crossing it, to be profoundly disturbed by these mysterious facts in the life of plants.

In tropical countries, where the question of the moisture necessary for the existence of the plant becomes the supreme cause of its life or death, we may watch spectacles which are of great interest for the scorners of the theory of the physiological life of plants. In order to preserve the water, one fern (*Polypodium imbricatum*) spreads its stem like a cover upon the tree which serves as its support, and thus keeps under this cover the moisture necessary to its existence during the dry season.

Another kind of fern, in Java, the *Dischidia rafflesiana*, forms each one of its leaves into an urn, which the rain fills with water. Naturalists who have had occasion to study on the spot certain aspects of the "common defence," a sort of defensive union arranged between plants and animals, give us some curious proofs of it. Thus certain ants, *aztica instabilis*, which install their colonies upon the leaves of the plant *Cecropia adenopus*,

which provide them with a rich food, defend their ally against the leaf-cutting ants. These alliances, more numerous and more efficacious than we dream, saving from destruction certain inferior vegetables and animals, thus preach the example of the benefits of union and concord.

Arthur Smith even goes so far as to attribute to plants a certain cerebral faculty. It is true that science has not yet discovered the existence of a brain, nor even of the nervous tissues belonging to it, but the botanists have not yet said their last word. The observation of certain phenomena of vegetable life point, in the mean while, to an hypothesis favourable in this respect. The water-lilac shuts its flower at the close of day and sinks beneath the water. The mimosa, at the sight of a heavy rain-cloud, folds its leaves and lowers it branches. The lilac at dawn reappears on the surface, whilst the mimosa regains its ordinary form when all fear of the storm has passed. Branches rest, "sleep" like animals, and this need of rest proves a certain cerebral fatigue anterior to the rest. Plants, then, feel fatigue. We may see this on touching the leaves of the sensitive plant several times. They close instinctively, and the neighbouring leaves follow their example. But if we repeat this operation a certain number of times the plant reacts less and less to our irritation. There comes a moment when, worn out with fatigue, it does not even respond to it. It, however, recovers its forces later on, for when rested, at the end of a certain time, if the irritation recommences, it again resists and responds to the provocation addressed to it.

Carnivorous plants manifest their digestive faculties

in the same way as animals, for animal digestion would be impossible without the intervention of the nervous tissues upon the gastric glands.

When a seed is sown upside down, it turns itself to bury itself in the earth. Darwin, so perspicacious in his conclusions, on considering this strange phenomenon, which he tried to explain by gravitation, could not help noting that the end of the rootlet, the future root, endowed with such diverse sensibilities, recalled the workings of the animal brain.

In order to convince ourselves of the mere identity of the vital phenomena in plants and in animals, we must above all compare the most simple animals and vegetables. The amœbas and certain monocellular vegetables show an identical sensibility in the change of their forms and in the formation of protoplasmic prolongations.

V

Philosophy has attempted to destroy this belief, so favourable to the animal world, which we find even in the most distant centuries. The exclusive right of man to intellectuality was affirmed under the influence of Descartes. It is man who possesses the thinking substance, whilst animals, devoid of soul and consciousness, are only pure automata. The world of ideas is completely shut to them, and their life obeys only physical irritations.

But modern zoology and psychology have undertaken the task of destroying in their turn this tentative theory. Helped by histology, anatomy, physiology,

and comparative biology, they triumphantly prove the identity of the cerebal structure in man and in the superior mammals.

The theory of consciousness, or rather of psychical life in animals, gains ground every day, both in the number of its adherents and the quality of its proofs.

The line of demarcation weakens more and more between animals situated in different grades of zoological classification, and almost vanishes at the limit of the two kingdoms; that is to say, between primitive plants and primitive animals. Certain psychologists even go so far as to speak of the vegetable soul. To Fechner the nature of his consciousness was analogous with that of the consciousness of animals. Haeckel tells us, for example, that between plasmophagic animals (*Protozoa*) and plasmodomic plants (*Protophytes*) there is no psychological difference, just as there is none from the point of view of consciousness. And can it be otherwise in the view of those who, like Haeckel, push the cellular theory to its logical end, considering the cell as the elementary organism from which is derived the physiological and psychological life of every organized being? Thus in his work on cellular souls and psychic cells, the same Haeckel speaks of the consciousness of these infinitely small protozoa, of their will, and of many other manifestations of their psychic existence.

The ardour of his convictions as to the unity of nature has doubtless carried the bold author of *The Riddle of the Universe* rather too far. We may limit ourselves, however, to noting, with so circumspect a physiologist as Max Verworn, that even those protozoa which are found at the lowest depth of animal life show a

certain psychic life, although branded with the mark of "unconsciousness."

In any case we must not let the term "unconsciousness" frighten us. Men, who attribute to themselves in their pride the monopoly of consciousness, in reality rarely have it, and on reflecting on the mysteries of this much-discredited consciousness, certain naturalists have even thought it possible simply to identify it with psychic life itself. "All psychic activity is conscious," says Wundt. From this point of view Haeckel is perhaps right in pleading in favour of the consciousness of unicellular beings.

VI

Thanks to the progress of comparative physiology, no prudent scientist of to-day would dare to doubt any longer the existence of a soul, or rather of an intelligence, in animals. We dare no longer deny to animals imagination, comprehension, the faculty, although limited, of generalization (generic images), and even certain virtues which we refuse to a great part of humanity: provision for the future, gratitude and profound attachment to their own, which often goes to the length of self-sacrifice. The gulf which separates the human from the animal world is narrowing more and more. We no longer speak of an impassable separation, but of the graduation of the intellectual faculties.

In the comparison made by Romanes between the psychological life of man and animals, we find this conclusion, to which all impartial observers of the life of animals will willingly subscribe, viz. cœlenterata corre-

spond to the new-born child, molluscs to that of seven weeks, reptiles and cephalopods to the child of four months, the carnivora to the child of ten months, whilst the anthropoid apes resemble in their intellect, children of fifteen months.

The same scientist, who was one of the most profound observers of the animal world, attributes in his curious diagram unusual mental qualities to the different representatives of the animal world. Thus, the apes and dogs are distinguished by certain moral qualities; apes and elephants, by the use of tools; the carnivora, the rodents, and the ruminants, by the comprehension of mechanism; the birds, by the recognition of pictures, by the understanding of words and of dreams; the hymenoptera, by the communication of ideas; the reptiles and the cephalopods, by the recognition of persons; the superior crustacea and the crabs, by reason; the fish and the batrachians, by association by likeness; the molluscs, by association by contiguity, etc.

The works of Darwin, Wallace, Lord Avebury (formerly Sir John Lubbock), and many other naturalists have greatly loosened the fictitious bounds interposed between the two branches of living organisms. Now-a-days the infinitesimal things of nature arrest our attention by the phenomena of their mental life, the more astonishing in that they were always denied or ignored. According to Ielt, certain species of South American spiders, use, with great cunning, the principles of mechanics, in order to carry big insects into their larders. We know the curious case of the *amœba*, waiting with intelligence for the issuing of an *acineta* from the breast of its mother so as to devour it, and

whilst waiting for this happy event being able to elude the venomous tentacles of its enemies. The observation of the intimate life of ants shows them to be in many respects superior to certain savage races of the interior of Africa. The reptiles and the crustacea often give proofs of sentiment, showing timidity and attachment. The bees which are found in the neighbourhood of sugar refineries find it simpler to go there direct instead of seeking their food in the world of flowers. Fish avoid the places where nets have been set for them. Even articulate language, considered up till the present the exclusive privilege of man, is beginning to be found in the world of birds, if we may judge by the minute researches made on the subject by M. Magaud d'Aubusson.

The spirit of investigation, which is so widespread among the monkeys, excites the admiration of Romanes, whilst Lord Avebury, Darwin, and many other naturalists give astonishing marks of the intelligence of pigeons. M. P. Hachet-Souplet, the author of *Dressage des animaux*, after having spent twenty years of his life in their education, states that the mechanism of sensation and perception in the animal is absolutely analogous to the infinitely more complicated mechanism of human consciousness. And after all, what is the art of taming if not the faculty of causing the animal to adopt by persuasion attitudes or movements contrary to its habits?

Now, education, in the strictest sense of the word, is only taming applied to our children. It means in both cases the utilization of the power of persuasion, of mental suggestion, which, coming from the stronger brain, reacts upon the weaker one. The faculty for being

educated is in itself a superior quality. We may recall, with reference to this subject, that mental suggestion only acts upon normal minds. According to the hypnotic experiments made by Dr. Bérillon, cretins and idiots are always rebellious to suggestion. It is, however, more than probable that the intelligence of animals has not undergone a great development in these later centuries.

The only thing which has changed has been our behaviour towards the animal world. We observe it more attentively, and in proportion as the field of our study widens, animal intelligence grows equally in our eyes, and reaches unsuspected limits. Who can predict to-day what the science of to-morrow may reserve for us in this respect?

VII

The unlooked-for notions to which the science of our day is leading us have been foreseen by the greatest philosophers of antiquity. Empedocles and Democritus attributed to plants a sort of conscious life guided by intelligence. We know the sentiments expressed on this subject by Plato and Aristotle, both of them partisans of the theory of the vegetable soul. The Fathers of the Church of the Middle Ages could not refrain from recognizing in animals and in plants a real basis of semi-conscious life. This pantheistic conception of the universe shows itself in the most zealous servants of monotheism. The literature of the Saints of the primitive times of the Church shows on this subject beliefs of a peculiar charm. They preached to wild beasts,

talked to the birds, and even deigned to converse with fishes. One of them believed in his candid soul that he had brought back the wolves to a feeling of respect for the sheep. In the opinion of many religious writers plants have souls capable of reclaiming their right to immortality. In his *Revelations of a Future Life* Archbishop K. Whateley tends to prove that plants as well as animals have a chance of enjoying immortality. Quite recently an English clergyman, the Rev. Forbes Phillips, of Gorleston, Yarmouth, scandalized his flock by preaching to them on the community of the future life of men, plants, and animals. To persons indignant at the prospect of finding in Paradise the souls of horses, dogs and cats, he simply said that when they had thought it over they would share his opinion, and would find it more agreeable to live in company with honest animals than with certain most detestable human beings. After all, the Biblical word Paradise is only the adaptation of a Sanscrit expression, much more ancient, Paradesha, which is translated in the Scriptures sometimes by the forest, sometimes by the park, always as a sort of admirable garden, where there would be plants, man, and animals.

It is interesting to note that simpler humanity had a more intense intuition of the identity of organic beings. The law-suits which were formerly instituted against animals, rested on the conviction that not only were their actions deliberate, but that also, like human beings, they ought to bear the responsibility of them. The Christian religion itself, far from combating this solidarity of beings so different from the point of view of their evolution, sanctified this theory by the authority

of the councils and representatives of the clergy. In 1120 the Bishop of Laon launched an excommunication against caterpillars, just as the Church did later, at Mayence, with regard to the Spanish fly. In 1454 the Bishop of Lausanne instituted a formal process against leeches, and obtained a decree against them to withdraw within three days under pain of excommunication. A cock, accused of witchcraft, was condemned to be burned by the executioner at Bâle, in 1474; and fifty years later the inhabitants of Autun entered into a suit against rats. The tribunal, led by a feeling of impartiality, allowed the forewarned rats an official defender, the lawyer Chassanée. The lawsuit dragged somewhat, on account of the difficulty of delivering the summons to the accused animals, and ended by the condemnation of the culprits. Towards the end of the seventeenth century there were in France many lawsuits against caterpillars, the most famous of which was doubtless that brought by the "Grand Vicaire" of Valence, condemning them to quit his diocese.

The revolutionary tribunal itself, presided over by Dumas (the 27th Brumaire in the year 2), pronounced judgment on a dog which was condemned to death. Now if these penalties inflicted upon animals make us smile, they bear witness to the instinctive sentiment of the solidarity of beings. Just as Paradise would gather into its bosom man, plants, and the animal races, so it was wished to make these two latter share our earthly sorrows and punishments.

VIII

Let us enter the mineral kingdom.

We know that in spite of all their efforts, biologists have not yet succeeded in giving an exact definition of life and death. If, as Pascal justly says, every definition is only the imposition of one word upon a *series of objects, created in the mind* in order to shorten speech, there can be no definition of natural phenomena, and the more complex the phenomena the more defective will be their alleged definitions. We may define things in geometry, in philosophy, in metaphysics, and in sociology. For the definitions may then answer strictly to the conventional data which we have decided to enclose in them. But when they refer to the things of nature, no definition can include their unforeseen or unsuspected modality, which the state of our knowledge or of our ignorance prevents us from perceiving.

To Aristotle, life was only nourishment, growth, and decay, caused by a principle which has its end in itself, "entelechia"; to Kant, it was an interior principle of action; to Bichat the whole of the functions which resist death. To Herbert Spencer, life is only the continued accommodation of the internal relations to the external relations; to Lamarck, a state which permits of organic movement under the influence of excitement.

In the opinion of modern biologists, such as Le Dantec, life begins in the fecundated egg, ends by death, and shows itself at every moment by a special structure which depends upon the structure existing during the previous instant and upon all that the being has done in the interval. The more the scientists, the

more the definitions, unless, imitating the example of Claude Bernard, they refuse to build upon running water and to define indefinable things.

It is the same with death. In the impossibility of enclosing in a narrow formula the idea of life and death philosophers and physiologists can only examine their relations with the exterior world. To understand the essence of life we need only observe its visible reactions, or note their absence in death.

We say a plant lives, an animal lives, or it is dead, basing the statement upon the presence or the absence of reactions which they are supposed to realize. In the category of vital reactions which strike our imagination most strongly we must place the property of living bodies to reconstitute themselves when mutilated, healing their wounds, and thus recovering their morphologic individuality.

Now crystals act like animated bodies with regard to mutilations. It is this which has caused Pasteur to speak of crystalline cicatrization. When, he says, a crystal has been broken in any of its parts and is replaced in the parent liquid, we see, at the same time as the crystal grows in every direction by the deposit of crystalline particles, a very active work going on in the broken or deformed part. In some hours the crystal not only gratifies us by the regularity of the general work in all its parts, but by the re-establishment of regularity in the mutilated portion. In the opinion of many scientists it would be rash to wish to place an insurmountable barrier between so-called inanimate matter and the organic world. According to Liebig, Ehrenberg, Claude Bernard, and many other eminent

chemists and physiologists, the vibratility of inert substances is only a variant of the irritability of living substances. The belief in their absolute rest is only a mere illusion of our senses.

Prof. Otto von Schrohn, who has devoted his entire life to the study of crystals, has shown us, after long research (in 1899), that crystallization, ordinarily considered as a phenomenon of inert nature, is in reality an organic phenomenon of living matter. The bacilli enter most of all into the composition of crystals, a series of micro-organisms, living beings who, *according to a preconceived plan*, succeed in grouping themselves in the diverse forms of well-known crystals. These bacilli, in conformity with their nature, crystallize themselves, if we may thus express it, in a manner answering to the known forms of the crystals. Thus when we perceive a scalenœdric crystal, we may be certain that it is the microbe of tuberculosis which has produced this strange agglomeration, just as the parallelipipedic form has its origin in the anthrax bacillus, the rhomboidic form comes from the bacillus "subtilis," and the prismatic hexagonal form from the bacillus of "tænia." The formation of crystals by myriads of living beings, working to the same end, and having for their goal a harmony of form striking all observers by its arrangement and its regularity, only confirms the beliefs of the ancients in the vitality of so-called inert bodies.

We may recall that law of Athens, the naïve dispositions of which charmed our childhood.

It condemned any inanimate object which, without human intervention, had caused the death of a man or a woman, to the penalty which entailed exile for the

crime of homicide. Even in our day certain fetish-worshipping races venerate stones, especially those which fall from heaven, and attribute to them a special soul. Amongst the Algonquins, the souls of axes and cauldrons cross the sea and go to the "Great Village."

Amongst the Buddhists, the belief in the life of the so-called inanimate world is general. Certain *Yoghis* pass their life in absolute immobility, not only to avoid hurting plants, but also to do no involuntary wrong to the pebbles strewed along their path.

Nirvâna, according to the sacred books of the *Vedas*, will gather into its bosom not only animals and plants, but also stones and rocks.

Ancient philosophers have seen in the attraction and the repulsion of bodies the initial form of the sympathies and antipathies which govern living beings. Empedocles regarded love and hate as the principles of movement in the universe, just as Schopenhauer has rejuvenated these old systems in identifying existence and will.

For whatever we may say, dead and living matter have profound affinities. There is not a single body to which life exclusively belongs. Its essential qualities are recognized with striking fidelity in dead matter also.

IX

The world of insects, and, above all, that of the infinitely little, the study of which dates only from the end of the eighteenth century, has surprised us by the multitude of facts showing their intellectuality.

The existence amongst them of mental communica-

tions is admitted by many scientists (Lord Avebury, Ebrard, P. Huber, etc.).

Scientists even talk glibly of the language of the antennæ, that exchange of sensations or ideas which is established by means of touches of the frontal appendages or antennæ.

Dr. Ph. Maréchal, who in his love for animals does not hesitate to place them above man, even admits, after the example of many apologists of bees and ants, the existence of a vocal language as well as the dumb language of the antennæ.

Bees, placed as sentries at the entrance to the hives during the night, call to their aid, if necessary, several of their companions by means of a particular sound. When the young queen, still shut up in the cell in which she is born, wishes to come out of her prison, she makes a noise like a little cry. The nurses then understand that it is time to remove the cover of the cell in which she is imprisoned.

In his curious work upon the psychic faculties of insects, Prof. A. Forel thus formulates the results of his minute observations—

"All the properties of the human intellect may be deduced from the properties of the intellect of the superior animals, and these latter also allow of the deduction of the intellectual properties of inferior animals. . . ."

We thus find ourselves confronted with a logical chain, the links of which gradually increase. And in fact, when we touch upon the lives of the best-observed insects, such as ants and bees, we are astonished at the richness of their psychic life. According to Huber,

Lord Avebury, Fabre, Forel, von Buttel-Reepen, and others, almost all insects possess memory, that is to say, they have the gift of storing up in their brains the impressions produced by the senses. And, equally essential, the insects know how to use them afterwards. The examples given on this subject by von Buttel relating to thieving bees, like those of Forel, which relate to slave ants going out to rob, are very significant.

When these latter rob nests situated at a great distance, they only go there whilst the latter still contain larvæ. But when there are none left they will not return.

It is not smell which shows them that they are empty, for these nests are often very distant, but the fact, preserved by memory, that there is nothing more to steal. In a word, we may conclude with Forel that the impressions of the senses, perceptions, associations, decisions, memory, and habits follow in the social insects the same laws as in the vertebrates and in man. Modern science even goes so far as to attribute to them will and sentiment.

Their *industrial* capacity is generally admitted. We all know that certain insects work with unparalleled cleverness. Their genius for utilizing all the means within their reach is often most marvellous. We may recall, for example, the bee, which is obliged to economize space in its hive, the first thing to be considered, and then to place in its cells the greatest possible amount of honey. And here our ingenious architects find an astonishing solution, of which many humans would not have thought. Thus they construct their hexagonal prisms, of which the base is a pyramid made of three

lozenges. The white ants (termites) show a quite surprising constructional talent. The Eiffel Tower, with its height of 300 metres, is only 187 times the average height of the artisan. But in order to be on a level with the arch of the termites it ought to be, according to the calculations of F. Houssay, 1,600 metres high. When we compare this masterpiece of the art of man with the cupola of the termite, with its numerous galleries and its four floors covered by the general exterior wall, the thickness of which rises at the base to 60 or to 80 centimetres; its numerous supporting columns; its vaults, etc., it is to the latter that we should give the prize for talent and skill.

Before these products of the work of insects we console ourselves by repeating in our pride that it is only a work of instinct. Intelligence and reflection are missing, we say. Who knows? All those who have most closely studied the concrete species of insects maintain the contrary. We may note that man is not an impartial judge of the dispute between himself and animals. Everything urges him, and his interest, in the first place, to deny an analogy, if not an equality, of talent in beings which seem to him greatly his inferiors. A delicate and subtle psychologist, M. Camille Mélinand, has perhaps found the right expression in saying that the insect, if it is not like the intellectual man, is at least like the specialist workman.

Condillac had already noted it: between animal instinct and human routine the resemblance is striking. But how many are there amongst human beings who consent to be guided by routine, and how many those who follow their original and fertile genius?

We are told that animals repeat their acts in a mechanical way. But workmen do the same. Does the insect then find itself in this respect on a level with average humanity? Who could state that there are not superior individuals among them?

Do insects repeat the same acts always and everywhere? Can we absolutely deny to them the existence of all progress? Does not observation teach us that with them there is also an adaptation of work, and if we may put it thus, the adaptation of reasoning to exterior conditions?

We know, for example, that the construction of cells varies according to the hive. We have only to give the bees wax in thick or thin slices to find the cells adapted to the material furnished (Tegetmeier). Here is a characteristic example given by Prof. Bouvier. When the bee-hives of the canton of Vaud were devastated by a terrible moth (sphinx, or Death's-head), the bees invented an ingenious system of constructions, preserving them from certain loss. With wax and propolis they constructed most complicated arcades and sinuous entries, in a word, a labyrinth, impassable for the sphinx. The following year the moths disappeared, and the bees ceased to use their protecting invention against their formidable enemies.

In our mania for seeing in all animals mere automata, we forget that many of their primordial qualities which seem to us instinctive are only learnt and acquired. Birds learn to fly just as they learn to construct their nests.

X

We talk of the properties of movement of living matter. What is this movement in protoplasm, that type expressive of life, if not a change of volume, form, and situation of the mass?

Now minerals, as Prof. Thoulet shows us, manifest in their special life the same capacity of movement, derived from the sun, the common source of all movement.

We have only to heat a mineral to see how it reacts under the influence of heat. Its hardness, its elasticity, its size, its molecular state, all change as if the mineral were a living being. Minerals are born, grow, and die, drawn into the sphere of influence of exterior factors which cause their transformation or their death.

In the accounts of the French Institute (1887) we find an interesting study by MM. Gernez, Parmentier and Auret, which throws a singular light upon the question with which we are dealing.

On cooling a very concentrated solution of hyposulphate of soda, in an ordinary freezing mixture, in the absence of any germ of ordinary crystals it produces special crystals. These are very fine needles, several centimetres long. But we have only to touch them with a glass rod previously placed in simple contact with prismatic crystals to cause the transformation of these needles into short thick crystals. In other words, the introduced crystals have fertilized the old ones and caused the sudden birth of new forms.

We have thus only to observe the existence of crystals to see an overflowing life where we did not even suspect

its existence. Crystals, however, are not an exception in the mineral kingdom. They have simply a kind of life more easily grasped by our imperfect organs of observation.

When we read what Mr. John W. Judd[1] says upon this subject we feel troubled as one is troubled in the presence of a newly discovered world. According to this scientist, crystals not only live, grow, and die, but they have besides the faculty of resuscitating themselves. Superior to man, they grow younger after having passed the age of senility. They thus realize the dream of the poet who wished to put youth at the end of human existence.

Like the little organisms of some rhizopods, or buds and branches broken or mutilated, a crystal repairs its losses during its growth. A little fragment of crystal grows and reproduces a whole analogous to the piece from which it has been detached; and this reparative force, this vital force if you prefer it, is so intense that the mutilated piece grows more quickly than the pieces left intact.

It has almost the power of generation, for its normal form may be completely modified by the presence of the infinitesimal traces of certain foreign substances. The presence of a piece of felspar is enough to cause a crystalline formation of felspar in surroundings where it would otherwise be conspicuous by its absence.

A crystal can arrest its evolution like some fakir of India, whom they bury under ground for several months, his mouth and eyes filled with sand. Aroused from his torpor he continues his vital cycle.

[1] A communication made to the Royal Institution of London in 1891.

They grow old like us, and old age even affects their intimate structure. There comes a moment when they lose their optical and physical properties and pass into the category of corpses, *pseudomorphs*.

It has taken a great number of centuries for us to perceive these vital manifestations of crystals, and it will perhaps need as many more to understand that life is around us always and everywhere.

Let us take any piece of inert matter: a stone, a pebble, a mineral. Let us submit it to the influence of exterior forces, magnetism, heat, electricity, light, and we shall easily perceive that no one of these influences will leave it insensible. Heat modifies even the electric properties of the mineral. It changes its hardness and its elasticity, and causes in it phenomena of every kind, beginning with those of movement and ending with those of decomposition. Armand Sabatier,[1] who has studied very deeply the identity of organic and inorganic life, gives a series of most convincing proofs in favour of this theory. We will quote a few of them.

Orthose deformed by heat cannot recover its original optic state. If the heat still rises, the molecular state changes yet more profoundly, the solid state gives place to the liquid, and fusion is produced. In its higher degrees there is volatilization, then comes dissociation and destruction or death. The movement of living beings, as we have said elsewhere, should be looked at in its most elementary form, its most simple; that is to say, the substance which serves as a basis for all living beings, in protoplasm. This phenomenon is shown there by molecular movements of the mass, which

[1] *Essai sur la Vie et la Mort.*

result in changes of volume, of form, and of situation of the mass or of portions of the mass of protoplasm.

Now amongst inanimate beings, amongst the minerals, there are also molecular movements which influence the form and the dimensions of the mass and even its state.

We speak of a fundamental difference between inert and animated matter, when we consider them from the point of view of their nutrition. It is generally admitted that living beings grow larger by the acquisition of a new substance which penetrates the organism and becomes identified with it, whilst the augmentation of volume of inert bodies is only attained by juxtaposition, a mechanical enlargement, a sort of new matter added to the old without the production of any intimate tie.

But if we take for our elements of comparison inert bodies in a liquid state (this is precisely the case with plasma) this difference would not be so strongly marked. We only need on the one hand to take, as our subject of comparison, not the cell, but the elements which constitute it, and we shall perceive that the newly arrived molecules which enlarge the protoplasm equally become merely superposed. And when we examine the growth by nutrition of solid living matter (the bones) we find that this is effected just as the inert matter by juxtaposition.

XI

Life and movement, far from being limited to plants and animals, belong, as we have shown, to the minerals also. They are the lot of the universe. The difference between animated matter and inert matter is not in the

presence or absence of life, but only in the degree of vitality, on the one hand the slow dumb life, and on the other the acute life. Both of them cross, mingle, and penetrate mutually. The spectacle of carbon drawn from carbonic acid by chlorophyll and transformed by animals into their own tissues, is found throughout all the range of the relations between the two worlds, the living and the so-called inanimate.

Universal activity, Alfred Fouillée tells us, paraphrasing the idea of Aristotle that "all movement in nature is a sort of appetite," would be unintelligible to us without universal sensibility. "There is not upon the one hand a feeling mind, and upon the other absolutely insensible matter, which, however, might be felt." According to the definition of Leibnitz there is nothing dead in nature.

Now whatever may be the lot of our terrestrial remains they must infallibly return at last to the bosom of living nature. Their last visible refuge for us being the mineral kingdom, as we have seen, this transformation in no way means the loss of life from the point of view of the general economy of beings.

Having become a mineral, the formerly living being again returns into the immediate kingdom of the living. Is not the mineral after all the principal food of man, plants, and animals?

Dr. Gaube, the creator of biological mineralogy, is right in saying that protoplasm itself is born of mineral matter, for the very simple reason that it could be born of no other source.

The influence of minerals upon the reproduction of the species is, according to the same author, so consider-

able that the demineralization of parents provokes sterility and thence depopulation, of which we complain so bitterly in plants. Nitrogen, that basis of our nutrition, is only one among the many minerals which give its character to the organism. Thus, silica and potash are the dominant minerals of races, silicate men being found mostly amongst fair races and those with more potash amongst the dark races.

Without subscribing to this doctrine, the application of which would doubtless carry us too far, we find that the principal fact arising from it can be contested by no one. It is to minerals that protoplasm owes its birth. The principle and the appearance of elementary life being so profoundly bound up with the existence of minerals, we see there a new and striking proof of the intimate tie which unites the minerals, so-called dead matter, with the animal and vegetable world endowed with life.

XII

The poets, with their power of divination, have often sung of the soul and the intelligence of things called inanimate. Victor Hugo goes even further. There is, he says, in the relations of man with animals, with flowers, and with all the objects of creation, a great morality which has as yet been hardly glanced at. It will end by being fully seen, and will become the corollary and the complement of human morality.

So with the philosophers and the poets of antiquity. Every body of living and inanimate nature was for them a macrocosm, compared with the human microcosm. A sort of universal soul, the principle of action,

animated the intelligent principle of this immense organism, aided by *nous*.

This presentiment of the poets and philosophers may in time become a reality. In proportion as science unveils before our eyes the intimate ties which bind all nature together, humanity will understand better and better the history of continuity and solidarity in the reciprocal relations of all the elements of the universe.

The two worlds, externally so separated, are thus united by the community of their origin, by the analogy of their existence, and by a profound affinity of their properties. Where does life end, and where does death begin? What is the one and what is the other?

Formerly we might lull our consciousness to sleep by showing it an impassable gulf between the two kingdoms, but science has carefully filled this up. And in proportion as we cross the frontier of ignorance we ask ourselves anxiously, Is death then only a simple aberration of our senses? And the many echoes which reach us from all the multiple branches of experimental science which are attacking this disturbing problem, only lessen our distress by continually widening the domain of life and, in consequence, diminishing that of death.

Let us limit ourselves for the instant to insisting upon this incontestable principle.

We owe our origin to the matter which in our ignorance we have wrongly called inanimate. In returning to the earth not only do we return towards the creative principle, but we reënter at the same time a store-house of new life.

CHAPTER VI

THE GREAT TERROR OF OUR LIVES

A.—Its Origin

I

WE tremble before death. At its approach a sort of anguish mingles with our thoughts. We avoid seeing it closely in others; we keep it far from us by all the powers of our reason. A vain attempt. With invincible obsession it still recalls itself to our consciousness. At each disappearance of a loved being, in face of a threatening disease, beside a cemetery, on the reading of a necrologic article in a paper, on looking at the final vanishing of the myriads of beings who surround us, it recalls itself to our "ego" as a sad necessity; a terrible and implacable end, the feared and hated limit of our earthly journey. No matter how much death is in us and around us, our eyes and our thoughts close, troubled, before the sight of it. Where are those who dare to brave it? They are the few heroes of duty, or again sages, less numerous still, who are strong through reason. So-called normal humanity ever turns from the most hated of the gods, as the expressive definition of the Greeks puts it. And when we consider it we perceive that there is nothing more natural than the sentiments inspired by death.

Everything contributes to render it feared and fearful; religions and their prophets, moralists, priests, popular legends and superstitions, literature, songs, the visions of the enlightened, pious, and even sceptical men. In fact, all humanity, from the awakening of its thinking faculties, seems to have tried to make death the most terrible of earthly spectacles.

When we were young we laughed at it like Cephalus, but, like Plato's hero, having become old and decrepit, we lament at the bitterness of the end. Just, however, as the excesses of our organism are always accompanied by efforts which unconsciously tend to hold us up on the slope of ruin, so, whilst breathing with full lungs the despair and the sorrows of death, we instinctively seek for remedies against its sufferings. From the first thinking beings who, unable to resign themselves to complete disappearance, have thought to find their salvation in a future life as the continuation of their earthly passage, humanity has always drunk thirstily the consolations which sweeten the cruel conception of the end.

II

The belief in an after life, the principal basis of all religions, and thence the belief in the human soul independent of the body, owes its origin to the terror of death. In the impossibility of persuading man that he will live after the decomposition of his body, it was necessary to find a more plausible and more likely argument to save him from the despair of nothingness. Above all, it was necessary to calm his apprehensions by the

hope of an after life. But an after life of what? Of his body fallen into corruption? Incapable of looking beyond the grisly spectacle which lay before his eyes, man fell back upon the existence of *another self* within him, an invincible and invulnerable being, which death could not seize even as his eyes could not perceive it. A subtle and abstract being, escaping from the attacks of physical destruction and derived from heaven and the divinity. Thence was born the belief in the soul. *Nirvâna* and Buddhism are equally grafted upon the same trunk. In vain they paint to us the delights of immobility and the joy of the cessation of life. Their doctrine cherishes, behind all these clouds, the same dream of survival dear to the rest of humanity.

With extinction (Nirvâna), so Buddhism teaches, the soul, freed from the life, vanishes. Far from perishing, however, it returns to the substance of the eternal being, and is withdrawn from the influence of time and place, causes and effects. It is thus replunged into an endless state of being.

At the root of all the faiths we find the same aspirations towards a future life, and the same ardent desire of attachment to the earthly life by indissoluble ties. If certain great creators of religions and dogmas seem to have been free from preoccupation about the after life, the crowds who followed them never failed to fill this void, and in this respect to violate their doctrines. Confucianism and Taoism, the two great faiths of the Chinese, if they had remained faithful to the teachings of their creators, would close to their initiates all possibility of an after life. And, nevertheless, future life in a latent condition yet forms part of these two faiths.

It is the same with the Jewish religion. The Old Testament says nothing of a future life, and yet not only Christianity, which springs from it, but also the Jews, faithful to their ancient beliefs, have introduced into it the dogma of the after life as an essential part of their faith. Besides this, the immortality of the soul only became part of the Christian religion several centuries after its foundation.

The idea of an immortal soul imprisoned in the body, to be freed from it immediately upon death, appears for the first time in a more precise manner than in the *Odyssey*, in the poet Phocylides, the contemporary of Thales and of Theognis, born at Miletus in the sixth century B.C. It was a great while before this belief was accepted by humanity of ancient times. Treated with scorn by some, admitted with many reserves by others, we find it, shortly before Christ, among the Pharisees, who had found it in the Greek writings inspired by the elegies and the moral poems of Hellenic literature.

The Mazdeism of Zarathustra, Christianity, Mahommedanism; in one word, all which bears the name of religion, becomes in this manner inseparable from the dogma of the after life. Are we to see in this a sort of unconscious calculation, as John Stuart Mill insinuates in his *Essay on Religion?* "The religions," he says, "which adjourn to another world the effects of divine justice, were bound to prevail at last over those which limited themselves to promising temporal sanction, because it was not so easy to prove their defaults."

Great minds often free themselves from the articles of faith or superstition current in their lifetime. Those men are not rare amongst philosophers who refuse to

subscribe to the popular dogmas. The source of the belief in the future life is, however, inexhaustible in them. It is only its manifestations which change their shape. Some believe in the persistence of an animated principle, others in the immortality of glory, others, again, in immortality of nature. All seem to be of Socrates' opinion, "that the thing is worth believing in, on the chance."

In the opinion of Aristotle, who laughed at the belief of Plato in the persistence and survival of the soul, our active intellect will mingle after our death with the active power of nature. To the Stoics, the soul, that morsel of celestial fire, returns on death to its place of origin, the universal soul. For almost all the scorners of the after life, death is, as it was for Plutarch,[1] the return to the native country. The curious discussion of Albertus Magnus is well known. After having enumerated thirty arguments against the immortality of the soul, he found thirty-six in favour of it, and joyfully declared himself convinced. The logic of Albertus Magnus has prevailed throughout the ages. Only these six decisive arguments are always arguments drawn in some way from the terrifying void which seizes upon us before the yawning grave.

For all that we have laughed or passed indifferently by in the spring of our existence, as soon as the leaves of the tree of life begin to fall we become reconciled to the smiling face turned towards us by the mirage of the other life.

Luther, who, at the beginning of his ardent campaign against Rome, classed the dogma of the immor-

[1] Agricola. 40.

tality of the soul amongst the "monstrous fables which are part of the Roman dung heap," thought it over later and became reconciled to the object of his sarcasm. Spinoza, if he takes care not to use the word immortality, yet resigns himself to admitting that of eternity. He also has found the consolation of death to lie in a return to the substance of the absolute being. Whilst all the philosophy of Spinoza seems opposed to the immortality of the soul, the philosopher, terrified before nothingness, denies his implacable logic and attaches himself to a mirage, the survival of his *ego*. According to the fundamental dogma of pantheism the soul is fixed to the body with absolute solidarity, and, as A. Franck has said,[1] the human soul is, in Spinoza's view, "only an aggregation of ideas necessarily bound to an aggregation of corporal molecules." The author of the *Traité-theologico-politique* declares besides that after the disaggregation of the organs our abstract capacities also disappear. Thus, with the death of the body die memory and consciousness, those two essential bases of the existence of the soul.

The soul, according to the logic of pantheism, is thus condemned to a final disappearance. And nevertheless our consciousness is so much attached to the dream of an after life that, breaking with his ingenious deductions, Spinoza has recourse to a principle of "eternity," which, whilst rejecting immortality, allows us to live with the imperishable life of the absolute principle.

Kant arrived at the conclusion of the reasonableness of eternal life; Hegel believes in reabsorption into the absolute being; Goethe, in enjoyment of the return to

[1] *Dictionnaire des sciences philosophiques*, Spinoza.

the infinite; Auguste Comte in cerebral immortality, in survival by ideas and by civilization; Herbert Spencer in the return to nature by way of evolution; and Renan, with his little sceptical smile, whilst preserving the individual immortality of the soul, speaks of its return to the immortality and the impersonality of the intelligence. . . . "We shall live," he tells us in his *Dialogues Philosophiques*, "by the trace which each of us leaves upon the bosom of the infinite." Thus Guyau, in his *Irreligion de l'Avenir*, drowns his despair before death in a belief in the immortality of our thoughts and actions, a dogma adopted by the greater part of the writers and thinkers of our day.

"That which has once truly lived will live again; that which seems to die is only preparing for rebirth. To imagine and desire the best, to attempt the great enterprise of the ideal, is to invite and to lead onwards all the generations which come after us. Our highest aspirations, which seem also the most vain, are like waves, which, having come up to us, will go beyond us, and perhaps, in uniting and amplifying, will shake the world."

"I am quite sure that the best in me will survive. No, not one of my dreams, perhaps, will be lost; others will gather them up, will dream them after me, until some day they will be realized. It is by the power of the dying waves that the sea fashions its beach and moulds the bed in which it moves."

In spite of these consolations scattered so profusely by religion and science, humanity has never ceased to fear death. The terror which it causes is universal. It hovers above countries, races, sexes, and even above the

intelligence of human beings. At the bottom of their consciousness mortals fear its approach as much as Mme. de Sevigné, who, in a great cry of anguish, sums up the apprehension of the end of all the human race.

"How shall I leave this life? Where? By what door? When will it be? And in what manner? Shall I suffer a thousand pains which will kill me in despair? I am swallowed up in such thoughts and I find death so terrible that I hate life more because it leads there, than because of the thorns with which it is strewn."

La Rochefoucauld even loses his philosophy of common-sense in the face of death. It tears this heartfelt cry from him—

"We can look fixedly neither at the sun nor at death."

The literature of all countries thus rings with the lamentations suggested by the necessity of departure.

III

From the days of Homer, through Dante and Shakespeare, ending with Baudelaire, Victor Hugo, and Leconte de Lisle, poets of all times, with very rare exceptions, were unanimous in placing their most lugubrious horrors around death. In the *Odyssey*, the shade of Achilles declares to Ulysses that "he would rather be a slave upon earth than reign in the land of the dead." For the Achaians of Homer, overflowing with life, death must have been a fearful thing. The subterranean world, to which went all mortals after their terrestrial pilgrimage, was shadowy and obscure.

That which struck them at the entrance "was destruc-

tion and the invisible." Hades and Persephone, a grisly couple, received their unwilling guests with malevolence. Men are no more in this kingdom than sorrowful shadows, bearing with them their eternal regrets for their life passed upon earth.

"O my child, O most unhappy of mortals," says Anticlea to her son Ulysses, on their touching meeting in the land of Persephone, "such is the lot of human beings when they are no more. Their muscles no longer support the flesh nor the bones. As soon as life has left the members the irresistible flame of fire consumes all, muscles, bones, and flesh. The soul alone escapes and flutters like a dream. Haste thee to regain the light."

The kings who recognize Ulysses, "all these simulacra of men who are no more," lament and weep abundantly for their former happiness and their recent sorrows. Their new life is only full of regrets for that which they have lost. Such is the existence of the heroes, like unto the gods. Beside it we see only the unimaginable tortures of those condemned to eternal punishment; we see Tityos, son of the august Gaia, whose entrails are torn and liver devoured by two vultures perched upon his flanks; Sisyphus lifting and pushing with all his might the gigantic rock, which falls back into the depths each time that it reaches the summit; Tantalus plunged up to the chin in water, which recedes from him whenever the unfortunate old man tries to moisten his lips and quench his thirst.

Hesiodus leads us further still on the same path of suffering. He shows us the Titans, the eldest sons of the Earth and the Sky, victims of their eternal martyr-

dom in the land of the invisible, which lies below Tartarus.

Thus from the light hand of the ancient rhapsodists the terror of death was launched across the centuries, countries, and literatures. The works of all races were infected with the apprehension of death, which, like a river with invisible banks, flows across human thought without distinction of race or culture. A study of the evolution of the terror of death in the literature of the past and of to-day, would become almost a universal history of literature itself. The meditations of the Fathers of the Church and the monks of the Middle Ages, would shine particularly in this concert of vociferations against death. "If the lightest wound made on the finger can cause so great a pain," we read, for example, in one of these pious works, "what a horrible torture must be death, which is the corruption or the dissolution of the entire body." The writers belonging to the refined races which are accused of decadence, such as France, or belonging to young nations of recent civilization, such as Russia, pay the same tribute to the terrors of death.

The hero of the *Death of Ivan Ilitsch* (Tolstoi), struggling wildly against the approach of the end, sums up in this wild cry the state of mind of our generation—

"Why death? May it come quickly. . . . But why quickly? Death, the shadows. . . . No! anything rather than death!"

In the childhood of Tolstoi we find these few words, which, placed in the mouth of a child who sees the death of his mother, sum up the fear which this Christian writer has all his life felt at the thought of death.

"Whenever I think of it a cold shiver goes through me from head to foot. I raised my head and saw the peasant woman perched upon a stool, holding with difficulty the little girl, who, waving her hands, threw back her little face convulsed with fear, her eyes fixed upon the face of the dead, still uttering terrible cries with a voice which had nothing of the human. I myself uttered a still more terrible cry, I think, than that which had struck me, and I rushed with one bound out of the room."

After seeing the death of his father Nicholas, in 1860, Tolstoi makes, in one of his letters, this cruel confession—

"Nothing is worse than death, and when we consider that it is the inevitable end of all which lives we must also recognize that nothing is worse than life. What is the good of so much effort, when at the end of it all, there is nothing left of that which was Nicholas Nicolaievitch Tolstoi?"

Vulgar and choicer souls are all alike in the same apprehension of the inevitable moment. Goncourt, in his *Journal*, states that the idea of death poisoned the life of Daudet, and that Zola, in spite of his philosophic mind and his rare courage, trembled before the death which obsessed him and caused him nightmares and insomnia. E. de Goncourt, in his turn, told me that if he could clear his consciousness from the idea of death, his life would be lightened by the removal of a great burden. On the occasion of an historic reception at the house of Victor Hugo, almost all the illustrious guests, on being questioned upon their conceptions of death, ingenuously confessed the fear and sadness with which it always inspired them.

Renan, in whom the thought of moral harmony and equilibrium always masters the tastes and feelings of his soul, strays, nevertheless, when he touches upon death. It make him lose his sense of proportion, and suddenly changes this ultra-modern thinker into the terrified man of the time of the cave-dwellers. "Death is odious," he cries, "detestable, futile, when it stretches its hand coldly and blindly over virtue and genius! There is a voice within us which only good and great souls can hear, and this voice cries to us without ceasing, 'Truth and good are the ends of life! Sacrifice all else to that end,' and when, following the call of this interior siren, we have reached the term where the rewards should lie. . . . O! deceitful consoler! There is none! This philosophy which promised us the secret of death stammers excuses. . . . Nature's goal has been reached, a powerful effort has been made, an admirable life has been realized, and then, with that carelessness which characterizes her, the enchantress abandons us, and leaves us a prey to the sad birds of night."

In vain they tell us that the apprehension of death weakens with the triumphant march of pessimism, that the human race, a prey to its sorrows and to its busy life, thinks less and less of its tragic end. The truth is that it still thinks as much of it, but it thinks differently.

Scepticism having spoiled for him the dream of the individual after-life and of the celestial paradise, the modern man hopes to clear his consciousness from the thought of death. But the latter clasps him more and more closely. The suffering which it causes us is more acute and more intense.

And yet what is the source of this apprehension which shows itself thus in every grade of human life?

B.—The Sentiment of the End

I

Although general, this sentiment is none the less one of the most complex. Its action depends not only upon certain properties deeply rooted in our consciousness, but, above all, upon an assemblage of circumstances created by man himself. One would think that a blind will had urged him to make the evils which torment him sadder still, and the affliction of uncertainty in which he struggles yet more cruel.

All things have a place in this fear of death, beginning with the unconscious fear of the unknown and ending in the poisons accumulated by man himself to make the joy of living degenerate into a permanent fear of death.

First of all, we see in it the apprehension of the unknown. We tremble before death just as we turn our eyes from a precipice or a bottomless well.

Behind that which we see there is always something which we do not see, and that invisible something frightens us. Our anxiety grows still greater when it is our own *Ego* which is fated to be thrown into this gulf of uncertainty.

Is this fear instinctive? The question is not without importance; for "instinctive" means above all independent of our will, and rebellious to education. It

should thus appear always and everywhere upon the approach of death. Now, we have only to study the numerous cases of premonitions and the stories of people escaped from mortal dangers to perceive the contrary.

We fear the pains of death. How often do we not hear people formulate the dream of sleeping and waking no more. Death occurring in these conditions seems to them sweet and desirable. In the idea of many people who have avoided the study of the phenomena of death, and have taken great care never to observe its real manifestations, death seems only the equivalent of suffering. To our terrified imaginations there always appears with the idea of death the dying man succumbing to superhuman suffering, with an emaciated face and features drawn with pain. He moans or weeps. He stares terrified at a fixed point which seems to draw nearer. He seems to struggle against an imperative call. His visage is convulsed, and his hands cling with the last powers of his body to the living who surround him, and then the horrible spectacle of his last agony begins.

We may spare ourselves this analysis by remarking that the dying lose their sensibility at that moment, and the exterior signs of suffering are, for the greater part, only mechanical reflexes which are shown without our consciousness. "Thou art wrong," Charron tells us, "to find death ugly, for it is not death, it is its mask. That which is hidden beneath is beautiful." (*De la Sagesse.*)

For the pains which accompany death are chiefly imaginary. Even putting on one side accidental death or death caused by the breaking of nerves, apoplectic

strokes, and diseases of the heart, in which pain is absent, the cases in which we suffer at the approach of death are very rare. Between the final end and suffering there is no relation of cause and effect. Quite on the contrary, we see certain sick persons, worn out with agony, the victims of cruel fevers, regain their calmness of mind at the last moment. The approach of the end, far from causing pain, produces thus in these cases a visible relief. Centenarians, having reached the limit of their normal life, fall asleep like children and depart without the least trace of a struggle. Pain is by no means inherent in death; it is our ignorance and our prejudices which have created this superstition, so terrifying to our minds and so opposed to reality.

II

Out of the numerous pages upon the *Ego of the Dying* which are scattered throughout the works of all peoples and all countries, we might easily gather an abundant harvest of proofs in favour of the state of beatitude and of felicity which accompanies the last moments of the dying. Without speaking of the Prophets and the Saints, who looked upon death as a deliverance from the burden of life, the authentic witness of the ancients and moderns shows them unanimous in this respect. Plutarch's *Lives of Illustrious Men* are notably rich in examples which corroborate our statement; but it might be objected that the heroes of Plutarch are of special and exceptional intelligence. Let us examine the death of simple beings, taken from average humanity, products of modern belief and intellectuality. Here is what

Montaigne says upon the subject of the death of La Boëtie—

"Attacked by a series of syncopes, La Boëtie expected from moment to moment to depart for ever. The ninth day (the 16th August, 1563), after having suffered a syncope the day before, he swooned, so that all believed him dead; but at last they roused him with wine and vinegar. But he lived not much longer afterwards, and seeing us weeping round him he said to us, 'My God! who is thus tormenting me? Why did you wake me from that great and pleasant rest in which I was? What ease you have drawn me from.'"

Elsewhere, Montaigne recalls the case of a man who fell from his horse. The accident was grave, and the horseman, who had lost much blood, very nearly died. It seemed to him that death was slowly wrapping him in its mantle. And these were the feelings which possessed his soul:

"It seemed to me that my life only held me, as it were, by the end of the lips. I shut my eyes to help it, as it seemed, to go forth, and I took a pleasure in enfeebling myself and letting myself go. It was a thought which only floated superficially in my soul, as weak and tender as all the rest; but, truly, not only free from displeasure, but mixed with that sweetness which those feel who let themselves glide into sleep. I believe that that is the state in which those are whom we see fainting with weakness in the agony of death, and I hold that we pity them without cause, believing that they are agitated with grievous pain or that they have their souls full of painful thoughts. And truly mine would have been a happy death, for the weakness of my mind

kept me from judging of it and that of my body from feeling aught."

Prof. Heim, in a curious debate held at the Alpine Club of Zurich (1895) upon the impressions of tourists who have had mountaineering accidents, reports a series of observations which all point in the same direction. And we must not forget that here it is a question of people who were, according to the vulgar expression, "at death's door," and have felt its preliminary symptoms. Now, according to the Swiss scientist, the following feelings almost inevitably accompany all accidents, from the moment when the subjects lose their foothold until that of the material shock and the physical arrest.

1. A feeling of beatitude.

2. Complete insensibility of touch and of the sense of pain.

3. An extreme rapidity of thought and imagination. In many cases the subjects say that they have passed in review all the course of their life.

When in the course of the year 1896 M. V. Egger inaugurated an interesting discussion in the *Revue Philosophique* upon the subject of the *Ego of the dying*, almost all those who took part in it contributed statements tending to corroborate the accuracy of the pages of Montaigne, and the cases quoted by Prof. Heim.

M. V. Egger, who insists upon the vision of the past life at the moment of death, does not claim that this latter is disagreeable or painful. On the contrary, indeed, it results from the observations quoted by this author that in old people the *Ego* becomes more clear at the last moment. "In order that the *Ego* may clearly

and definitely condense itself," he says, "the approach and announcement of death is necessary." "We may even add," he tells us elsewhere, "that the *Ego* is growing during the entire life, and is finished only at death."

The most important thing of all for us is that this more or less frequent vision is in no way accompanied by displeasing sensations, and even in many cases brings with it a great joy, the consciousness of our individuality as a whole, which we can only conceive in fragments during the course of life.

Dr. Sollier, who has had occasion to study several most interesting cases of a similar kind, declares also that the approach of death, or, if we prefer it, the idea of death, far from causing any pain, is always accompanied by feelings of happiness.

Here is the case of a young woman, a morphinomaniac, who, on the suppression of the morphine, became subject to syncopal attacks which might at any moment have caused death.

"She had a very clear idea that she was going to die. . . . She did not suffer, and at the very moment when the smallness of the pulse and slowing of the respiration, the pallor, and the coldness of the extremities gave warning of a syncope, she said that she felt extremely well and wanted nothing, and repulsed all that was attempted in order to lessen the attacks.

"On recovering from a very grave syncope, from which she had only been roused by again administering morphine, she cried, 'What a long way I have come back! How happy I was!' And she told me later that at the very moment in which she felt herself to be

losing consciousness she felt extraordinarily comfortable, feeling herself no longer upon earth, although she could still hear and see everything with extreme clearness, and at the same time she had seen pass before her, in a sort of panorama, the phantasmagoria of all her past life."

Another woman, threatened with death in the course of an attack of peritonitis, told the same doctor that she had an impression of comfort, or rather of the absence of all pain, and that she faced death without the slightest regret for the past.

The case of a young girl of seventeen, attacked with very dangerous typhoid fever, is no less instructive. She heard the doctors say that she had only a few more hours to live, and yet the idea that she was going to die had no reaction upon her.

Later on, attacked by a puerperal hemorrhage, she had a very clear impression that she would succumb to it. She felt the same sensation of physical well-being and of complete detachment as the first time, whilst her thoughts dwelt not upon her past, but on the future of those whom she expected to leave.

We may recall these words, spoken by Mr. Hunter at the moment of his death: "If I could hold a pen I should use it to write how pleasant it is to die." Also we may refer to the inquiry made among his colleagues by Sir Lyon Playfair, the celebrated English doctor, who almost unanimously confirms his own observations as to the serenity of expression in the dying.

If, starting from these concrete facts, we try to arrive at their explanation, we shall end with this clear conclusion: that in the two principal categories, in which

may be placed all the accidents of death, there is neither logically nor scientifically a place for suffering or terror.

Let us consider, first, death caused by an exterior accident. All the forces of our will and all our vital energy are concentrated upon resistance to the evil which threatens us. Our consciousness is penetrated by it, and by that very fact rejects all other interior suggestions.

Neither our virtues nor our sins can have any influence upon the character and the issue of this struggle, the result of impulse and of instinctive movement. This insensibility to ideas which do not concern our defence causes, if not serenity of spirit, at least the absence of painful feelings.

In the more usual cases when death approaches quietly, and slowly takes hold on our consciousness, soaking slowly into it as a near and inevitable necessity, we have only to do with physiological phenomena. These are shown sometimes by local suffering which has nothing in common with death, or by a weakening of the nervous system, a sort of anæsthesia which goes from the periphery to the centres. Logically, it should be shown by insensibility to pain.

Our weakened consciousness is no longer capable of feeling either great joy or great pain; we find ourselves in a state of analgesia of our *ego*, closed to external excitements. The vision of the past, the concentration of all life in the eyes of the dying, is in no way an inevitable element in the apparatus of death. Sometimes it forms part of its train, sometimes it disappears from the consciousness of the dying, but when it shows itself it gleams in the form of a moving pano-

rama, of a dream peopled with shadows which defile before the eyes of the departing as pictures of his native hearth before a soldier, dropping with fatigue after a day's painful march.

III

Religious and superstitious men generally believe in remorse of the conscience, which, like a gigantic threatening block, rises before the dying man and reminds him of his sins. This conception of the agony depends most of all upon the faith and the intellectuality of the dying man. In the stories of men doomed to death who have carefully observed their last sensations, the fact of remorse of conscience is, as we have seen, nowhere noted.

A much more important *rôle* belongs doubtless to the vision of what comes after death. Without dwelling upon the belief in the immortal soul, which, in its pure form, is a treasure-house of peace and consolation, we may point out here the superstitions of hell, of purgatory, and many other cruel threats, corollaries of the future life. Although we say with Rousseau that an eternity of suffering accords neither with the weakness of man nor with the justice of God, or with Fénelon that the small number of the elect dismays the human heart, man does not reflect, and he does not discuss. He believes. And in his belief in the atrocious tortures which await him at the end of his terrestrial pilgrimage, his face is grey with fear and his mind shivers with horror. The necessity and the utility of future sufferings enter thus in an indirect manner into the domain

of longevity. This is not the place in which to discuss whether the human race could not exist on the principle of duty, of imperative obligations (Kant); on a basis of love as the supreme justice (Aristotle), or upon the principle of virtue of which the result is found in itself (Seneca), instead of promises of reward or threats of expiation; promises and threats both equally degrading, both having their origin in low egoism and its debasing interests. Imbued with ideas of chastisement, persuaded of the cruelty of his God, the believer trembles before death. It shows itself to him in the shape of a tribunal without appeal, with a cruel sentence pronounced in advance. How superior in this respect are moralists like Jules Simon (*Religion Naturelle*) or Jouffroy (*Cours de droit Naturelle*), who let us off hell and only maintain Paradise for the greater consolation of the human race. It would be difficult to deny that all these sanctions which influence the state of mind of the dying are the invention of man. It is thus in any case an artificial and factitious sentiment, foreign to the mind of the free man.

It is to be remarked that Hell, with its eternal punishment, is completely foreign to the Old Testament as well as to the teaching of Jesus. Even dogmatic belief in immortality comes, so Bourdeau tells us,[1] not from the Gospels, but from theorists who some centuries later tried to combine the idea of a resurrection with Alexandrine Platonism.

The dogma of the perpetuity of punishment was a long while before it gained admittance to the Christian religion. Maintained with ardour by St. Ambrose,

[1] *Problème de la mort* (Félix Alcan, éditeur).

St. Chrysostom, St. Augustine, and Tertullianus, against Origen, St. Basil, and many others, it was edicted as a formal dogma by the fourth Council of Lateran (13th century), and confirmed in the 16th century by the Councils of Florence and Trent.

In the fact that those races which fear death least are precisely those who reject eternal pain and punishment (the disciples of Brahmanism and Buddhism), we see an eloquent proof that our sentiments of death depend upon the ideas which we adopt with regard to it. There is nothing innate and nothing fatal in our apprehensions and in our sorrow about death, for they are in fact only the result of ideas acquired by inheritance, education, and the influence of our surroundings.

The example of the Japanese shows us to what a degree education enters into our passionate attachment to life. The excessive self-respect of the sons of Nippon leads them to prefer, for example, death to the gentlest captivity. The sailors of the *Kinshu-Maru*, the Japanese transport sunk by the Russians in the last war, all preferred death rather than falling into the hands of the enemy. The noble classes in Japan have always claimed the honour of ripping themselves up upon the least occasion. Suicide, in the form of *Hara-Kiri*, became almost a frenzy; they committed, and still commit, suicide, with delight.

The ceremony which accompanied this solemn act was most complicated. The principal actor generally opened his stomach with refined elegance. A Daimio used an imposing ceremonial in such a case. He killed himself in public and pronounced a funeral oration which charmed the audience. A friend, placed beside him,

had the task of cutting off his head immediately after the hero of the occasion had opened his stomach.

The *Hara-Kiri* of the 47 Ronins is still celebrated, and will doubtless long inflame the imagination of the Japanese. In vain do law and government oppose this custom, which is so prejudicial to the normal development of the country; *Hara-Kiri* as a special conception of life, and above all of death, still exists among the customs of Japan. What further proof is needed that it is chiefly our ideas which make us fear or desire death? . . .

Death as death, contains nothing which should frighten us. It is the idea which we have of it which is the cause of our fear. Were it terrifying, it would have appeared so to Socrates, says Epictetus, with reason. It would have seemed such, we may add, to the Stoics, and to all the great and wise men who have welcomed it with calmness or joy. "We are wrong to fear it," cried Socrates, "for it is perhaps our greatest good upon earth." Whilst nearing his death he taught his pupils that it would be stupid to fear it, for we cannot fear things that we do not know. Death is a complete destruction—we then enter a state of sleep and we feel nothing—or else it is a passage to another life where we shall find those who were before us. And what greater happiness can there be than to be condemned to meet the great men who have preceded us? The Stoics, and with them the Greeks and the Romans, who knew how to spare themselves the pain of death, were faithful to the sensible precepts of Epicurus and Seneca.

"Death," said the first, "can be an evil neither for the sensibility, because it takes from us the possibility

of suffering; nor for the reason, because it is in the order and the logic of nature" (*Diogenes of Laërtius*).

In the opinion of Epicurus it is imagination which engenders the fear, or rather all the fears, of death. It is by starting from the idea that the subterranean dwelling destined for the dead must be the kingdom of night and shadows that the Greeks had, little by little, filled it with the most horrible spectres. In time death became a real horror for the people. According to Cicero's picturesque expression, the idea of death weighed upon the antique world like the fabled rock upon Sisyphus. And there was nothing to sweeten this second life of pains, obscurity, and punishments without end, the conception of the Christian paradise with its calm joys being, as yet, completely wanting.

In seeking to combat the chimerical apprehensions of this subterrestrial life, with its unlimited, because eternal, cruelties, Epicurus found an efficient weapon in absolute negation. We "die entirely," and nothing, "not the least little nothing," as they say in the song, remains behind us.

"Death is nothing to us," says Epicurus in his *Maxims*, "for he who is once dissolved into his elements is incapable of feeling, and that which is not felt is nothing to us."

He improved upon this idea in this expressive passage: "When we are, death is not; when death is, we are no more. It is thus neither for the living nor for the dead, since for those who are, it is not; and those for whom it is, are no more" (*Diog. Laërt.*, 125).

To Seneca death was the best of life's inventions.

"It is an important thing," this philosopher tells us,

" to know how to depart without regret when the springs of life are dried up and we have reached our inevitable hour. If there be anything distressing in this business we should not impute it to death, but to him who dies. For we do not suffer more ills at the time of death than after death itself, and it is equally foolish to fear that which we shall not feel and to apprehend that which we shall never suffer." And he finds a remedy against the sorrows and pains of death in the contempt which we should show for them.[1]

The railleries of Epicurus upon death, return like refrains in modern philosophy. Schopenhauer adopts his principal theme, and also talks of our imagination as the sole source from which flow our irrational fears. " After us, is nothing," declares the author of the *World*,[2] " and, therefore, why should we disturb ourselves about what comes after us? Is it not just as irrational as to fear that which was before us? The nothing which lies in wait for us, and the nothing which preceded us, are of the same value. . . ."

Another German philosopher, Feuerbach, has also taken another favourite theme of Epicurus and made it into an entire symphony upon death. To console his disciples, Epicurus taught them that terrestrial life has no consequences either before birth or after death. But although shut in by these sometimes narrow limits, life is still infinite in the pleasure which it gives us. " Time, whether it be boundless or limited, holds an equal pleasure " (Epicurus, *Diog. Laërt.*). Feuerbach, taking

[1] " Contemne mortem! Nihil triste est, quum hujus metum effugimus " (*Epistle* LXVIII).

[2] Schopenhauer, *Die Welt als Wille*, Vol. II.

up this theory, says in his turn that "each instant is a full and entire existence of infinite importance. . . . At each instant we drink to the dregs the chalice of immortality, which, like Oberon's cup, refills itself continually" (M. Guyau, *La Morale d'Epicure* (F. Alcan). The length of these instants is of little consequence. It is their intensity which gives them their exclusive value. Life thus considered is long, indeed very long, and has a capital value. The emptiness which comes after is nothing compared with it, and Feuerbach mocks to the same extent Pagans and Christians, philosophers and the vulgar, who turn away from the alleged nothingness of life, and only contemplate the real nothingness which awaits us after death. He, however, foresaw this objection—

Life, being too short, can by no means satisfy all the desires that lie in us! . . .

Feuerbach is in no way troubled by these unjustified complaints.

"Musical tones," he tells us, "although within time, are yet by their meaning beyond and above it. The sonata which they compose is also of short duration; it is not played eternally, but is it only long or short? What would you say, I ask you, of him who whilst it was being played did not listen but reckoned, and took its length as the basis of his judgment? Doubtless the name of madman would seem too weak for such a one. What, then, must we call those who claim to judge life by saying that it is ephemeral and limited?"

"Death is nothing, life is all," such is the capital basis of the philosophy of Epicurus and of his numerous disciples throughout all ages.

"Quitting life," Marcus Aurelius tells us, "is not a distressing thing, for if there are gods they will not hurt thee; and if there are not, or if they take no care for things here below, why should I care to live in a world without providence and without gods?"

Montaigne mocks at those who are troubled at death, which does not concern us either dead or living. "Alive because you are; dead because you are no more." To Charron (*De la Sagesse*) death is a beneficent thing, which we ought rather to bless, "for if it were taken from us we should regret it much more than we fear it; and if it came not, we should desire it more strongly than life."

"The science of dying," he tells us elsewhere, "is the science of liberty, and without it there is no pleasure in life; no more than in the enjoyment of a thing which we always fear to lose" (Book II, chap. xi.). And what is death, rightly called?

We should be wrong, Charron thinks, to trust to "the inconsidering vulgar," for whom it would be an evil; but we should rather believe with the wise, who teach us that it is "liberation from all ills."

And indeed how could one fear it? And Charron adds mischievously, that "it was to play the intelligent and the self-conceited, it was to feign to know what no one knows."

According to Bacon (*Moral and Political Essays*) it is in a well-occupied life that we find consolation against death. "He who is taken in the midst of a great design with which he is profoundly occupied *feels death no more* than the warrior who is mortally wounded in the heat of combat." Voltaire shares the ideas of Charron on

this subject. "We must take every care to scorn death and taste life." "We have seen people who have been glad to die," he tells us elsewhere, "but we have seen none who complained of being dead." According to Montesquieu, "we should weep for men at their birth, and in no way at their death." All then depends on the angle from which we contemplate it. An object of terror for some, it becomes the cherished dream of others.

To Horace, death brings with it a great sweetness. Behind its sad face hides the love of those whom we are quitting. "That same man," the poet tells us, "whom all envy, all will love so soon as he has closed his eyes."

Whilst Genesis sees in it the curse and the chastisement of man, the Vedas are enraptured at its appearance on the earth. When we examine the impression which it makes in the immediate neighbourhood of the dying man, we perceive the falsehood of its alleged horrors. The numerous letters quoted by Camille Flammarion in his curious work on *L'Inconnu* tend to destroy the hideous image of our end, and give it back to us purified from its contact with the horrors with which the excessive credulity of past centuries has endowed it. All nature seems to participate in the calm of departure; children elbow the dead, in their delicious innocence; inanimate objects are touched on its approach and mingle with human life, and the dying themselves smile upon the living. Death, looked at thus, becomes almost attractive and sympathetic. It is shown freed from the terror and severity of the Scriptures, and reveals itself rather as sad and merciful. It falls among

men like a drop of dew upon a plant, delicious in its rapid fall, and unexpected as a surprise. Beaming or sad, it holds something of a majestic kindliness, and offers its fraternal embrace to humanity. The goddess of death, as she is shown by the greater part of the correspondents of the author of *L'Inconnu*, has nothing in common with the ancient "fate," which made the green fruits fall, changed men into stones, and withered the young trees.

These serene representations of death bear a lesson in themselves. They prove chiefly that humanity thirsts for other ideas, and that it instinctively aspires to a gentler philosophy, to a definite break with the depressing superstitions of the past.

C.—Death from a Logical Standpoint

I

Let us consider death from the abstract standpoint. Every one is agreed so long as it concerns the acknowledgment of our powerlessness to perceive and understand the exterior world. Psychology and logic teach us that all that which we believe we see or hear outside us, is within us. The exterior world only possesses the power of waking our senses, or causing them to act, of putting in movement sensations and ideas which are really in ourselves. The sensitive qualities of the object are in no way attached to the thing. According to Kant (*Criticism of Pure Reason*) extent is not a quality of matter, but a form of sensibility. The material phenomena which we perceive are purely sub-

jective, and only depend upon the nature and the form of our sensibility. According to Descartes, it would be difficult to believe in the existence of the body if divine proof were not there to guarantee it to us. Malebranche held that divinity is not enough, and that we need a special revelation to make us believe in what does not seem to exist. Berkeley, wishing to do without divine intervention, follows his implacable reasoning to the conclusion that no bodies exist outside ourselves. But let us put aside these extravagances of idealism, and pass on to the positivist theories of John Stuart Mill.

"A cause," says he, "as a cause, does not resemble its effects; a wind is not like the sensation of cold, nor heat like the steam of boiling water. Why then should matter resemble our sensations? It can be established as an evident truth and admitted by all authors whom we now need take into account, that we know and can know absolutely nothing of the exterior world" (*System of Logic*). Death consequently only deprives us of our own conceptions of light created by our own eye, of forms created by our touch, and of sounds created by our ear. *Our nervous centres, on their departure, may carry with them the entire world and its attributes.*

For the doctrine according to which the human organism is only a reunion of animal unities with distinct nervous centres, will be more and more demonstrated, we hope, by contemporary science. In his speech at his reception by the Academy, Claude Bernard almost formally attributes the gift of intelligence to different nervous centres. In giving the example of a frog, which, after having been decapitated, still pushed aside with its foot the pincers which were hurting it,

he explains this act by its dependence upon a centre, which, situated in the spinal marrow, may act under the influence of an exterior or peripheric sensation. In other words, each function of the body possesses its special nervous centre; a true inferior brain. Dr. Carpenter's experiment throws a still stronger light upon the case quoted above. When acetic acid is applied to the inner condyle of the femur of a freshly decapitated frog, this latter will wipe off the acid with the foot which is on the same side as the acid. But if this foot be amputated, the animal, after some hesitation, will use the foot on the opposite side.

A long time before Claude Bernard, Dr. Durand (de Gros) in his *Electrodynamique vitale* (1855) and *Les Origines animales de l'Homme*, attempted to prove that man is only an aggregation of unities, individually provided with all the essential elements of life, but grouped in a hierarchic and harmonious whole under the direction of the Supreme head. The learned author of *Philosophie Physiologique* firmly believed that the nervous centres of the reflex system, being identical with the brain from the histological, organological, and physiological point of view (a theory approved by doctors and physiologists), are equally so from the psychic point of view. Each one of these spinal nervous centres is, like the encephalic nervous centre, the seat of a principle which feels, understands, is moved, and wills; the seat of a psychic centre, or, if we prefer it, the seat of a soul.

Our *ego* thus becomes a hierarchy of psychic individualities, graduated from the encephalic ganglions and the elongated marrow to the inferior extremity of the

spinal tree (Durand, de Gros), *Variétés Philosophiques*, 1900 (Felix Alcan, éditeur). Our nervous centres thus feel the sensation of pain or joy. This explains to us the pain felt by persons put to sleep with chloroform. We might, it is true, oppose to this the statement of the greater part of those operated upon, who, when they awake, maintain that they have felt nothing. This is untrustworthy; the passage from sleep to normal life being ordinarily accompanied by forgetfulness of the anterior state.

These different units of the human body enjoy autonomy, and have each their principle of thought and of intellectual life. This theory was enlarged upon by Claude Bernard.[1] Physiological experiments show us, he says, that the intelligence is by no means concentrated in the cerebral organs alone, but that on the contrary it dwells in diverse degrees in a number of unconscious nervous centres, graduated all along the cerebro-spinal axis, which can work independently although co-ordinated and subordinated hierarchically one to the other. Each function of the body thus possesses its special nervous centre; a true inferior brain.

At first sight materialistic, this theory tends in reality to the reconciliation of two irreducible theories. For, besides the federation of cellular republics, an ideal union, there is the union of the parts in matter. "That which is called matter is only an assembly of centres of power" (Faraday).

Death only causes the disaggregation and the dissolution of the agreement of the whole. Can it also destroy the power existing in the plurality of the nervous

[1] See also his inaugural speech at the French Academy, 1869.

centres, those elementary organisms which form the apparent *ego?*

We must remember above all that power is always indestructible, and that consequently, as Leibnitz has already said, power works by the sole means of its own energy (*sed sola sublatione impedimenti*). Power and substance are inseparable; all substance is force and all force is substance. Experience is opposed to the conception of absolutely passive substances, devoid of all energy. Modern science teaches us besides that the dissimilar appearances of the forces which are given off by substances (magnetism, electricity, weight, etc.), are due in reality to one power alone, the material substance, into which all the other varied forces resolve themselves.

Following this reasoning, minds which do not recoil before the problems of higher scientific speculation may easily grasp the truth which is found in a nebulous state in the consciousness of all thinkers; corporeal death is only a transformation of power, and the freeing of the partial intelligences of our nervous centres.

II

The better to face our anxiety at the prospect of death, let us think of the hundreds of thousands of Buddhists who are enchanted with its delights. The same thought of the end which makes one part of humanity suffer, lifts the disciples of *Nirvâna* to the heights of happiness. We alone think differently.

It depends upon us to change our conceptions of

death, and by modifying them to avoid one of the causes which contribute to the shortening of our earthly sojourn. Bacon, in his project of *Euthanasia*, wished that art should be employed to render it acceptable. "Man is incapable of healthily enjoying life," he tells us, "if he has not a calm idea of death!" The truth being that in any case he enjoys it for a shorter time. The terror of death paralyzes and often arrests life. Cases are well known of men who have died at the mere presence of dangers threatening their life. The terror of death, which works slowly, kills also slowly. Sick persons who gather from their doctors a presentiment of their term of existence, usually die before reaching it.

A Russian lady, Countess M——, told me with regard to this a tragic fact which occurred in her family, which might be considered as a typical case.

It concerns the Z—— family, one of the oldest in Moscow. The great-grandfather of the Z——s died at the age of fifty-five, after a rather too exciting life. The grandfather died by accident, also at the end of his fifty-fifth year. Now the grandson of the first of the Z——s was always thought to have excellent health. Handsome, rich, and intelligent, he was much loved and admired in high Russian society. At the approach of his fiftieth year Z——'s aspect suddenly changed. His careworn face betrayed secret anxieties, he withdrew from society, and plunged into melancholy meditation. And yet his strong physique was in striking contrast to his melancholy thoughts and sick man's fancies.

"What is the matter?" the Countess M—— asked him.

"My fifty-fifth year is drawing near, and, as you know, cousin, that means death for us Z——s."

In vain did his friends point out to him the error in his calculations, the anxious Z—— answered them by the innate certainty which he had of his approaching death.

His birthday falling on the 25th June, his friends all rejoiced to see Z——, at the beginning of the month, still among the living.

"And your presentiment?" every one asked him.

"Patience," he answered; "the month is not finished yet."

And on the 23rd June Z—— was dead!

A victim of his deadly beliefs and his imaginary terror, Z—— had ceased to take food. The dismal and incurable sadness which possessed him had ruined his digestive apparatus. He hardly took any nourishment, and departed one day in the flower of his age, a victim of the fear of death, which had fascinated him and carried him off.

We only need threaten certain insects with death to cause the interruption of their vital functions. Fear draws men instinctively just as the lodestone draws iron. The terror of death poisons and shortens life. Universal literature, which has contributed to the creation of the terror of death, may, perhaps, some day redress its wrongs by rendering it gentle and smiling for us. Literature, with the help of religious superstition, has made it so cruel that the most unfortunate amongst men turn from it discouraged. Obsessed by the cries of distress which reach it from every side, humanity veils its face, terrified before the idea of death. But, like a child's

bogey, the more we fly from it, the more it follows us; the more threatening become its looks, and the wickeder its aspect. Let us look boldly and closely at it. Let us mock its unknown threats and its nightmare mask. And from cruel and inhuman, it will become kind and caressing, simple and natural, charitable and compassionate, the bosom of sublime fraternity for all the living beings of nature.

CHAPTER VII

LIFE AS AN ARTIFICIAL CREATION

A.—Homunculi of Yesterday and To-morrow

I

IN all ages superior intellects have been haunted with the idea of the creation of their like, without the help of woman, and against the limitations of the Holy Scripture. From the days of Prometheus, who formed man out of the mud of the earth, and stole fire from the gods to animate him, up to the scientists of our time, we have never ceased to wish to rival Heaven. Thus, for example, Amatus Lusitanus claims to have seen in a phial a marmoset "as long as a thumb," which Julius Camillus had made; and that Pope Benedict IX held "*conjured*" in a sugar-pot seven beneficent spirits. The occult books of the Far East also constantly tell us of the creation of artificial beings. This tendency, however, has never revealed itself in a more precise form than in the theoretical constructions of Paracelsus.

This restless innovationist and genius, who revolutionized the medical art of the sixteenth century, and to whom medicine owes the use of opium, mercury, and antimony, was seized with a fine ardour for the creation of little living beings, *homunculi*, who, as he taught,

would live upon air only, and draw from it the elements indispensable to life.

"True children of nature, they would engender mandrakes, when they had come to their manhood" (Paracelsus).

The father of Western occultism passed through the Middle Ages like a fearful tempest, which purified the air, although it caused considerable damage. After having destroyed ancient therapeutics, to found a new system which has lasted until our day; after having reached the idea of the organic unity of our body, and pointed out all the inanity of the theories of Galen and Avicenna; after having reformed chemistry and helped the progress of philosophy and morals, he sowed madness in the brains of his contemporaries and of his future disciples by enveloping his theories in a confusion of cabalistic words, and driving their minds to researches more dangerous than those of the ontology of the poor metaphysicians.

It does not come within my scope to follow the traces of those amongst his disciples who claimed to have created and given life to little men, by the help of the means indicated by the Swiss master. Paracelsus doubtless never made *homunculi*, for we only find them mentioned in his fantastic theories. Had he created them, his secretary and calumniator Oporinus would not have missed a chance of mocking at this artificial progeniture.

But it was enough to prepare people's minds for these conceptions, for them to become articles of faith for his successors. Thus the few centuries which separate us from Paracelsus, boast of having seen artificial beings created by man in man's likeness. Opinions, how-

ever, vary concerning the method of their creation. Some saw in it an impious work of Satan; a revolt against Heaven, the sole dispenser of human creation. Others attempted it with words of prayer upon their lips, seeing nothing reprehensible in this augmentation of God's servants. . . .

The occult writings of the time are full of allusions to the real creation of *homunculi*. They speak of them as we speak of spirits, in which many people believe without having seen them. There was, however, one strange *savant* who seems to have brought into the world—by the synthetic method—living beings, called *homunculi*, who filled with rumours certain necromantic meetings of the times.

This miraculous man was no other than Count J. F. Kueffstein, the rich Austrian gentleman who owed his name to the famous fortress of the Tyrol. In the eyes of his adversaries he was said to have sold his soul to the devil, like his former rival, the noble Pole, Twardowski. Accompanied by his factotum, Joseph Kammerer, a sort of blend of servant and confidential secretary, he travelled all over Europe, stopping in cloisters and with thaumaturgists and necromancers. In the course of his travels in Italy he became associated with the Abbé Géloni, a famous occultist, who taught him the art of creating *homunculi*. Before relating their curious experiments let us say a few words about their historian, Joseph Kammerer.

It was the business of this latter to note, with his admirable common-sense, the minor expenses of his noble master by the side of his extraordinary exploits. His notes, taken from day to day, initiate us into the

price of rooms at an inn and of hair-powder, as well as informing us of the deeds of the aforesaid *homunculi*, to whom Kueffstein had given life. His private diary was published for the first time in the Freemasons' Almanack, *The Sphinx*, by Dr. Besetzny, and afterwards analyzed in the *Sphinx* magazine.[1]

It is needless to add that we attach no more importance to the experiments of Count Kueffstein than to the alleged miracles worked by Tautriadelta, the famous English thaumaturgist. Unlikely from the scientific point of view, the story of Joseph Kammerer yet surpasses by its strange charm all the inventions of Edgar Poë and of Hoffmann. It is the more captivating in that it has stirred the imagination of several of our ancestors, sometimes even costing them their reason.

What, then, were these spirits of Kueffstein? Certain disciples of Paracelsus believe in their reality, as they believe in the *homunculi* created by the author of the book of Sylphs and Nymphs. To Karl Kiesevetter, to whom we owe the first ideas about the spirits of Kueffstein, their existence is beyond doubt. Nevertheless, if this latter has a simple faith, his explanations are extremely muddled. Were these spirits only disguised amphibia? But the latter have neither hair nor beards. Were they devils? But these last neither breathe, nor believe, nor scratch. Thus, these could only be elves, elementary spirits.

Thus he replies to the unknown by the unknown. However it may be, Kammerer's journal supplies us with the most delightful tale of *homunculi* of any age.

[1] A translation of this has been given in *l'Initiation*, a magazine devoted to the higher philosophy.

On looking at it closely we should be tempted to see in these spirits only the synthesis of all the phantasmagoria of the occult science of the past.

The birth of spirits recalls too the mysteries of sympathetic cures by means of images. The liquid with which the dung-heap was watered and the dung-heap itself are the true elements of magic, the Cabbala and Theurgy united.

II

The *homunculus* was re-born in another form with the genesis of the science of embryogeny. When Leeuwenhoeck discovered the mobile, and therefore living, spermatozoïd, his scientific *confrères*, such as Hartsoeker and many others, influenced by the anthropomorphic principles then in fashion, declared that this microscopic being contained neither more nor less than a little man, *homunculus*, with his power of growth. Some years later Dalenpatius claims to have seen this *homunculus*, and so that no doubt might exist on the matter he sums up his observations in a drawing from nature.

The origin of living beings is thus explained in the simplest manner. The *homunculus* seen in the spermatozoïd gave birth, in the course of time, to a *homunculus* of the same kind, he equally owing his origin to a series of *homunculi* which had preceded him.

We have thus the essence of the theory of involution, which existed for a long while before the present convincing one of *epigenesis,* which we owe to Caspar Frederick Wolff.

According to the first doctrine, we create nothing whatever, for generation, instead of creating, only unveils an

offspring, pre-existing, already formed in the germ, by waking it from its lethargic state. The germ received from some the name of egg (these are the ovists, such as Haller and Swammerdam), from others that of the spermatic animal (spermatists or semenists such as Leeuwenhoeck and Spallanzani).

According to the *ovists* and *semenists* it is the egg alone which has the property of forming the new being. What, then, performs the fecundation? They reduce it to the *rôle* of a physical excitant which determines the development of the egg.

The genesis of the being thus appears in a form which recalls the explanations of Kueffstein.

How, for example, are mules born? Let us listen to that which an ovist, Bonnet,[1] teaches us. The mule comes from the germ of a horse contained in the mare. This germ *contains all the organs of the animal,* but crumpled, crushed and folded. The seminal liquid of the ass swells and unfolds them, as that of the horse would have done, but it distends and swells the crupper and the feet less, and the ears more, etc.

By the side of this doctrine is developed that of *epigenesis*, of *progressive formation*, the only one adopted by modern biologists, and according to which no part of the germ pre-exists in the form taken by the living being. This germ, the so-called *homunculus* of the involutionists, is only a cellular mass, which, by a slow process, takes a successive series of forms before reaching its definite shape.

The first phase of the evolution of the cellular mass is almost the same in all the beings of the animal kingdom.

[1] Quoted by Delage in his treatise on *Heredity*.

The cell, the starting-point of the living world, is not only identical in all animals, but also in vegetables. Both of them have a similar fundamental structure.

The cell which is found as the basis of all vital organization, whether that of an animal or a vegetable, is thus the first determined form of life. It does not follow that it must be at the same time its most elementary form. Thanks to the botanist, P. Cohen, the creator of the protoplasmic theory, we know to-day that the cell itself is a complicated apparatus, a sort of mould which holds the living matter, the *protoplasm* which *forms* the first *physical basis of life* (Huxley, *The Natural Sciences and the Problems which they Raise*).

Protoplasm itself is, now and henceforward, abandoned as the first basis of life. This honour belongs, thanks to the works of eminent micrographers such as Bütschli, Strassberger, Weitzel, Heitzmann, etc., to the plastidules, fine granulations linked together by very slender filaments. According to Haeckel these plastidules are the elementary constituents of matter, having the power of vibratory and undulatory movement, the physical properties of material molecules; and, besides this, a vital property—memory, or power to preserve the species of movement by which their activity is manifasted (Claude Bernard, *Leçons sur les phénomènes de la vie*).

If we wish now to sum up the mysteries of the birth of beings we can only say with Baer—

"The living being springs from a primitively identical cell, the primordial egg. It is built up by progressive formation or *epigenesis*, in consequence of the proliferation of this primitive cell, which forms new cells; this

latter becomes more and more diversified and associates itself into cords, tubes, and flakes, which eventually constitute the different organs. This structure becomes more and more complicated, in such a way that the forms become more and more specialized in proportion as the development advances. It is the most general form, that of the branch, which first manifests itself; then that of the class, then that of the order, and at last the species."

This takes us far enough from the conceptions of the Homunculus. And yet its abstract idea nevertheless exists in the two most respected doctrines of modern embryogeny.

III

Have not the *ancestral plasmas* of Weissmann, as well as Darwin's theory of gemmules, a close affinity with the belief in Homunculi? Let us recall in a few words the teaching of Darwin with regard to gemmules. According to him, each cell contained by the organism produces a considerable number of gemmules, which exactly copy the cell from which they were born. These same gemmules travel about the organism, and on reaching a neuter cell they give it the character of the cell from which they come.

In the process of generation one at least of the gemmules of each cell is introduced in each sexual element. The spermatozoïd consequently contains gemmules of all the cells. The ancestral plasmas of Weissmann (he names thus the particles comprised in the nucleus of the reproductive cells) have in their turn the faculty of reproducing ancestral characters; this ingenious basis

being used by Weissmann to explain his theory of atavism and heredity.

The name has changed. We no longer speak of Homunculi, but when we attempt to explain the mystery of heredity we stray, without thinking of it, into the neighbouring domain of the old belief in the preformation of beings.

Protoplasm or the plastidule being the starting-point of life, how can we explain the immutable constitution of the organism in spite of its varied alimentation? We have only to study the microscopic point from which is derived our body, always practically the same in its nervous system, having the same complications, the same number of senses and of members, and their identical faculty of evolution, to be led to notice this, which draws so near to belief in the Homunculus. It is in the protoplasm that the source lies whence flow all the subsequent and fixed variations of the organism. Does protoplasm contain in the germ the essential parts of our body, and its properties of chemical synthesis? Is protoplasm only the ideal summing up of abstract qualities? Who knows?

In the present state of science protoplasm, or the plastidule, remains one of its most interesting mysteries. Nothing is admitted except that it is the smallest and most complex of organic bodies, that is to say, just enough to sharpen all suppositions, and to render probable the boldest theories of inquiring minds. Homunculi have, up to the present, taken no other form than those of the more or less insipid phantasmagoria, the more or less ingenious automata, of more or less bold impostors.

B.—Artificial Life and Automata

The theory of the artificial creation of living beings, far from being a dream peculiar to certain races or certain periods, has been, on the contrary, universal in all time and places. And whilst philosophers and scientists tend and have always tended towards belief in the possibility of the artificial creation of living matter, simpler humanity has appeased its passion for rivalling the laws of nature by making and admiring miraculous automata, those simulacra of living beings. Mechanical science has perhaps struggled as hard to create "living dolls" as metaphysics to tell us the secrets of the beyond. Both have equally failed. Nevertheless, their works arrest the attention of those who deplore the work of so many brains, worn out in such ungrateful efforts. From the time of Archytas, the Greek mechanician of the fifth century before Christ, who made a dove which could fly in space, up to the celebrated chess-player, or the "*Andalouse, secrétaire universel*" of our fairs, what works and fantasies have there not been in this domain.

We may recall the famous iron fly of the Bishop of Naples, the wise Virgilius, as Gervais calls him, which, led like a shepherd's dog and placed upon one of the gates of the town, prevented any other fly from entering Naples during eight years, and thus preserved the meat in that town from corruption.

Albertus Magnus constructed an "android" which opened his door and even pronounced several words distinctly. St. Thomas Aquinas broke it one day,

taking it for a work of the devil. Such too was the "young girl" made by Descartes, which a superstitious captain threw into the sea. The three automata of Vaucanson, which roused the admiration of his contemporaries, were doubtless of the same family. The flute-player executed a dozen different airs, thanks to the insufflation of air into the instrument, whilst his duck not only made the movements of a living animal, but also ate, digested, and rejected the products of its digestion by the ordinary channels.

The most extravagant thing of this kind was certainly Baron Wolfgang von Kempelen's chess-player. The man, life-size and dressed in Oriental costume, was seated upon a chair, which was made in one piece, with a kind of box mounted upon wheels. Its speciality was to play chess with the celebrities of the time. Lifting the left arm, which it usually kept stretched out upon a cushion, it pushed the pieces. When any one tried to deceive it, it calmly took the piece and put it back in its place. It nearly always won, and if a joker annoyed it by his unequal play or false moves, the automaton finished the game by mixing up the pieces.

In 1809 it played chess with the first Napoleon at Schoenbrunn. The Emperor placed himself opposite the automaton, and the courtiers, anxious to see the results of this duel, seated themselves at some distance away from the players. Napoleon played several times wrongly, and the automaton merely replaced the pieces in position, then, with an irritated movement, he muddled the game by upsetting all the pieces.

The Emperor rose smiling, and thus the famous game ended.

A more characteristic adventure happened to the automaton at the beginning of its wanderings in Russia. The Empress Catherine II having heard of its prowess asked the Baron von Kempelen to present it at the Court of St. Petersburg. After hesitating for some time, the Baron at last decided to go, and the automaton played three games with the Tzarina, all of which he won. The discomfited Empress wished to buy the automaton at any price, so as to have so clever a player always with her.

The Baron swore by all the gods that he could not part with the automaton, no one else understanding the management of the boxes which were in the bottom of the coffer, and he succeeded in escaping from the Russian capital with his treasure.

Every one was lost in conjecture as to the nature of this singular chess-player. Some suspected magic, others electricity; at last Decremps, in his *Magic Unveiled*, stated his opinion that the chess-player had for its only mystery a cleverly concealed man, and he was completely right.

Here is the solution of the riddle, as fantastic as if it were born of the brain of a Ponson du Terrail.

In 1776 a Livonian regiment rebelled against the Russians. One of the insurgents, the Polish captain Wronski, fell in an encounter with the regular army, with both his feet broken by a shell. His companions managed, nevertheless, to carry him from the battlefield to the house of a Russian doctor, Oloff. The doctor hid and tended the condemned man, and amputated his feet. But this provisionary asylum became more and more dangerous, a price having been placed upon the head of Wronski.

In the interval the generous doctor received a visit from his scientific friend the Baron von Kempelen, well known in Germany for his studies and his eccentricity.

The doctor told him his troubles, and Kempelen, seeing Wronski's prodigious power at chess, conceived the ingenious idea of making him in three months an automaton which should enchant the whole of Europe. Deeply attached to his work, he became its showman. They crossed the Russian frontier, and went into Prussia, whence, a little while after, Kempelen returned to Russia with his now celebrated chess-player.

We may add that the "chess-player" which was shown in Paris in 1783 and 1784 roused the admiration of Panckoucke himself, who, in his supplement to the *Grande Encyclopédie*, goes into ecstasies at the cleverness of this prodigy.

The player disappeared without leaving any traces of his existence, except a few pieces of iron sold to M. Crosier, a Paris merchant.

This was doubtless one of the most talked-of automata.

At the present moment the United States are excited about an automobile man, who, driven by a disguised electric motor, runs about the country, gesticulating, laughing, and talking to passers-by, whilst drawing behind him a carriage containing several persons. The problem of breathing some germs of real life into the automaton is greatly preoccupying the thought of the New World, and causes most animated discussions.

The violence with which the most worldly nation discusses the solution of this fantastic task proves once

more how much the riddle of life disturbs, and at the same time interests, the most diverse minds.

Will humanity continue its dreams of artificial creation, or will it renounce them definitely? The question is all the more delicate in that modern science, without giving it more importance than it deserves, yet slowly travels towards its solution. It is still for ever preoccupied with Homunculi, although it never speaks of them.

The pretensions of actual science are not so chimerical as were those of the supporters of Paracelsus. The thing which it would steal from Nature is only the secret of creating a simple living cell, a tiny mass of protoplasm. Then helped by evolution. . . . But what is the good of losing ourselves in suppositions? let us rather think of the victories of the day. They are most significant.

C.—Creation of Living Matter

I

To understand that which follows we must remember the amazing progress achieved by organic chemistry during the last forty years. Before the illustrious chemist, M. Berthelot, had established the new methods of synthesis which we may call for further clearness chemical creation, it was believed that organized beings were outside the laws which ruled mineral matter. Organic chemistry and mineral chemistry were two absolutely distinct branches. In his classical treatise on chemistry, published towards 1820, Berzelius himself

teaches that not only is organic chemistry based upon special laws, but also that we shall never succeed in discovering them.

The work of Berthelot, *Organic Chemistry*, founded upon synthesis, appeared in 1860, and the established conceptions vanished on the spot as if touched by a magic wand. What had happened?

We know that living beings may be reduced to four simple bodies, three of which are gaseous: oxygen, nitrogen (elements of air), hydrogen, a constitutive part of water; and a solid and fixed body, carbon. These four fundamental bodies (added to small proportions of sulphur, phosphorus, and other matter) are the only elements used by nature for the creation of *all animal and vegetable substances*.

By combining these four simple bodies among themselves, Berthelot succeeded in creating different organic compositions. He fully proved that without the aid of forces peculiar to living nature, merely by combining amongst themselves the fundamental bodies, and by the aid of heat, light, and electricity, organic compositions may be produced.

After thirty years of persevering work on this subject, Berthelot states, in his *Synthèse Chimique* (1891) that "in proportion as we rise to *more complicated* compositions, reactions become more easy and more varied, and the resources of synthesis augment at each new step."

Synthesis thus extends its conquests from the simple elements to the most complicated substances, "so that we can set no limits to its progress. It opens at the same time an unlimited field for future research. . . ."

And in order to understand this hope of the morrow, it is enough to compare it with the conquests of yesterday. What has not been reproduced since 1860 by stealing this mysterious privilege of nature? We began by carburetted hydrogen, alcohols, alkalis, aldehydes, organic acids, amides, and ethers; arriving later at sugar of gelatine, scattered throughout the animal tissues; Taurine, a matter contained in bile; and the syntheses of certain fatty bodies. Würtz has obtained vinous alcohol, and Lilienfieldt has made a synthesis of albumen by condensing phenol and amedo-acetic acid with a small quantity of phosphoro-chloric oxide.

Perkins has produced Coumarin, a crystallizable principle which is found in tonkin beans. Grimaux has realized the synthesis of the acid principle of the lemon, as well as that of dextrin or non-fermentable sugar. Piria has created hydrate of benzoin (essence of bitter almonds) by the distillation of a mixture of benzoate and formate of lime. Cahours has reproduced an oil absolutely identical with that of the *Gaultheria procumbens*, a plant of the heath family; Kolbe has reproduced salicylic acid; Perkins and Duppa, malic and tartaric acids (acids of certain fruits), just as Dessaignes has realized hippuric acid. Schützenberger has even given the synthesis of a matter embodying all the characteristic features of the peptones. In other words, he has offered us a body doing the work of the organism itself, the higher work of our vital functions. We see before us here an albumen, which, although artificially fabricated in a laboratory, shows all the chemical and physical characteristics of living albumen. There is, however, a sensible difference between the two kinds

of albumen; that obtained by the chemical method is not capable of playing the part of decoy, and has not the same activity as protoplasm. Shall we ever succeed in bridging this gulf?

Let us listen to what M. Sabatier, the eminent zoologist of Montpellier, tells us on this subject.

"We may yet hope, for it is not impossible, as Pflüger thinks, that non-living albumen and active albumen are only 'isomeres,' that is to say *bodies having the same elementary composition* and only differing from each other by the *reciprocal disposition of the atoms* in the molecule."

Now, as chemistry can produce isomeric changes in many bodies, there is no special reason why it should not do it in the case of albumen. The modification of atoms realized in this manner would at once give us the beginning of living organisms.

The chemistry of the laboratories is not, it is true, in any way analogous to animal chemistry. Without going as far as Bichat, in whose opinion an insuperable gulf divides chemical properties from vital properties, we must not forget that experimentalists as bold as Claude Bernard always forbade themselves to attempt to identify the work of chemical creation with that of organic creation.

But we must remember, on the other hand, that the laws of general chemistry cannot be violated in living beings, for there are not two chemistries. At any rate they resemble each other in a striking manner. Only that of the laboratory is executed with the help of agents, of apparatus created by the chemist; the chemistry of the living being is executed by the help of agents

and apparatus which the organism has created (*Leçons sur les phénomènes de la vie*). The animal transforms starch into sugar, and fat saponifies in the animal's intestines as it is saponified in a laboratory. But in a chemical laboratory starch is transformed into sugar by the help of an acid made by the chemist himself. Fatty bodies, too, are saponified, but with the aid of caustic potash or of the superheated vapour of water.

If the two products are thus identical, their fabrication is different. In both cases animal chemistry has only used the means which the organism procures for it. It has transformed starch into sugar with the help of diastasite, and in the second case it has used pancreatic juices, both produced by the organism itself.

From this the conclusion which has been made by Claude Bernard, that the chemist *may produce the products of the living being*, but that he will never make its tools, is but a step.

Now even this last affirmation is all the more dangerous in that at the present time we are completely ignorant of the nature of these agents or tools of the living body.

How does animal chemistry produce fatty or albumenoid bodies? How, indeed! We know nothing, and we shall know nothing for many years. The syntheses of starch or of seeds are produced in the midst of almost unfathomable obscurity, and we must add to this the impossibility of checking results by the method of vivisection, this latter ordinarily resulting in the arrest of the phenomena of life.

Every hope is, however, possible when we see the incessant progress of chemical synthesis more and more

lessening the distance which separates it from organic creation.

The triumphs of the human brain are unlimited. It would thus be as unjust to attempt to fix bounds for the evolution of chemical synthesis, as it would be bold to assign in advance any limit to physical discoveries. The scientific progress of these last years encourages the boldest hopes. Any one who had dared to predict twenty years ago that we should see through opaque bodies, should telegraph without a wire, and hear the human voice at a distance of more than a hundred miles would have been laughed at. Anaxagoras was joked at because he had claimed that the sun was greater than the Peloponnesus, just as Harvey was mocked for his theory of the circulation of the blood, or Mayer and Joule for their invention of thermodynamics. The celebrated Lavoisier wrote a treatise to prove that stones could not fall from the sky, just as certain chemists try to prove to us to-day the impossibility of the synthesis of living matter. They forget, however, the important fact that modern chemistry, by augmenting the number of syntheses, arrives little by little at the appropriation in an experimental manner of the privileges of animal chemistry.

II

What does it matter, after all, that the processes of the laboratory are not the same as those of animal chemistry, or, to employ the expression of Claude Bernard, the laboratory is not a copy of nature, if the decisive results which it obtains are the same, or nearly the same?

And even in accomplishing this work of creation, in preparing albumenoid matter, in thus creating life, scientists will not have a great deal to be proud of.

Have not the diatoms and the foraminifera who live at the bottom of the ocean done from time immemorial the work which may be accomplished in centuries to come by some Pasteur? There, where there is nothing but chalk and silica, they transform these substances into starch and albumen, an unconscious work of sublime synthesis!

After all we only work with life to create life. The fundamental basis, the creation of first causes, escapes us. We do not make, we only *apply* the forces and the materials placed by nature at our disposition.

The *homunculus*, if they ever succeed in creating him, will be by that very fact the product of divinity for all believers, and in any case that of nature, belonging to the world of her causes, her effects, and her manifestations.

It will be wrong also to believe that his fabrication, were it ever arrived at, would be the profanation of man, as we are wrong every time that we try to degrade and debase matter which, like the soul, flows from the same mysterious source.

"Let us not forget," Schopenhauer tells us, "that this dust which we are pleased to treat as vile matter, in its evolution, becomes plant, animal, and man!"

III

But shall we succeed in it? Felix Le Dantec makes somewhere this judicious remark—

"So long as we have not made the synthesis of a monera we have no right to affirm that this synthesis is possible, but neither have the *vitalists* the right to state that this synthesis is impossible."

We see that the two camps are resting on their acquired positions. And those who believe in the possibility of the creation of living matter may make a free avowal of their faith without putting themselves outside the laws of positive science.

After all, do we not watch every day syntheses of enormous quantities of protoplasmic substances?

Only, as Pasteur has pointed out, this creation takes place in reactions into which enter *pre-existing quantities* of the same substances.

What does it matter! Artificial creation, either with or without these pre-existing quantities, will always be creation. In handling inanimate matter we do not any the more *create* in the strict signification of the word. We only *transform pre-existing things*. Man would thus be unjustifiable if he wished to bring into the realm of organic synthesis more ambition than he has ever cherished in regard to inorganic bodies.

But here is a consideration which deserves to arrest the attention of the vitalists. We know that elementary or primary life did not at once appear upon our planet. There is not in the living world a monera or a plastidule capable of living in a temperature of above 200° C. Now whilst the temperature of the earth was above 200°, elementary life could not exist on it. Hundreds of centuries must have passed before the moment when the earth became inhabited, when life in its first elements at last appeared. It was not there before, it was formed

there, born there. The mystery of creation lies consequently around us, before or behind us.

It is even simpler than we think. The protoplasm which constitutes the vital principle is only a physico-chemical arrangement. Elementary life is not even linked to any kind of form (the nucleus and the cortical layer being only the results of an ulterior development), for the gymnocytodes have no determined form, no structure, and no variation of parts. And yet they form living and complete beings (Haeckel's "moneres"). Then, in proportion as we push our embryogenic investigations further, the secret of life becomes simplified and reduced to physico-chemical combinations, the enigma of which is difficult but by no means impossible to solve.

Have we the right to proclaim now and henceforward that we ought to renounce for ever the attempt of discovery?

We should evidently be wrong in wishing to treat the creation of artificial life as a Hoffmannesque phantasy, for there is no doubt that science thinks of it and considers it realizable. One of the distinguished physiologists of the United States, Mr. I. Loeb, a professor of the University of Chicago, has published in the *American Journal of Physiology* (October 1900) not only his studies which have been pursued for several years in company with other scientists towards the creation of living beings, but he even insists upon the success obtained, which seems to him incontestable.

Here are the experiments which he has performed, with the help of Prof. E. B. Wilson of the University of Columbia. Having placed a certain number of un-

fecundated sea-urchin's eggs in a basin containing salt water, they added to it a solution of chlorate of magnesium. After two hours, in consequence of "endosmosis" (a tendency shown in two substances to pass into each other, or rather a current which establishes itself from inside to outside in two liquids of different density), the eggs gave birth to living cells which, on development in the laboratory, became true living blastoderms. To prove that these eggs contained in them no germ of life, Messrs. Loeb and Wilson placed them in sea water, where, so long as the chlorate of magnesium did not interfere, they remained in the state of inert matter. The very large number of experiments made under the same conditions, persuaded the two scientists that life had been created in this case thanks to endosmosis and to the chemical element introduced into the sea water. We may add that chlorate of sodium and chlorate of potassium produced the same result.

The two scientists are also inclined to believe that electricity plays some part in this creation, the chemical elements which they employed being electrolytic bodies.

Emboldened by this success, the two professors tried to create living cells by the help of unfecundated eggs of other fishes of the species of *Arbacia*, *Stronglyocentrotus*, and *Asterias*, and they have been perfectly successful.

Following Loeb, many scientists, such as Morgan, Fischer, Bataillon, and, above all, Delage, Giard, and Henneguy in France, working along the same lines, have succeeded in pushing his discoveries much further. Delage has confirmed Loeb's results. He has even

succeeded in giving his alkalines a greater efficiency while working with the eggs of *Stronglyocentrotus*.

M. Henneguy has subjected frogs' eggs to the action of a solution of azote, potash, and ammonia, and the eggs segmented and developed. M. Delage substituted for these fertilizers, or, if we may so put it, these solid creators, gaseous creators. Thus the eggs of *Asteria* or starfish immersed in carbonic acid produced embryos. It was only necessary to subject the eggs to a bath in a bottle of seltzer water and to return them to the sea water, and little living larvæ issued from the unfertile egg, the egg which was inert and inanimated.

Two of Loeb's pupils, Mathews and Witcher, have proved the possibility of producing parthenogenesis by simple mechanical agitation, shaking or physical heat. Another of his pupils, Greeley, has proved the influence of heat of different degrees on the segmentation of the eggs.

The utilization of the cathodic rays emitted by radium has also been tried. Under their influence the segmentation of the eggs of *Stronglyocentrotus lividus* has been obtained, and also half-morulas of sixteen cells.

Giard has also shown that it is possible to augment or lessen the intensity of vital phenomena by the help of progressive dishydratation, followed by hydratation. Thus the development of the eggs of *Asteria rubens* only begins when the eggs are withdrawn from the saline solution and replaced in sea water.

Have these embryos, provoked to life in so artificial a manner, any chance of long life? Can the larvæ of asterias become asterias in their turn? Here experiment stops, and we can only look to the future, which is full of promise.

From the point of view of the evolutionist theory, nothing allows us to contest the possibility of creating germs of human life by the same processes.

And after all, since living matter and so-called dead matter are in no way separated by any impassable gulf, since, as we have seen above, the basis of living matter has been already successfully made, nothing forbids us to believe in the possibility of realizing in the course of centuries the dream of Homunculi!

But most certainly it is not the chemical laboratory which will succeed in giving birth to a living being. The goal of chemistry is only the formation of the substances composing living beings. But, armed with its conquests, physiology will intervene to crown the work of chemistry by finally creating beings endowed with organic life.

These living beings, too, in their elementary form, are perhaps already created. We know that a man, a cat, or a dog, is made up of an extremely great number of little masses of gelatinous substance called *plastides*.

What is the life of a man? The result of the lives of millions of plastides. For each plastide lives its own life, and there are even cases in which the man dies whilst the plastides composing him continue to live. Now, biology proves to us that among the phenomena observable at a given moment in a living plastide there is none which has no affinity to physics and to the chemistry of inert bodies. Nothing in them permits us to separate them from the body of elements already studied and *possible of reproduction*.

What would these living organisms be, thus created by man without the help of woman?

It is quite evident that they would not resemble us. They would have first of all the great advantage that they would not physically resemble the great monkeys, and morally would have neither our vices nor our virtues. This alone is very consoling for the pessimists of our day. They would not devour each other for questions of food like the animals, nor for the shadows of social and religious truth like men. By this alone they would be nearly angels. Their mentality, differing in every way from that which is engendered by our prejudices, would perhaps allow them to penetrate the mysteries of the beyond, which have cost humanity the sacrifice of so many ingenious brains. . . .

After all these products of the laboratories of to-morrow, the Homunculi might be perfected by all the discoveries of future science. They might be endowed with the exquisite qualities possessed by the rotifera or the cardigradès, which possess the power to live several lives.

We know, for example, that the "anguillules" of wheat, which only live ten months, live, once dried, for whole years, reviving again when simply wetted. Spallanzani has thus revived anguillules as many as sixteen times. Who knows? We might perhaps endow the Homunculi with the capacity for resurrection possessed by the rotifera, who, when definitely dead, are born again to life under the influence of a drop of water (Broca's Report to the Biological Society in 1860). A Homunculus would only have to manifest a desire to rid himself of his sufferings or the curiosity to see the centuries to come, and he could at once arrest his life and bequeath his resurrection to the centuries to come.

All the complaints brought against the defective creation of man might thus be repaired. Helmholtz claims that the human eye is contrary to common-sense and to the elementary demands of optics. The human body is full of imperfections. Widerheim has counted in man 107 hereditary organs which are no longer of use, and are only an inheritance from bygone times. Let us take for example the lachrymal caruncle. It is absolutely useless. It is the remains of the third eyelid of the mammifera. The epiphysis of the brain is only the rudiment of an ancestral organ, the third eye or "cyclopean" eye of the saurians.

All these remains of a time which is no more are often even harmful, being almost inharmonious.

Some scientists criticize the illogical construction of our brains, others the great misfortune of our life which only allows us to enjoy its delights at the moment when we lose the means of seizing them. For at the time when we at last succeed in understanding life we generally quit the world of mortals.

The Homunculi of to-morrow may thus embellish and brighten the aspect of some thousandth century. Some fine day, strong and powerful, they will perhaps form another kind of humanity, and will claim their rights from men. The produce of quick brains, they will create, by means of synthesis, beings like themselves. Humanity will thus at last be divided into *man-monkeys* and *Homunculi*.

The reasoning of certain pessimistic sociologists gives us a glimpse of the creation of Homunculi as a necessity of future ages. With the creation of a third sex composed of spinsters a redoubtable danger has been created

for the development of humanity. In England the celibacy of women has ceased to be a disadvantage for the weaker sex. To-day it is a new social force. More numerous, and better organized, unmarried women in England have invaded all the liberal professions, and, by the help of powerful leagues, even exercise a decisive action upon the politics and government of their country. These working bees, with their reserve of force untouched by love or maternity, form in reality a class of the population apart. Far from complaining of their present life, they are proud of it, and gather an increasing number of recruits around their standard.

Their indifference to conjugal joys, and even their content with celibacy, very often voluntary, acts contagiously upon the women of the Continent. Having diminished the importance of man, the *new woman* of Germany, France, and Italy is becoming used to the idea of living independently and without him. The celibacy of moneyless women is thus being reinforced by voluntary celibacy, caused by a contempt for man, marriage, and love.

The danger is not yet very visible on the horizon, but it only needs to be possible to conceive it to make the hypothetic syntheses of living beings still more interesting.

This gives matter for reflection to all inquirers such as Bellamy, Crookes, C. Richet, Gabriel Tarde, Mantegazza, and many others, who try to appease our sorrows of to-day by brilliant pictures of the life of to-morrow. Why not go a step further in the realm of fancy? Why refuse oneself the pleasure of seeing our planet peopled, in some hundredth century, by the

rivals of man; rivals created by his own brain as the last great punishment for his pride and his implacable march towards progress without a goal?

And do we not depend, alas! according to Goethe, upon the creatures which we have made?

In the presence of the evils which devour the world of our days, let us dream of these strange beings which await its old age. For the creation of the distant future, the *brain-man* will come perhaps from the *monkey-man*, the man of our day; as this latter (at least so they tell us) is born of some plastide. Let us taste the charm of the mystery which envelops the road towards the artificial creation of living beings, since the unforeseen and the mysterious are still the most attractive flowers of the surprise tree of science. Let us enjoy the dream which it lets us cherish of *homunculi*, these ideal beings of to-morrow, direct descendants of our *thought*, and resign ourselves with gentle pleasure to the belief that we shall see our planet peopled in the long march of the centuries with other masters, other aspirations, and other virtues.

Shall we ever reach there? We may hope or fear it. Humanity has taken less time to succeed in the making of albumen than the seas to change their bed. Without discounting the sudden progress of modern science, we may foresee that the fabrication of living matter will be perfected during a long series of centuries, and that, aided by the evolution of living principles, we shall perhaps find ourselves some day before the living product of our brains.

The possibilities of nature are infinite, as Huxley has so justly said. Nothing then authorizes us to doubt

that the intensity of life will be some day rendered more powerful by science. It may not perhaps succeed in creating new life. No matter, so long as it can preserve and greatly strengthen existing life. And that will be enough. We long most of all for things which are rare and difficult to obtain. Seeing the little care which Nature takes of the vital principle, the prodigality with which she scatters it about the universe, the possibility of its creation and the necessity which she imposes on us of continuing the cycle of our existence through a series of transformations, we shall the better seize the divine philosophy of life, the sense of which goes far beyond the bounds and limits of the register of births and deaths. We shall cease at the same time to adore it or to fear it beyond measure. . . .

CHAPTER VIII

FOR THE LOVERS OF LIFE

(Recapitulation)

OUR life is nothing but a long and implacable battle with death. The thought of the inevitable end fills the mysterious background of our being. However much we mock or fear it, we cannot free ourselves from its domination. The human consciousness is impregnated with it, from its awakening until its last act. We can smother this preoccupation like a drunkard who drowns his sorrows in wine. It is useless. Our mind, delivered from the passing whirl of life, will infallibly bring us back to the spectacle of death. The philosophy of the end remains, and will remain, the supreme philosophy of races, religions, and civilizations. To-day, just as thousands of years before us, we might define the mentality and morality of men by their relations with death.

But what is death? We generally suffer too much at its approach, and think too little of its real meaning. All that is incomprehensible in it fascinates us and fills us with sadness, whilst we turn away from those aspects of it which are reassuring and accessible to our minds. In one word, death should be regarded and thought of with more serenity.

I

The world is led, not only by ideas, but above all by words. It is sometimes only necessary to give a thing a pleasant or a repulsive name, and our mind will be at once penetrated with the significance thus lent to it. The word becomes idea, thought, and conviction, the covering of the object thus identifying itself with the object itself. If the vanishing of our body instead of being called death or disappearance had been conceived as a resurrection, a sort of return to the immortality of nature, it would rather evoke a delicious shiver at the mystery of the after life, instead of the horrors of nothingness.

The auto-suggestion of words has not only a strong repercussion upon the evolution of our thoughts and sensations, but it also acts upon our physiological life. We have shown how the false definition of old age succeeds in shortening life. Men arrived at a certain age, die, intoxicated with the idea of the inevitable approach of death.

A distinguished alienist of New York, Dr. E. C. Spitzka, has made a curious observation. Many people die of hunger after two or three days of privation. Now the examination of fasting men, such as Succi, Dr. Tanner, and many others, has shown that man can live from ten to twelve days without food. Why then this precipitate death of the first mentioned? Their minds being imbued with the idea of the necessity of dying in a few days, this augments their suffering, diminishes their power of resistance, and precipitates the final end.

With identical wounds a vanquished army has always more dead than a conquering one. Certain persons, by virtue of the same principle, expire at the exact moment that has been predicted to them.

A falsely established opinion makes us believe that damp air is heavier than dry air, and as soon as the weather becomes rainy we complain of the increase of weight which falls upon our organism. We complain of it because we suffer from it. Now this suffering is purely imaginary, it is caused by false knowledge, by an illusion fostered by our ignorance. In reality dry air is much heavier than damp air, for the very simple reason that the latter is mixed with a gas (water in a gaseous state) the weight of which represents hardly two-thirds that of air. A balloon rises from earth much more easily upon a dry day than upon a damp day. Dry air being much heavier than the surface of the balloon, this last shows a much greater power of ascension upon a dry day than upon a rainy one.

Pascal had a glimpse of the great power of habit, which is only suggestion in graduated doses. There are things, he tells us, which it is greatly to our interest to believe and which seem inadmissible. Now what can we do to cause our reason to adopt irrational things? We must prepare for it and incline our machinery towards it. We must use mechanical processes. We use will to form habit, and this latter in its turn forms our faith. By the mere repetition that God is in the heavens, we shall believe that the dwelling of God is above our heads. It is by will that we repeat certain words, and it is these words which in course of time become our faith. It is this faith in its turn which

impresses our mind, and makes its conceptions hereditary and innate.

Faith is born of words, and acts are born of faith. Our moralist has thus foreseen that psycho-physiologic faith, which was to be exactly formulated later by A. Fouillée. Not only do ideas change to power and to acts, but acts, by their repetition, are transformed in their turn to power and to ideas.

The false direction given to our thoughts of death has falsified its significance and its end.

II

And first of all can we admit that death is so terrible a thing as is generally thought? Can we admit that nature has inspired in us an excessive love of life whilst showing to us the hard necessity of its end? Are we not the victims of a wrong interpretation of the meaning of death? What! Give us a violent appetite for life, increase it by every means, whilst at the same time forbidding us to satisfy it? The conscious force which presides over our destinies would then show itself more diabolical in its cruelty than the most savage cannibals. Again, an unconscious or blind power could not have conceived the idea of so refined a torture. And the more one thinks of it the more inevitable seems one conclusion. Death is perhaps not so desperate a solution as we think it.

We have distorted its meaning and thus it escapes our comprehension. The fear with which it inspires us may be compared to the fear of poverty. Those who look at its good side easily accommodate themselves to

it. Others, and these are far more numerous, fear it like death itself. All depends on the angle at which we place ourselves to observe it. Here and everywhere it is the *comprehension* of the thing upon which depends our joy or sorrow. It is that which makes us turn by turn happy or unfortunate, which plunges us into joy or sorrow. The thing itself remains invariable.

Bacon observes in his *Moral and Political Essays* that there is no passion in the heart of man so weak that it cannot surmount the fear of death. The desire of vengeance triumphs over death, love scorns it, honour breathes it, despair flies to it, fear advances it, faith embraces it with a sort of joy. . . .

The great poets, who with their supreme intuition have succeeded in foreseeing the science of to-morrow, have found in the picture of the infinite sorrows and limitless despair which death means to the vulgar, smiling visions of hope and joy. Virgil says with irony:

"Usque adeone mori miserum est?"
(Is it such a great misfortune to lose one's life?)

To Lucretius death alone comes to the help of nature in creating life. . . . Lamartine salutes it in his unforgetable verses as a celestial liberator, who, far from presenting himself under a gruesome aspect, with a cruel forehead and a treacherous eye,

"N'anéantit point, mais délivre. Sa main,
Céleste messager, porte un flambeau divin.
Quand mon œil fatigué se ferme à la lumière,
Tu viens d'un jour plus pur inonder ma paupière.
Et l'espoir près de toi, rêvant sur un tombeau,
Appuyé sur la foi, montre un monde nouveau."

If things are ordinarily only valued for their rarity, *life*, as the great object of our efforts, of our enthusiasm and our desires, being more frequent, more durable, and above all inseparable from the organized being, loses by that very fact much of the price of affection which we attach to it. Scattered with an unparalleled prodigality, it is universal in the world.

Considered impartially in the light of modern science the phenomenon of death offers us much unforeseen consolation. *It transforms but does not destroy.* Now, whilst the principle of transformation attracts us by its novelty and the charms of the unknown, that of destruction terrifies us by the vision of nothingness. And besides, death which we fear as the unknown terror, with its sudden and unforeseen apparitions, is in us and around us. Death is our companion of every day and every minute, and its manifestations are as permanent as those of life.

When we remember that we are dying piecemeal at every moment we cease to understand the fear with which the so-called final deliverance inspires us.

We know that our body is composed of an innumerable quantity of cells, which live each its own life and keep their individuality. Guided by the principle of the division of labour each cell fulfils its functions and contributes to the prosperity of the whole. The cells are the bearers of hereditary properties, the source whence are born the germs of new tissues, in fact, the motors of the vital activity of our organism.

Now these cells, the infinite number of little beings of which our physiological *ego* is composed, are born, evolve, and die. The continued, permanent, and inex-

tricable death of these cells thus forms the condition of our life. Without the death of the cells of the salivary glands there would be no saliva, a condition inseparable from digestion, and, consequently, from life itself. With the death of a cell, however, dies a portion of ourself. Looked at from this point of view our organism is nothing but a vast cemetery, and our vital processes are a series of successive burials.

The cells are not automatic little beings, working independently one of another. As in a well-organized state, where each citizen has his rights and his duties, each cell has its functions to fulfil, whilst being bound up with the whole of our nervous system. The excitement of one cell not only causes reaction in itself, but at the same time the excitement of the entire organism is shown.

The division of labour of the cells does not prevent either their solidarity or their unity. Certain cells are limited to the function of conductors of excitement.

Certain others, more central, only gather and transform the excitement transmitted by the former. All, living their individual lives, form, nevertheless, intrinsic parts of our corporeal *ego*, and when certain of them take their departure they are infinitesimal portions of our *ego* which have died.

The cells of the organism live together and die separately (Engelman).

Out of thirty thousand millions of cells of which the human organism is composed it is absolutely admitted that at least twenty-four thousand millions are renewable. In other words, about 80 per cent. of our organism is constantly dying and being replaced by other

cells. According to the studies made by Messrs. Chantemesse and Podwyssotzky (*Processus Généraux*) a red corpuscle dies at the end of from two to three weeks; as to the white corpuscles, the leucocytes and phagocytes, their duration is still more ephemeral. The greater part of our glands, such as the mucous glands, show us a spectacle of incessant renewal. The work done by our organism in destroying our epidermis is incalculable, for we are continually changing our skin.

We have spoken, however, of certain elements of our organism which are outside the general rules. We refer to the nervous cells and those of the striated muscular fibre. Their change only occurs in the augmentation of their bodies. The latter takes the form of hypertrophy occasioned by age and exercise. The cells change their form, we are told, but not their number. But without insisting on their relatively small proportion we may remark that it would be more than bold to speak of their immobility. Here equally we must remember the wearing of the tissues. We excrete every moment a great many chemical elements and we absorb as many. Supposing that the number of cells remains invariable we must nevertheless bow to the evidence that there is something changed in the *essence* of the cerebral cells, as they act in a new-born child and in an adult being.

These partial deaths of our *ego* are, however, effected without causing us any trouble whatever. Is it because we do not think of them? The reasons for this indifference are at the same time instructive and consoling.

They show us that the necessity, the frequency, and the permanence of a phenomenon take from it all its marks of terror and make it commonplace to the mind.

We do not think of this series of deaths of our physiological *ego*, just as we do not think of the series of deaths of which our soul is constantly the theatre. For our moral and intellectual *ego* is also only a vast cemetery, where lie our successive states of consciousness. In the case of a thinking being the morrow never finds him identical with his state of the previous day. The sensations, the thoughts, the pleasures or the vexations of life, and in default of these the constant and brutal fact of the variations of age and of the health of the body, are for ever modifying, in an uninterrupted manner, the state or rather the states of our soul. It dies in us from our infancy onward. It goes in pieces, in imperceptible fragments. The soul of an old man is not the soul of the dawn of his life. Between the soul which a woman has at five years old and that which she will have at fifty the gulf is doubtless more profound than between the soul of a Renan and that of a Polynesian.

These phases of incessant *renovation* give to the human mind the aspect of a cemetery of dead souls, just as our physiological life is only an interminable funeral procession of dead cells.

III

And yet it is sad to part from one's "individuality." For death, they tell us, brings with it its disaggregation and its disappearance. But what is the individuality? We suspect its existence, but we do not know it. Where does it begin? What is our *ego*, what are its essential qualities? How can we separate it from the other individualities which people the universe?

Science refuses to give it a definition, religion sometimes raises it in our eyes and sometimes tramples it scornfully under-foot, whilst our observation of ourselves and of our surroundings inspires us with the most contradictory conclusions.

Physiologically our body is only a co-ordination of numerous cells, limitless and nameless republics, subject to evolution and revolution, always changing and always changeable, living, disappearing, and resuscitating in our organic economy. Is our individuality that of our infancy, adolescence, maturity, old age, or senility, or of the thousand passing shades which separate the chief divisions of human life? Each step that we take in life, each day which is added to its past cycle, the food which we take and that which we do without, the exercise of the body and that of the intellectual faculties, our joys and sorrows, happiness and unhappiness, sickness or insomnia, all contribute to the fundamental modification of our organism, and thence to the alteration of our *ego*.

In the psychic kingdom analogous phenomena manifest themselves, as we have seen, unceasingly. Thanks to the progress of contemporary psychology, we know that our consciousness may be not only simple but double or even triple.

Phenomena are known, which are henceforth indisputable, of the doubling or even tripling of our soul, which yet does not cease to be one and indivisible.

What then is this individuality which we lament? We do not even know what we lose at the moment when it leaves us. Let us at least look at the consolations which its alleged disappearance brings with it.

Let us re-establish the conception of the "individuality" as it is shown us by the language and the philosophy of our day. By the "individual" we commonly understand an aggregation of parts, bound together by the solidarity of their interests. Should we try to disaggregate them, damage results to the whole and to the parts which compose it. The "individuality" thus understood consists in the relation existing between each animal or vegetable and its species. We speak of the "individual animal," or "vegetable," but we refuse to apply the same term to the mineral world. The reason is that the attributes of the individual lie above all in its vitality. Without life there can be no individual.

Now all the elements which form our idea of personality are found, according to the general belief, in the animal and vegetable world, and we have seen in studying the identity of animated and so-called inanimate objects that they are found also in the mineral world.

According to the happy phrase of M. A. Sabatier, the learned director of the Institute of Zoology, at Montpellier, crystal forms an individuality with numerous parts intimately united in "special relation and with a determined form, with an exchange of influence, and solidarity." All its parts are bound up and united by a correlation of functions and forms, and thus resembling individuals of the animal and vegetable world it divides and multiplies itself. There is a crystalline mineral segmentation as there is a cellular segmentation. Crystals live, grow, die, and resuscitate.

If we pass on to science we perceive that the definitions of personality are still less satisfying. The idea

of individuality as it is generally understood, so C. S. Minot tells us, does not exist in nature; and even the notion of death applied in an indifferent fashion to representatives of the uni- and multi-cellular races rests on a wrong basis. Our understanding of personality arises from myth, the windfalls of our fantasy.

The most certain thing is that matter remains indestructible, and that death is, after all, only its transformation. Now the individuality, as we conceive and love it, the alleged disappearance of which fills us with horror or sorrow, may be found again in the successive phases which matter must go through.

What is the value of the personality of the successive changes which the body shows? What is the individual worth in certain representatives of the human species? We hardly ever know. It is difficult to speak of the value of a thing of which we know nothing.

IV

One imperative consequence of life is that it can only be born of death. "Life—is death" (Claude Bernard). The individual only lives because he dies. In the egg the muscles, the bones, the nerves, and the organs appear and take their form, and, whilst developing the same organs become disorganized and destroyed. The evolution of the being is only the invisible theatre of death. The most salient facts of life, the most imposing, those in fact that permit us to distinguish a living organism from an inert body, are intimately allied to death. The anger which causes us to contract the

muscles, the laugh which makes our faces beam, the thought which wrinkles our forehead, the æsthetic enjoyment which hastens our pulsation, are always accompanied by an organic destruction, a death of the cells.

Life has never been found without the co-existence of these two principles; creation and its equivalent organic destruction. We shall never succeed in separating them except in our minds. In reality they exist simultaneously in all beings, however simple or complex. Thus the desiccation of beings (the disappearance of the moisture necessary to the organism) arrests life, and, moreover, suspends organic destruction. From the moment when destruction ends, the vital creation equally ceases, and the organism returns to an inert state (latent life). But as soon as the moisture is restored, the organism recommences the process of destruction even before passing to vital creation (Chevreul's experiment). Marmots, when they wake after their hibernation, at once destroy their stored up provisions. Without destruction there is no vital creation.

Without death there is no life. Organic creation, Life, is unimaginable without the physico-chemical phenomena of destruction.

Always and everywhere death and life succeed each other, and mingle in a mysterious embrace. They form a unity in which the several partial differences plainly show the identity of their common base. There are as many of the principles of *life* in *death* as principles of *death* in *life*. We might express their curious intimacy by a formula of the precision of a chemical combination :

Life—Death applying to life, and *Death—Life* summing up the essence of death.

The principle of life seems so deeply rooted in organized bodies that it ends by triumphing, in spite of all the obstacles which spring up in its path.

The tomb of death is in reality only the cross roads of a new life, a most intense one. The death of the individual is, in fact, only the end of a certain form of federation of molecules. But at the very moment when their disaggregation reaches its terminating point in the grave, when the oxygen which formerly animated all the machine whilst it lived on earth breaks up its pieces in fury and disseminates its infinitesimal parts, our transformed body recommences a new life.

Even the cremation of corpses cannot quite absolutely kill the germs of life. It continues then under the less seizable form of gas and ashes, which belong to the domain of the mineral kingdom, the immense universal reservoir of Life.

"The matter, at this moment scattered like dust and ashes upon the soil," so Schopenhauer tells us, "will not be long, once dissolved in water, before it becomes crystal; it will shine like a metal, then it will give off electric sparks, and its galvanic tension will allow it to supply a force powerful enough to decompose the most resistant combinations, to reduce earth into metals; it will metamorphose itself into plant and animal, and from its mysterious bosom will develop that life the loss of which fills short-sighted humanity with so much inquietude."

Cabanis tells us elsewhere that "there is no death in nature. Its youth is eternal, like its activity and its

fertility. Death is an idea relating to perishable beings, to these fugitive forms upon which the beam of life shines successively, and it is these uninterrupted transformations which constitute the order and the matter of the universe."

Life is a *constant force of nature* by the same right as gravitation and weight, Raoul Pictet also tells us. After having followed up the studies inaugurated with so much success by Casimir de Candolle, E. Sarasin, Du Bois-Reymond, Susani, Bertin, and others, upon the action of low temperatures, the eminent Swiss scientist has arrived at the logical conclusion [1] that life does not disappear, and only demands the presence of a persistent organism in order to reveal itself. "This once obtained, you may heat it, place it in water and light, and, just as a steam engine begins to work in similar conditions, the germ will live and develop."

His process is a very simple one. We know that at low temperatures of, for example – 100°, life ceases to manifest itself. In consequence when, by the help of liquid air, we reach – 200°, we ought to kill all the germs of life, and to annihilate all chemical action and reaction. And yet organized beings, after having been subjected to the influence of this low temperature, being re-exposed to the influence of heat, recover their vital properties.

Life has thus persisted like a true natural force. It is this which has caused Pictet to say that if we can put together an organized dead structure in all its parts, physico-chemical conditions would be enough to develop in it all the living phenomena of vegetative life.

[1] Conference published in the *Archives des sciences physiques naturelles* (1893).

V

Life dwells in every cell. It is nowhere centralized in any organ or in any apparatus of the body. All physiological, pathological, or toxic phenomena are at bottom only cellular actions, general and special, according to modern physiology. We have no right to claim that death, in breaking up the cellular constitution, at the same time causes the death of all the cells. We know the curious experiments upon the vitality of the different organs of the so-called dead individual. Let us recall those of Paul Bert upon animal grafting. The eminent physiologist asked himself the following question. When a rat, for example, upon the head of which the tail of another rat has been grafted, reaches the limit of old age, would it not be possible by transplanting the foreign appendix on to a young animal to assure it of a second period of existence by this addition of new blood provided with fresh vitality? By reproducing this transmission upon successive generations, would not one succeed in indefinitely rejuvenating the original organ without its ceasing to be itself, and would one not thus succeed in withdrawing it from the law of death? The experiment, partly executed, succeeded, and the success is disturbing to our ordinary conceptions of death. No, life does not end with the circulation of the blood and the beating of the heart. As Spallanzani has shown, muscles separated from the body continue to produce carbonic acid.

In certain insects not only eyes but a whole part of the head, after having been cut off, continue to grow and

recover their former shape.[1] In the experiment with a washed liver, as we have seen above, this organ when taken from a living being continues to make sugar. For, whatever we say, death does not scientifically mean the arrest of life. The vibratile movements of the epithelial hairs in the air-passages are prolonged as long as fifteen hours after death. The materials of digestion sometimes continue to move in the digestive tube, the capillaries contract themselves so as to move on through the veins all the blood which they contain. The pupil of the eye in corpses shows contractions and dilatations which often quite change the expression of their physiognomy (C. Bertin). Even the secretive organs continue to elaborate their products after death;[2] even after having removed the viscera surrounding the heart, the beating of this organ (40 to 50 times a minute) has been noted in a decapitated criminal more than an hour after his execution.

The theory of the continuation of human life in a latent state has been lately enriched by an incontestable fact which authorizes the boldest suppositions. We may remember the curious case of the young sailor Igardens, who fell into the Mediterranean at the beginning of the month of June 1898. When his comrade Aguel at last succeeded in recovering his body all hope was abandoned of restoring Igardens to life. His heart no longer beat, and his body did not respond to exterior excitements. But, remembering the process recommended by Dr. Laborde for restoring the drowned to life by means of rhythmic traction of the tongue, Aguel set to

[1] J. Carrière.

[2] Ludwig, Rahn, and Bécher's experiments upon decapitated dogs.

work. When at the end of two hours the attempt to resuscitate the corpse had produced no result, the cause of Igardens seemed to be definitely lost, and he was declared dead, but the indefatigable Aguel continued his work for a third hour, at the end of which the dying man gave signs of life, and was subsequently saved.

This fact, attested by the officers of the ship, would, forty years ago, have seemed inadmissible. Life persisting in spite of undeniable death and ending by showing itself where it seems to be finally extinct, is a thing to penetrate us with terror, or, if we prefer it, to fill us with comfort and hope.

Behind these crude manifestations there are then impenetrable states of life which the biology of our great-great-grandsons will doubtless unravel.

Brown-Sequard having one day cut off the head of a dog brought up in his laboratory, called it by its name. The eyes of the bleeding head, which was no longer a part of the body, turned towards the celebrated physiologist as if his voice had been recognized by the faithful dog. By injecting fresh blood into the head of a recently-decapitated criminal, Charles Robin tells us, a momentary resurrection of the vital harmony may be caused. Brown-Sequard believed this operation to be practicable, but he was right to recoil before the tortures which the horrible consciousness of its situation must cause to the fragment of body. Theoretically realizable, this experiment only depended on the precision of the operator.

In the cold-blooded vertebrates, and amongst the invertebrates, plastides may continue to live singly a very

long while after the death of the being to which they belong.[1]

Death does not then destroy life; it only frees the cells, those partial energies which compose the organism. Philosophically speaking, life persists in spite of the breaking of the contact of the whole.

Grafting and budding in plants are only performed by virtue of the same principle of the autonomy of the cells. Our living body is perhaps after all, as John Herschell has defined it, only a combination of millions or thousands of millions of little beings or living individuals. Human life would thus be only the result of these tens of thousand of lives, whose greater meaning escapes us.

The cell (the atom), Lavoisier states, in spite of its movements, its migrations, and its apparent changes, remains indestructible. And this indestructibility of matter is a primordial and fundamental condition of its existence, its inevitable and essential attribute. Even a piece of coal, which we handle and burn as we will, does not disappear from the universe. We can only destroy its exterior form, we are powerless to annihilate it. When it has ceased to exist to our eyes it nevertheless continues its vital career by forming part of a carbonic acid, of an oxide of carbon, of an organic or inorganic carburate, or of a carbonate.

[1] Le Dantec, Introduction to the *Théorie Nouvelle de la Vie.*

VI

Death, as we fear it, is but an empty word. Above it lies the law of the conservation of matter, an immortal law, the law of Life. Its principle once realized in the world with the first cell (protoplasm or plastidule), it has served as a starting-point for all varieties of organic beings which people the earth. The first germ thus becomes eternal in its essence, for it is always the same life that continues. If death could destroy the life of the cell this life would have undergone interruptions, and would logically have disappeared with the vanishing of the first plastidule.

The *continuity* of life, and consequently the immortality of the partial forces which dwell in us, is the elementary law of the evolution of beings.

Man offers us a still more consoling spectacle, with his myriads of living cells, his fascinating mystery, his aspirations, and his impenetrable psychic faculties.

What can we say too of the immortal and almost palpable life of the plasma, which, once born, pursues its existence through millions of generations, whilst guarding all the time its typical faculties? All changes around the plasma, but it, eternally young, still feeds, maintains, and immortalizes life.

The conception of death, as it is enrooted in our minds, makes us hate and fear it. For the happiness of humanity, which trembles cowardly before death, we must demolish these erroneous opinions. Yes, death is only the mysterious continuation of life. What does it matter that it is differently manifested? What does

it matter if a living being has more or less varied and complex organs or apparatus, lungs, a heart, a brain, or glands? All this is not absolutely necessary to life.

Death conceived as "a repugnant nothingness" was enough to sadden our existence; death considered as a change of life will prevent us from fearing it and make us almost love it.

APPENDIX

THE HOMUNCULI OF YESTERDAY AND TO-MORROW

IT was in Calabria that Count Jean-Ferdinand Kueffstein, chamberlain to Marie-Theresa, met the Abbé Geloni. Both were Freemasons and Rosicrucians, both were equally plunged into the study of the marvellous. Shut up in the laboratory of the Convent of the Carmelites, they worked day and night for five weeks, attempting to steal some of the mysteries of nature, that fathomless gulf. Before the kindled fire the two scientists evoked scenes which made the hair of the impassive Kammerer stand on end.

Then, one fine day, the spirits, the *Homunculi*, appeared. Ten were created, amongst them *a King*, *a Queen*, *an architect*, *a monk*, *a miner*, *a nun*, *a seraph*, *a chevalier*, *a blue spirit* and *a red spirit*.

As they came into the world they were shut up in a receptacle of glass holding two litres. These bottles were filled with holy water, and tied up in a damp ox bladder. A seal of wax was placed upon this to prevent the spirits from issuing from the flasks. The abbé then blessed the new beings which had come amongst mortals, and artificial "creation" was thus clothed with the religious sanction.

One starry night, Kammerer tells us, the eight spirits were carried into a garden situated outside the cloisters. These creations of Count Kueffstein and the Abbé Geloni did not weigh very much.

Like gudgeons, "none of them was more than a span long." What had to be done was to enlarge and develop them. Each carrying two receptacles, the count, the secre-

tary, and a monk of the cloisters went to the end of the garden. They first of all proceeded to the burial of the "spirits" in two cart-loads of mules' dung.

For several days they watered the dung heaps with a mysterious liquor prepared in the convent of the Carmelites. Under the influence of this ingredient, the dung began to ferment and the spirits which were buried in it seemed to be interested in the operation, for they "cried and squeaked like hungry mice." Four weeks passed thus, weeks full of anxiety and waiting. On the twenty-ninth day, the count, accompanied by the Abbé Geloni and Kammerer, went into the garden. The priest, clothed in his chasuble, celebrated a religious ceremony, the count prayed and recited psalms, whilst Kammerer swung the censer. The eight spirits were dug up and carried to the laboratory, where they took a comforting bath in warm sand for three days and three nights.

A prodigious metamorphosis followed. From the moment when Kammerer was again permitted to see the spirits, he was astonished at the changes which had ensued in the interval. First of all they had all grown, and each one had acquired the special marks which were to characterize them in their new life. The men had beards, "very thick and bristly," the ladies an angelic expression of face. The Abbé Geloni took charge of their costume; the king received on this occasion a fine crown and a sceptre; the chevalier a sword and a lance; and the queen a precious diadem. Even the architect was given a compass and square.

The eight spirits were not easy to manage. Evil in their nature, they quarrelled, and above all too soon acquired human passions. Did not the monk take a fancy to bite the Abbé Geloni on the thumb at the moment when the latter was cutting his hair? And then their food demanded peculiar care. Every three or four days they were given a special preparation which the count boiled in a little silver box and served to them with a spoon "which had not yet served any use."

We must add the prayers which had to be recited during

the operation of feeding, the benedictions which had to be given to the spirits, and above all the special care necessitated by the magic seal. For the little men showed a desire to escape, and to prevent them the receptacles were not only sealed but mysterious prayers were said and formulæ of exorcism recited which paralyzed their spirit of revolt.

There was only one little being, who by his gentleness seemed to repay his creators for the pains of his creation. This was the "blue" spirit. His face, full of kindliness, expressed such a resignation that Kammerer can hardly speak of him without emotion. They had not even to trouble about his food; the water which they gave him always remained pure and clear. When Count Kueffstein struck the magic seal which covered the ox bladder with a little silver hammer this clear water became coloured with a beautiful celestial blue, the blue of those seraphs of which innocent souls dream. It was only necessary to recite "a little Jewish prayer" for his visage to appear, at first very small, hardly as big as "a grain of hemp," but which in developing attained the proportion of a normal human figure.

The "red" spirit was the contrary of his gentle comrade. He, indeed, seemed like the devil in person. Evil and insolent, he would stick out his extravagant tongue and roll his eyes like an epileptic. He even had to be fed with the blood of a freshly killed animal.

This household of thirteen, consisting of ten spirits, two evocators, and the poor Kammerer, who was charged with the terrible task of supervision, lasted for a long while. Count Kueffstein for some time took a fancy to transport his "little household" to Vienna, where he showed the divining talents of his spirits to the initiates of the Masonic Lodge of the Orient at Vienna. The meetings there began at eleven o'clock in the evening and finished at one in the morning. Amongst the attendants we may note first Count Max de Lambery, diplomatist and writer. But the latter, having one day called the spirits "horrible toads" Count Kueffstein no longer allowed him to go and see them. We may name as

well the Count of Thun, the celebrated partisan of Mesmer and of Puységur.

As they grew older the spirits became more and more wicked and turbulent, and Kammerer felt so much anxiety regarding them that he would not under any pretext whatever live near the laboratory. When they were in an ill-humour they answered all the questions put to them by nonsense, or, still worse, expressed themselves in riddles, brain-racking double-dutch, the sense of which it was impossible to grasp.

And whilst the two spirits, the "red" and the "blue," informed Count Kueffstein upon all questions, proving to him in a palpable manner that to the spirits nothing is impossible, the eight others would not take the trouble to answer questions which did not concern their special province. Thus the king and queen would only give information about things concerning diplomacy, etiquette, and politics, the monk and the nun upon religious questions, the seraph upon what passes in the celestial spheres, and the miner upon the mysteries of the bowels of the earth.

But misfortune is always near us, lying in wait for spirits as if they were mere mortals.

Count Kueffstein, seeking one day a mislaid manuscript of Paracelsus, which he wished to consult, asked an opinion upon the subject from the monk. He had the misfortune to throw down the receptacle, which broke into a thousand pieces. They took from it the monk, wounded and bruised. In vain did they lavish on him every care, in vain they subjected him to magnetisation; the poor monk died for good and all, after having several times and by great efforts tried to breathe the air, rolling his little eyes in a fearful manner. He was buried in a coffin of black cardboard, and the count shed abundant tears on the occasion.

The king's adventure was quite different. One day he succeeded in escaping from his receptacle and in approaching that of the queen. Kammerer, entering the laboratory, perceived the grave danger which threatened the two royal spirits, for the little escaped king was bending over the

receptacle of the queen, regarding her with a wicked and fiery air. At his secretary's cries the count arrived terrified, and both set themselves to the pursuit of the little "lover," who, more and more enraged, jumped from one piece of furniture to another like a squirrel, squalling like "Satan" until the moment when, overcome with fatigue, he fell.

The count took him up in his hands, but the little king, bounding under this insult, bit his creator on the nose, and the seigneur kept the marks of it for fifteen days.

The death of the monk left the count inconsolable. Together with the Count of Thun, he resolved to replace him by an admiral. Again shut up in his laboratory, Kueffstein, with his friend the Count of Thun, worked there for weeks on end before a fantastic fire. They only succeeded, however, in producing a feeble little being, not bigger "than a young leech," who, after some convulsions, died miserably.

This was the end of the dream of creation. Perhaps through weariness, perhaps through the fear of hell, or perhaps touched at last by the prayers of his wife, the count decided, as we are told by the Masonic collection, to get rid of his nine spirits.

What became of them? Occult history does not say.

THE PHILOSOPHY OF LONG LIFE

By JEAN FINOT. Demy 8vo.

PRESS OPINIONS

THE extracts from the articles and reviews devoted to "The Philosophy of Long Life" (French edition) which we publish below, show that the ideas defended in this book may have a comforting effect upon the popular conception of life and death. These opinions, which emanate from writers, doctors, philosophers, and scientists, both French and foreign, are significant precisely on account of the variety of their origin.

". . . The author preaches a comfortable optimism, and from this point of view the perusal of his work is to be recommended, besides the fact that his book is full of new ideas and by a thousand questions opens unsuspected horizons . . ."—*Chronique médicale* (Paris, December 1901).

". . . The work of a gentle philosopher, sceptical and disillusionised. His theories are of a kind to calm those who fear the final gulf, and shiver at the silence of the tomb . . ."—*Chronique des livres* (Paris).

". . . The author brings to it so much originality and boldness that his theory—above all optimistic and consoling—will not fail to move all those who take the trouble to think about the reason of things. . . ."
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". . . If this book does not always convince the reader, it has at least the merit of making him think. We may add that it is brightly written and with a clearness which renders its speculations, of a usually very dry nature, most attractive. . . ."—M. P., *Revue Générale des Sciences* (September 15, 1901).

". . . In the course of his optimistic thesis the author has employed a wise popularisation and a healthy philosophy, writing a book which may be read with pleasure and profit and makes one think, a not very usual occurrence. . . ."—Dr. J. HÉRICOURT, *Revue Scientifique* (Paris).

". . . The success of M. Jean Finot proves how much the pessimists are mistaken in their appreciation of death. . . ."—*Le Temps* (Paris).

". . . These are not the dreams of a mystic but the deep-rooted affirmations of a scientist, who can justify them from the scientific point of view. . . ."—OTHO HORTH, *Frankf. Zeitung* (January 13, 1901).

". . . An original and singularly interesting book, but believers will not perhaps read its two parts with quite the same feelings. The first will have their complete approbation : the other, without directly combating their religious convictions, cannot but shock them. . . ."—R. LEBLE, *Journal de Bruxelles* (January 18 and February 8, 1901).

". . . Poets might draw from this work a mine of new and profound philosophic inspiration. Finot is without doubt the most optimistic among men and philosophers. And curiously enough, we return with him to the divine paganism by the road of modern science. . . ."—ENRICO CORRADINI, *Marzocco* (Florence, January 26, 1903).

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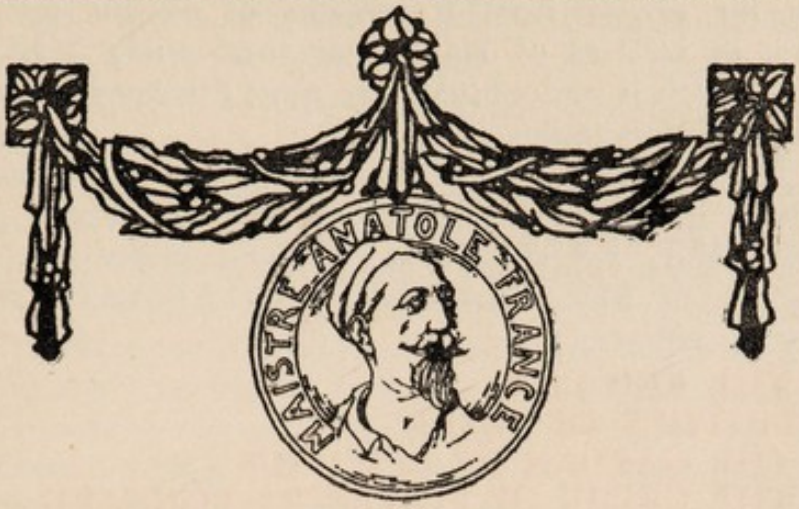

THE WORKS OF ANATOLE FRANCE

IT has long been a reproach to England that only one volume by ANATOLE FRANCE has been adequately rendered into English; yet outside this country he shares with TOLSTOI the distinction of being the greatest and most daring student of humanity now living.

¶ There have been many difficulties to encounter in completing arrangements for a uniform edition, though perhaps the chief barrier to publication here has been the fact that his writings are not for babes—but for men and the mothers of men. Indeed, some of his Eastern romances are written with biblical candour. "I have sought truth strenuously," he tells us, "I have met her boldly. I have never turned from her even when she wore an

unexpected aspect." Still, it is believed that the day has come for giving English versions of all his imaginative works, as well as of his monumental study JOAN OF ARC, which is undoubtedly the most discussed book in the world of letters to-day.

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¶ The translation of these books has been entrusted to such competent French scholars as MR. ALFRED ALLINSON, HON. MAURICE BARING, MR. FREDERIC CHAPMAN, MR. ROBERT B.

DOUGLAS, MR. A. W. EVANS, MRS. FARLEY, MR. LAFCADIO HEARN, MRS. JOHN LANE, MRS. NEWMARCH, MR. C. E. ROCHE, MISS WINIFRED STEPHENS, and MISS M. P. WILLCOCKS.

¶ As Anatole Thibault, *dit* Anatole France, is to most English readers merely a name, it will be well to state that he was born in 1844 in the picturesque and inspiring surroundings of an old bookshop on the Quai Voltaire, Paris, kept by his father, Monsieur Thibault, an authority on eighteenth-century history, from whom the boy caught the passion for the principles of the Revolution, while from his mother he was learning to love the ascetic ideals chronicled in the Lives of the Saints. He was schooled with the lovers of old books, missals and manuscripts; he matriculated on the Quais with the old Jewish dealers of curios and *objets d'art*; he graduated in the great university of life and experience. It will be recognised that all his work is permeated by his youthful impressions; he is, in fact, a virtuoso at large.

¶ He has written about thirty volumes of fiction. His first novel was JOCASTA & THE FAMISHED CAT (1879). THE CRIME OF SYLVESTRE BONNARD appeared in 1881, and had the distinction of being crowned by the French Academy, into which he was received in 1896.

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