# Illogical Geology

## The Weakest Point in The Evolution Theory


BY

GEORGE McCREADY PRICE

EDITOR OF "THE MODERN HERETIC," AND AUTHOR OF "OUTLINES OF MODERN SCIENCE AND MODERN CHRISTIANITY."



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"It is a singular and a notable fact, that while most other branches of science have emancipated themselves from the trammels of metaphysical reasoning, the science of geology still remains imprisoned in '*a priori*' theories."—*Sir Henry Howorth*: "*The Glacial Nightmare and the Flood.*" *Preface. VII.*



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# PART I

# PREFACE

This book is not written especially for geologists or other scientists as such, though it deals with the question which it discusses from a purely scientfic standpoint, and presupposes a good general knowledge of the rocks and of current theories. It is addressed rather to that large class of readers to whom geology is only an incident in larger problems, and who are not quite wholly satisfied with those explanations of the universe which are now commonly accepted on the testimony of biological science. I am free to say that my own conviction of the higher value and surer truth of other data outside of the biological sciences have always been given formative power in my own private opinions, and that in this way I have long held that there must be something wrong with the Evolution Theory, and also that there must be a surer way of gauging the value of that Theory, even from the scientific standpoint, than the long devious processes connected with Darwinism and biology. Some years ago, when compelled to investigate the subject more fully than I had hitherto done, I discovered, somewhat to my own surprise, the phenomenal weakness of the geological argument. The results of that investigation have grown into the present work.

Though mostly critical and analytic, it is not wholly so. But so far as it is constructive there is one virtue which can rightly be claimed for it. It is at least an honest effort to study the foundation facts of geology from the inductive standpoint, and whether or not I have succeeded in this, it is, so far as I know, the only work published in the English or any other language which does not treat the science of geology more or less as a cosmogony.

That such a statement is possible is, I think, my chief justification in giving it to the public. It would seem as if the twentieth century could afford at least one book built up from the present, instead of being postulated from the past.

GEORGE McCREADY PRICE.

257 South Hill Street,
Los Angeles, California,
June, 1906.

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## PART I



## PART II



# INTRODUCTION

A brief outline of the argument which I have used in the following pages will be in order here.

Darwinism, as a part, the chief part, of the general Evolution Theory, rests logically and historically on the succession of life idea as taught by geology. If there has actually been this succession of life on the globe, then some form of genetic connection between these successive types is the intuitive conclusion of every thinking mind. But if there is no positive evidence that certain types are essentially older than others, **if this succession of life is not an actual scientific fact,** then Darwinism or any other form of evolution has no more scientific value than the vagaries of the old Greeks—in short, from the standpoint of true inductive science it is a most gigantic hoax, historically scarce second to the Ptolemaic astronomy.

In Part One I have examined critically this succession of life theory. It is improper to speak of my argument as destructive, for there never was any real constructive argument to be thus destroyed. It is essentially **an exposure,** and I am willing to **give a thousand dollars** to any one who will, in the face of the facts here presented, show me **how to prove** that one kind of fossil is older than another.

In Part Two I have attempted to build up a true, safe induction in the candid, unprejudiced spirit of a coroner called upon to hold a *post mortem.* The abnormal character of most of the fossiliferous deposits, the sudden world-wide change of climate they record, the marked degeneration in all organic forms in passing from the older to the modern world, together with the great outstanding fact that human beings, with thousands of other living species of animals and plants have at this great world-crisis left their fossils in the rocks all over the world, prove beyond a possible doubt that our once magnificently stocked world met with a tremendous catastrophe some thousands of years ago, before the dawn of history. As for the **origin** of the living beings that existed before that event, we can only **suppose a direct creation,** since modern science knows nothing of the spontaneous generation of life; or of certain types of life having originated **before** other types, and thus being able to serve as **the source of origin** of other alleged succeeding types.

With the myth of a life succession dissipated once and for ever, the world stands face to face with creation as the direct act of the Infinite God.

# CHAPTER I.

## THE ABSTRACT IDEA

How many of us have ever tried to think out a statement of just how we would prove that there has been a succession of life on the globe in a particular order?

Herbert Spencer did* and he did not seem to think the way in which it is usually attempted a very praiseworthy example of the methods to be pursued in natural science.

He starts out with Werner, of Neptunian fame, and shows that the latter's main idea of the rocks always succeeding one another over the whole globe like the coats of an onion was "untenable if analyzed," and "physically absurd," for among other things it is incomprehensible that these very different kinds of rocks could have been precipitated one after another by the same "chaotic menstrum."

But he then proceeds to show that the science is "still swayed by the crude hypotheses it set out with; so that even now, old doctrines that are abandoned as untenable in theory, continue in practice to mould the ideas of geologists, and to foster sundry beliefs that are logically indefensible."

Werner had taken for his data the way in which the rocks happened to occur in "a narrow district of Germany," and had at once jumped to the conclusion that they must always occur in this relative order over the entire globe. "Thus on a very incomplete acquaintance with a thousandth part of the earth's crust, he based a sweeping generalization applying to the whole of it."

Werner classified the rocks according to their mineral characters, but when the fossils were taken as the prime test of age, the "original nomenclature of periods and formations" kept alive the original idea of complete envelopes encircling the whole globe one outside each other like the coats of an onion. So that now, instead of Werner's successive ages of sandstone making or limestone making, and successive suites of these rocks, we have successive ages of various types of life, with successive systems or "groups of formations which everywhere succeed each other in a given order; and are severally everywhere of the same age. Though it may not be asserted that these successive systems are universal, yet it seems to be tacitly assumed that they are so. . . . Though, probably, no competent geologist would contend that the European classification of strata is applicable to the globe as a whole; yet most, if not all geologists, write as though it were so."

Spencer then goes on to show how dogmatic and unscientific it is to say that when the Carboniferous flora, for example, existed in some localities, this type of life and this only must have enveloped the world.

"Now this belief," he says, "that geologic 'systems' are universal, is quite as untenable as the other. It is just as absurd when considered *a priori;* and it is equally inconsistent with the facts," for all such systems of similar life-forms must in olden time have been of merely "local origin,"

* "Illogical Geology; Illustrations of Universal Progress," pp. 329-380; D. Appleton & Co., 1890.

just as they are now. In other words, we have no scientific knowledge of a time in the past when there were not zoological provinces and zones as there are to-day, one type of life existing in one locality, while another and totally different type existed somewhere else.

Then, after quoting from Lyell a strong protest against the old fancy that only certain types of sandstone and marls were made at certain epochs, he proceeds:

"Nevertheless, while in this and numerous passages of like implication, Sir C. Lyell protests against the bias here illustrated, he seems himself not completely free from it. Though he utterly rejects the old hypothesis that all over the earth the same continuous strata lie upon each other in regular order, like the coats of an onion, he still writes as though geologic 'systems' do thus succeed each other. A reader of his 'Manual' would certainly suppose him to believe, that the Primary epoch ended, and the Secondary epoch commenced, all over the world at the same time. . . . **Must we not say that though the onion-coat hypothesis is dead, its spirit is traceable, under a transcendental form, even in the conclusions of its antagonists.**"

Spencer then examines at considerable length the kindred idea that the same or similar species "lived in all parts of the earth at the same time." "This theory," he says, "is scarcely more tenable than the other."

He then shows how in some localities there are now forming coral deposits, in some places chalk, and in others beds of Molluscs; while in still other places entirely different forms of life are existing. In fact, each zone or depth of the ocean has its particular type of life, just as successive altitudes do on the sides of a mountain; and it is a dogmatic and arbitrary assumption to say that such conditions have not existed in the past.

"On our own coasts, the marine remains found a few miles from shore, in banks where fish congregate, are different from those found close to the shore, where only littoral species flourish. A large proportion of aquatic creatures have structures that do not admit of fossilization; while of the rest, the great majority are destroyed, when dead, by the various kinds of scavengers that creep among the rocks and weeds. So that no one deposit near our shores can contain anything like a true representation of the fauna of the surrounding sea; must less of the co-existing faunas of other seas in the same latitude; and still less of the faunas of seas in distant latitudes. Were it not that the assertion seems needful, it would be almost absurd to say that the organic remains now being buried in the Dogger Bank can tell us next to nothing about the fish, crustaceans, mollusks, and corals that are now being buried in the Bay of Bengal."

This author evidently found it difficult to keep within the bounds of parliamentary language when speaking of the absurd and vicious reasoning at the very basis of the whole current geological theory; for, unlike the other physical sciences, the great leading ideas of geology are not generalizations framed from the whole series or group of observed facts, but are really abstract statements supposed to be reasonable in themselves, or at the most **very hasty conclusions based on wholly insufficient data**, like that of Werner in his "narrow district of Germany." Sir Henry Howorth* has well

* "The Glacial Nightmare and the Flood," Preface VII.



expressed the urgent need that there is of a complete reconstruction of geological theory:

"It is a singular and a notable fact, that while most other branches of science have emancipated themselves from the trammels of metaphysical reasoning, the science of geology still remains imprisoned in *a priori* theories."

But Huxley* also has left us some remarks along the same line which are almost equally helpful in showing the essential absurdity of the assumption that when one type of life was living and being buried in one locality another and very diverse type could not have been doing the same things in other distant localities.

This is how he expresses it:

"All competent authorities will probably assent to the proposition that physical geology does not enable us in any way to reply to this question—Were the British Cretaceous rocks deposited at the same time as those of India, or were they a million of years younger, or a million of years older?"

This phase of the idea, however, is not so bad, for the human mind refuses to believe that distant and disconnected groups of similar forms were not connected in time and genetic relationship. It is really the reverse of this proposition that contains the most essential absurdity, and this is the very phase that is most essential to the whole succession of life idea. Huxley, indeed, seems to have caught a glimpse of this truth, for he says:

"A Devonian fauna and flora in the British Islands may have been contemporaneous with Silurian life in North America, and with a Carboniferous fauna and flora in Africa. **Geographical provinces and zones may have been as distinctly marked in the Palaeozoic epoch as at present.**"

Certainly; but if this be true, it is equally certain that the Carboniferous flora of Pennsylvania may have been contemporaneous alike with the Cretaceous flora of British Columbia and the Tertiary flora of Germany and Australia. But in that case what becomes of this succession of life which for nearly a century has been the pole star of all the other biological sciences —I might almost say of the historical and theological as well?

Must it not be admitted that in any system of clear thinking this whole idea of there having really been a succession of life on the globe is not only not proved by scientific methods, but that it is essentially unprovable and absurd?

Huxley, in point of fact, admits this, though he goes right on with his scheme of evolution, just as if he never thought of the logical consequences involved. His words are:

"In the present condition of our knowledge and of our methods (*sic*) one verdict—'not proven and not provable'—must be recorded against all grand hypotheses of the palaeontologist respecting the general succession of life on the globe."

In view of these startling facts, is it not amazing to see the supernatural knowledge of the past continually and quietly assumed in every geological vision of the earth's history?

* "Discourses Biol. and Geol.," pp. 279-288.

# CHAPTER II.

## HISTORY OF THE IDEA

Among the few stray principles that the future will probably be able to save from the wreck of Spencer's philosophy, is the advisability of looking into the geneology of an idea. What has been its surroundings? What is its family history? Does it come of good stock, or is its family low and not very respectable?

This is especially true in the case of a scientific idea, which above all others needs to have a clean bill of health and a good family record. But, unfortunately, the idea we are here considering has a bad record, very bad in fact; for the whole family of Cosmogonies, of which this notion is the only surviving representative, were supposed to have been banished from the land of science long ago, and were all reported dead. Some of them had to be executed by popular ridicule, but most of them died natural deaths, the result of inherited taint, in the latter part of the eighteenth and early nineteenth centuries. It is perfectly astonishing how any of the family could have survived over into the twentieth century, in the face of such an antecedent record.

For one of the chief traits of the family as a whole is that of mental disorder of various stages and degrees. Some of them were raving crazy; others were mild and comparatively harmless, except that their drivel had such a disturbing effect on scientific investigations that they had to be put out of the way. It seems such a pity that when this last fellow, early in life, was up before Doctors Huxley and Spencer for examination, he was not locked up or put in limbo forthwith. This is especially unfortunate, because this survivor of an otherwise extinct race has since then produced a large family, some of which it is true have already expired, while the eldest son, Darwinism, was reported in 1901 to be "at its last gasp,"* and was even said last year to have had its "tombstone inscription" written by von Hartmann of Germany. But the succession of life idea itself, the father of all this brood, is still certified by those in authority to be healthy and *compos mentis*.

The Cosmogony Family is a very ancient one, running back to the time of Plato and Thales of Miletus. Indeed the cuneiform inscriptions of Babylonia seem to indicate that a tribe with very similar characteristics existed several millenniums before the Christian era. But discarding all these, the first men that we need to mention are perhaps Burnet and Whiston, who knew no other way of arriving at geological truth than to spin a yarn about how the world was made. Woodward seems to have had a little better sense, and is named along with Hooke and John Ray as one of the real founders of the science.

Unfortunately the brood of Cosmogonists was not dead, for Moro and De Maillet were at this same period spinning their fantastic theories about the origin of things; or as Zittel puts it, "accepted the risks of error, and

* Nature, Nov. 28, 1901, pp. 76, 77.



set about explaining the past and present from the subjective standpoint."* This tendency we will find to be a birthmark in the family, and will serve to invariably identify any of them wherever found. We must remember this, and apply the test to the modern survivors.

Buffon seems to have been really the founder of the family in the modern form. He is credited with the sarcastic remark that "geologists must feel like the ancient Roman augurs who could not meet each other without laughing;" though in view of his fantastic scheme of seven "epochs," in which he endeavors to portray "the beginning, the past, and the future (*sic*) of our planet," † one is reminded of the common symptom which manifests itself in thinking all the rest of the world crazy.

The "Heroic Age of Geology" succeeded this period, and was characterized largely by a determination to discard speculation, and to seek to build up a true science of actual fact and truth.

We have already seen from Spencer's remarks that A. G. Werner, who was, however, one of the leaders in Germany at this time, was very far from following true inductive methods. And the following language of Sir Arch. Geikie shows that in him the family characteristics were decidedly prominent:

"But never in the history of science did a stranger halucination arise than that of Werner and his school, when they supposed themselves to discard theory and build on a foundation of accurately-ascertained fact. Never was a system devised in which theory was more rampant; theory, too, unsupported by observation, and, as we now know, utterly erroneous. From beginning to end of Werner's method and its applications, assumptions were made for which there was no ground, and these assumptions were treated as demonstrable facts. The very point to be proved was taken for granted, and the geognosts, who boasted of their avoidance of speculation, were in reality among the most hopelessly speculative of all the generations that had tried to solve the problem of the theory of the earth."‡

In fact this author says that:

"The Wernerians were as certain of the origin and sequence of the rocks as if they had been present at the formation of the earth's crust." (pp. 288-9.)

Here we see the family characteristics very strongly developed.

In speaking of Werner's five successive "suites" or onion-coats in which he wrapped his embryo world, Zittel complains:

"Unfortunately, Werner's field observations were limited to a small district, the Erz mountains and the neighboring parts of Saxony and Bohemia. And his chronological scheme of formations was founded upon the mode of occurrence of the rocks within these narrow confines." (p. 59.)

And yet, as we have seen, it is precisely such a charge as this that Spencer and Huxley bring against the modern phase of the doctrine of successive ages based on the succession of life idea. Werner, from observations "limited to a small district," constructed his scheme of exact chronological sequence, basing it entirely upon the mineral or mechanical character

* "History of Geology," p. 23.
† Zittel, p. 42.
‡ "Founders of Geology," p. 112; Johns Hopkins Press, 1901.

of his "suites." And hundreds of enthusiastic followers long declared that the rocks everywhere conformed to this classification, even so great an observer as von Humboldt thinking that the rocks which he examined in Central and South America fully confirmed Werner's chronological arrangement.

But such notions to-day only cause a smile of pity, for it is now well known that, take the world over, the rocks do not occur as Werner imagined, though, as Geikie says, he and his disciples were as certain of the matter "as if they had been present at the formation of the earth's crust." Besides, as already pointed out, we moderns ought now to have pretty well assimilated the idea that while one kind of mineral or rock was forming in one locality, a totally different kind of deposit may have been in process of formation in another spot some distance off at the very same time, and we cannot imagine a time in the past when this principle would not hold good. But in a precisely similar way the idea of a time value was, as we shall see, transferred from the mechanical and mineral character of the rocks to their fossil contents; and from observations again "limited to a small district," William Smith and Cuvier conceived the idea that the fossils occurred only in a certain order; that only certain fossils lived at a certain time; that, for example, while Trilobites were living and dying in one locality, Numulites or Mammals positively were not living and dying in another locality, though in any system of clear thinking this latter notion is just as irrational as that of Werner. Hence Spencer is compelled to say, "though the onion-coat hypothesis is dead, its spirit is still traceable, under a transcendental form, even in the conclusions of its antagonists."

The two cases are exactly parallel; only it has taken us nearly a hundred years, it seems, to find out that the fossils do not follow the prearranged order of Smith and Cuvier any better than the rocks and minerals do the scheme of Werner. If hundreds of geologists still seem to think that the fossils in general agree with the standard order, we must remember how many sharp observers said the same thing for decades about Werner's scheme. The taint of heredity will always come out sooner or later; and both of these schemes exhibit very strongly the family history of the whole tribe of Cosmogonies, viz., the facts refuse to certify that they are of sound mind.

It was William Smith, an English land surveyor, who first conceived the idea of fixing the relative ages of strata by their fossils. Just how far he carried this idea it seems difficult to determine exactly. Lyell* says nothing along this line about him, save that he followed the leading divisions of the Secondary strata as outlined by Werner, though he claims "independently" of the latter. Whewell† remarks rather pityingly on his having had "no literary cultivation" in his youth, but has nothing about the degree in which he is responsible for the modern scheme of life succession of which many modern geologists have made him the "father." Geikie and Zittel are much more explicit. The former‡ says that "he had reached early in life the conclusions on which his fame rests, and he never advanced beyond them." "His plain, solid, matter-of-fact intellect never branched into theory

* "Principles," p. 50, 8th Ed.
† "History of the Inductive Sciences," vol. ii., p. 521.
‡ "Founders of Geology," pp. 237-8.



or speculation, but occupied itself wholly in the observation of facts." Zittel* says pretty much the same thing, remarking that "Smith confined himself to the empirical investigation of his country, and was never tempted into general speculations about the history of the formation of the earth"—words which to my mind are the very highest praise, for they seem to indicate that he was only in a very limited way responsible for the unscientific and illogical scheme of a "phylogenic series" or complete "life-history of the earth," which now passes as the science of geology. Doubtless like his little bright-eyed German contemporary, A. G. Werner, he had not had his imagination sufficiently cultivated in his youth to be able to appreciate the beauty of first assuming your premises and then proving them by means of your conclusion, i.e., first assuming that there has been a gradual development on the earth from the lowest to the highest, and then arranging the fossils from scattered localities over the earth in such a way that they cannot fail to testify to the fact.

The following may be taken as a fair statement of what he actually accomplished and taught:

"After his long period of field observations, William Smith came to the conclusion that one and the same succession of strata stretched through England from the south coast to the east, and that each individual horizon could be recognized by its particular fossils, that certain forms reappear in the same beds in the different localities, and that each fossil species belongs to a definite horizon of rock." †

But even granting the perfect accuracy of this generalization of Smith's for the rocks which he examined, I fail to see how it is any better than Werner's scheme, which Zittel characterizes as "weak" and premature, and of which Whewell (p. 521) says that "he promulgated, as respecting the world, a scheme collected from a province, and even too hastily gathered from that narrow field."

Quoting again from Zittel's criticism of Werner's work ("Hist. of Geology," p. 59), we must admit that Smith's observations also were "limited to a small district," and "his chronological scheme of formations was founded upon the mode of occurrence of the rocks (fossils) within these narrow confines." There is, as we have shown, a monstrous jump from this to the conclusion that even these particular fossils must always occur in this particular relative order over the whole earth. How can any one deny that if we had a complete collection of all the fossils laid down during the last thousand years—when all admit that the so-called "phylogenic series" is complete—particular fossils would in many cases be found to occur only in particular rocks, and we could still arrange them in this same order from the lowest to the highest forms of life, while we might even happen to find "small districts" where the "mode of occurrence of the rocks within these narrow confines" would have all the appearance of showing a true

* "History," p. 112.
† Zittel, "History," p. 110. It should be noted that all these rocks in England thus examined by Smith make up only a small fraction of the total geological series—largely what we now call the Jurassic and Cretaceous rocks.

"phylogenic" order. This of itself ought to be sufficient to show us the weakness of this subjective method of study, and the purely hypothetical and imaginary value of the fossils in determining the real age of a rock deposit.

The name of Baron Cuvier is the next that we have to consider. An examination of part of his teaching will come naturally a little later when considering "extinct species." That part of his work which related to the doctrine of Catastrophism is somewhat aside from the subject of our study; while with regard to his influence on the succession of life idea *per se* there is not very much that need be said. And yet Cuvier is the real founder of modern cosmological geology, and thus in a certain sense the father of biological evolution.

But if the absence of the architectonic mania for building a cosmogony will serve to remove in a great measure any suspicions with regard to William Smith's results, we cannot say the same for those of Cuvier. In his scheme the hereditary Cosmological taint, which is such an invariable characteristic of the family, is very strong, though disguised and almost transfigured by learning and genius. It is doubtless these latter qualities which have secured for the theory such a phenomenal length of life, though of course we know that nothing born of this whole brood can ever secure a permanent home in the kingdom of science.

"How glorious," wrote this otherwise truly great man in his famous "Preliminary Discourse," "it would be if we could arrange the organized products of the universe in their chronological order, as we can already (Werner's onion-coats) do with the more important mineral substances!"

His work (with that of his co-laborer Brongniart) on the fossils of the Paris basin was probably accurate and logical enough for that limited locality. It was only when he quietly assumed as Werner had done, that the rocks must always occur in this particular order all over the world, or as Whewell expresses it, "promulgated as respecting the world, a scheme collected from a province, and (perhaps) even too hastily gathered from that narrow field"—it was only, I say, when this monstrous assumption was incorporated into his scheme, and he began to call into being his vision of organic creation on the instalment plan, as Werner had done with the minerals, that his great and valuable work for science became tainted with the deadly Cosmological virus, dooming it to death sooner or later. Sherlock Holmes might attempt to diagnose a disease by a mere glance at his patient's boots, but even this gave him more data and was a more logical proceeding than the facts and methods of Cuvier supplied for constructing a scheme of organic creation.

It will not be necessary to detail the manner in which the modern "phylogenic series" was gradually pieced together from the scattered fragments here and there all over the globe; but it should be noted here that the whole chain of life was practically complete before any serious attempt was made to study the rocks on the top of the ground, and to find out how this marvellous record of the past joined on to the modern period, thus reversing completely the true inductive method, and leaving the most important of all, viz., the rocks containing human remains and other living



species, over till the last, with the result that we have for over half a century been laboring under a "Glacial Nightmare," and these deposits on the top of the ground "still remain in many respects the despair of geology."

Then came Lyell, Agassiz, and Darwin; and now in the light of the keen discussions instituted by Weismann in the later eighties of the last century, the modern world is pretty well agreed on two results, viz., that so far from natural selection being able to originate a species, it can't possibly originate anything at all, and also that no individual can transmit to his descendants what he has himself acquired in his lifetime, and hence it is hard to see how he can transmit what he has not got himself and what none of his ancestors ever had.

I have not the space to show how Agassiz further complicated the problem immensely by his absurdly illogical use of his three "laws" of comparison, when the prime fact of there ever having been a succession of life on the globe in any order whatever had never been proved; but I am free to say that if Cuvier's system of creation on the instalment plan had been fact instead of fancy, some scheme of evolution would undoubtedly be implied in this general fact. It is this instinctive feeling on the part of modern scientists which makes them to-day, while confessing the failure of Darwinism, still cling to the general idea of evolution somehow. Hence it seems quite evident that, having deviated from strict inductive methods by pursuing this *'ignis fatuus* of a cosmological history of creation, it was essential in the interests of true science to go the whole journey and make a complete investigation of the biological side of the question, in order to complete the demonstration that science was on a wrong tack entirely. Darwin and Weismann were inevitable in view of the wholly unscientific course on which biology entered under the guidance of Buffon and Cuvier.

What then can we take as the general lesson to be learned from the stubborn way in which, for over a hundred years, the world has followed this hypnotic suggestion of folly, that we might explain our genesis and being from the scientific standpoint? One of the lessons—there may be others—is that science knows nothing about origins, and that, in speculating along these lines, the cosmological taint will always vitiate the accuracy of our conclusions and debauch the true spirit of induction. A hundred years ago, they thought they knew all about how the world was made. The keen investigations inspired by Darwinism were necessary to convince us that we know nothing at all about it. Modern biology has simply developed a gigantic *reductio ad absurdum* argument against the easy assumptions of the earlier geologists that it occurred by a progression from the low to the high. A hundred years—nay fifty years ago—this assumption did not appear so unscientific, for we did not then have the biological evidence to refute such an idea. Now, however, in the light of the modern progress of science, this awful mystery of our existence, of our creation and destiny, is borne in upon us from every dividing cell, from every sprouting seed, from countless millions of the eloquent voices of nature, which our forefathers were too blind to see, too deaf to understand; and with weary, reluctant sadness does science confess that about it all she knows absolutely nothing.

# CHAPTER III

## FACT NUMBER ONE

Hitherto we have been dealing only with the *a priori* aspects of the succession of life idea. We have seen that it is really based on two primary assumptions, viz.:

(1) That over all the earth the fossils must always occur in the particular order in which they were found to occur in a few corners of Western Europe; and also—

(2) That in the long ago there were no such things as zoological provinces and zones, and totally different types of fossils from separated localities could not possibly have been contemporaneous with one another as we know they are today in "recent" deposits.*

On the blending of these two assumptions, the latter essentially absurd, and the former long ago disproved by the facts of the rocks, has been built up the towering structure of a complete "phylogenic series" from the Cambrian to the Pleistocene. The way in which, as we have been, Spencer and Huxley treated this subject, reminds us very much of the old advice, "When you meet with an insuperable difficulty, look it steadfastly in the face—and pass on." For neither they nor any of their thousands of followers have ever, so far as I know, pointed out the horrible logic in taking this immense complex of guesses and assumptions as the starting-point for new departures, the solid foundation for detailed "investigations" as to just how this wonderful phenomenon of development has occurred. For after Agassiz and his contemporaries had built on these large assumptions of Cuvier, and had arranged the details and the exact order of these successive forms by comparison with the embryonic life of the modern individual, the evolutionists of our time, led by such men as Spencer and Haeckel, with their "philogenetic principle," prove their theory of evolution by showing that the embryonic life of the individual is only "a brief recapitulation, as it were from memory," of the geological succession in time. There would really seem to be little hope of reaching with any arguments a generation of scientists who can elaborate geneological trees of descent for the different families and genera of the animal kingdom, based wholly on such a series of assumptions and blind guesses, and then palm off their work on a credulous world as the proved results of inductive science.

And yet I am tempted to make some effort in this direction. And since we have now examined the *a priori* aspects of the question, it remains to test the two above mentioned assumptions by the facts of the rocks. The second, indeed, involving as it does a profound supernatural knowledge of the past, and being so positively contrary to all that we know of the modern world as to seem essentially absurd, is yet by its very nature beyond the reach of any tests that we can bring to bear upon it. Hence it remains to

* The onion-coat hypothesis, which is the only other alternative, modern science professes to have abandoned.



test by the facts of the rocks the assumption that all over the earth the fossils invariably occur in the particular order in which they were first found in a few corners of Western Europe by the founders of the science. Have we already a sufficiently broad knowledge of the rocks of the world to decide such a question? I think we have.

To begin then at the beginning, let us try to find out how we can fix on the rocks which are absolutely the oldest on the globe. We would expect to find a good many patches of them here and there, but there must be some common characteristic by which they may be distinguished wherever found. Of course, when I say "rocks" here I mean fossils, for as has long been agreed upon by geologists, mineral and mechanical characters are of practically no use in determining the age of deposits, and we are here dealing only with life and the order in which it has occurred on the globe. Accordingly our problem is really to find that typical group of fossils which is essentially older than all dissimilar groups of fossils.

In most localities we do not have to go very far down* into the earth to find granite or other so-called igneous rocks, which not only do not contain any traces of fossils, but which we have no proper reason for supposing ever contained any. These Azoic or Archaean rocks constitute practically all the earth's crust, there being only a thin skim of fossiliferous strata on the outside somewhat like the skin on an apple. Now it would be natural enough to suppose that those fossils which occur at the bottom, or next to the Archaean, are the oldest. This is doubtless what the earlier geologists had in mind, or at least ought to have had, for it is not quite certain that they had any clear thoughts on the matter whatever. They did not really begin at the bottom, but half way up, so to speak, at the Mesozoic and Tertiary rocks, and Sedgwick and Murchison, who undertook to find bottom, got too excited over their Cambro-Silurian controversy to attend to such an insignificant detail as the logical proof that any type of fossils was really older than all others. If they had really stopped to consider that some type of fossil might occur next to the Archaean in Wales, and another type occur thus in Scotland, while still another type altogether might be found in this position in some other locality, and so on over the world, leading us to the very natural conclusion that in the olden times as now there were zoological provinces and districts, the history of science during the nineteenth century might have been very different, and this chapter might never have been written. But this commonplace of modern geology, that any type of fossil whatever, even the very "youngest," may occur next to the Archaean, was not then considered or understood; and when about 1856 it came to the recognized, other things were allowed to obscure its significance, and the habit of arranging the rocks in chronological order according to their fossils was too firmly established to be disturbed by such an idea.

* When the text-books speak of ten or twelve miles thickness of the fossiliferous rocks, the reader should remember how the rocks have to be patched up together from here and there to make this incredible thickness, as only a small fraction of such a thickness exists in any one place.

But the Fact Number One, which I have chosen as the subject of this chapter, is the now well established principle that **any kind of fossil whatever, even "young" Tertiary rocks, may rest upon the Archaean or Azoic series, or may themselves be almost wholly metamorphosed or crystalline, thus resembling in position and outward appearance the so-called "oldest" rocks.**

The first part of this proposition, about any rocks occurring next to the Archaean, is covered by the following quotation from Dana:*

"A stratum of one era may rest upon any stratum in the whole of the series below it,—the Coal-measures on either the Archaean, Silurian, or Devonian strata; and the Jurassic, Cretaceous, or Tertiary on any one of the earlier rocks, the intermediate being wanting. The Quaternary in America in some cases rests on Archaean rocks, in others on Silurian or Devonian, in others on Cretaceous or Tertiary."

It would be tedious to multiply testimony on a point so universally understood.

As for the other half of this fact, that even the so-called "youngest" rocks may be metamorphic and crystalline just as well as the "oldest," it also is now a recognized commonplace of science. Dana† says that as early as 1833 Lyell taught this as a general truth applicable to " all the formations from the earliest to the latest."

The first reference I can find to any disproof of this old fable of Werner's, that only certain kinds of rock are to be found next to the "Primitive" or Archaean, is in the observations of Studer and Beaumont in the Alps, (1826-28), who found "relatively young" fossils in crystalline schists, which, as Zittel says, "was a very great blow to the geologists who upheld the hypothesis of the Archaean or pre-Cambrian age of all gneisses and schists."

James Geikie, doubtless referring to the same series of rocks, tells us that:—

"In the central Alps of Switzerland, some of the Eocene strata are so highly metamorphosed that they closely resemble some of the most ancient deposits of the globe, consisting, as they do, of crystalline rocks, marble, quartz-rock, mica schist, and gneiss."‡

Hence we need not be surprised at the following statement of the situation by Zittel.§

"The last fifteen years of the nineteenth century witnessed very great advances in our knowledge of rock-deformation and metamorphism. **It has been found that there is no geological epoch whose sedimentary deposits have been wholly safeguarded from metamorphic changes,** and, as this broad fact has come to be realized, it has proved most unsettling, and has necessitated a revision of the stratigraphy of many districts in the light of new possibilities. The newer researches scarcely recognize any theory; they are directed rather to the empyrical method of obtaining all possible information regarding microscopic and field evidences of the passage from

*"Manual," p. 399, Fourth Ed.
†"Manual," p. 408.
‡"Manual of Historical Geol., p. 74.
§"Hist." p. 360.



metamorphic to igneous rocks, and from metamorphic to sedimentary rocks."

But in addition to what Zittel means by recognizing "no theory" as to the origin of the various sorts of "igneous" rocks, it seems to me that this "broad fact" ought surely to prove "most unsettling," to the traditional theories about certain fossils being intrinsically older than others. With our minds divested of all prejudice, and this "broad" Fact Number One well comprehended, that any kind of fossil whatever may occur next to the Archaean, and the rocky strata containing it may in texture and appearance "closely resemble some of the most ancient deposits on the globe," **where** on this broad earth shall we look for the place **to start** our life-succession? That is, where can we now go to find those kinds of fossils which we can prove, by independent arguments, to be absolutely older than all others? It may seem very difficult for some of us to discard a theory so long an integral part of all geology; but until it can be proved that this "broad fact" as stated by Zittel and Dana is no fact at all, I see no escape from the acknowledgment that the doctrine of any particular fossils being essentially older than others is a pure invention, with absolutely nothing in nature to support it.

Or, to state the matter in another way, since the life succession theory rests logically and historically on Werner's notion that only certain kinds of rocks (fossils) are to be found at the "bottom" or next to the Archaean, and it is now acknowledged everywhere that any kind of rocks whatever may be thus situated, it is as clear as sunlight that the life succession theory rests logically and historically on a myth, and that there is **no way of proving what kind of fossil was buried first.**

Of course, the reason the followers of Cuvier and his life succession now find themselves in such a fix as this is because they have not been following true inductive methods. Theirs has been a geology by hypothesis instead of by observed fact. They started out with a pretty scheme ready-made about the origin and formation of the world, perfectly innocent of any evil intent in such a method of procedure, and unconscious of its speculative character; and for nearly a hundred years they have supposed that they were following inductive methods in Geology. But in view of what we have now learned I think we are perfectly justified in adapting and applying to Cuvier and the modern school of geologists what Geikie* says about Werner and his school:

"But never in the history of science did a stranger hallucination arise than that of Cuvier and the modern school, when they supposed themselves to discard theory and build on a foundation of accurately ascertained fact. Never was a system devised in which theory was more rampant; theory, too, unsupported by observation, and, as we now know, utterly erroneous. From beginning to end of Cuvier's method and its applications, assumptions were made for which there was no ground, and these assumptions were treated as demonstrable facts. The very point to be proved was taken for granted, and the evolutionary geologists who boasted of their avoidance of speculation, were in reality among the most hopelessly speculative of all the generations that had tried to solve the problem of the theory of the earth."

*"Founders of Geology," p. 112.

# CHAPTER IV

# FACT NUMBER TWO

If we had ample evidence that a certain man was personally acquainted with Julius Caesar, that they were born in the same town, went to school toegther, served in the same wars, and later carried on an extensive mutual correspondence, would we not conclude that they must have lived in the same age of the world's history? I confess that the conclusion seems quite unavoidable. Who would dream that eighteen centuries or more had separated the two lives, and that while one was an old Roman the other was an American of the latter nineteenth century?

Some such a puzzle as this is presented in geology under the general subject of **conformability.** Let me define this term.

Strata laid down by water are in the first place in a horizontal position. Some subsequent force may have disturbed them, so that we may now find them standing up on edge like books in a library. But all human experience goes to show that they were not deposited in this position. Some disturbing cause must have taken hold of them since they were laid down, for the water in which they were made must have spread them out smooth and horizontal, each subsequent layer or stratum fitting "like a glove" on the preceeding. Thus when we find two successive layers agreeing with one another in their planes of bedding, with every indication that the lower one was not disturbed in any way before the upper one was spread out upon it, the two are said to be **conformable.** But if the lower bed has evidently been upturned or disturbed before the other was laid down, or if its surface has even been partly eroded or washed away by the water, the strata are said to be **unconformable,** or they show **unconformability** in bedding.

Of course, in all this we are dealing only with **relative** time. When we find one bed or stratum lying above another in their natural position, the lower one is of course the older of the two; but whether laid down ten minutes earlier, or ten million years earlier, how are we to determine? Ignoring the matter of the fossils they contain, must we not own that, though there is no way of telling just how much longer the lower one was deposited before the next succeeding, yet if the two are **conformable** to one another, and the bottom one shows no evidence of disturbance or erosion before the other was fitted upon it, the strong presumption would seem to be that no great length of time could have elapsed between the laying down of the two layers. To say that we have here a geological example similar to that of a modern American having been personally acquainted with Julius Caesar, would seem to be quite "inexplicable," as Herbert Spencer used to say.

But if the life succession theory be true, we have just such a conundrum in our Fact Number Two, which is that **any formation whatever may rest conformably upon any other "older" formation.**

The lower may be Devonian, Silurian, or Cambrian, and the upper one



Cretaceous or Tertiary, and thus according to the theory millions on millions of years must have elapsed after the first, and before the following bed was laid down, but the conformability is perfect, and the beds have all the appearance of having followed in quick succession. Sometimes, too, though less frequently, these age-separated formations are lithologically the same, and can only be separated by their fossils!

But before going into the minute description of any of these cases, we must notice some general statements. Thus as long ago as the date of the publication of "The Origin of Species," Darwin, in speaking of the "Imperfection of the Geological Record," could speak of "The many cases on record of a formation conformably covered, after an immense interval of time, by another and later formation, without the underlying bed having suffered in the interval by any wear and tear."*

Also Geikie,† in speaking of how "fossil evidence may be made to prove the existence of gaps which are not otherwise apparent," says that "It is not so easy to give a satisfactory account of those which occur where the strata are strictly conformable, and where no evidence can be observed of any considerable change of physical conditions at the time of deposit. A group of quite conformable strata having the same general lithological characters throughout, may be marked by a great discrepance between the fossils of the upper and the lower part." In many cases he says these conditions are "not merely local, but persistent over wide areas. . . . They occur abundantly among the European Palaeozoic and Secondary rocks," and are "traceable over wide regions."

We have seen how Dana admits that "A stratum of one era may rest upon any stratum in the whole series below it, . . . the intermediate being wanting." He classes this under the head of the **"Difficulties"** of the science, quite naturally as it would seem, though he does not expressly assert that these age-separated formations are often **conformable** to one another, as Geikie and Darwin have said in the above given quotations.

The literature really teems with illustrations of these facts, and the more detailed accounts contained in the various Geological Reports are often quite charmingly *naive* in their description of the conditions. Two examples, however, must suffice, both from the Canadian North West.

The first is from the Report on the region about Banff, in Alberta, near the line of the Canadian Pacific Railway, and just east of the Rockies.

"East of the main divide the Lower Carboniferous is overlaid in places by beds of Lower Cretaceous age, and here again, although the two formations differ so widely in respect to age, one overlies the other without any perceptible break, and the separation of one from the other is rendered more difficult by the fact that the upper beds of the Carboniferous **are lithologically almost precisely like those of the Cretaceous (above them.) Were it not for fossil evidence, one would naturally suppose that a single formation was being dealt with."**‡

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* "Origin," Vol. II., p. 58: Sixth Ed. The first edition, I believe, contains the same language.

† "Text-Book," p. 842.

‡ Canadian "Annual Report," New Series, Vol. II., Part A, p. 8.

The other example is from the District of Athabasca.

"The Devonian limestone is apparently succeeded conformably by the Cretaceous, and with the possible exception of a thin bed of conglomerate of limited extent, which occurs below Crooked Rapid on the Athabasca, the age of which is doubtful, **the vast interval of time** which separated the two formations, is, so far as observed, **unrepresented** either by deposition or erosion."*

Of course, some geological writers labor to explain this thundering rebuke of their theory, just as the Ptolemaic astronomers had their "deferrents" and "epicycles" for every new difficulty. But surely the detailed records of such observations as these are fearful examples of the power of tradition to blind the minds of investigators to the meaning of the very plainest facts.

On a previous page (Id. p. 51), the author last quoted gives us some idea of the "remarkable persistence" of this instructive case of conformability, which extends from the Athabasca "in a broad band around the southern end of Birch Mountains, and across Lake Claire to Peace River, and up the latter stream to a point two miles above Vermillion Falls."

The distance, as I judge from the map, can not be less than 150 miles in a straight direction, thus making a district of probably several thousand square miles in extent where, according to the theory of a life succession, nature must have put an injunction on the action of the elements, and they had to continue in the *status quo* for millions of ages, or from the Devonian to the Cretaceous "age," the water neither wearing away nor building up over any part of this consecrated ground during all this time.

Nor is this all, for from Part E, Report (p. 209) of this same volume, we are told of strata near Lake Manitoba, **over 500 miles away,** in almost the same wonderful relationship,—"Devonian rocks very similar in character" to those in Athabasca still overlaid directly by the Cretaceous, though in this case as it happens "unconformably." It would almost seem to be a *bona fide* case of Werner's onion coats cropping out.

And all this incredible picture of nature's inconsistent behaviour in past ages is necessitated solely by the loving allegiance with which the infallibility of the life succession theory is regarded by modern geologists.

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* "Annual Report," New Series, Vol. V., Part D, p. 52.

# CHAPTER V

## TURNED UPSIDE DOWN

How many of us have ever seen a mountain fall? Not very many. And yet events even more wonderful than this have frequently occurred in the past, as we are confidently assured by the leaders in geological science. Thus, in speaking of a certain region in the Alps, Dana* says that "one of the overthrust folds has put the beds upside down over an area of 450 square miles."

It is well worth our while to try to understand this statement. Our first and most natural inquiry is, What is it that leads scientists to think so? The details of this particular case are not very accessible, and so we are driven to reasoning from analogy from the known methods and constructions employed in this science. We must agree that none of the authorities who report this circumstance can testify as eye-witnesses of this marvellous event: they were not there on the spot when old Mother Earth turned this huge calcareous and silicious pancake. And yet there must be some kind of evidence by which these eminent men have arrived at this conclusion. What kind of evidence can it be?

We cannot imagine any physical evidence which could even remotely suggest such an idea. In fact from the universal custom of making the contained fossils the supreme test of the age of a rock deposit, we are perfectly safe in concluding that it is **solely because the fossils occur here in the reverse of the accepted order,** that we have this astounding picture of an immense mountain mass having been put "upside down over an area of 450 square miles." The "older" fossils are evidently here on top, while the "younger" ones are underneath, and of course some explanation must be given of this flat contradiction of the life succession theory.

But let us retrace our steps somewhat, and pick up the thread of our argument. We have already found quite serious reason to question the accuracy of this life succession theory: but there is still another way of testing its rationality. If certain fossils are not necessarily older than certain others, it might reasonably be expected that we would now and then find them reversed as to position, i. e., with the "younger" below and the "older" above. Accordingly we have the following very necessary caution from Prof. Nicholson:†

"It may even be said that in any case where there should appear to be a clear and decisive discordance between the physical and the palaeontological (fossil) evidence as to the age of a given series of beds, it is the former that is to be distrusted rather than the latter."

To meet all ordinary cases of this character, where the differences involve only a few formations representing a few "ages" or a few million years, the theory of pioneer "colonies" was invented by Barrande in 1852.

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* "Manual," p. 307.
† "Ancient Life-History of the Earth," p. 40.

But for extreme cases, say where Silurian or Cambrian fossils occur above Jurassic, Cretaceous or Tertiary, there is in such a predicament always an anxious search made for faults and displacements; or gigantic "thrust-faults" or "overthrust folds," like the example already quoted from Dana, are described in picturesque language, many miles in extent—inventions which, as I have already suggested of a similar expedient to explain away evidence, deserve to rank with the famous "epicycles" of Ptolemy, and will do so some day.

Here is Geikie's highly instructive statement regarding the same conditions:—

"We may even demonstrate that in some mountainous ground, the strata have been turned completely upside down, *if* we can show that the fossils in what are now the uppermost layers ought properly to lie underneath those in the beds below them."*

Some day, I fancy, a statement like this will be regarded as a literary curiosity.

There are plenty of examples under this head, though two or three ought to be as good as a dozen. In the part of Alberta east of the Rockies already referred to, is a section of country of about fourteen square miles at least—and we know not how much more—where Cambrian fossils are found above Cretaceous, and the inevitable "thrust fault" is thus described by one of the officers of the Canadian Geological Survey. He has just been speaking of "a series" of these "gigantic thrust faults":—

"One of the largest and most important of these occurs along the eastern base of the chain, and brings the Cambrian limestones of the Castle Mountain group over the Cretaceous of the foot hills. This fault has a vertical displacement of more than 15,000 feet (? three miles), and an estimated horizontal displacement of the Cambrian beds of about seven miles in an easterly section. The actually observed overlap amounts to nearly two miles. The angle of inclination of its plane to the horizon is very low, and in consequence of this its outcrop follows a very sinuous line along the base of the mountains, and acts exactly like the line of contact of two nearly horizontal formations.

"The best places for examining this fault are at the gaps of the Bow and of the south fork of the Ghost River. At the former place the Cretaceous shales form the floor of the bay which the Bow has cut in the eastern wall of the range, and rise to a considerable height in the surrounding slopes. Their line of contact with the massive gray limestones of the overlying Castle Mountain group is well seen near the entrance of the gap in the hills to the north. The fault plane here is nearly horizontal, and the two formations, viewed from the valley, appear to succeed one another conformably."†

But what an amazing condition of affairs is this. Here are great mountainous masses of rock, very similar in mechanical and mineral make-up to thousands of examples elsewhere. The line of bedding between them

* "Text-Book," p. 837, Ed. of 1903.

† "Annual Report," New Series, Vol. II., Part D, pp. 33-34.



"acts exactly like the line of contact of two nearly horizontal formations," and in a natural section cut out by a river the two "appear to succeed one another conformably." And yet we are asked to believe that all this is merely an optical illusion. The rocks could not possibly have been deposited in this way, for the lower ones contain "Benton fossils" (Cretaceous), and the upper ones are Cambrian, and almost the whole geological series and untold millions of years occurred after the upper one, and before the lower one was formed. Solely on the strength of the infallibility of a theory invented a hundred years ago in a little corner of Western Europe, which "promulgated, as respecting the world, a scheme collected from that province," and assumed that over all the world the rocks must always follow the order there observed, we are here asked to deny the positive evidence of our senses because these rocks do not follow this accepted order. I must confess that I cannot see the force of such a method of reasoning. It is carrying the argument several degrees beyond the reasoning of the three little green peas in the little green pod, as narrated in the exquisite fable of Eugene Field. These wise little fellows noticed that their little world was all green, and they themselves green likewise, and they shrewdly concluded from this that the whole universe must also be green. But we are not told of their travelling abroad and persisting in a systematic attempt to explain all subsequently observed facts in terms of their theory.

This government Report last quoted from says that in the eastern part of Tennessee the Appalachian Chain "presents an almost identical structure," and refers to a similar state of things in the Highlands of Scotland. Dana, in the last edition of his "Manual" (p. 359), refers to this report, and reproduces some of its plates showing some of the structures referred to; and on another page, in speaking of this similar example in Scotland, says that "a mass of the oldest crystalline rocks, many miles in length from north to south, was thrust at least ten miles westward over younger rocks, part of the latter fossiliferous"; and further declares that "the thrust planes look like planes of bedding, and were long so considered."*

Geikie quite naturally devotes several pages in his "Text-Book" to a description of these conditions in the Highlands; but from one of his first reports on these observations, published in *Nature*† we get some much more suggestive details. The thrust-planes, he says, are difficult to be "distinguished from ordinary stratification planes, like which they have been plicated, faulted, and denuded. Here and there, as a result of denudation, a portion of one of them appears capping a hill-top. One almost refuses to believe that the little outlier on the summit does not lie normally on the rocks below it, but on a nearly horizontal fault by which it has been moved into its place."

Speaking of some similar conditions in Ross Shire, which he himself had previously described as naturally conformable, he declares:—

"Had these sections been planned for the purpose of deception they could not have been more skillfully devised . . . and no one coming first to this ground would suspect that what appears to be a normal stratigraphical sequence is not really so."

* pp. 111, 534.

† Nov. 13, 1884, pp. 29-35.

"When a geologist finds" things in this condition, he says, "he may be excused if he begins to wonder whether he himself is not really standing on his head."

But I would only weary the reader by attempting to pursue this subject further. Those who wish to do so will find many additional examples in the larger works of Dana, Le Conte, Prestwich, and Geikie, to say nothing of the more detailed statements buried in numerous Government Reports and spcial monographs in German and French.

From the very same set of beds different observers try to explain these puzzles in very different ways. Some, like Heim, will describe gigantic over-thrust folds, and will draw immense arcs of circles several miles high in the air, as the place where the rocks must once have been. Others, like Rothpletz, from an examination of the very same rocks, will cut the mountain up into sections with imaginary fault-planes, and will tell how, in the district about Glarus for example, an enormous mass of mountains "travelled from east to west a distance of about twenty-five miles from the Rhine valley to the Linth," or how the "Rhatikon Mountain mass travelled from Montafon valley to the Rhine valley, about nineteen miles from east to west."*

With regard to some at least of these conditions in the Alps, Geikie virtually admits that these incredible and self-contradictory earth-movements are necessitated by and described from fossil evidence only, for he says:—

" . . . the strata could scarcely be supposed to have been really inverted, save for the evidence (*sic*) as to their true order of succession supplied by their included fossils." " . . . portions of Carboniferous strata appear as if regularly interbedded among Jurassic rocks, and indeed could not be separated save after a study of their enclosed organic remains."†

In fact, we are perfectly safe in concluding in all similar cases that we may encounter in the literature of the science that it is the reversed order of the fossils which constitutes the whole evidence; for, as I have said, we can imagine no possible physical evidence competent to form a foundation for such ideas, nor do I know of anything save the exigencies of this venerable theory of life succession, for which otherwise competent observers will thus freely sacrifice their common sense. When the dividing line between two sets of strata "acts exactly like the line of contact between two nearly horizontal formations," so much so that in a natural section cut out by a river the two "appear to succeed one another conformably," a calm judicial mind, divested of all theoretical prejudice, instead of talking about these conditions having been planned by nature "for the purpose of deception," will find no difficulty at all in believing that these rocks were really laid down in the reverse order in which we now find them, with the "younger" below and the "older" above, and only one under the hypnotic spell of a pre-conceived theory would at the suggestion of such a fact begin "to wonder whether he himself is not really standing on his head."

* See *Nature*, Jan. 24, 1901, p. 294.

†"Text-Book," p. 678.

# CHAPTER VI

## FACT NUMBER FOUR

There is only one class of agents now working upon the rocks of the globe which have been in business continuously ever since the dry land appeared, and which have left us a legible record of approximately the amount of business they have been doing all these centuries. And my Fact Number Four, which will complete this line of argument in illustrating the antagonism between the facts of the rocks and the theory of life succession, is that the rivers of the world, which of course are the agents to which I have referred, in traveling across the country, act precisely as if they knew nothing of the varying ages of the rocks, but on the contrary treat them all alike as if they were of the same age, and as if they began sawing at them all at the same time. Of course it is, evidently, in only a few cases where the records are so free from ambiguity as to be quite incapable of being misunderstood, that is, the cases of rivers with steep rocky gorges, or those that cut through mountain ranges; but there are several such rivers in the world, and they all seem to tell the same story.

The famous Colorado River is a good example. It flows from "younger" strata into "older" in its deep cutting across the Arizona plateau.* Stated in terms of the current theory, this means that when the region of country about the lower part of this river's course first became dry land, the upper part was still sea, and that thus there was no such river in existence here until the very "youngest" of these rocks was formed. For otherwise the river must have started running from the sea toward the dry land, i.e., running up hill. Stated in terms neutral as to theory, it means that the whole of this region of country, drained by this large river, with its rocks of many varying "ages," was all elevated practically as it is now before this river began its work of erosion. It treats all these rocks as if they were of the same age, and as if it began sawing at them all at the same time.

Also its companion, the Green River, cuts through the Uinta Range in the same manner. Similar conditions are said to occur on the Danube, and in the river-courses of the Himalayas, and elsewhere.

In the case of the Colorado, Zittel says that:

"Powell's explanation of the apparent enigma is that after the river had eroded its channel rocks were uplifted in one portion of its course, but so slow was the rate of uplift that the river was enabled to deepen its channel, either proportionately or more rapidly, so that it was never diverted from its former course."

It was by similarly cunning inventions that the early writers on astronomy, alchemy, and medicine evaded the force of accumulated facts which told against their absurd theories.

We have now completed our survey of the strictly stratigraphical phases of this question, and have found four very remarkable principles about the rocks, which I wish to summarize here before proceeding further.

*See Zittel, "History of Geol," pp. 210, 211.

(1) The "broad fact," as stated by Zittel and Dana, that any kind of rocks whatever, i.e. containing any kinds of fossils, even the "youngest," may rest on the Archaean, and may thus in position, as also in texture and appearance, resemble the very oldest deposits on the globe.

(2) That any kind of beds may rest in such perfect conformability on any other so-called "older" beds over vast stretches of country that, "were it not for fossil evidence, one would naturally suppose that a single formation was being dealt with," while "the vast interval of time intervening is unrepresented either by deposition or erosion." The youngest seem to have followed the oldest in quick succession.

(3) That in very many cases and over many square miles of country these conditions are exactly reversed, and such very "ancient" rocks as Cambrian limestones are on top of the comparatively "young" Cretaceous, while the lime between them "acts exactly like the line of contact of two nearly horizontal formations," and in a natural section made by a river the two "appear to succeed one another conformably." To any one ignorant of the theory of life succession they have every appearance of having been deposited as we find them.

(4) That the rivers of the world, in cutting across the country, completely ignore the varying ages of the rocks in the different parts of their courses, and act precisely as if they began sawing at them all at the same time.

Now I know not what additional fact can be demanded or imagined to complete the demonstration that there is **no particular order** in which the fossils can be said to occur as regards succession in time. It is true, some fossiliferous deposits, metamorphosed almost beyond recognition, and buried deep beneath thousands of feet of subsequent deposits, have enough appearance of remote antiquity about them in all conscience. But to increase this antiquity by saying that other equally prodigious masses of rocks elsewhere were deposited long after these, or by pointing to still other deposits in another region which are said to be older than any of the others, is an illogical and wholly unscientific procedure. I fear I could scarcely confine myself within the bounds of parliamentary language were I to attempt to express an opinion regarding any effort that may now be made to justify the life succession theory in view of the above acknowledged facts.

And surely it is scarcely necessary in this enlightened age to point out how completely this vitiates any biological argument (such as that of Darwinism) which has incorporated into its system the results of such illogical reasoning, or which in any way is dependent upon the conclusions of such a theory of geology. In view of the laws of evidence, which every intelligent person is supposed to understand now-a-days, surely some strange things passed for scientific proof during the nineteenth century. For, as we have seen, the earlier geologists did little better than **assume** the succession of life bodily; than Agassiz and his contemporaries **arranged the details** and the exact order of these successive life forms by comparison with the embryonic life of the modern individual; and now the evolutionists of our day, led by such men as Spencer and Haeckel with their "phylogenetic principle," **prove their theory of evolution** by showing that the embryonic life of the



modern individual is only "a brief recapitulation, as it were, from memory," of the (assumed) geological succession in time. Surely this will some day make a more amazing record for posterity than those of phlogiston or the epicycles of Ptolemy.

If I am now asked: What do the rocks have to tell us, in view of the fact that they refuse to testify to a life succession? I can only say that we are not as yet in a position to decide this question. There are several other matters connected with the character and mode of occurrence of the fossils, which are almost equally important with anything already considered, in forming a true scientific induction regarding this matter. These facts must be considered in subsequent chapters. Already, however, we can say this much, that we have in the rocks almost as complete a world, in some respects vastly more complete, than the living world of to-day. With the life succession theory repudiated, we have still to deal with the fossils themselves which have been thus systematically classified; **but this geological series becomes only the taxonomic or classification series of an older state of our present world,** buried somehow and at some time or times in the remote past—the how and the when of which we have not as yet the means to determine.

But I think we are now prepared to enter the mazes of the biological argument, and to study the subject of extinct species, which by many is supposed to furnish a line of independent evidence in favor of the life succession theory.

# CHAPTER VII

## EXTINCT SPECIES

Let us now test the value of this assumed life succession by another very simple question. In "Eocene times," so we are told, England was a land of palms, with a semi-tropical flora and fauna. In fact at this time, cycads, gourds, proteads (like the Australian shrubs and trees), the fig, cinnamon, screw-pine, and various species of acacias and palms, abounded in England and Western Europe; while turtles, monkeys, crocodiles, and other sub-tropical and warm-temperate forms were equally abundant. Then again, in the Pleistocene deposits of the same countries, we find various species of elephant and rhinoceros, with a hippopotamus, lion, and hyena, identical with species now living in the tropics, "although," as Dana says, "these modern kinds are dwarfs in comparison."

**Now, how are we to prove that these various forms of animal life did not exist together in these countries at the same time as the trees and plants before mentioned?**

Lions and monkys, hippopotami and crocodiles, with elephants, hyenas, and rhinoceroces, now live beneath the palms, mimosas, acacias, and other tropical plants represented in the Eocene and Miocene beds. What is there to hinder us from believing that they all lived there together in that olden time? Surely it would be the very irony of scientific fate if forms now so closely connected in life should in death be so divided. Or, to present it in another form, why should we be asked to believe that these acacias, cinnamons, palms, etc., lived and died ages or millions of years before the lions, elephants, rhinoceroses and hippopotami, came into existence to enjoy their shade; and then, after these unnumbered ages had dragged their slow length along and vanished into the dim past, and all these semitropical plants had shifted to the tropics or been turned into lignite, these lions, elephants, and hippopotami came into existence in these same localities, when no such plants existed anywhere in Europe?

Surely we ought to expect some pretty substantial evidence for such a violation of "the observed uniformity of nature." We generally boast that we have outgrown the crude ideas of the earlier years of the science when they spoke of "ages" of limestone making or of sandstone making; but it seems that some of us have not yet attained to that broad view of the essential unity of nature in which the flora and fauna of our world are seen to be just as indissolubly connected with each other. But nature could as easily be persuaded to produce for a whole age nothing in the way of rock but limestone or conglomerate, as to adjust her powers to such an unbalanced state of affairs as is spoken of above, with the animals in one age and the complementary plants in another.

But in considering this question as to why the Eocene plants and the Pleistocene animals may not be supposed to have lived contemporaneously together, we are brought face to face with the second supposed argument in favor of there having been a succession of life on the globe. The answer



given is that all the animals of these "early" Tertiary beds are extinct species, also very many of the plants; while the hyena, lion, hippopotamus, etc., of the Pleistocene are identical with the living species, and even the mammoth is so closely like its nearest surviving relative, the Asiatic elephant (*E. indicus*), that these also might be classed as identical.*

This point being considered by many as so important, and having such a vital connection with the whole life succession theory, we must go into the matter somewhat in detail, even at the risk of appearing rather technical to some.

If the Palæozoic and Mesozoic strata are often of enormous extent, spreading in vast sheets over wide regions, so that their stratigraphical order in any particular district is quite readily made out, it is in most cases altogether different with the Tertiary and Pleistocene deposits. For these resemble one another so much in everything except their fossils, and occur so generally in detached and fragmentary beds, holding no stratigraphical relation to one another, that Lyell devised the plan of distinguishing them from one another and arranging them in the accustomed order of successive ages, by their relative percentages of living and extinct mollusca. With only unimportant changes, Lyell's divisions are still followed in classifying off the Tertiary and post-Tertiary beds. Those with all the species extinct, or less than 5 per cent. living, are classed as Eocene; those containing few extinct forms, or nearly all living species, are classed as Pleistocene or post-Tertiary. The Miocene and Pliocene represent the intermediate grades, and all are supposed to be a true chronological order. It goes without saying that in actual practice it is often so extremely difficult to adjust these differences that beds are assigned to an "early" or a "late" division on general principles by what the literary critics would call "tact" or "intuition," rather than by the strict percentage system, though for these large and important divisions of Tertiary and post-Tertiary rocks, these are absolutely the only professed grounds on which the subdivisions are distinguished and arranged in the customary order of time.

In the words of Dr. David Page:

"As there is often no perceptible mineral distinction between many clays, sands and gravels, it is only by their imbedded fossils that geologists can determine their Tertiary or post-Tertiary character."†

Now to say that a set of beds, ninety-five per cent. of whose fossils belong to extinct species, and only five per cent. are now living, must be vastly older than another set where these percentages are reversed, i.e. where the species are nearly all living, seems at first thought an eminently reasonable idea, and we immediately begin to imagine the long ages it must have taken for these exceedingly numerous and apparently vigorous species to wear out and become extinct in the alleged ordinary way by the merciless struggle for existence with forms more fitted to survive.

But it is hardly necessary to point out that all this is based on the assumption of Uniformity in its most extreme type, a doctrine which not only denies that these living forms are merely the lucky survivors of tremendous

*See p. 39 of this volume.
†"Intro. Text-Book," p. 189.

changes in which their contemporaries perished, but which in essence is taking for granted beforehand the very point which ought to be the chief aim of all geological inquiry, viz., How did the geological changes take place? It would not be considered a very scientific procedure for a coroner, called upon to hold a *post mortem*, to content himself with interesting statistics about the percentage of people who die of old age, fever, and other causes, while there was clear and decisive evidence that the poor fellow had been shot. In this case, as in geology, it is not merely the result that is wrong, but the whole method of investigation. For, as in the latter case we don't want to know how people generally die, but how this particular person actually did die, so, in our study of geology, we do not wish to know merely the rate at which changes of surface and extinctions of species are now going on, and then project this measure backward into the past as an infallible guide, but we wish to know for sure just what changes of this nature have taken place. A true induction is, I think, capable of deciding very positively whether or not the tools of nature have always worked at the same rate and with the same force as at present; and this method of arranging the fossils in supposed chronological order on the percentage basis mentioned above, is only an extreme form of methods claiming to be inductive which in this age of the world ought to be considered a shame and a disgrace, because, as Howorth says, they are based, "not upon induction, but upon hypotheses," and have "all the infirmity of the science of the Middle Ages."

Then again, it occurs to us, that this method, of attaching a time-value to percentages of extinct or living species, would make the sub-fossil remains of the bison on the Western prairies almost infinitely older than those of the lion, hippopotamus, etc., in the Pleistocene beds of Europe; for (except for some few specimens artificially preserved, and which may be ignored in this connection) the bison is today absolutely extinct, while the Pleistocene mammals are found by the thousand in the proper localities and show no signs of surrender in the struggle for existence. Similar comparisons might be made between the great wingless birds of Madagascar, Mauritius and New Zealand, and the many cases of "persistent" forms which have survived unchanged from Carboniferous, Silurian, or Cambrian times, a period of time which, in the language of the current geology, means quite a large fraction of eternity. But all of these considerations show that the mere fact of certain species being extinct and others being now alive, is no trustworthy guide in determining the relative age of their remains, until we first find out how they happened to become extinct.

The inquiry as to the how and the when (relatively) is an absolutely essential preliminary in any such investigation; and is inseparably united in nature with the general question of how the great geological changes have taken place in the past. Of course, if everything like a world-catastrophe is a priori denied; if, in other words, it is settled from the first that all these fossils living and extinct did not live contemporaneously with each other, the living ones being simply the lucky survivors of stupendous changes in which the others perished, then all pretense of a scientific investigation of the subject is at an end. If a coroner has it settled beforehand that an



accident or a murder could not possibly have occurred, then his profession of a candid *post mortem* examination is only a farce; for he does not hold it to find out anything, since he knows everything essential about it beforehand. Uniformitarians would certainly make poor coroners, or for that matter poor investigators of law or history, or anything else.

Will some one please give us a reasonable explanation of why the lion, hippopotamus, rhinoceros, and elephant shifted from England to the tropics? Or will they explain how, at this same general time, some elephants and rhinoceroses got caught in the merciless frosts of Northern Siberia so suddenly that their flesh has remained untainted all these centuries, and is now, wherever exposed, greedily devoured by the dogs and wolves?

An abundant warm-climate vegetation once mantled all the polar regions, and its fossils have been found just about as far north as explorers have ever gone; while Dana says that, "The encasing in ice of huge elephants, and the perfect preservation of the flesh, shows that the cold finally became suddenly extreme, as of a single winter's night, and knew no relenting afterwards."*

Now, if no one can deny this sudden change of climate over half the world or so at least, is it not extremely unscientific to deny that this same cause, whatever it may have been, was quite competent to bring about a good many other changes, and the extinction of numerous other species which we are so often reminded must imply the lapse of untold ages of time? The economizing of energy, or the famous law of parsimony as stated by Leibnitz, is quite appropriate in this case, and may be referred to again in the sequel. The principle upon which I must here insist is that the mere fact of certain species being extinct, and others being now alive, gives no clue whatever to the relative age of these remains, until we first ascertain why, how and when this extinction was brought about. And yet, though every one admits the fact of tremendous changes of climate, etc., having intervened between that ancient world and our own (the true extent and character of which, as I have said, ought to be the chief point of all geological investigation), no allowance seems ever to be made for this as a powerful cause of extermination of all forms of life. But in the utter absence of any such explanation as to how and when, and in the very teeth of these facts assuming a dead-level uniformitarianism, the presence of ten, fifty or a hundred per cent. of extinct forms in a set of beds is manifestly of no scientific value in determining age. It would be many degrees more reasonable and accurate to arrange all the Greek and Latin books of the world in chronological order according to the percentage of their words which have survived into the English language. Indeed, it would be much like a coroner, at the inquest following a railway disaster, attempting to arrange the exact order in which the various victims had perished by the proportionate number of surviving relatives which each had left behind him.

And the completely worthless character of such "evidence" of age becomes, if possible, more apparent when we consider that very many of these so-called "extinct" forms are not really distinct species from their living

* "Manual," p. 1007. Prof. Dana has italicized the word "suddenly."

representatives of to-day. "It is notorious," says Darwin, "on what excessively slight differences many palaeontologists have founded their species." And even to-day, in spite of all that we have learned about variation, little or no allowance seems ever to be made for the effects of a certainly greatly changed environment. If the fossil forms among the mollusks and other shell fish for instance, are not precisely like the modern ones in every respect, they are always classed as separate species, the older forms thus being "extinct," in utter disregard of the striking anatomical differences between the huge Pleistocene mammals and their dwarfish descendants of to-day, which for a hundred years or so were declared positively to be distinct from one another, but are now acknowledged to be identical.

Of course no one denies that there are numerous extinct forms among the invertebrates, just as we know there are among the huge vertebrates of the Mesozoic and Tertiaries, none of which we moderns have ever seen alive. Other forms do not appear familiar to our modern eyes, because larger or of somewhat different form; but to say that they are really distinct species from their modern representatives, or to say that no human being ever saw them alive, are statements utterly incapable of proof. Up to about the year 1869 it was stoutly maintained that man had never seen any of these fossil forms in life. But no one now maintains this view, for human remains have now been found along with undisturbed fossils of the Pleistocene, or even middle Tertiaries, while the paintings on the cave walls of Southern France seem conclusive that they were copied from life when the mammoth and reindeer lived side by side with man in that latitude. Hence the only question now is, and it is the supreme question of all modern geology, **WITH HOW MUCH OF THAT ANCIENT FOSSIL WORLD WERE THESE EQUALLY FOSSIL MEN ACQUAINTED?** If Man lived in "Pliocene" or perhaps "Miocene times," when a luxuriant vegetation was spread out over all the Arctic regions, what possible evidence is there to show that his companions, the rhinoceros, hippopotamus, mammoth, etc., were not also living then and browsing off just such plants, when the Arctic frosts caught them in the grip of death and put their "mummies" in cold storage for our astonishment and scientific information? Things which are equal to the same thing are equal to each other; why should not the plants and animals, contemporary with the same creature (man), be just as truly contemporary with one another? If man was contemporary with the Miocene plants, and the Pleistocene mammals were contemporary with man, what is there to forbid the idea that the Pleistocene Mammals and the middle Tertiary flora were contemporary with each other?

For nearly half a century geologists have never had the courage to face this problem fairly and squarely, with all preconceived prejudices about uniformity cast aside. Is it possible that all the plants and animals of the Tertiaries and the Pleistocene may have really lived together in the same world after all? But the trouble would then be that, with this much conceded, the whole "phylogenic series" would tumble with it, and become only the taxonomic or classification series of that ancient world with which these fossil men were acquainted. To appropriate the words of one who has done much to clear the ground for a common-sense study of geology,



I know of nothing against such an idea save "the almost pathetic devotion of a large school of thinkers to the religion founded by Hutton, whose high priest was Lyell, and which in essence is based on *a priori* arguments like those which dominated Mediaeval scolasticism and made it so barren." *

Baron Cuvier's work in the line of comparative osteology has never been surpassed, perhaps never equalled since, and he is said to have been "the greatest naturalist and comparative anatomist of that, or perhaps of any time." (Le Conte, "Evol. and Rel. Thought," pp. 33, 34); and yet he maintained till the last that all those which we now call the Pleistocene mammals were distinct species from the modern ones; and it is only of recent years and with extreme reluctance that many of them have been admitted to be identical with the ones now living. All of which tends to show how unreliable are those assertions commonly found in the text-books about all the species of the so-called "older" rocks being extinct. It is only with hesitation that such specific distinctions are surrendered even to-day, though during the last few decades a steady progress has been made in bringing the palaeontology of the higher vertebrates into line with our increased knowledge of zoology, thus breaking down many of the specific distinctions which have long been maintained between the fossil and the living forms. Even the mammoth has been found to have so many characters identical with the modern elephant of India, and such a complete gradation exists between the two types, that Flower and Lydekker acknowledge the transition from one to the other is "almost imperceptible," and express a doubt whether they "can be specifically distinguished" from one another.†

But the extreme reluctance with which anything like a confession of this fact leaks out in our modern literature can be readily understood when we try the hopeless task of splicing the environment of the modern form with that of the ancient on any basis of uniformity.

Zittel gives us a peep behind the scenes which helps us to appreciate the value of a percentage of extinct species as a test of the age of a rock deposit.

He pictures the uncritical work of the earlier writers on fossil botany, until August Schlak (1868-91) made a great reform in this science; and Zittel declares that "now the author of a paper on any department" of fossil botany "is expected to have a sound knowledge" of the systematic botany of recent forms. But he adds: "It cannot be said that palaeozoology (the science of fossil animals) has yet arrived at this desirable standpoint."

But he justifies this charge of want of confidence by saying:

"Comparatively few individuals have such a thorough grasp of zoological and geological knowledge as to enable them to treat palaeontological researches worthily, and there has accumulated a dead weight of stratigraphical-palaeontological literature wherein the fossil remains of animals are named and pigeon-holed solely as an additional ticket of the age of a rock-deposit, with a willful disregard of the much more difficult problem of their relationships in the long chain of existence.

"The terminology which has been introduced in the innumerable mono-

* Howorth, "The Glacial Nightmare and the Flood," preface, xx, xxi.
† "Mammals, Living and Extinct," pp. 428-9.

graphs of special fossil faunas in the majority of cases makes only the slenderest pretext of any connection with recent systematic zoology; if there is a difficulty, then stratigraphical arguments are made the basis of a solution. Zoological students are, as a rule, too actively engaged and keenly interested in building up new observations to attempt to spell through the arbitrary palaeontological conclusions arrived at by many stratigraphers, or to revise their labors from a zoological point of view." *

Doubtless this scathing impeachment of the common mania for creating new names for the fossils has especial reference to the case of the lower forms of life. For if, in spite of the brilliant and withal careful work of Cuvier, Owen, Wallace, Huxley, Ray Lankester, and Leith Adams, with numerous others that might be mentioned, there are still grounds for such grave doubts of the values of specific distinctions in the case of the mammals, whose general anatomy and life-history are so well known and their almost countless variations so well studied out, what must be the confusion and inaccuracy in the case of the lower vertebrates, and especially of the invertebrates, whose general life-history in so many instances is so dimly understood, and the limits of their variations absolutely unknown? Remembering all this, what is our amazement when we read in this same volume by Professor Zittel† that the tendency among many modern writers in dealing with these lower forms of life, is toward the erection of the closest possible distinctions between genera and species, until recent palaeontological literature is fairly innundated with new names; and all this with the purpose, unblushingly avowed, of "enhancing the value" of such distinctions as a means of determining the relative ages of strata, and to "bring the ontogenetic and phylogenetic development" of the various forms "into more apparent correspondence." I do not exaggerate in the least, as the reader may see by referring to Zittel's book; though not wishing to make my readers "spell through" another quite technical paragraph I have refrained from direct quotation.

But surely we have here a most amazing style of reasoning. It is another clear case of first assuming one's premises, and then proving them by means of one's conclusion. The method here employed seems about like this: First assume the succession of life from the low to the high as a whole; then in any particular group, as of Brachiopods or Mollusks, decide the momentous question as to which came first and which later in "geological time" by comparing them as to size, shape, etc., with the live modern individual in its development from the egg to maturity; and lastly, take the results of this alleged chronological arrangement to prove just how the modern forms have evolved. Surely it is a most fearful example of otherwise intelligent men being hypnotized by their theory into blind obedience to its suggestions and necessities.

Not long ago I had occasion to write to a well-known geologist about a Lower Cambrian mollusk which appears strikingly like a modern species. I give below an extract from his reply which bears directly upon this point. I withhold the name, for the information was given in a half-confi-

* "Hist. of Geol.," pp. 375-6.
† pp. 400, 403, 405.



dential manner, but I may say that the author's work on the Palaeozoic fossils is recognized on both sides of the Atlantic.

"Some geologists make it a point to give a new name to all forms found in the Palaeozoic rocks, i.e., a name different from those of modern species. I was taken to task by a noted palaeontologist for finding a pupa (a kind of land snail) in Devonian beds; but I could not find any point in which it differed from the modern genus [? species]. Yet if I could have had more perfect specimens I might have found differences."

Such disclosures speak volumes for those able to understand; and lead one to receive with a smile the familiar assertion that all the species of the Palaeozoic and other "older" rocks are extinct. And we can now form a truer estimate of the high scientific accuracy of Lyell's ingenious division of the Tertiary beds, according to the percentage of living or extinct Mollusks which they contain.

But from the inherent weakness of the argument about extinct species as thus revealed, it follows that chronological distinctions based on any proportionate number of extinct species have absolutely no scientific value; and hence that the life succession theory finds no support from these chronological distinctions, just as we have already seen that it is without a vestige of support from the stratigraphical argument.

The life succession theory has not a single fact to confirm it in the realm of nature. It is not the result of scientific research, but purely the product of the imagination.

# CHAPTER VIII

## SKIPPING

We have now to deal with another absurdity involved in the life succession theory, the discussion of which grows naturally out of the subject of extinct species.

As preliminary to the subject here to be presented, we must bear in mind that the present arrangement of the fossils in alleged chronological order, as well as the naming of thousands of typical specimens, was all well advanced while as yet little or nothing was known of the contents of the depths of the ocean, or even of the land forms of Africa, Australia, and other foreign countries. In most of the important groups of both plants and animals, the detailed knowledge of the fossil forms preceded the knowledge of the corresponding living forms, just as Zittel says that the theories of the igenous origin of the crystalline rocks "had been laid without the assistance of chemistry" and the knowledge of the microscopic structure of these rocks.* On pp. 128-137 of his "History," this author shows how, up to 1820, little or nothing of a scientific character was known of any of the classes of living animals save mammals. During the last half century, however, the progress of science has been steadily showing case after case where families and genera, long boldly said to have been "extinct" since "Palaeozoic time," are found in thriving abundance and in little altered condition in unsuspected places all over the world. And the point for consideration here is the manifest absurdity of these inhabitants of the modern seas and the modern land **skipping** all the uncounted millions of years from "Palaeozoic times" down to the "recent," for, though found in profuse abundance in these "Older" rocks, not a trace of many of them is to be found in all the "subsequent" deposits.

The proposition here to be considered and proved I shall venture to formulate as follows:

**There is a fossil world, and there is a modern living world; the two resembling one another in various details as well as in a general way; but to get the ancestral representatives of many modern types, e.g. countless invertebrates, with other lower forms of animals and plants, we must go clear back to the Mesozoic or the Palaeozoic rocks, for they are not found in any of the "more recent" deposits.**

I have already remarked that the blending of the doctrine of life succession with that of uniformity, must inevitably have given birth to the evolution theory, for it is evident that the succession from the low to the high could only have taken place by each type blending with those before and those after it in the alleged order of time. That such is not the testimony of the rocks, even when arranged with this idea in view, is too notorious to need any words of mine, for it has been considered by many† the "greatest of all objections" to the theory of evolution.

* "History," pp. 327, 3 41.

†See Le Conte, "Evol. and Religious Thought." p. 253.



This abruptness in the disappearance of "old" and the first appearance of "new" forms, has brought into being that "geological scape-goat," as James Geikie has called the doctrine of **the imperfection of the record.** But Dawson has well disposed of this argument in the following words:

"When we find abundance of examples of the young and old of many fossil species, and can trace them through their ordinary embryonic development, why should we not find examples of the links which bound the species together?"*

But is is equally evident that each successive series ought to contain, in addition to its own characteristic or "new" species, **all the older forms which survived into any later deposits, or are now to be found living in our modern world.** Such no doubt was the idea of those of the early geological explorers who discarded Werner's onion-coat theory, and they tried to arrange their series accordingly. This reasonable demand is still recognized as good; and the principle is alluded to by Dana when he attempts to show how strata might be discovered and "proved" to be older than the present Lower Cambrian rocks.†

It is, I say, still recognized in theory that the "younger" deposits ought to contain samples of the "older" types which were still surviving, in addition to their own characteristic species; but with the progress of geological discovery it has long since been found that such an arrangement was utterly impossible. Indeed, it would almost seem as if modern writers had forgotten the principle altogether.

For, as already said, according to the present chronological arrangement, many kinds of invertebrates, both terrestrial and marine, occurring in comparative abundance in our modern world, are found as fossils only in the very "oldest" rocks and are **wholly absent from all the rest!!!** Others which date from "Mesozoic times" are wholly absent from the Tertiaries, though abundant in our modern world. This I regard as another crucial test of the rationality of this idea of a life succession.

Of course there are certain limitations which must be borne in mind. If we find a series of beds made up largely of deep sea deposits, we cannot reasonably expect to find in them examples of all the land forms of the preceding "ages" which then survived, nor even of the shallow water types. Nor, conversely, can we demand that, in beds crowded with the remains of the great mammals and plants, and thus probably of fresh or shallow water formation, we ought to find examples of all the marine types still surviving. We now know that each level of ocean depth has its characteristic types of life, just as do the different heights on a mountain side. This doctrine of "rock facies" was, I believe, enunciated first in 1838. Edward Forbes also did much for this same idea, showing how at the present time certain faunas are confined to definite geographical limits, and particular ocean depths. Jules Marcou about 1848 applied this principle to the fossils and showed how such distinctions must have prevailed during geological time.

Here it seems that we are at last getting a refreshing breath of true

* "Modern Ideas of Evol." p. 35.

†See "Manual," pp. 487-8.

science; but if carried out in its entirety how shall we assure ourselves that in the long ago very diverse types of fossils, e.g. gratolites and numulites, or even trilobites and mammals, could not have been contemporary with each other? This principle of "rock facies," if incorporated into the science in its early days, would have saved the world from a large share of the nonsense in our modern geological and zoological text-books.

But in answer to any pleadings about the imperfection of the record, or any protests about the injustice of judging all the life-forms of an "age" by a few examples of local character, i.e., of fresh, shallow, or deep water as the case may be, the very obvious retort is, Why then are such local and fragmentary records given a time value?. Why, for example, should the Carboniferous and associated formations be counted as representing all the deposits made in a certain age of the world, when we know from the Cambrian and Silurian and also from the alleged "subsequent" Jurassic that there must have been vast open sea deposits formed contemporaneously?

As Dana expresses it:

"The Lias and Oolyte of Britain and Europe afforded the first full display of the marine fauna of the world since the era of the Subcarboniferous. Very partial exhibits were made by the few marine beds of the Coal measures: still less by the beds of the Permian, and far less by the Triassic. The seas had not been depopulated. The occurrence of over 4,000 invertebrate species in Britain in the single Jurassic period is evidence, not of deficient life for the eras preceding, but of extremely deficient records."*

Surely these words exhibit the "phylogenic series" in all its native, unscientific deformity. It is because the Coal-measures, the Permian, and the Triassic, are necessarily "extremely deficient records" of the total life-forms then in the world, that I am writing this chapter, and this book. But it seems like perverseness to plead about the imperfection of the record, and yet refuse the evidently complemntary dposits when they are presented. If, as this illustrious author says, "The seas had not been depopulated," what would he have us think they were doing? Were they forming no deposits all these intervening ages that the Carboniferous, Permian, and Triassic were being piled up? Were the fishes and invertebrates all immortalized for these ages, or were they, when old and full of days translated to some supermundane sphere, thus escaping deposit in the rocks? Did the elements continue in the *status quo* all these uncounted millions of years? and if so, how did they receive notice that the Triassic period was at last ended, and that it was time for them to begin work again? I do not like to appear trivial; but these questions serve to expose the folly of taking diverse, local, and partial deposits, and attaching a chronological value to each of them separately, and then pleading in a piteous, helpless way about the imperfection of the record.

And yet I cannot promise to present a tithe of the possible evidence, because of two serious handicaps. First, the ordinary literature of the science is silent and meagre enough in all conscience, even though the bare fact may be recorded that a "genus" of the Cambrian or Silurian is "closely

* "Manual," p. 776.



allied" to some genus now living. It may be even admitted that "according to some it is not generically distinct from the modern genus" so-and-so; but the authors never descend below the "genus," and in most cases forget to tell us whether or not it occurs in other "later" formations, though of course the presumption is that it does not, but has skipped all the intervening ages, or it would hardly be named as a characteristic type of the formation in which it occurs.

But this disadvantage, serious though it be, is scarcely worth speaking of when we remember the significant words of a well-known authority already quoted:

"Some geologists make it a point to give a new name to all forms found in the Palaeozoic rocks, i.e. a name different from those of modern species."

Or Zittel's confession that:

"The terminology which has been introduced in the innumerable monographs of special fossil faunas in the majority of cases makes only the slenderest pretext of any connection with recent systematic zoology; if there is a difficulty, then stratigraphical arguments are made the basis of a solution. Zoological students are as a rule too actively engaged and keenly interested in building up new observations to attempt to spell through the arbitrary paleontological conclusions arrived at by many stratigraphers, or to revise their labors from a zoological point of view."

Hence I have no reluctance in saying that, in the present confused state of the science, it is utterly impossible to find out the truth as to how many hundreds of these "genera" of the Paleozoic rocks may have survived to the present, though having skipped perhaps all the formations of the intervening millions of years. I doubt not that the number is enormously large, though as I have not attempted "to spell through the arbitrary palaeontological conclusions" scattered through the literature, I can only depend on a few though striking examples that lie on the open pages of the ordinary text-boks.

The larger mammals can of course furnish us no examples, for the "age" in which they abounded is quite conveniently modern, and is separated from the present by no great lapse of time. Of the smaller marsupials, quite a number of jaw-bones have been found in the Jurassic and Triassic, one from the latter being strikingly like the living *Myrmecobius* of Australia. They are scarcely more numerous in the Cretaceous of America, while in the foreign rocks of this system Dana says that "Only one species had been reported up to 1894." Those strange, sad-eyed creatures called Lemurs deserve a passing notice, for though now confined as to their typical forms to the island of Madagascar, their fossils seem as exclusively confined to the temperate regions of the New and the Old World. Flower and Lydekker enumerate about fifteen fossil species, and add that:

". . . it is very noteworthy that all these types seem to have disappeared from both regions with the close of the upper portion of the Eocene period."*

But this jump from the "Eocene period" to the present is as nothing

* "Mammals, etc." p. 696.

compared with the secular acrobatics of some of the fishes and especially of the invertebrates. The living Cestraciont sharks, of which there are four species found in the seas between Japan and Australia, seem to disappear with the Cretaceous, skipping the whole Tertiary Epoch, as do also a tribe of modern barnacles which, as Darwin says, "coat the rocks all over the world in infinite numbers." The Dipnoans or Lung-fishes (having lungs as well as gills, such as the *Ceratodus* and *Lepidosiren*), which are represented by several living species in Australia and South Africa, are the remains of a tribe found in whole shoals in the Carboniferous, Triassic and Jurassic rocks, but not, so far as I know, in any of the intervening rocks. The living Ceratodus was only discovered in 1870, and was regarded as a marvel of "persistence." On a pinch, as when his native streams dry up, this curious fellow can get along all right without water, breathing air by his lungs like a land animal. If in the meantime he was off on a trip to the moon, he must have "persisted" a few million years without either.

But his cousin, the *Polypterus* of the Upper Nile, has a still more amazing record, for he has actually skipped all the formations from the Devonian down to the modern; while the Limuloids or sea scorpions have jumped from the Carboniferous down.

The Mollusks and Brachiopods would afford us examples too numerous to mention. How is it possible that these numerous families disappear suddenly and completely with the Mesozoic or even the "early" Palaeozoic, and are not found in any "later" deposits, though alive now in our modern world? Parts of Europe and America have, we are told, been down under the sea and up again a dozen times since then; why then should we not expect to find abundant remains of these "persistent" types in the Mesozoic and Tertiaries? Surely these feats of time-acrobatics show the folly of arranging contemporaneous, taxonomic groups in single file and giving to each a time value.

The Chalk points a similar lesson. It was not till the time of the "Challenger" Expedition that the modern deposits of Globigerina ooze, made up of species identical with those of the Chalk, were known to be now forming over vast areas of the ocean floor. In the words of Huxley, these modern species "bridge over the interval between the present and the Mesozoic periods." *

As for the silicious sponges found in the Chalk, which were such puzzles for the scientists during the first half of the nineteenth century. because their living forms were unknown, the deep-sea investigations have solved the problem, for in 1877 Sollas demonstrated "the identity of their structure with that of living Hexactinellids, Lithistids, and Monactinellids." †

And yet with all the alleged vicissitudes of the continents during the millions of years since the Cretaceous age, there is so far as I am aware not a trace of either the chalk or the sponges in any of the "subsequent" rocks. Pieces of Cretaceous rock are of course found thus sporadically as boulders, but there is no natural deposit of this kind. But in the light

* "Discourses Biol. and Geol." p. 347.
† Zittel, "Hist. of Geo." p. 388.



of these modern discoveries why is not the Chalk of "the white dear cliffs of Dover," full of modern living species as we now know it to be, just as "recent" a deposit as the "late" Tertiaries or the Pleistocene?

Another good illustration of the absurdity of the present arrangement of the rocks is found in the Echinoderms—crinoids, star-fishes, sea-urchins, etc. Of the latter Prof. A. Agassiz found in the deep waters of the West Indies, four genera of Echinids or sea-urchins of the "later Tertiary," but 21 genera of the "early" Tertiary, 10 of theCretaceous, and 5 of the Jurassic.*

But far from being uncommon we know that similar discoveries have been in almost constant progress during the last half century. And were it not that "zoological students are," as Zittel says, "too actively engaged and keenly interested in building up new observations to attempt to spell through the arbitrary palaeontological conclusions" found in the "dead weight of stratigraphical-palaeontological literature," these is no telling what hosts of similar facts might not be pointed to regarding the forms found in all the "older" rocks.

Of the star-fishes and serpent-stars (*Asteridea* and *Ophiuridea*), Zittel says: "It would seem that the Palaeozoic 'sea-stars' differed very little from those in the seas of the present age." (p. 395.) The crinoids, we are told, "are among the earliest in geological history," making up vast limestones of the Palaeozoic rocks; and forms scarcely separable from the modern are found in the Jurassic, but so far as the text-boks tell us are absolutely unknown in any later deposits. But there are several modern genera, such as Pentacrinus, Rhizocrinus, Bathycrinus, etc., found in the deep waters of nearly all the oceans. The genus Rhizocrinus was discovered off the coast of Norway about the sixties of the last century. But what were these creatures doing since "Jurassic times," while the "pulsating crust" was putting parts of the continents under the sea for ages at a stretch? Why did they form no deposits during the Cretaceous, Eocene, Miocene or Pliocene ages? Surely the absurdity of the present arrangement is evident to a child. During all these intervening ages the climate of the globe continued of the same remarkable mildness, fossils of all these formations being found about as far north as explorers have ever gone. Why did the crinoids and polyp-corals suspend business from "Jurassic times" to the "recent," merely to accommodate a modern theory? Dana says that "The coral reefs of the Oolyte in England consist of corals of the same group with the reef-making species of the existing tropics," † and he argues from this fact that the mean temperature of the waters must have been about 80 deg. F. But a luxuriant vegetation still continued in the Arctic regions during the Cretaceous and the Tertiaries. How absurd to say that these corals built no reefs about the European coasts during all these ages. Or, to put the matter in another way, considering how many of their characteristic types are alive in our modern seas, why should we say that the crinoidal or coral limestones of the Mesozoic or Palaeozoic rocks are not as recent as the nummulitic limestones of the Eocene or any late Tertiary deposits?

It is no answer at all to tell us that, though the general types are the

* Dana, "Manual," p. 59.
† "Manual," p. 793.

same, the species of the Palaeozoic and the Mesozoic are entirely extinct. I have not had the courage "to attempt to spell through" all the "dead weight" of the modern literature, but I think that the world would like more satisfactory proof of this oft-repeated assertion than the customs and traditions of a hundred years, and the exigencies of a fanciful theory. This worn-out argument of Cuvier's about extinct species has kept up a running fight with common sense for many decades, and though driven backward from one point to another over the long thin line of this taxonomic series of the fossil world, it still contests every inch of ground.

But let us try the tree-ferns and cycads of the coal beds of the "older" rocks. In northern regions they are not found "later" than the Triassic and Jurassic, and doubtless the same holds good of the rocks in the Tropics, where the modern species now live in fair abundance. But how did they come to shift to the Tropics so many millions of years before the palms, etc., of the Tertiaries thought it time to do the same? The climate had not changed a bit: how did they come to scent the coming "Glacial Age" so much earlier than their more highly organized fellows?

The "Challenger" expedition found some Cyathophylloid corals now building reefs at the bottom of our modern ocean. The geologists had already assigned the last of them to the Carboniferous and Permian rocks with the idea that they were extinct. But where have these fellows kept themselves during all the intervening ages while the continents were deep under the ocean time and time again? or why are not the rocks containing their fossils as "recent" as any deposits on the globe?

And so I might go on. There is hardly a tribe found in the "older" rocks which does not have its living representatives of to-day, and with, I believe, a fair proportion of the species identical; though in hundreds, perhaps thousands, of cases these species, genera, or even whole tribes, have somehow skipped all the intervening formations.

But let us drop this method of studying our subject, and look at it from a slightly different standpoint.

Thus Dana* says that:

"The absence of Lamellibranchs in the Middle Cambrian, although present in both Lower and Upper, means **the absence of fossils from the rocks, not of species from the faunas.**"

He puts this in italics by way of emphasis, for it is certainly a reasonable idea, and as A. R. Wallace says, "no one now doubts that where any type appears in two remote periods it must have been in existence during the whole intervening period, although we may have no record of it."† But what would be the result if we only extend this idea to its logical conclusion? It seems to be an effort to avoid one of the absurdities of the onion-coat theory, without, however, discarding that theory altogether.

In speaking of some corals and crinoids of the Devonian which "were absent" from some of the divisions of this formation because the conditions

* "Manual," p. 488.
† "Distribution of Life," p. 33.



of the seas about New York "were unfavorable," Dana says that "they were back when the seas were again of sufficient purity."*

In his review of these formations he enlarges on this subject:

"At the close of the early Devonian the evidences of clear seas—the corals and crinoids, with most of the attendant life—disappear, migrating no one knows whither. . . . With the variations in the fineness, or other characteristics of the beds as H. S. Williams has illustrated, the species vary. . . . **The faunas of each stratum are not strictly faunas of epochs or periods of time, but local topographical faunas.** After the Corniferous period, corals, crinoids, and trilobites still flourished somewhere, as before, but they are absent from the Central Interior until the Carboniferous age [opens."

Here we are certainly getting a refreshing breath of common-sense geology; but what would become of current theories if we enlarge a little on this idea?

What if the gigantic dinosaurs of the Cretaceous or the equally marvellous mammals of the "early" Tertiaries of the Western States, described by Marsh and Cope, and the Pleistocene mammals of other parts of America and of Europe and Northern Siberia, "are not strictly faunas of epochs or periods of time, but local topographical faunas?" What if the world-wide limestones of the Cambrian and Silurian, and the no less enormous or widespread nummulitic limestones of the Eocene, extending from the Alps to Eastern Asia, and constituting mountains ten, fifteen, or twenty thousand feet high—what if these are possibly **contemporaneous with one another?** Supposing the coal-measures of Nova Scotia and Pennsylvania, and the Cretaceous and Tertiary lignites of Vancouver Island, Alberta, and the Western States are not strictly floras of epochs or periods of time, but local topographical floras?‖

But it must be confessed that the logical extension of this broad view of the fossils, and the projection of our modern zoological provinces and zones back into the fossil world would mean the death-blow to the life succession theory, and might have a very disturbing effect upon certain theories about human origins and other genetic relationships which have grown quite popular since the middle of the last century.

* "Manual," p. 611.
† "Manual," pp. 628-6.
‖ Note.—This is only carrying the argument a little further than Huxley does when he says that "A Devonian fauna and flora in the British Islands may have been contemporaneous with Silurian life in North America, and with a Carboniferous fauna and flora in Africa. Geographical provinces and zones may have been as distinctly marked in the Palaeozoic epoch as at present." "Discourses," p. 286.

# PART II.

# CHAPTER IX

## GRAVEYARDS

"The crust of our globe," writes a distinguished scientist, "is a great cemetery, where the rocks are tombstones on which the buried dead have written their own epitaphs." The reading of these epitaphs is the business of geology; and too often, as we shall see, the record is that of a violent and sudden death.

With the doctrine of Uniformity as a theoretical proposition, I shall have little to say. At best it is a pure assumption that the present quiet and regular action of the elements has always prevailed in the past, or that this supposition is sufficient to explain the facts of the rocks. In its more extreme form it becomes an iron dogma, which shuts out all evidence not agreeable to its teachings. But in its essential nature, whether in its least or its most extreme form, it is not approaching the subject from the right standpoint. It seeks to show how the past geological changes may have occurred; it never attempts to prove how they must have occurred. And I may say in passing, that it is largely for the purpose of avoiding the cumulative character of the evidence gathered from every stone quarry and from every section of strata in every corner of the globe, that the uniformitarians have wished to have these burials take place on the installment plan; for otherwise the violent and catastrophic character of the events recorded in the rocks would become too plainly manifest. But if a coroner, called upon to hold an inquest, were to content himself, after the manner of Lyell and Hutton, with glittering generalities about how people are all the time dying of old age, fever, or other causes, coupled with assurances of the quiet, regular habits and good reputation of all his fellow citizens, I do not think that he would be praised for his adherence to inductive methods if we could get at clear and decisive evidence that the poor fellow under examination had been shot. Just so with common-sense methods in geology. **A true induction is capable of finding out for certain** whether or not the present quiet regular action of the elements has always prevailed in the past; and it is most unscientific to assume, as the followers of Hutton and Lyell have done, that the comparatively insignificant changes within historic time have always prevailed in the past, when there is plenty of clear and decisive evidence to the contrary.

The general fact which I wish to develop in this chapter may be stated somewhat as follows:

**Rocks belonging to all the various systems or formations give us fossils in such a state of preservation, and heaped together in such astonishing numbers, that we cannot resist the conviction that the majority of these deposits were formed in some sudden and not modern manner, catastrophic in nature.**

But before giving any examples of these abnormal deposits we must first study the modern normal deposits; before we can rightly understand the sharp contrast between the ancient and the modern action of the ele-

ments, we must become familiar with the way in which fossils are now being buried by our rivers and oceans.

One of the many geological myths dissipated by the work of the "Challenger" Expedition, which, as Zittel says, "marks the grandest scientific event of the nineteenth century," is that about the ocean bottom and the work now being carried on there. The older text-books taught that, not only was the bottom of the ocean thickly strewn with the remains of the animals which died there and in the waters above, but also that the oceanic currents were constantly wearing away in some places and building up in others over all the ocean floor, and hence producing true stratified deposits. Accordingly it was said that it was only necessary for these beds to be lifted above the surface to produce the ordinary rocks that we find everywhere about us. But we now know that the ocean currents have, as Dana says, "no sensible, mechanical effects, either in the way of transportation or abrasion." * We know also that all kinds of sediment drop so much quicker in salt water than in fresh, that none of it gets beyond the narrow "continental shelf" and the classic 100 fathom line, which in most cases is not very far from shore. In the north Atlantic there are sediments found in deeper water produced by ice-floes or icebergs dropping their loads there; but we cannot suppose such work to have gone on when the Arctic regions were clothed with a temperate-climate vegetation, much less that such things occurred over all the earth. On the floor of the open ocean, and away from the tracks of our modern icebergs, we have two or three kinds of mud or ooze formed from minute particles of organic matter; but besides these **absolutely nothing** save a possible sprinkling of volcanic products, which of course are limited in their distribution. Where then can we find a stratified or bedded structure now being formed over the ocean bottom? Dana says there is nothing of the kind now being produced there, save as the result of possible variations during the passing ages in the organic deposits thrown down, where a bed of ooze may be supposed to be thrown down directly upon another kind of ooze. There is **no gravel, no sand, no clay,** but whatever variation there might be in the organic deposits, the new kind would be laid down immediately upon the preceding similar deposits, unless a thin sprinkling of volcanic dust happened to intervene.

Thus to explain practically all the deposits found in the rocks, we are absolutely limited to the shore deposits and the mouths of large rivers. Here we certainly have alternations of sand, clay and gravel, producing a true bedded structure. But I ask: What kind of organic remains will we get from these modern deposits? Certainly nothing like the crowded graveyards which we find everywhere in the ancient ones.

Darwin, in his famous chapter on "The Imperfection of the Geological Recor," has well shown how scanty and imperfect are the modern fossiliferous deposits. The progress of research has only confirmed and accentuated the argument there presented on this point. Thus Nordenskiold, the veteran Arctic explorer, remarks with amazement on the scarcity of recent organic remains in the Arctic regions, where such a profusion of animal life exists; while in spite of the great numbers of cats, dogs and other

* "Manual," p. 229.



domestic animals which are constantly being thrown into rivers like the Hudson or the Thames, dredgings about their mouths have revealed the surprising fact that scarcely a trace of any of them is there to be found. *

Even the fishes themselves stand a very poor chance of being buried intact. As Dana † puts it:

"Vertebrate animals, as fishes, reptiles, etc., which fall to pieces when the animal portion is removed, **require speedy burial after death,** to escape destruction from this source (decomposition and chemical solution from air, rain-water, etc.), as well as from animals that would prey upon them."

If a vertebrate fish should die a natural death, which of itself must be a rare occurrence, the carcass would soon be devoured whole or bit by bit by other creatures near by. Possibly the lower jaw, or the teeth, spines, etc., in the case of sharks, or a bone or two of the skeleton, might be buried unbroken, but a whole vertebrate fish entombed in a modern deposit is surely a unique occurrence.

But every geologist knows that the remains of fishes are, in countless millions of cases, found in a marvelous state of preservation. They have been entombed in **whole shoals,** with the beds containing them miles in extent, and scattered over all the globe. Indeed, so accustomed have we grown to this state of affairs in the rocks we hammer up, that if we fail to find such well-preserved remains of vertebrate fishes, land animals, or plants, we feel disappointed, almost hurt; we think that nature has somehow slighted this particular set of beds. But where in our modern quiet earth will we go to find deposits now forming like the copper slate of the Mansfield district, the Jurassic shales of Solenhofen, the calcareous marls of Oeningen on Lake Constance, the black slates of Glarus, or the shales of Monte Bolca?—to mention some cases from the Continent of Europe more than usually famous in the literature for exquisitely preserved vertebrate fishes, to say nothing of other fossils. According to Dana, all these must have met with a "speedy burial after death"—perhaps before, who knows?

Buckland ‡ in speaking of the fossil fish of Monte Bolca, which may be taken as typical of all the others, is quite positive that these fish must have "perished suddenly," by some tremendous catastrophe.

"The skeletons of these fish," he says, "lie parallel to the laminae of the strata of the calcareous slate; they are always entire, and so closely packed on one another that many individuals are often contained in a single block. . . . **All these fish must have died suddenly** on this fatal spot, and have been speedily buried in the calcareous sediment then in course of deposition. From the fact that certain individuals have even preserved traces of color upon their skin, we are certain that they were entombed before decomposition of their soft parts had taken place."

In many places in America as well as Europe, where these remains of fish are found, the shaley rock is so full of fish oil that it will burn almost like coal, while some have even thought that the peculiar deposits like

* *Pop. Sci. Mo.*, Vol. xxi, pp. 143, 693.
† "Manual," p. 141.
‡ "Geol. and Min.," Vol. I., pp. 124-5. Ed. 1858.

Albertite 'coal" and some cannel coals were formed from the distillation of the fish oil from the supersaturated rocks.

De La Beche * was also of the opinion that most of the fossils were buried suddenly and in an abnormal manner. "A very large proportion of them," he says, "must have been entombed uninjured, and many alive, or, if not alive, at least before decomposition ensued." In this he is speaking not of the fishes alone but of the fossiliferous deposits in general.

There is a series of strata found in all parts of the world which used to be called the "Old Red Sandstone," now known as the Devonian. In this, almost wherever we find it, the remains of whole shoals of fishes occur in such profusion and preservation that the "period" is often known as the "Age of Fishes." Dr. David Page, after enumerating nearly a dozen genera, says:

"These fishes seem to have thronged the waters of the period, and their remains are often found in masses, as if they had been suddenly entombed in living shoals by the sediment which now contains them."

I beg leave to quote somewhat at length the picturesque language of Hugh Miller † regarding these rocks as found in Scotland.

"The river bull-head, when attacked by an enemy, or immediately as it feels the hook in its jaws, erects its two spines at nearly right angles with the plates of the head, as if to render itself as difficult of being swallowed as possible. The attitude is one of danger and alarm; and it is a curious fact, to which I shall afterward have occasion to advert, that in this attitude nine-tenths of the *Pterichthes* of the Lower Old Red Sandstone are to be found. . . . It presents us, too, with a wonderful record of violent death falling at once, not on a few individuals, but on whole tribes."

"At this period of our history, some terrible catastrophe involved in sudden destruction the fish of an area at least a hundred miles from boundary to boundary, perhaps much more. The same platform in Orkney as at Cromarty is strewed thick with remains, which exhibit unequivocally the marks of violent death. The figures are contorted, contracted, curved, the tail in many instances is bent round to the head; the spines stick out; the fins are spread to the full, as in fish that die in convulsions. . . . The record is one of destruction at once widely spread and total, so far as it extended. . . . By what quiet but potent agency of destruction were the innumerable existences of an area perhaps ten thousand square miles in extent annihilated at once, and yet the medium in which they had lived left undisturbed in its operations?

"Conjecture lacks footing in grappling with the enigma, and expatiates in uncertainty over all the known phenomena of death."

I shall not taunt the uniformitarians by asking them to direct us to some modern analogies. But I would have the reader remember that these Davonian and other rocks are absolutely world-wide in extent.

Surely Howorth is talking good science when he says that his masters Sedgwick and Murchison taught him "that no plainer witness is to be found of any physical fact than that Nature has at times worked with enormous

*"Theoretical Geol.," p. 265. London, 1834.
† "Old Red Sandstone," pp. 48-221-2.



energy and rapidity," and "that the rocky strata teem with evidence of violent and sudden dislocations on a great scale."

I have spoken only of the class Fishes. But what other class of the animal kingdom will not point us a similar lesson? The Reptiles and Amphibians, to say nothing of the larger Mammals, are also found in countless myriads, packed together as if in natural graveyards. Everybody knows of the enormous numbers and splendid preservation of the great reptiles of the Western and Southern States, untombed by Leidy, Cope and Marsh. One patch of Cretaceous strata in England, the Wealden, has afforded over thirty different species of dinosaurs, crocodiles, and pleisosaurs. Mr. Chas. H. Sternberg, one of Zittel's assistants, recently reported great quantities of Amphibians from the Permian of Texas. They are of all sizes, some frogs being six feet long, others ten. Besides these he found three "bone-beds" full of minute forms an inch or less in length. Of the small ones, which I judge must represent whole millions of young ones suddenly entombed, he says:

"I got over twenty perfect skulls, many with vertebrae attached, and thousands of small bones from all parts of the skeleton. In one case, a complete skull, one-fourth of an inch in length, had connected with it nearly the entire vertebral column, with ribs in position, coiled upon itself, bedded with many bones of other species in a red silicious matrix. So perfectly were they weathered out that they lay in bas-relief as white and perfect as if they had died a month ago; a single row of teeth, like the points of cambric needles, occupied both sets of jaws." *

How many more such cases there may have been in these "three bone-beds full" of similar remains, it would be interesting to know. But though somewhat aside from the present subject, I cannot refrain in passing from referring to the wonderful preservation of these remains. It is preposterous to say that these bones have lain thus exposed to the weather for the millions of years postulated by the popular theory. There is not a particle of scientific evidence to prove that they are not just as recent as any specimen from the Tertiaries or the Pleistocene. Buffon and Cuvier proved the mammals to be of "recent" age, because they occurred in the superficial deposits. They never heard of the Triassic, Jurassic, and Cretaceous of Colorado and Wyoming, nor these Permian of Texas. Think of this frog's teeth "like the points of cambric needles," and he and his fellows "as perfect as if they had died a month ago." Of one of the big six-foot specimens this author says: "Its head was so beautifully preserved, and cleaned under long erosion, it was difficult to believe it was not a recent specimen." While of the little six-inch fellow referred to above he says: "The bones of the skull are perfectly preserved, quite smooth, and show the sutures distinctly; there is no distortion, some red matrix attached below seems absolutely necessary to convince the mind that it is not a thing of yesterday." James Geikie † mentions the case of the Elgin sandstones "formerly classed as 'Old Red,'" but which are now called Triassic, "from the fact that they have yielded reptilian remains of a higher grade than one would expect to meet with in

*Pop. Sci. News, May, 1902, pp. 106-7.
† "Histor. Geol.," p. 53.

old Red Sandstone." Since these strata slide up and down so easily, we have here far more urgent scientific reasons for calling these amphibian remains of Texas among the most "recent" geological deposits on the globe.

But I must return to my subject. The Invertebrates are also eloquent to the fact of abnormal conditions having prevailed when their remains were entombed. We could go through the whole list, but it is the same old story of abnormal deposits, essentially different from anything that is being made to-day.

Where, for instance, in the modern seas, will we find the remains of polyp-corals now being intercalated between beds of clays or sands over vast areas, as we find them in the Lias and Oolyte of England and elsewhere? Corals require a definite depth of water, neither too deep nor too shallow, but it must be clear and pure; and nothing but some awful catastrophe could place a bed of coral remains a few feet or a few inches in thickness over the vast areas that we find them. Crinoids require the same clear, pure water, but much deeper, some of the modern kinds living over a mile down, but every student of the science knows that the Subcarboniferous limestone of both Europe and America (called Mountain Limestone in England), so noted for its crinoids and its corals, is constantly found intercalated between shale or sandstone, or between the coal beds themselves as at Springfield, Ill., or in the Lower Coal Measures of Westmorland County, Pa. There are of course, here and there, great masses of these rocks which represent an original formation by growth *in situ*; but no sane man can say this for these great sheets perhaps only a few inches in thickness, for in many cases they show a stratified or bedded structure just as much as a sandstone or a shale. In some tables given by Dana on pp. 651-2 of his "Manual," compiled from four different localities, I count no less than 23 beds of limestone thus intercalated, though we are not told how many of them contain corals or crinoids. Such details are generally omitted as of little consequence.

Next, let us try the Lamellibranchs, such as the clam, oyster, and other true bivalves. These creatures have an arrangement in the hinge region by which the valves of the shell tend to open, but during life are held together by the adductor muscles. When dead, however, these muscles relax and decay, and then the valves spread wide open. Of course there are some, such as certain kinds of clams, which burrow in the mud or sand, and the shells of these, if they happened to die a natural death in their holes, could not spread very far apart. However some mud must even then wash into their burrows and into their empty shells. But many kinds of bivalves do not thus burrow in the ground; and when the fossils of such kinds are found in quantity with the valves applied and often hollow, as is so frequently the case in many of the "older" rocks, I cannot see how we are to understand any ordinary conditions of deposit. And yet we are gravely assured by a high authority, that "A sudden burial is not necessary to entombment in this condition."

Or, let us take the Brachiopods. These have a bivalve shell, the parts of which, however, are not pulled apart after death, and only need to open a little way even in life to admit the sea water which brings them their food. Yet, though the valves do not gape after death, there is when dead



and empty a hole at the hinge or beak, which would readily admit mud if such were present in the water, or if the shells after death were subject to the ordinary movements of tide, wave and current. Yet Dawson * says of the Brachiopods, Spirifer and Athyris:

"I may mention here that in all the Carboniferous limestones of Nova Scotia the shells of this family are usually found with the valves closed and the interior often hollow."

Of course he tries to explain how this state of things might occur "in deep and clear water"—for some of the modern species are found in the clear depths 18,000 feet down—and he thinks that their entombment in this condition "does not prove that the death of the animals was sudden." But we now know that there is no means of producing a stratified formation in this "deep and clear water," and hence that some revolution of nature is implied by the conditions in which we find them.

Some people seem to have converted David Hume's famous sentence into a scientific formula, thus: "Anything contrary to Uniformity is impossible: hence no amount of evidence can prove anything contrary to Uniformity."

For the trouble in this case is that, not only do such conditions prevail "in all the Carboniferous limestones of Nova Scotia," which must be several thousands of square miles in extent, but in the Devonian shales and Silurian limestones of Ontario and the Middle States at least—perhaps over the rest of the world—the Brachiopods are found in this same tell-tale condition, and it would establish a very dangerous precedent to admit abnormal conditions in even a single case.

I have only touched upon the voluminous evidence that might be adduced in the case of the lower forms of life. Had I the space, I might show how the marvelously preserved plants of the coal beds tell the same story. But we must pass on to consider the remains of the larger land animals. I have already given a quotation from Dana about the mammoth and rhinoceros in Northern Siberia, where he says that their encasing in ice and the perfect preservation of their flesh "shows that the cold finally became suddenly extreme, as of a single winter's night, and knew no relenting afterward." Not very many serious attempts have been made to account for this remarkable state of things, which is a protest against uniformity that can be appreciated by a child, and I never heard of any theory which attempted to account for the facts without some kind of awful catastrophe.

Many, however, seem to have little idea of the extent of these remains in the Arctic regions. They are not all thus perfectly preserved, for thousands of skletons are found in localities where the ground thaws out somewhat in the short summer, and here of course, the skin and tissues could not remain intact. Remains of these beasts occur in only a little less abundance over all Western Europe, and the mammoth also in North America, well preserved specimens having been obtained from the Klondike region of Alaska; and there is nothing to forbid the idea that many, if not most of these latter specimens were also at one time enshrined as "mummies" in

* "Acadian Geol.," p. 260.

the ice, which has since melted over the more temperate regions. But we must confine ourselves to the remains in Siberia. Flower and Lydekker tell us that since the tenth century at least, these remains have been quarried for the sake of the ivory tusks, and a regular trade in this fossil ivory, in a state fit for commercial purposes, has been carried on "both eastward to China, and westward to Europe," and that "fossil ivory has its price current as well as wheat."

"They are found at all suitable places along the whole line of the shore between the mouth of the Obi and Behring Straits, and the further north the more numerous do they become, the islands of New Siberia being now one of the favorite collecting localities. The soil of Bear Island and of Liachoff Islands is said to consist only of sand and ice with such quantities of mammoth bones as almost to compose its chief substance. The remains are not only found around the mouths of the great rivers, as would be the case if the carcasses had been washed down from more southern localities in the interior of the continent, but are imbedded in the frozen soil in such circumstances as to indicate that the animals had lived not far from the localities in which they are now found, and they are exposed either by the melting of the ice in unusually warm summers, or by the washing away of the sea cliffs or river banks by storms or floods. In this way the bodies of more or less nearly perfect animals, even standing in the erect position, with the soft parts and hairy covering entire, have been brought to light." *

But these remains of the mammoth, though the best known, are not the only ones attesting extraordinary conditions: though of course in warmer latitudes we do not find perfect "mummies" with the hide and flesh preserved untainted. Let us go to a warmer climate, to Sicily, and read a description of the remains of the hippopotamus found there. I quote from Sir Joseph Prestwich:

"The chief localities, which centre on the hills around Palermo, arrest attention from the extraordinary quantity of bones of *Hippopotami* (in complete hecatombs) which have there been found. Twenty tons of these bones were shipped from around the one cave of San Ciro, near Palermo, within the first six months of exploiting them, and they were so fresh that they were sent to Marseilles to furnish animal charcoal for use in the sugar factories. How could this bone breccia have been accumulated? . . . The only suggestion that has been made is that the bones are those of successive generations of *Hippopotami* which went there to die. But this is not the habit of the animal, and besides, the bones are those of animals **of all ages down to the foetus,** nor do they show traces of weathering or exposure. . . .

"My supposition is, therefore, that when the island was submerged, the animals in the plain of Palermo naturally retreated, as the waters advanced, deeper into the amphitheatre of hills until they found themselves embayed, as in a seine, with promontories running out to sea on either side and a mural precipice in front. As the area became more and more circumscribed the animals must have thronged together in vast multitudes, crushing into the more accessible caves, and swarming over the ground at their entrance, until overtaken by the waters and destroyed." †

* "Mammals," p. 430.

†"On Certain Phenomena, etc." pp. 50-52.



Our author then adds this summary of his argument:

"The extremely fresh condition of the bones, proved by the retention of so large a proportion of animal matter, and the fact that animals of all ages were involved in the catastrophe, shows that the event was geologically, comparatively recent, as other facts show it to have been sudden."

That it must have been a good deal more "sudden" than even this author will admit, is evident from the nature of the hippopotamus. I never thought that it was particularly afraid of the water, or likely to be drowned by any such moderate catastrophe as Prestwich invokes in this singular volume. The reader must, however, note that this affair, like the entombment of the mammoth, certainly **took place since man was upon the globe,** even according to the uniformitarians. Would it not be economy of energy to correlate the two together? But if man dates from "Miocene times," as some contend, he must have witnessed half a dozen awful affairs like these, for there is scarcely a country on the globe that has not been under the ocean since then.

Let us proceed.

But whither shall we turn to avoid finding similar phenomena? The vast deposits of mammals in the Rocky Mountains may occur to the reader. As Dana says, they "have been found to be literally Tertiary burial grounds." I need not go into the details of these deposits, nor of those in other places containing the great mammals which must have been contemporary with "Tertiary man," for I would only weary the reader with a monotony of abnormal conditions of deposit—unlike anything now being produced this wide world over. We shall be stating the case very mildly indeed, if we conclude that the vast majority of the fossils, by their profuse abundance and their astonishing preservation, tell a very plain story of "speedy burial after death," and **are of an essentially different character** from modern deposits.

Prof. Nicholson, in speaking of the remains of the Zeuglodon, says:

"Remains of these gigantic whales are very common in the 'Jackson beds' of the Southern United States. So common are they that, according to Dana, 'the large vertebrae, some of them a foot and a half long and a foot in diameter, were formerly so abundant over the country in Alabama that they were used for making walls, or were burned to rid the fields of them.' "*

Shortly before his death in 1895, Dana prepared a revised edition of his "Manual," and in it he gives us quite a rational explanation of this case, as follows:

"Vertebrae were so abundant, on the first discovery, in some places that many of these Eocene whales must have been stranded together in a common catastrophe, on the northern borders of the Mexican Gulf—possibly by a series of earthquake waves of great violence; or by an elevation along the sea limit that made a confined basin of the border region, which the hot sun rendered destructive alike to Zeuglodons and their game; or by an unusual retreat of the tide, which left them dry and floundering under a tropical sun." (p. 908.)

* "Ancient Life-History," p. 300.

That is, this veteran geologist in his old age would not attempt to account for such abnormal conditions without a catastrophe of some kind. But if we use similar explanations for similar conditions, where shall we stop through the whole range of the rocks from the Cambrian to the Pleistocene?

Dana became very fond of this idea of earthquake waves, and invoked them to account for "the universality and abruptness" with which the species disappear at the close of "Palaeozoic time," using as the generating cause the uplifting of the Appalachian Mountains, with "flexures miles in height and space, and slips along newly opened fractures that kept up their interrupted progress through thousands of feet of displacement," from which he says "incalculable violence and great surgings of the ocean should have occurred and been often repeated. . . . Under such circumstances the devastation of the sea border and the low-lying lands of the period, the destruction of their animals and plants, would have been a sure result. The survivors within a long distance of the coast line would have been few."*

But as this sudden break in the life-chain "was so general and extensive that no Carboniferous species is known to occur among the fossils of succeeding beds, not only in America and Europe, but also over the rest of the world" (p. 735), he is obliged to make his catastrophe by earthquake waves positively **world wide.** Hence he adds: "The same waves would have swept over European land and seas, and there found coadjutors for new strife in earthquake waves of European origin."

At the close of the Mesozoic he uses similar language, though in this case he has the whole range of the mountains on the west of both North and South America, the Rockies and the Andes, in length a "third of the circumference of the globe," "undergoing simultaneous orogenic movements, with like grand results." (p. 875.) "The deluging waves sent careering over the land" would, he thinks, "have been destructive over all the coasts of a hemisphere," and "may have made their marches inland for hundreds of miles" (p. 878), sweeping all before them.

I should think so; but then what becomes of this doctrine of uniformity? Personally, I have not the slightest objection to these "deluging waves sent careering over the land," for I feel sure that just such things have occurred, and on just such a scale as our author pictures, for, as he says, the destruction of species "was great, **world-wide,** and one of the most marvelous events in geological history." (p. 877.)

But it seems to me that here we have an enormous amount of energy going to waste. Others have demanded a continent to explain the appearance of a beetle in a certain locality; but here we have a great world-wide catastrophe to explain the sudden disappearance of merely a few species. Why not utilize this surplus energy in doing other necessary work, that has certainly been accomplished somehow, but has hitherto gone a-begging for a competent cause? The only thing I object to in Dana's view of the case is his way of having these "exterminations" take place on the installment plan. For in that way we have to work up a great world catastrophe to do only a very limited amount of work, and then have to repeat the thing

*"Manual," p. 736.



another time for a similarly limited work, **when one such cosmic convulsion is competent to do the whole thing.** I plead for the "law of parsimony," and the economizing of energy.

The vast shoals of carcasses which seem to be piled up in almost every corner of the world are *prima facie* evidence that our old globe has witnessed some sort of cosmic convulsion. The exact cause, nature, and extent of this event we may never have sufficient facts to determine, though two or three additional facts having a bearing on the subject will be considered in the following chapters.

# CHAPTER X

## CHANGE OF CLIMATE

Another great general fact about the fossil world may be stated about as follows:

**All of the fossils** (save a very few of the so-called "Glacial Age," and they admit of other easy explanation) **give us proofs of an almost eternal spring having prevailed in the Arctic regions, and semi-tropical conditions in north temperate latitudes; in short give us proofs of a singular uniformity of climate over the globe which we can hardly conceive possible, let alone account for.**

The proofs of this are almost unnecessary, as this subject of climate has been pretty well discussed of late years. And it was the overwhelming evidence on this point which forced Lyell and so many others to decide against the theory of Croll, which called for a regular rotation of climates, for they said that the fossil evidence was wholly against such a view. Howorth has given an admirable argument on this point in Chapter XI of his second work on the Glacial Theory * and to it I would refer the reader for details which I have not the space to reproduce here.

This author first remarks:

"The best thermometer we can use to test the character of a climate is the flora and fauna which lived while it prevailed. This is not only the best, but is virtually the only thermometer available when we inquire into the climate of past geological ages. Other evidence is always sophisticated by the fact that we may be attributing to climate what is due to other causes; boulders can be rolled by the sea as well as by sub-glacial streams, and conglomerates can be formed by other agencies than ice. But the biological evidence is unmistakable; cold-blooded reptiles cannot live in icy water; semi-tropical plants, or plants whose habitat is in the temperate zone, cannot ripen their seeds and sow themselves under arctic conditions. . . . We may examine the whole series of geological horizons, from the earliest Palaeozoic beds down to the so-called Glacial beds, and find, so far as I know, no adequate evidence of discontinuous and alternating climates, no evidence whatever of the existence of periods of intense cold intervening petween warm periods, but just the contrary. Not only so, but we shall find that the differentiation of the earth's climate into tropical and arctic zones is comparatively modern, and that in past ages not only were the climates more uniform, but more evenly distributed over the whole world."

Without attempting to follow through the whole series of formations we may note a few characteristic statements of the text-books. Thus Dana says of the Cambrian:

"There was no frigid zone, and there may have been no excessively torrid zone."

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* "The Glacian Nightmare and the Flood," pp. 426-479.



While of the Silurian coral limestones of the Arctic regions he says:

"The formation of thick strata of limestone shows that life like that of the lower latitudes not only existed there, but flourished in profusion." *

Howorth thus quotes Colonel Fielden, the Arctic explorer, regarding the fossil Sclerodermic corals of the Silurian, widely distributed in the Arctic regions:

"These undoubted reef-forming corals of the Silurian epoch were just as much inhabitants of warm water in northern latitudes at that period as are the Sclerodermata of to-day in the Indo-Pacific and Atlantic oceans. . . . These corals were forms of life which must have been tropical in habits and requirement."

In fact coral limestones of the Carboniferous system are the nearest known fossiliferous rocks to the North Pole, and from the strike of the beds must underlie the Polar Sea. In the words of Howorth, "Coal strata with similar fossils have occurred all round the Polar basin . . . and may be said, therefore, to have occupied a continuous cap around the North Pole." †

Again I quote from Howorth regarding the Mesozoic rocks:

"This very widespread fauna and flora proves that the high temperature of the Secondary era prevailed in all latitudes, and not only so, it pervaded them apparently continuously without a break. There is no evidence whatever, known to me, that can be derived from the fauna and flora of Secondary times, which points to any period of cold as even possible. There are no shrunken and stunted forms, and no types such as we associate with cold conditions, and no changes evidenced by intercalated beds showing vicissitudes of life."

The following is from Nordenskiold, as quoted by Howorth, and refers to the whole geological series:

"From what has been already stated it appears that the animal and vegetable relics found in the Polar regions, imbedded in strata deposited in widely separated geological eras, uniformly testify that a warm climate has in former times prevailed over the whole globe. From palaeontological science no support can be obtained for the assumption of a periodical alternation of warm and cold climates on the surface of the earth."‡

And now we have the equally positive language of A. R. Wallace:

"It is quite impossible to ignore or evade the force of the testimony as to the continuous warm climate of the North Temperate and Polar Zones **throughout Tertiary times.** The evidence extends over a vast area both in space and time, it is derived from the work of the most competent living geologists, and it is absolutely consistent in its general tendency . . . Whether in Miocene, Upper or Lower Cretaceous, Jurassic, Triassic, Carboniferous or Silurian times, and in all the numerous localities extending over more than half the Polar regions, we find **one uniform climatic aspect of the fossils.**" §

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* "Manual," pp. 484, 524-6.
† Op. cit. pp. 434-6.
‡ Id. p. 46.
§ "Island Life," pp. 182, 195-6; "Nightmare," pp. 455-6.

Of course in all this I am taking the various kinds of fossils in the traditional chronological order. But I shall presently show on the best of authority that Man existed in "Pliocene" or perhaps "Miocene times," and in view of such an admission we have, even from the standpoint of current theory, a vital, personal interest in this question of climate. Let us take, then, the following from James Geikie, the great champion of the Glacial theory, on the climate of the Arctic regions at this part of the human epoch:

"Miocene deposits occur in Greenland, Iceland, Spitzbergen, and at other places within the Arctic Circle. The beds contain a similar (similar to the "most luxuriant vegetation" of Switzerland) assemblage of plant-remains; the palm-trees, however, being wanting. It is certainly wonderful that within so recent a period as the Miocene, a climate existed within the Arctic regions so mild and genial as to nourish there beeches, oaks, planes, poplars, walnuts, limes, magnolias, hazel, holly, blackthorn, logwood, hawthorn, ivy, vines, and many evergreens, besides numerous conifers, among which was the sequoia, allied to the gigantic *Wellingtonia* of California. This ancient vegetation has been traced up to within eleven degrees of the Pole." *

According to Dana and other American geologists the "Glacial Period" is only a variation intervening between the warm Tertiary and the equally warm "Champlain Period," and it was during the latter that the mammoth, mastodon, etc., roamed over Europe, Asia, and America. Of the climate then indicated, when all acknowledge that Man was in existence, this author says:

"The genial climate that followed the Glacial appears to have been marvelously genial to the species, and alike for all the continents, Australia included. The kinds that continued into modern time became dwindled in the change wherever found over the globe, notwithstanding the fact that genial climates are still to be found over large regions." †

In his "Geological Story Briefly Told," he uses even stronger language:

"The brute mammals reached their maximum in numbers and size during the warm Champlain Period, and many species lived then which have since become extinct. Those of Europe and Britain were largely warm-climate species, such as are now confined to warm temperate and tropical regions; and only in a warm period like the Champlain could they have thrived and attained their gigantic size. The great abundance of their remains and their condition show that the climate and food were all the animals could have desired. They were masters of their wanderings, and had their choice of the best." ‡

"The genial climate of the Champlain period was *abruptly* (italics Dana's) terminated. For carcasses of the Siberian elephants were frozen so suddenly and so completely at the change, that the flesh has remained untainted." (Id. p. 230.)

I quite agree with this author that the evidence is conclusive as to the climate and food being "all the animals could have desired," and that

* "Historical Geology," p. 76.
† "Manual," p. 997.
‡ p. 225, Edition of 1875.



they must have "had their choice of the best." But it seems to me that in following out their theory these authors have not left the poor creatures very much to choose from. For as the inevitable result of their theory in arranging the plants as well as the animals in chronological order according to the percentages of living and extinct forms, they have already disposed of, and consigned to the "early" Tertiaries, etc., all the probable vegetation on which these animals lived, and thus have nothing left on which to feed the horse and bison, rhinoceros and elephant, etc., away within the Arctic Circle, except the few miserable shrubs and lichens which now survive there.

But this strange, inconsistent notion of Dana's that the so-called Glacial phenomena lie in between the warm Tertiary and the equally warm "Champlain period," is easily understod as the survival of the notion, so tenaciously held even later than the middle decades of the nineteenth century, that Man was not a witness of any of the great geological changes. When the evidence became overwhelming that Man lived while the semi-tropical animals roamed over England, the "Glacial period" still remained as a sort of buffer against the dangerous possibility of extending the human period back any further. I am not aware that this venerable scientist ever became quite reconciled to the idea of "Tertiary Man," though in his "Manual" he mentions a few evidences in favor of this now almost universally accepted opinion.

As for the real teachings of the Drift phenomena there is no need of explanation here. At the very most they are confined to a quite limited part of the northern hemisphere, there being no trace of them in Alaska, nor on the plains of Siberia, where now almost eternal frosts prevail.* In fact they are practically confined between the Rocky Mountains and the Missouri River on the west, and the Ural Mountains on the east; and with a little common sense infused into the foundation principles of the science we will cease to be tormented with a "Glacial Nightmare." Much of the Drift phenomena with the raised beaches are certainly later events than most of the other geological work, but are inseparably connected with the general problem in their explanation. Even from the ordinary standpoint, I am not aware that the elaborate argument of Howorth has even been satisfactorily answered. Indeed, I feel almost like saying that this writer's various contributions to the cause of inductive geology mark the beginning of the dawn.

Hence it may suffice here to merely call attention to the great simplicity introduced into this vast complexity of the glacialists, by the positive assurance of this author that the "Drift period" and the Pleistocene end together, and join onto the modern; or perhaps I ought rather to say that the so-called Glacial phenomena lie in between the true fossil world and our modern one.

"Thus, in regard to the Pleistocene mammals, the view is now generally accepted that, in every place where they have been found in a contemporary bed, that bed underlies the till, and is therefore pre-glacial. As

* See Dana's "Manual," pp. 945, 977; also "The Glacial Nightmare," pp. 45-2, 531, etc.

in other places, so here (Scotland), teeth and bones of mammals have occurred in the clay itself; but in all such cases they occur sporadically and as boulders. As Mr. James Geikie says, 'They almost invariably afford marks of having been subjected to the same action as the stones and boulders by which they are surrounded; that is to say, they are rubbed, ground, striated, and smoothed.'" *

And again:

**"The Pleistocene fauna, so far as I know, came to an end with the so-called Glacial age."** (Id. p. 463.)

From a recent notice in *Nature* † it would seem that even Dr. H. Woodward, of the British Museum, supports this general view in his "Table of British Strata," by the statement that the glacial deposits contain **only derived fossils.**

But this is such a decided simplification of the problem of climate that I am utterly at a loss to understand how any one can still cling to the complex and highly artificial arrangement of numerous "interglacial" periods, to account for a few bones of mammals or a few pockets of lignite; and how they can even place between the "Glacial period" and our times the "genial Champlain period," with it, as Dana says, **"abruptly terminated,"** and becoming **"suddenly** extreme as of a single winter's night." Howorth, in the latter part of the chapter already quoted from (pp. 460-478), gives a good review of this subject of intermittent climates, and strongly supports his contention that the **stratigraphical evidence** all points to the fact that the Pleistocene forms are always older than the Drift-beds, and where the flora and fauna of the Pleistocene occur in the Drift, they do so only as boulders; that, in fact, as he says in his Preface, "The Pleistocene Flood . . . **forms a great dividing line** in the superficial deposits," separating the true fossil world from the modern.

I have hardly the space to repeat here my argument about the extremely fanciful way in which geologists classify the various members of the Tertiary group and the Pleistocene. And yet I must say a few words. I have tried to show the utter nonsense of the common custom of classifying these beds according to the percentage of living and extinct forms which they contain, when the real fact is that the number and kinds of the ancient life-forms which have survived into the modern era is a purely fortuitous circumstance, being limited solely to those lucky ones which could stand the radical change from a tepid water or a genial air to the ice and frosts which they now experience, to mention only one circumstance of that cosmic convulsion which we now know to have really intervened between that ancient world and our own. **YET IT IS ON SUCH EVIDENCE ONLY** that these Pleistocene forms are separated from the Tertiaries, or that the Tertiaries themselves are classified off—at least as far as the invertebrates and the plants are concerned. No one claims that the so-called Glacial beds can be sharply distinguished from other deposits on purely mechanical make-up. Indeed, I am strongly of the opinion that very many Archaean soils, totally unfossiliferous themselves, and resting on unfossiliferous rocks,

* "Great Ice Age," p. 129; "Nightmare," p. 473.
† See *Nature* April 11, 1901, p. 560.



have been assigned to the "Glacial age," merely because their discoverers did not know what else to do with them. When beds contain fossils, the latter are the one and only guide in determining age; but in view of the purely arbitrary character of this method of classifying off the Tertiary and post-Tertiary rocks, I do not see where we are going to **draw the line** when we once admit that the post-Tertiary beds contain only "derived fossils." It seems to me truly astonishing that shrewd reasoners, like Howorth and Dr. Woodward, have not seen the dangerous character of this precedent which they have admitted. For with that marvelous climate of all geological time continuing right up to that fatal day when it was "abruptly terminated," and the mammoth and his fellows were caught in the merciless frosts which now hold them, the percentage of all the lucky forms of life, plants, invertebrates, or mammals, which could stand such a change and "persist" into our modern world, must be **utterly nonsensical as a test of age** even from their standpoint.

In resuming the main argument of this chapter, I need only summarize by saying that the evidence is conclusive that all geological time down to this sharp "dividing line" was characterized by a surprisingly mild and uniform climate over all the earth. The modern period is characterized by terrific extremes of heat and cold; and now little or nothing can exist where previously plant and animal life flourished in profusion.

This radical and world-wide change in climate, therefore, demands ample consideration when seeking a true induction as to the past of our globe. That it was no gradual or secular affair, but that the climate "became **suddenly** extreme as of a single winter's night," the Siberian "mummies" are unanswerable arguments. **That it occurred within the human epoch** all are now agreed.

# CHAPTER XI

# DEGENERATION

There is another great general fact about the fossil world which seems to be a natural corollary from the one already given about climate.

It is this:

**The fossils, regarded as a whole, invariably supply us with types larger of their kind and better developed in every way than their nearest modern representatives, whether of plants or animals.**

This fact also is so well known that it needs no proof. Through the whole range of geological literature I do not know of a word of dissent from this general fact by any writer whatever. Proof therefore is not necessary, though a brief review of a little of the evidence may refresh our memories.

To begin with the Cambrian, Dana says:

"The Pteropods, among Mollusks, were much larger than the modern species of the tribe. The Trilobites even of the Lower Cambrian comprise species as large as living Crustaceans. The Ostrapods are generally larger than those of recent times." *

Again, in speaking of the general character of the Cambrian fossils, he says:

"The types of the early Cambrian are mostly identical with those now represented in existing seas, and although inferior in general as to grade [in the "Phylogenic series"], they bear no marks of imperfect or stunted growth from unfit or foul surroundings." (p. 485.)

The well known Mollusk, *Maclurea magna*, which is so enormously abundant in the Silurian, is often eight inches in diameter, and the astounding Cephalopod genus, *Endoceras*, consisting of twenty species, found only in two divisions of the Lower Silurian, has left shells over a foot in diameter, and ten or twelve feet long!

Of the fishes of the Devonian we have, among other remarks of a similar character, the following:

"The Dipnoans, or 'Lung-fishes,' were represented by gigantic species called by Newberry *Dinichthys* and *Titanichthys*, from their size and formidable dental armature. . . . A still larger species is the *Titnichthys clarki* of Newberry, in which the head was four feet or more broad, the lower jaw a yard long. This jaw was shaped posteriorly like an oar blade, and anteriorly was turned upward like a sled runner."†

One of the ancient Eurypterids from the Old Red Sandstone of Europe has a length of six feet, which is more than three times that of any Crustacean now living. While a gigantic Isopod Crustacean from the same strata had a leg the basal joint of which was three inches long, and three-

* "Manual," p. 487.
† pp. 618-9.



quarters of an inch through, which is larger than the whole body of any modern species.

The ancient "Horse-tails," "Ground-pines," Ferns and Cycads were trees from 30 to 90 feet high, and their carbonized stems and leaves make up many of our largest and best beds of coal. Compared with them the modern representatives are mere herbs or shrubbery.

Of the gigantic insects of the Devonian and Carboniferous beds we might make similar remarks. Some of the ancient locusts had an expanse of wing of over seven inches; while many of the ancient Dragon-flies had bodies from a foot to sixteen inches long, with wings a foot long and over two feet in spread from tip to tip.

Here is James Geikie's summary of the leading types of the Palaeozoic:

"Many Palaeozoic species were characterized by their large size as compared with species of the same groups that belong to later times. Thus, some Trilobites and other Crustaceans were larger than any modern species of Crustaceans. The Palaeozoic Amphibians also much exceeded in size any living members of their class. Again, the modern club-mosses, which are insignificant plants, either trailing on the ground or never reaching more than two feet in height, were represented by great lepidodendroid trees."

Sternberg, in speaking of some of the frogs which he found in the Permian of Texas, says:

"I found several skulls that measured over a foot from the end of the chin to the distal point of the horns. . . . I think when alive the frog must have been six feet long." *

He mentions another specimen which was "about 10 feet long," the head of which was "about 20 inches in length," with jaws "more powerful than those of an ox."

Of the monstrous Dinosaurs of the Mesozoic rocks one hardly needs to speak.

"They were the most gigantic of terrestrial animals, in some cases reaching a length of 70 or 80 feet, while at the same time they had a height of body and massiveness of limb that, without evidence from the bones, would have been thought too great for muscle to move."†

They abound in both the Old and the New World.

Of the gigantic Mammals of the Tertiary beds of the Western States, it would also be superfluous to speak; their gigantic size is known by every high school pupil, or every one who has visited any important museum in Europe or America.

We may perhaps be reminded again that all the species of these "older" rocks are extinct species. I have already suggested the grave doubts on this point, regarding the great mass of the lower forms of life, plant and animal; but we will let that pass. But let us take some of the "late" Tertiary and Pleistocene mammals, which cannot be distinguished from living species, and how do we fare? It is the same old story; the moderns are degenerate dwarfs.

* *Pop. Sc. News*, May, 1902, p. 106.
† Dana, "Manual," p. 761.

The hippopotamus (*H. major*) is a good one to start with, for Flower and Lydekker* say that it "cannot be specifically distinguished from *H. amphibius*" of Africa. This gigantic brute used to live in the rivers of England and Western Europe. The text-books generally say in "Pliocene times," because, I suppose, no one has the courage to suggest that it lived under the ice of the "Glacial period." We are always pointed to the wool on the rhinoceros and the mammoth as indicating a somewhat cool climate, but the well known amphibious habits of the hippopotamus cannot be so easily disposed of. But if, as I believe, this world never saw a foot of ice at the sea level till the end of the "Pleistocene period," to speak after the current manner, the problem becomes very simple. In that case the time of the Hippopotamus in England was neither earlier nor later than that of the palms and acacias of the "early" Tertiary or Mesozoic rocks, or than that of the mammoth, lion, and hyena of the Pleistocene. There is as we now know absolutely nothing but an out-of-date hypothesis to indicate that they did not all live there together. We may, if we choose, try to dovetail those conditions into the present on the basis of uniformity and slow secular change, by assuming a few million years for the process, but there is neither a particle of evidence nor of probability that the hippopotamus was not contemporary alike with the palms of the Eocene and the elephants and lions of the post-Tertiary.

As for the mammoth itself, which Flower and Lydekker have intimated may turn out identical with *E. Columbi* and *E. armeniacus*, and thus the direct ancestor of the modern Asiatic elephant (*E. indicus*), some have argued that its average size was not greater than that of the existing species of India and Africa. But Nicholson says that it was:

". . . considerably larger than the largest of living elephants, the skeleton being over sixteen feet in length, exclusive of the tusks, and over nine feet in height." †

Dana is equally positive:

"The species was over twice the weight of the largest modern elephant, and nearly a third taller."‡

The upper incisors or tusks were very much longer than in the modern species, being from ten to twelve feet long, and sometimes curved up and back so as to form an almost complete circle. As these tusks continue to grow throughout life, their enormous length is, I take it, a proof of much greater longevity and thus of greater vitality than in the cases of the modern species. The latter is simply a degenerate.

And so I might go on with the Edentates, the Ungulates, the Rodents, the Carnivores, etc., for the same thing must be said of all.

As Sir William Dawson § remarks:

"Nothing is more evident in the history of fossil animals and plants of past geological ages than that **persistence or degeneracy are the rule** rather than the exception. . . . We may almost say that all things left

* "Mammals, etc., p. 281.
† "Ancient Life-History," p. 357.
‡ "Manual," p. 998.
§ "Modern Ideas of Evolution," Appendix.



to themselves **tend to degenerate**, and only a new breathing of the Almighty Spirit can start them again on the path of advancement."

In spite of the long popular views of Cuvier, every modern scientist admits that the great lion and hyena of the Pleistocene are identical with the living species of Africa. Many say the same thing of the fossil bear as compared with the modern brown bear and the grizzly, though, as Dana remarks of all three, lion, hyena, and bear, "these modern kinds are dwarfs in comparison."

I quote again from Dana:

"Thus the brute races of the Middle Quaternary on all the continents exceeded the moderns greatly in magnitude. Why, no one has explained."*

This was in 1875. In the last edition of his **"Manual,"** published shortly after his death, he has this to say in addition:

"A species thrives best in the region of fittest climate. **In the Pleistocene, the fittest climate was universal.** Geologists have attributed the extinction of most of the species and the dwindling of others to the cold of the Reindeer epoch. It is the only explanation yet found, though seemingly insufficient for the Americas." (p. 1016.)

However, since the discovery of the pictures of the reindeer and the mammoth drawn and even painted **side by side** on the caverns of Southern France, undoubtedly from life and by the same artist, we do not hear so much about the "Reindeer epoch," and the "Mammoth epoch." A little thought should have suggested long ago that it was more reasonable to suppose the reindeer, glutton, musk-ox, etc., to have been originally adapted to the high mountains and table lands of that ancient world, than to imagine all the fauna careering up and down over continents and across seas like a lot of crazy Scandinavian lemmings, as the migration theory involved. But most geologists seem never to have had any use for mountains or plateaus, except to breed glaciers and continental ice-sheets. But the only point which I wish to insist upon here is that the cause, **whatever it was,** that made such a zoological break at the "close" of the Pleistocene, and which compelled the shivering, degenerate survivors, that could not stand the new extremes of frost and snow, to shift to the Tropics—this cause was certainly competent to do a good deal more work in the way of "extinction" or "dwindling" of species than the uniformitarians have generally given it credit for.

And in summing up this matter regarding the size and physical development of species, we must confess that we find in geology no indication of inherent progress upward. Variation there is and variation there has been, even "mutations" and "saltations," but with one voice do the rocks testify that the general results of such variation have not been upward. Rather must we confess as a great biological law, that **degeneration has marked the history of every living form.**

* "Geol. Story Briefly Told," p. 229.

# CHAPTER XII

# FOSSIL MEN

There is still another fact which we must consider ere we can frame any wise or safe induction regarding the geological changes. It is this:

**Man himself, to say nothing of numerous living animals and plants, must have witnessed something of the nature of a cosmic convulsion—how much it is the object of our search to find out.** Even according to the ordinary text-books, he must have seen the uplifting of the greater part of the mountain chains of the world; while he certainly lived in conditions of climate, and of land and water distribution, together with plant and animal surroundings, which preclude the possibility of dovetailing those conditions into the present order of things on any basis of uniformity.

By this proposition I simply mean that Man must have witnessed a cosmic geological catastrophe of some character and of some dimensions—the true nature and probable limits of this catastrophe ought to be the chief point of all geological inquiry. But instead of this method, instead of finding out whether our present world was ever a witness of such an event, the founders of the science began at the little end of an assumed succession of life (involving a preposterous supernatural knowledge of the past), and gradually worked up a habit of explaining everything in terms of Uniformity long decades before they would acknowledge that Man or the present order of things had anything to do with this fossil world. The evidence on this latter point finally became overwhelming; but with their habit of Uniformity well mastered, and their long, single file of life succession all tabulated off and infallibly fixed, modern geologists have hitherto refused to look at the whole science from this new point of view, or to reconstruct geological theory if need be in accordance with a true modern induction.

And in this proposition the reader will understand that I believe in what is called "Tertiary man." I am aware that a few scientists still contest this view, but the evidence (from the standpoint of current theory) seems to me to be overwhelmingly against them. But in this fact, if it be a fact, that Man lived under the wholly strange and different conditions of "Pliocene" or perhaps "Miocene times," is **THE VERY STRONGEST POSSIBLE ARGUMENT** that I can conceive of for the necessity of a complete reconstruction of geological theory—I mean, of course, apart altogether from the preposterous way in which the life succession was assumed and built up and then treated as an actual fact. It was when this grim fact of Man's inseparable connection with the fossil world was borne in upon me, that I began to realize the possibility and imperative necessity of reconstructing the science on a truly inductive basis.

I shall not undertake to give a complete up-to-date argument for "Miocene" or even "Pliocene Man." The subject is still under discussion as to **just how far back** along this thin line of receding life forms Man actually



did live, and from the peculiar methods now in vogue which are so wholly subjective in character, it would seem to be capable of settlement in almost any way one chooses. However, whole volumes are being written on the subject, and the end is not yet. But there is no denying that human remains have frequently been found in strata which, but for their presence, would have been assigned a place far back in "Tertiary time." The existence of strong evidence for "Tertiary Man" no one would think of denying.

In all this, of course, I am considering the question from the common uniformitarian standpoint. But why should it be necessary for us to positively settle the question as to just how far back in geological time Man actually did live? For those who have attentively read my statement of the unscientific methods of classifying these Tertiary and post-Tertiary beds—or all the others for that matter—I need not here add any further argument. If the accepted succession of life is, to put it as mildly as possible, not quite a scientific certainty; if the time-honored custom of classifying these so-called "superficial" beds by their relative percentages of extinct and living forms rests under a shadow of suspicion as to its scientific accuracy; if, above all, we do not at the beginning prejudice the whole case by the assumption of uniformity, **what need is there of determining whether "Pliocene" or "Miocene" shells are found with these fossil human remains?**

That Man lived in Western Europe contemporary with those giants of the prime, the elephant and the musk-ox, the rhinoceros and the reindeer, the lion, the Cape hyena, and the hippopotamus, at which time a very different distribution of land and water prevailed over these parts, with a radically different mantle of climate spread over all, no one will deny for a moment. Such facts are now found in the primary text-books for our children in the public schools.

But since geologists still classify the rocks as they do, and give a time value to percentages of extinct and living species of marine shells, etc., we are in a measure compelled to take the matter where we find it, and enquire how far back in geological time, i.e., among what kinds of fossils, are human remains found?

One of the best popular works on the subject that I know of is "The Meeting-Place of Geology and History," (1894) by Sir J. W. Dawson; though, like all other works of its kind written from the religious standpoint, it endeavors as far as possible to minimize the evidence in support of Man's geological antiquity.

This author thinks that Dr. Mourlan, of Belgium, has "established the strongest case yet on record for the existence of Tertiary Man." (p. 30.) It is that of some worked flints and broken bones of animals "imbedded in sands derived from Eocene and Pliocene beds, and supposed to have been remanie by wind action." Prestwich * has brought forward similar facts; and though the evidence in favor of the genuine geological character of these remains seems to me little if any better than that from the auriferous gravels of California, I am willing to **take them as reported.**

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* "Controverted Questions of Geology," Article III, 1895.

Dawson speaks of the nearly entire human skeleton described by Quatrefages from the Lower Pliocene beds of Castelnedolo, near Brescia, and only answers it with a sarcastic remark about the well developed skull of this ancient man.

"Unfortunately the skull of the only perfect skeleton is said to have been of fair proportions and superior to those of the ruder types of post-Glacial men. This has cast a shade of suspicion on the discovery, especially on the part of evolutionists, who think it is not in accordance with theory that man should retrograde between the Pliocene and the early modern period instead of advancing." *

Lastly, we have the following about the Miocene:

"There are, however, in France two localities (Puy, Courney and Thenay), one in the Upper and the other in the Middle Miocene, which have afforded what are supposed to be worked flints."

He adds that "The geological age of the deposits seems in both cases beyond question;" but contents himself with a derisive answer about these chipped flints being possibly "the handiwork of Miocene apes."

This language, coming from such a source, would seem as good evidence as is needed to prove that Man was contemporary with, and that his remains are now found among the fossils of the Middle Miocene. For it must be remembered that these are reluctant admissions drawn from this illustrious scientist, who was one of the last champions of the old ideas about the "recent" origin of Man. As Pres. Asa Mahan of Cornell has said, "Admissions in favor of truth from the ranks of its enemies constitute the highest kind of evidence." At any rate, I shall treat this point as already proved, **for whether this particular instance is accepted or not, practically all modern writers admit the fact of "Middle Tertiary Man."**

I have already alluded to the recently discovered paintings on the cave walls of Southern France, where reindeer, aurochs, horses and mammoths have been reproduced with striking accuracy and skill, and of such an age that they have in places been covered by stalactites over two inches in thickness. The Marquis De Nadaillac,† who has given the best description of these interesting antiquities that I have been able to see, remarks that "the drawing is wonderful," and that "we are justly astonished to find such artistic performances in times so distant from ours, and in which we did not suppose a like civilization."

I have not seen the geological date to which these remains have been assigned, but doubtless it is the very "latest" part of the Pleistocene—they show far too high a development for "Miocene" or even "Pliocene times." But I should like to be shown some good and sufficient reason for saying that these men are not just as likely to have been contemporary with the Middle Tertiary fauna and flora as any others. **Some men were as commonly admitted.** And in the name of sacred common sense, if the human period is thus elastic enough to stretch out over the Pleistocene, the Pliocene, and clear back to the "Middle Miocene," **why can't we do the same for all of man's strange companions,** the mammoth and the Cape hyena, the reindeer

* "Meeting-Place," pp. 28, 29.
† *Pop. Sc News*, Feb. 1902.



and the hippopotamus, the lion and the musk-ox, etc.? The usual sneers about it being impossible for this apparently incongruous mixture to live side by side in the same district must now cease. They certainly did live side by side, as is shown by these companion pictures of the mammoth and the reindeer in the very southern part of sunny France, to say nothing of the numerous cases where the bones of the above mentioned animals are all mixed together indiscriminately. How is it unreasonable to suppose that these elephants, lions and hippopotami lived beneath the "early" Tertiary palms, cinnamons, and mimosas of the lower elevations, while the reindeer, musk-ox and glutton lived beneath the maples, birches and beeches of the high mountain sides? Some such conditions must have existed, for that magnificent world, whose ruins we now find buried beneath our feet, was **a homogeneous and harmonious** unit in its plant and animal life, in spite of the fables upon which we have so long been fed in the name of geological science. Things which are equal to the same thing must be equal to one another; hence the plants and animals which were contemporary with the same creature (Man) must have been **contemporary with each other;** and hence there is absolutely nothing to forbid the idea that Man and his Pleistocene companions were really contemporary with the flora and fauna of the Middle Tertiary.

Hence we may now proceed to inquire what geological changes have occurred since the "Middle of the Miocene," according to the accepted teachings of geology.

Our first point must be that of climate, and I have already given abundant evidence to show that at that "time" an abundant warm-climate vegetation mantled all the Arctic regions. As already quoted from Wallace, throughout the whole Arctic regions, and during the whole of geological time, "we find one uniform climatic aspect of the fossils," and "It is quite impossible to ignore or evade the force of the testimony as to the continuous warm climate of the North Temperate and Polar Zones throughout Tertiary times."

That this astonishingly mild and uniform climate prevailed over these regions until and during the time of the mammoth, we ought not to have a shadow of doubt. **What single bit of positive evidence is there to show that it did not?** That he must have had some such vegetation on which to feed is certain, and there is no proof of any previous interruption of these conditions save a series of hypotheses. He and his fellows browsed on semi-tropical and warm temperate plants far within the Arctic Circle, if there happened to be land there, doubtless over the very Pole itself; but suddenly!! lo, something caught him with the grip of death—

> "And wrapped his corpse in winding-sheet of ice,
> And sung the requiem of his shivering ghost."

Who has not read of their untainted meat now making food for dogs and wolves? Their stomachs are well filled with undigested food, showing, as one author remarks, that they "were quietly feeding when the crisis came." Dr. Hertz recently reported one not only with its stomach full of food, but with its mouth full, too. No wonder that even an orthodox geologist like Prof. Dana is compelled to say that these things prove "that the

cold finally became **suddenly** extreme, as of a single winter's night, and knew no relenting afterward."

Here then is one very notable geological event which has taken place within the human epoch, and the only thing of its kind of which geology has an undeniable record, viz., a sudden and radical change in the earth's climate; **a cosmic affair, and not a local phenomenon.** I need not here attempt to discuss the **how** of this world catastrophe as it must have been, or the other changes inseparably involved. The fact itself is as certain as Man's own existence.

The next division of our subject, in further consideration of the changes that have taken place since Man's existence, as stated at the beginning of this chapter, relates to the changes of land and water distribution since "Middle Miocene times." And here again I shall try to take the classification of these rocks just as I find them.

The first thing which impresses us is the extremely fragmentary distribution of the Miocene and Pliocene beds. Not, however, that they are uncommon nor yet of small extent. On the contrary they are scattered over America and Eurasia—and all the rest of the globe for that matter—like the spots on a leopard, or the warts on a toad's back, till it becomes one of the unsearchable mysteries of the science how these innumerable patches can be got down under the ocean to receive their load of sediment, without deluging the surrounding regions in a similar manner. But then, to be sure, fresh-water lakes will answer the same purpose, and are particularly indicated when the **proportion** of plants and terrestrial animals is **in excess** of the true marine fossils. And so enormous fresh-water basins are described here and there, with the great mammals crowding about their margins in their zeal to become fossilized, that the mountain tops may be saved from going under once more—or perhaps I should say to enable the modern writers to get some of these strata puckered up to their full height before these "late" Tertiary deposits were made. This mountain making business is another affair that geologists would like to have take place on the installment plan, but unfortunately it seems to have been nearly all postponed till the very close of "geological time." This arrangement of fresh-water lakes saves the central Rocky Mountain region from going down again beneath the deep. But it cannot save the Alps, Juras and Appenines in Europe, nor parts of the Himalayas, and I know not what other mountains in Asia, nor the coast region of California and Oregon in America, to say nothing of large parts of the Andes in South America, with regions in Africa and Australia.

But what is the use of trying to figure out the amount of our earth which has been under the ocean since "Middle Tertiary times," and thus since Man was upon it? To save the northern half of Europe with all of Canada from again going under at the close of the "Tertiary period," geologists have spread out their continental ice sheets, and have asked them to do duty instead of water. But this is hardly sufficient, for the "upper" or "later" part of the so-called "Glacial" deposits are clearly stratified; and so they either invoke a **"flood vast beyond conception,"** as Dana does in America for the "final event in the history of the glacier," or, as others prefer, the whole region is baptized again. As Dawson says



in his "Meeting-Place of Geology and History," **"No geological event is better established than the post-Pliocene submergence."**

But I must not weary the reader by dwelling on this monotonous repetition of catastrophes—for must they not have been catastrophic if such ups and downs of whole continents are crowded within the human period? We may allow a number of thousands of years for Man's possible existence, but Archaeology and History alike protest against the **millions** of years required to explain these continental oscillations on any basis of uniformity. One such period of horror ought to be enough for us, and to understand or explain it in a truly scientific manner, we must with it correlate the sudden and world-wide change of climate already described.

One more point demands consideration ere we complete this subject of what Man has witnessed of geological change. For, according to current theory **almost all the mountains have been either wholly formed or at least completed within quite "recent" times:** indeed many of the greatest mountain chains have been puckered up from the position of horizontal strata wholly since "Miocene times," which for us means since Man was upon the globe.

Thus Dana in speaking of the part of Western America which has been elevated since "Miocene times," says that it—

". . . probably included the whole of the Pacific mountain border, from the line of the Mississippi Valley to the Pacific coast line and outside of this line for one or more scores of miles." *

And he adds the significant words:

"Contemporaneously, similar movements were in progress over the other continents: along the Andes, affecting half, at least, of South America; the Pyrenees, Carpathian Alps, and a large part of Europe; the Himalayas and much of Asia." (p. 365.)

Let us now take a brief glance at a few of the details of what these mountains were thus doing while Man was living in semi-tropical England, or at least Western Europe.

In speaking of foreign examples of Tertiary mountain-making this author devotes especial attention to the Alps and the Juras, for their structure is better understood, having been more carefully studied. And of an example described by Heim, already spoken of, he says:

"One of the overthrust folds in the region has put the beds upside down over an area of 450 square miles. Fifty thousand feet of formations of the Jurassic, Cretaceous, Eocene Tertiary and Miocene Tertiary, were upturned **at the close of the Miocene period."** †

With what a whack must this mighty mass of rocks have fallen on itself—miles in thickness, and turned "upside down over an area of 450 square miles"!!!

Of course I am here taking the record just as I find it, as I have already discussed this matter of "overthrust folds."

I need not give further examples from the other great mountain ranges. Their structure is not so well understood as that of the Alps, though doubt-

* "Manual," p. 364.
† p. 367.

less when examined they will be found just as "young," and just as full of astonishing mountain movements as those already examined. But this much is already certain, that practically over all the world the mountains were either completed or wholly raised from the sea level during "late Tertiary" and "early Quaternary time." No wonder Dana says that this fact "is one of the most marvelous in geological history."

"It has been thought incredible that the orographic climax should have come so near the end of geological time, instead of in an early age when the crust had a plastic layer beneath, and was free to move; yet the fact is beyond question." ("Manual," p. 1020.)

I think I have now abundantly proved the various heads of the proposition with which I began this chapter, viz., that even from the standpoint of the current theories:—*

(1) Man must have seen the entire elevation or at least the completion of practically all the great mountains of the world, such as the Rockies, Andes, Alps, Himalayas, etc.

(2) The relative distribution of land and water surface has—since Man's advent as commonly stated—changed completely. The land and water have practically changed places over the greater part of the globe.

(3) Man lived while the Arctic regions had a mild soft climate, and he lived to see these conditions so suddenly changed that some of his dumb brute companions were caught in the waters and frozen so speedily that their flesh has remained untainted. Other considerations show this change of climate to have affected the whole globe.

The lesson to be drawn from this as the last fact in the line of cumulative evidence here presented, will be considered in the following chapter.

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*(Note. In this discussion I have purposely ignored the various instances where human remains have been reported from deposits of even greater "antiquity" than the Middle Tertiaries.)

# CHAPTER XII

# INDUCTIVE METHODS

In the First Part of this book I tried to examine into the facts and methods which are commonly supposed to prove that there has been a succession of life on the globe. We found that this life succession theory has not a single fact to support it; that it is not the result of scientific research, but wholly the product of an inventive imagination; that no one kind of fossil has even been proved or can be proved to be intrinsically older than another, or than Man himself; and hence that a complete reconstruction of geological theory is imperatively demanded by our modern knowledge.

In the Second Part I have brought out the following additional facts:

1. The abnormal character of much of the fossiliferous deposits.
2. A radical and world-wide change of climate.
3. The marked degeneration in passing from the fossil world to the modern one.
4. The fact that the human race, to say nothing of a vast number of living species of plants and animals, has participated in some of the greatest of the geological changes—we really know not how to limit the number or character of these changes.

Surely a true spirit of scientific investigation would now begin to inquire, **How did these changes take place?** Discarding the use of stronger language, it is at least utterly unscientific to begin somewhere at the vanishing point of a past eternity and formulate our pretty theories as to how this deposit was made, and how that was laid down, and the exact order in which they all occurred; while these "recent" deposits, in which our race and the plants and animals living about us are acknowledged to be concerned, are left over till the last, and we then find that they admit of absolutely no explanation. We ourselves, to say nothing of thousands of living species of plants and animals, have participated in some of the very greatest of the geological changes—we know not how many or how great. **These things must be first explained.** Has anything happened to our world that will explain them? Are there known forces and changes now in operation which, granting time enough, will amply and sufficiently explain these facts, as simply one in kind with those of the present day?

To this last question we must admit that our historic experience, prolonged over several thousand years, utters a thundering **NO!**. Volcanoes are every now and then breaking forth; but volcanoes and mountain ranges have nothing in common with one another as to structure and origin. No one claims that a single mountain flexure is now being formed or has been formed within the historic period. There are indeed "creeps" in the rocks in certain places, but these are not such as to contribute to the height of the mountains in which they occur, but rather the reverse. Sudden changes of level within small areas have occurred, but neither in extent nor in kind do they furnish any key as to past changes of level; while the so-called

"secular" changes are so microscopic in extent and so doubtful in character that they are utterly unworthy of consideration in view of the stupendous problems which we are trying to explain. The well-known work of Eduard Suess is a standing protest that such geological chances are **not now in progress;** for, in speaking of how the land and ocean have exchanged places in the past, Zittel represents him as teaching that their "cause of origin until now **has not yet been discovered."***

Or, to quote the expressive words of Suess himself, with which he concludes his discussion of this very subject:

"As Rama looks across the ocean of the universe, and sees its surface blend in the distant horizon with the dipping sky, and as he considers if indeed a path might be built far out into the almost immeasurable space, so we gaze over the ocean of the ages, but **no sign of a shore shows itself to our view."** (Id. p. 294.)

As for climate, I never heard any one suggest that cosmic changes of climate are now known to be going on, much less that **sudden** changes of the kind indicated by the North Siberian "mummies" are in the habit of occurring. In fact, we must all own that the mountains, the relative position of land and water, as well as the climate of our globe, are each and all now in a state of stable equilibrium, and have been in this state since the dawn of history or of scientific observation.

Accordingly I ask, **How much time is needed** to account for the facts before us on the basis of Uniformity? In common honesty will a short eternity itself satisfy the stern problem before us? I cannot see that it holds out the slightest promise of solving it; while, on the other hand, I am sure that, in dealing with the past of Man's existence (theories of evolution and all other theories of origins whatever cast aside), we are not at liberty to make unreasonable demands of time. The evidence of history and archaeology is all against it.

From the latter sciences it can be shown that at their very dawn we have, over all the continents, a group of civilizations seldom equalled since save in very modern times, and all so undeniably related to one another and of such a character that they prove a previous state of civilization in some locality **together,** before these scattered fragments of our race were dispersed abroad. We can track these various peoples all back to some region in Southwestern Asia, though the exact locality for this source of inherited civilization has never yet been found, and it is now almost certain that it is somehow lost in the geological changes which have intervened. For when we cross the well marked boundary line between history and geology, we have still to deal with men who apparently **were not savages,** men who with tremendous disadvantages could carve and draw and paint as no savages have ever done, and who had evidently domesticated the horse and other animals. But as to time, history gives no countenance to long time, i.e., what geologists would call long. Good authentic history extends back a few score centuries, archaeology may promise us a few more. As for **millions** of years, of even a few **hundred thousands,** the thing

* "History," p. 320.



seems too absurd for discussion, unless we forsake inductive methods, and assume some form of evolution *a priori.*

Hence it ought to be evident that no amount of learned trifling with time will solve our problem without supposing some strange event to have happened our world and our race, long ago, and before the dawn of history. I see no possible way for scientific reasoning to avoid this conclusion. Ignoring for the present the Chaldean Deluge tablets, and what Rawlinson calls the "consentient belief" in a world-catastrophe "among members of all the great races into which ethnologists have divided mankind," which like their civilization has the earmarks of being **an inheritance** from some common source before their dispersion, we may note that most geologists now admit the certainty of some sort of catastrophe since man was upon the earth. I might mention Quatrefages and Dupont, Boyd Dawkins, Howorth, Prestwich, Wright and Sir William Dawson, with many others. Even Eduard Suess teaches a somewhat similar local catastrophe, though like the others only as a reluctant concession to the insistent demands of Chaldean history and archaeological tradition. But all of these affairs are mere makeshifts in view of the tremendous demands of the purely geological evidence, and all alike (save perhaps those of Wright and Howorth) labor under the strange inconsistency of supposing that such an event could occur without leaving abundant and indellible marks upon the rocks of our globe. While in view of the evidence given through the previous pages, I insist that the purely geological evidence of a world catastrophe is immeasurably stronger than that of archaeology, that in fact the whole geological phenomena constitute a cumulative argument of this nature.

But if this be granted, we must then inquire, What was its nature? and what its extent? The former is quiet easily answered: the latter problem is still somewhat beyond our reach.

As to its character, the evidence is very plain. It was a veritable cataclysm of some sort: it deals with great changes of land and water surface. If the geological succession is but a hoary myth, and if we find countless modern living species of plants and animals mixed up in all the "older" rocks, we cannot ignore these in a rational and unprejudiced reconstruction of the science. But, ignoring these, we must remember that **even the Tertiary and post-Tertiary deposits are absolutely world wide, and are packed with fossils of living species.** Not a continent and scarcely a country on the globe but contains great stretches of these deposits, laid down by the sea where now the land is high and dry. The sea and land have practically shifted places over all the globe since Man and thousands of other living species left their fossils in the rocks. It is only the stupendous magnitude of these changes which has made our scientists reluctant to admit the possibility of such a catastrophe.

With the myth of a life succession dissipated, a broad view of the fossil world cannot fail to convince the mind of the reality of some such cosmic convulsion, and convince it with all the force of a mathematical demonstration. Great groups of animals have dropped out of sight over all the continents, and their carcasses have been buried by sea water where we now find high plateaus or mountain ranges. Ignoring completely the

abundant fossils in the so-called "older" rocks, and fixing our attention entirely on the Tertiary and Pleistocene beds that are acknowledged to be closely connected with the human race and the modern world, we still have a problem in race extinction alone that appals the mind. The mammoth, rhinoceros and mastodon, together with "not less than thirty distinct species of the horse tribe," as Marsh says, all disappear from North America at one time, and the most ingenious disciple of Hutton and Lyell has been puzzled to invent a plausible explanation. But when we consider that at this same "geological period" similar events were occurring on all the other continents —the huge ground-sloths (megatheriums) and glyptodons in South America; "wombats as large as tapirs," and "kangaroos the size of elephants" in Australia; the mammoth and woolly rhinoceros in Eurasia; together with an enormous hippopotamus, as far as England is concerned, to say nothing of those great bears, lions and hyenas, with a semi-tropical vegetation, all disappearing together at the same time, or shifting to the other side of the world—it becomes almost like a deliberate insult to our intellectual honesty to be approached with offers of "explanations" based on any so-called "natural" action of the forces of nature. But when, in addition to all this, we consider the fact that those human giants of the caves of Western Europe were contemporary with the animals mentioned above, and disappeared along with them at this same time, while mountain masses in all parts of the world crowded with marine forms of the so-called "older" types positively cannot be separated in time from the others, it becomes as certain as any other ordinary scientific fact, like sunrise or sunset, that our once magnificently stocked world met with some sudden and awful catastrophe in the long ago; and is it in any way transgressing the bounds of true inductive science to correlate this event with the Deluge of the Hebrew Scriptures and the traditions of every race on earth?

We have already seen how Dana supposes two such events, one at the close of the "Palaeozoic age," and the other at the close of the "Mesozoic," merely to account for the astonishing disappearance of species at these periods when the fossils are arranged in taxonomic order; but if we once admit such an event with Man and all the other species contemporary with one another, where shall we limit its power to disturb the land and water and churn them all up together, leaving the present simply as the ruins of that previous world? The fact is, the current Geology is wholly built up from the Cambrian to the Pleistocene on the dogmatic denial that any such catastrophe has occurred to the world in which Man lived, for one such event happening in our modern homogenous world is enough to make the whole pretty scheme found in our text-books tumble like a house of cards. Like the patient and exact observations of the Ptolemaic astronomers, which accumulated volumes of evidence contradicting their own theories, and which in the hands of Copernicus and Galilio, Kepler and Newton, sealed the doom of astronomical speculation and laid the foundations of an exact science of the heavens; so have the indefatigable labors of thousands of geologists accumulated evidence which strikes at the very foundation of the current Uniformitarianism, and casts a pall of doubt over every conclusion as to how or when any given deposit of the "older" rocks was produced.



Here we must leave the question for the present. The possibility of such a world-wide catastrophe, which might account for the major part of the geological changes, needs no apology here. The slightest disturbance of the nice equilibrium of our elements would suffice to send the waters of the ocean careering over the land; and in the abundance of astronomical causes competent for such disturbance we cease to regard such an event as necessarily contrary to "natural law." The possibility of such a thing no competent scientist now denies; it is the problem of recovery from such a disaster which makes the perplexity. But incredible or not as the latter may be regarded, I claim to have established a perfect chain of scientific argument proving a world-wide catastrophe of some sort since Man was upon it. But this fact, if once admitted, strikes at the very foundation of the current science, and bids us readjust our theories from this view-point. The venerable scheme of a life succession becomes only the taxonomic or classification series of the world that existed before this disaster, and it becomes the business of our science to find out how many and what deposits were due to this event, and what were accumulated during the unknown period of previous existence. Those of us who wish to speculate can then let our imaginations have free play as to the uncounted ages before that event; but the "phylogenic series" as a rational scientific theory is in limbo forever. Inductive geology, therefore, deals not with the formation of a world, but with the ruins of one; it can teach us absolutely nothing about origins.

The latter problem lies across the boundary line in the domain of philosophy and theology, and to these systems of thought we may cheerfully leave the task of readjustment in view of the facts here presented. A few disconnected thoughts along these lines I have ventured to insert here, not strictly as a part of my purely scientific argument, but as an appendix.

# APPENDIX

# APPENDIX

## REFLECTIONS

In the preceding pages I have endeavored to develop a scientific argument pure and simple. Yet I do not feel called upon to apologize in any way for attempting now to show the connection between an inductive scheme of Geology as set forth in the body of this work and the religion of Christianity; though my remarks along this line must necessarily be very brief.

The most fundamental idea of religion is the fatherhood of God as our Creator. The only true basis of morality lies in our relationship to Him as His creatures. During the latter half of the nineteenth century the Biblical idea of a creation at some definite and not very remote period in the past became much modified by reason of certain theories of evolution, which explained the origin of plants and animals as the result of slow-acting causes, now in operation around us, prolonged over immense ages of time. These theories, though built up wholly on the current Geology as a foundation, were yet supposed to be firmly established in science, and after a spirited discussion among biologists for a few years, were almost universally accepted in some form or other by the religious leaders of Christendom. And though the "Theistic Evolution" of recent years may be supposed to have modified somewhat the stern heartlessness of pure Darwinism, it still leaves the Christian world quite at variance with the old Pauline doctrines regarding good and evil, creation, redemption, the atonement, etc.

And these are not the only effects of the general acceptance of these ideas as an explanation of the origin of things. We see their moral effects in the generation now coming on the stage of action—men educated in an atmosphere of Evolution, and accustomed from youth to the idea that all progress, whether in the individual or the race, is to be reached only by a ceaseless struggle for existence and survival at the expense of others. In the words of Sir William Dawson, these doctrines have "stimulated to "an intense degree that popular unrest so natural to an age discontented with its lot . . . and which threatens to overthrow the whole fabric of society as at present constituted." *

This popular and perfectly natural application of the evolution doctrine to every-day life is certainly intensifying, as never before, the innate selfishness of human nature, and, in every pursuit of life, embittering the sad struggle for place and power. Perhaps no other one cause and result serve more plainly to differentiate the present strenuous age from those that have gone before. The hitherto undreamed-of advantages and creature comforts of the present day, instead of tending toward universal peace and happiness, are apparently only giving a wider range to the discontent and depravity of the natural human heart. So much so, that any one familiar with

* "Modern Ideas of Evolution," p. 12.

the history of nations cannot but feel a terrible foreboding creep over him as he faces the prospect presented to-day by civilized society the world over.

The only remedy for the many and increasing evils of our world is the old-fashioned religion of Christ and His apostles. And this applied, not to the state, but to the individual. The soul-regenerating truths of Christianity have always, wherever given a proper test by the individual, resulted in moral uplift and blessing. Ecclesiastical policies and ideas have always, wherever allowed to influence civil legislation, resulted in oppression and tyranny.

What has Geology to do with all this? It has much to do with it. Correct ideas of geology will remove a great many vain notions—I had almost said superstitions—regarding our origin, which now pass under the name of science. And in thus removing false ideas it **leaves the ground cleared** for more correct ideas regarding **creation**, and thus for truer concepts of **morality**, the old idea of "must" and "ought" based on our relation to God as His creatures.

Mark the words I have used. **Inductive Geology can never prove creation.** It may remove obstructions which have hitherto obscured this idea, but this is the utmost limit of any true science. Inductive Geology removes forever the succession-of-life idea, and thus may **suggest** the only seeming alternative, viz., Creation as the definite act of the Infinite God. Before this awful yet sublime fact, with all the fogs of evolution and metaphysical subtilties cleared away, the human mind stands to-day as never before within historic times.

With a fairly complete knowledge of the chemical make-up of protoplasm, with a good acquaintance with the life history and reproduction of living cells, we yet **know nothing of the origin of life.** With a good working knowledge of variation, hybridization, etc., **we know nothing of the origin of species.** While with a fairly good understanding of the present geographical distribution of species, and of where their fossils occur in the rocks, we are **profoundly ignorant of any particular order** in which these species originated on our globe, or whether they all took origin at **approximately one and the same time.** In short, having reached out along every known line of investigation, until we have apparently reached the limits of the human powers in investigation and research, twentieth century science must stand with uncovered head and bowed form in presence of that most august thought of the human mind, **"In the beginning God created."**

And yet, personally, I am firmly convinced that the origin of life and of our cosmos, was according to law, and the laws of nature. As has been said, How could the origin of nature be contrary to nature? How could the origin of present forms and conditions be in any way at variance with the laws by which these forms or conditions are maintained? And while I do not consider it a very promising field of research, we ought to have no more reluctance, *per se*, to considering the manner in which the first cell or the first species was formed, than the way in which a chicken is produced from the egg. Of course in either case we must have the materials, and some outside Cause to originate the conditions and conduct the process; they both require the immanent presence and fostering care of the great Creator



In this connection I beg leave to quote somewhat at length from my book, "Outlines of Modern Science and Modern Christianity."

"We are getting no nearer the real mystery in the case by saying that all the tissues of the chick are built up by the protoplasm in the egg. The protoplasm in the toes is the same as that in the little creature's brain. Why does the one build up claws and the other brain cells? Does memory guide these little things in their wonderful division of labor? But they all started from one original germ cell, hence they all ought to have the same memory pictures. Or have they entered into a mutual-benefit arrangement, like the members of a community, as Haeckel would have us believe, each contributing by actual desire and effort, I suppose, an individual share to the general progress of the whole?—No; they have all the appearance of being mere automata working at the direct bidding of a Master Mind. Every step of the process needs a Creator, just as much as the first cell division. In the words of one of the highest of scientific authorities, 'We still do not know why a certain cell becomes a gland-cell, another a ganglion-cell; why one cell gives rise to a smooth muscle-fibre, while a neighbor forms voluntary muscle;' and this also 'at certain, usually predestined, times in particular places.'" And in the same way the idea of a Creator would not be disposed of, even if we could possibly hit upon the probable process of world-formation. We would not, by understanding the **process**, really get at the **cause** of the phenomena, any more than we do now at the real cause of life. From the scientific method the real mystery remains as much behind the veil as ever before." (pp. 111, 112.)

Again I quote from this same work:

"The origin of organic nature could not well have been otherwise than by natural process. Do we understand all natural processes? At some time life was not in existence on our globe. All agree that it had a beginning. Even if created by the great Creator, the living was at some time formed from the not-living or the not-material. It does not take even Huxley's famous 'act of philosophic faith' to believe that. So that, in spite of all the haze that has been thrown about this question, the Biblical creation of the organic from the inorganic is no more contrary to, or even outside of, natural law than is evolution. . . .

"But see what we avoid. According to the Bible, death in even the lower animals (and consequently all misery and suffering: the less is included in the greater) is only the result of sin on the part of man, the head of animated nature, a reflex or sympathetic result, if you will. But with evolution we have countless millions of years of creature suffering, cruelty, and death before man appeared at all, cruelty and death that. . . . have no moral meaning at all, save as the work of a fiend creator, or a bungling or incompetent one." †

The author then gives a quotation from Le Conte, illustrating the extremely various ways in which matter and energy act on the different planes of their existence, while "The passage from one plane upward to another is not a gradual passage by sliding scale, but at one bound. When

* "*Nature*," May 23, 1901, pp. 75, 76.
† "Outlines," etc., p. 116.

the necessary conditions are present, a new and higher form of force at once appears, like birth into a higher sphere. . . . It is no gradual process, but sudden, like birth into a higher sphere.''*

The argument then proceeds as follows:

"The living at some time originated from the not-living. **We call it creation.** Can any one find a better name? It is preposterous to call it a process of development or evolution due to the inherent properties of the atoms, and effected by them alone. And yet it is doubtless as much according to 'natural law' as are the invariable and exact combinations of chemistry. We do not understand the ultimate reasons for chemical affinity any more than we do for gravitation. They are only expressions of the methodical, order-loving mind of Deity. Creation was only another action of the same mind, and we are not really finding any new difficulty when we say that the processes or the reasons for creative action are beyond our comprehension. When we can really solve some of the myriad problems right before our eyes, it will be time enough to complain about creation being incomprehensible or contrary to 'natural law.'

"Well, then, remembering that, even according to Huxley's 'act of philosophic faith,' the origin of the living from the not-living must at some time have taken place according to natural law, **why should we suppose that such a process was confined to one example?** If, when the young planet 'was passing through physical and chemical conditions which it can no more see again than a can can recall his infancy,' the 'necessary conditions' were favorable for one such creation of life, **why not a few billion?** Would the production of a few billion such beginnings of protoplasm be any less 'natural' than of one alone? Remember, however, that both the arrangement of these 'necessary conditions,' as well as the endowing of matter with these 'properties,' not only requires a cause, but this cause must be intelligent, for there is indisputable design in this first origin of life. . . . The food for a developing embryo might, for aught that we know, be conveyed to it direct from the ultimate laboratories of nature, and it thus be built up by protoplasm in the usual way, without the medium of a parent form—other than the great Father of all. Or would it be any less according to natural law to believe that a bird passed through all the usual stages of embryonic development from the not-living up to the full-fledged songster of the skies **in one day**—the fifth day of creation? **And if one example, why not a million?** For, remember that the youthful earth was then passing through strange conditions, 'which,' as Huxley says, 'it can no more see again than a man can recall his infancy.' "†

Omitting some remarks about embryology, I continue this quotation as follows:

"But what 'law' would be violated in this springtime of the world if, instead of twenty years or so for full development, the first man passed through all these stages **in one day**—the sixth of creation week? He might as well have originated from the not-living as the evolutionist's first speck

*"Evolution and Religious Thought," pp. 314-316.
†"Outlines," etc., p. 119, 120.



of protoplasm, for he certainly now starts from a mass of this same protoplasm, identical, as we have seen, in all plants and animals.

"And by originating thus, he would escape that horrible heritage of bestial and savage propensities which he would get through evolution, a heritage that would make it not his fault, but his misfortune, that sin and evil are in the world, and which would also shift the responsibility for the evidently abnormal condition of 'this present evil world' off from the creature to the Creator, and change to us His character from that of a loving Father, fettered by no conditions in His creation, to that of either a bungling, incompetent workman or a heartless fiend; for, though I am almost ashamed to write the words, the god of the evolutionist must be either the one or the other." (p. 121.)

**With an appreciation nurtured by centuries of study of God's larger book, baffled often though she has been, and disappointed many times in the words she has endeavored to spell out, Science to-day proclaims its subject, its title page, which she has now at last deciphered, "In the beginning God created the heaven and the earth."**

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