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MAN AND
HIS MANOR

Yours Truly

N. G. [illegible]

MAN AND HIS MANOR

A History and An Outlook

BY

NATHAN GRIER MOORE, LL.D.

AUTHOR OF THE THEORY OF EVOLUTION
AN INQUIRY

VERIFIED AS TO BASIC FACTS BY A DISTINGUISHED SCIENTIST • SIFTED AND CONSTRUED ACCORDING TO LEGAL METHODS BY AN EXPERIENCED LAWYER

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Dedication

THE AUTHOR DEDICATES THIS STUDY

TO THE

INTELLIGENT LAYMAN

WISHING TO KNOW THE HISTORY OF HIS RACE, AND OF THE EARTH, ITS HOME, BUT CONFUSED BY CLAMOROUS VOICES, AND WITHOUT THE TIME OR TASTE FOR AN INVESTIGATION OF HIS OWN

IF INDEED THERE IS ANOTHER
WORLD TOWARD WHICH HUMANITY MOVES
IT OUGHT TO BE ASSURED, REMEMBERED AND PRE-
PARED FOR. YET THE TENDENCY HAS LATELY
BEEN TO DENY IT OR FORGET IT. IT IS THE
AUTHOR'S SPECIAL DESIRE TO REFUTE
THIS, AND HE BELIEVES IT CAN BE
DONE WITH NO DEPARTURE FROM
THE ESTABLISHED VERITIES
OF SCIENCE.

PART ONE

THE HOME OF MAN

IN COURSE OF PREPARATION

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CHAPTER I

FUNDAMENTALS: A STARTING POINT

THE *first man's eyes opened on a completed universe, with all its units smoothly operating under fixed laws, as perfectly as now. His faculties have strained ever since to account for it, and for himself. He has found no answer worth considering which does not involve a supernatural cause, and we also must begin with that. Our knowledge of what we call the "order of creation" comes in two ways;—by a simple narrative from an authoritative source, and by an inherent capacity for discernment, applied to a study of the works themselves. The first is stable, but in broad terms. The second is a growth, and always subject to correction. When truly known they will not differ, but in its greater detail the second should illuminate the first.*

The latter is our present theme.

CHAPTER I

Fundamentals: A Starting Point

OUR primary topic is the physical world. It divides most easily into three stages: The *first* runs from the place where matter begins to the place where the planets emerge. As the earth is one of these, this stage may be called the stage of anticipation,—corresponding to the building up of an estate before the arrival of the master. The *second* runs from the emergence of the planets, at the time when the earth breaks away from the sun, and starts to follow its own orbit, to the time when it has gathered about it its sheath of clouds and atmosphere, wrinkles into valleys and hills, and lacks only life to become exuberant as we see it. This may be called the period of preparation, and corresponds to the outer equipment of the new estate,—the erection of fountains, the carving and sculpture; the setting up of the portcullis and the great gates. The *third* runs from the completion of the structure and external equipment to the time when life has arrived, the gates are swung open, ready for the Lord of the Manor, when he appears at the threshold. At this stage life, below humanity, is everywhere; beasts roam the forests, birds build in the shrubbery, fish swim in the waters, and flowers perfume the air. It may be called the stage of occupation. Still to follow will be the period of cooperation of matter and life, in their higher phase,—humanity. There, and thereafter, to its conclusion, our story will center around man, as distinct from the orb he occupies. There we will study him; his origin; his growth to maturity; his physical life; and then the fitness of earth or man for a prolonged future. There we will attempt an estimate of the outlook for continued existence after the body dies. But this will arise later. The physical world is our present theme; and we may suitably begin with a picture, familiar to humanity from its earliest stage.

THE SKY BY NIGHT:

How far can you see? The computations of the very wise are mere approximations. They have a basis, but definition is difficult. All the orbs in the heaven are in swift motion; the earth, on which we stand is itself in motion. You see a myriad of floating stars, distant, but bright. They looked to the ancients like punctures in a blue dome, for the earth was supposed to be flat, and the sky seemed to fit down over it like the cheese cover in the country store; but you have many advantages, and can better apprehend it. You are aware that the nearest fixed star is 270,000 times the distance of the sun from the earth; but the sense of distance is lost in that immensity. You wonder not so much at its remoteness as at its majesty. You have no trouble in believing that the great nebula in Andromeda is so far away that its light takes nine hundred thousand years to reach you, travelling at the rate of 186,000 miles per second. Yet your untrained eye can follow the beam to its origin. It is to the eye like a thread of gold, but it bears to earth not only beauty but power, and by it the world may be flooded with light. The Chicago World's Fair of 1893 was held forty years ago. At that time a ray of light left Arcturus, which is comparatively near. In that time, travelling at that swift rate, it arrived in time to open Chicago's second World's Fair, on the evening of May 27, 1933. It was caught up,—trapped, as it were, by delicate scientific devices, and used, for the first time in history, for such a purpose. You ought to see clearly that picture, not only for its own sake, but for the pathos of its circumstances. That use, and the complex method wrought out for it, were suggested by Dr. Edwin Brant Frost, for many years the astronomer of the Yerkes Observatory, at Geneva Lake, Wisconsin, and under his direction it was demonstrated that evening. The project caught the public interest, and when, as it was growing dark, multitudes of men and women gathered in the court of one of the great buildings to witness the spectacle they sat silently waiting. On the platform were many men distinguished in science. As the project was new it was especially thrilling; and the auspices were such that no mere sleight of hand was feared. In a distinguished position was Doctor Frost, honored but modest. The audience was intent, as voices were heard from remote places, and from lofty towers, explaining the stages of preparation as they appeared, and giving eloquent descriptions of the things that were and that were to be; and of that miracle of light, closing that night its journey of forty years. Doctor Frost was a deeply interested listener to the words of others, but himself gave to the spectators,—all unconsciously,—

the assurance of verity. As the darkness deepened the signal was given, and with a flash the light came on. It was Arcturus, from all that distance. It came as a single beam, strengthened and built up by the devices of able astronomers, and others skilled in electric appliances. It was directed first to a nest of sensitive cells on the top of a high tower, and lighted there another beam,—turning in circling motion; and this, as it turned, fell upon and lighted a series of others, one by one, on the great buildings facing the lagoon. Each caught the beam, and transmitted it to others of its own group, until the whole area was blazing with floods of light. It fell on roofs and towers, on the wide lagoon, and on the lifted faces of the great audience. Doctor Frost alone could not see it, for alas, he was blind. His vision had wasted away and failed in the long period of his watch of the sky. Oh but I am sure he saw it, more clearly perhaps than many of those in the company, and he knew it for what it was. Would you call that a dream? Certainly it was not that to him. It was a wonder and a delight; and I suppose he forgot that it was also a triumph.

Floating so high, and sent on some such distant errands, are also our dreams about space, as we think them through. Though ever so assured they seem like mere imagining. The times and conditions we seek to picture are remote, for the worlds, once very young, are now very old, and there has been no observer, and there is no record; yet the facts should be as clear, even now, as our knowledge of Arcturus, confirmed, as they are, partly by the conclusions of science, and partly by the later evidence of our own senses. We may call our reflections musing, but we cannot call them dreaming.

The facts we have by this time acquired, in respect to those remote ages when organization began, have a basis of evidence sufficiently verified to make it trustworthy; but if time were comparable progress must have been slow. There were, as we believe, periods of utter stillness, the length of which we cannot measure, and human life began too early and will end too soon to catch them all. It is fancy now, free, but not unguided, that sets them so closely before us; but this does not destroy their impression, nor abate our confidence. Wherever our human faculties came from, one of the most striking is the flexibility of the fancy, and the vividness with which it brings before us things and events which, even if the eye could have been directed on them, must have been almost or wholly invisible. Fancy pictures them, and touches them with color, but they are true,—as we have learned from other sources, not to be denied. The rainbow; the aurora borealis; a distant flame; a flash among the stars; are facts, as well as fancy; and those who judge,—even among the sciences,—only by the senses, lose not only beauty but often verity.

SPACE; HOW CAN WE DESCRIBE IT?

Empty space had no conditions, of time or form or extent. Inevitably true, it does not admit of description. Even the idea floats away from us. Imagination finds no place to take hold of it. It had no time limitations, and no dimensions. The ancients drew a circle to represent eternity, because it had no beginning and no end; but even a circle has a boundary. When you have drawn your circle as large as you can, there is still space outside; but even if space is not technically infinite, it has no limitations. Fortunately the mere historian, who himself views these things in pictures, can get along as well as he needs without profound abstractions; and this is fortunate, for the mysteries of theoretical physics, (Mr. Einstein's for example), seem nearly as confusing to their proponents as they are to their readers. Having some small experience with higher mathematics this writer is convinced that even an expert may, and sometimes does, work out hypotheses or equations which he himself does not understand; and his efforts to turn them into intelligible English are sometimes pitiful. The average reader, intelligent enough to know the knowable, has little occasion, and perhaps little taste, for the abstruse; yet he does not deny it because it lacks mass and measurement. It is easy to be lost in the hazes which surround such puzzles, and the seeker is not much relieved,—though he may struggle to appear so,—when a wise looking gentleman explains that his theory requires persistency of rays or beams, without a stopping place; and that when going on forever seems to defy rules those rays are supposed to turn back upon themselves, at an undetermined place. It does not help the man in the audience when the proponent, by way of illustration, likens the universe to a soap bubble, with a vacant interior. This seems to the auditor only to illustrate one incomprehensible idea by another. It is somewhat as if, in describing his theory of relativity, Professor Einstein should suggest squaring the circle as the first step. The mind,—no mind,—it would appear, can grasp either. Certainly the mere historian, viewing it from the outside, can form no picture of it. Such a supposition may seem true to one who believes he has learned to comprehend so obscure a standard of truth, but who can tell? If untrue who can expound the error? It seems unknowable, but is today being laboriously explained in unknown tongues, to, and alas by, people who do not themselves understand it. The explanation is in English words, which ought to be intelligible, but are not grasped by the hearer; and this prevents their adding appreciably to our store of learning. The Greeks nicknamed those who talked a different language "barbar," or barbarians. What shall we call those who talk English,—wrong side out? If the investigator has a conception of infinite space he fails, in spite of his efforts, to impart it. Perhaps our language is inadequate. Shall we recommend Esperanto? It has happened often in the writer's experience that an illustration is harder to understand than the proposition it is intended to explain. Difficult as Prof. Einstein's theory is, the apprehension of it is not improved by the picture of a traveler either walking straight ahead forever, or round and round perpetually, on the surface of a soap bubble with no interior. The mind is paralyzed at the very beginning, and nothing afterwards makes any difference. The reader cannot even understand the language. St. Paul described such a situation thus:

> "Therefore if I know not the meaning of the voice I shall be unto him that speaketh a barbarian, and he that speaketh shall be a barbarian unto me."

Our own simpler proposition, to which we return, is that space is boundless, but not infinite. The soap bubble may be an illustration of rays of light, or waves of heat, or energy, but it is no illustration of space, for the bubble may be *small* or *large,* and still leave space unused. This boundless space, which yet is not infinite, is hard to apprehend, but no harder than eternity in time. Both are inevitably true; and both would,—perhaps,—be simple to Prof. Einstein or Prof. Jeans.

AN EFFORT TO COMPREHEND SPACE:

If we conceive ourselves to be starting out in space, on a voyage of discovery, we are lost about as soon as we begin. Having nothing for comparison, and no standards of distance, we can never establish a location. Having no time standards, we cannot estimate our speed. Are we floating or swimming; are we rising or falling; are we moving fast or slow, or not at all? How shall we ever retrace our course, if we seek to return toward our point of departure? Even imagination must have a starting point, but this has none. We strain our vision and our hearing, but we see nothing, and hear nothing. We find nothing to compare with, and nothing to cling to. Alas, we have lost ourselves in mystery. What then;—nothing;—nothing. Such is empty space, and this must be our first premise. Yet it is certainly true. No one, to our knowledge, has ever suggested a comprehensible alternative.

TIME:

Here also, before the planets, we were without comparison or standards. When we let go and floated away all tests were gone. There was no day nor night; no sun nor moon; no sense of rotation nor movement.

At this stage time was not, and never had been. Even at the present day, by its very name, time is a fragment of an unknown total; it is "a piece cut off,"—as it is often explained;—but from what; and has the residue a limit? Even echo does not answer, for there is no echo. At this day, with all our learning, we measure specified time by the movements of heavenly bodies, and comparative time by its consequences; but here, in the midst of space, we had no heavenly bodies, and there were no consequences. We ourselves were but theoretical, and even infinite time would leave no marks upon us. Here no bell rings, no clock strikes, no whistle blows, no cock crows. Around us is utter silence,—if we can imagine anything so profound.

Thus time is nothing; nothing;—and we are alone.

We shall have occasion to consider elsewhere the question of mere duration, in relation to the development of the universe, and of time during the period of earth preparation. We shall then have something to compare with, for the planets will be here.

CONDITIONS:

We can—faintly and inadequately, perhaps—imagine total darkness—velvety blackness; and this surrounds us in space. Says Dr. Nordmann of Paris:

> "The true sky is black; a deep black of eternal mourning."

So also says Dr. Jeans, in his description of a voyage to the sun in a rocket.

Is blackness a color, or the absence of color? We put the old conundrum, but cannot answer it. We strain our eyes, but see nothing. We are assured by many scientists, and with special vividness by Prof. Jeans, that even now, with the celestial system complete, when we have passed the field of the earth's atmosphere, "we find ourselves in blackness—deep blackness—through which the stars shine out." Prof. Pickard, on his recent flight in an aluminum ball to a height of ten miles above the Swiss Mountains, found it nearly so; but here we have no stars, and no balloon; but only deep darkness and dead silence. The balloon rises and falls, but inside the aluminum ball there is no sensation and no awareness, except that when it approaches the earth the temperature rises. Oh it is very cold. Prof. Pickard, on his flight, found the temperature ten miles above the earth 148 degrees below zero—Fahrenheit; and scientists compute for us the temperature of distant space at 486 degrees below. We—being theoretical persons—do not feel it, but extreme cold prevails, and heat is absent.

What again is darkness? Is it merely the absence of light, or is it something affirmative—deeper and more impressive. We do not need to know, but even the suggestion is awesome.

What is cold? Is it merely the absence of heat, or is it also affirmative, and specific? Many say so; but this, and even our effort to comprehend it, from our position as spectators on the side lines, causes a double shudder.

Such then was, as nearly as our language can picture it, the condition of space at the earliest stage of the universe. It is hard to realize, but such in all its aspects it must have been;—so vast, so black, so still, so cold, so empty, so lonely, and so terrifying. Was it indeed cold, when space was empty? The writer does not know; he only knows that it was lonely, and quiet; and it was grim, as an empty world must be.

Professor Einstein presents proof that there is a basis for his theory, and the facts he furnishes we can apprehend, but we laymen need not apologize for balking at his explanation of "time-space." We see quite well that there was a time and a condition when there was nothing in the universe but space, and our dream of it "is not all a dream"; for heat and light and movement were not yet,—nor even matter; it was vacancy alone. Even now space is nearly like that, in the void places, between the stars.

But now the story of the universe is about to move on a stage. Space has been empty, but the first appearance of matter is close at hand. Reality, so far as anything can exist but not apprehended, is to arise. Matter will be there, but still invisible and intangible.

To help us appreciate what it is, and what it is not, certain leading facts should be considered. Only a few are primary:

MATTER: ITS NATURE; ITS FORMS:

We are very sure that there was a time when matter did not exist, and a later time when it did. There are some who think it always existed. This would avoid one difficulty, but lead to others. We will consider this briefly in another place. Casting out mere floating fancies, and anchoring to certainties, we cannot doubt that it exists now. If it had no beginning, it would be an exception to a broad rule of science. Of a discussion in his day about this, Lord Byron said:—"When Bishop Berkeley said there is no matter, and proved it, 'twas no matter what he said." At least we are all sure that matter, or what then represented it, was highly rarified in its earliest known stages. It is so, even yet, in the open spaces between the worlds. There it still exists in its original form, but the particles are so sparse as to be invisible. Dr. Jeans, in a vivid simile, says of it:

> "There is only about one molecule to the cubic inch, and a single breath from the lungs of a fly could fill a large cathedral with air of this density."

Such, then, was the condition of original matter when its history begins. It was in the form of minute particles, once supposed to have reached an irreducible minimum in the atom; but now the basic particles are said to be electrons and protons, minute enough to be invisible, and therefore theoretical. They are so small that their existence is affirmed only because of their results, which brings them exceedingly close to nothing; and yet science affirms and accepts them with confidence. A chief marvel is that they are not alike. Ninety-two distinctive elements were there, each with its own unchangeable characteristics. The clearest evidence that they are not a mere hypothesis lies in a comparison. Electrons are so small that Dr. Abbott, attempting to describe them, says it would take 50,000,000,000 in a line to form the diameter of a dot like a period in print. These constitute matter, which is now so massed that the earth weighs, says Jeans, in tons, a figure represented by 6 with twenty-one ciphers; and the sun's mass is 332,000 times as great. With these before us it is still difficult to believe in any unit so small, but it is equally difficult not to.

Dr. R. S. Lull, in "Ways of Life," says of the condition of matter in the nebula:

> "This nebulous material (giving rise to the sun), was so diffused that the residual material left in the most perfect man-made vacuum is dense compared with it."

But this was not the earliest condition of space. If matter had a beginning there must have been a time when it had not begun. Space must have existed first, but it was *empty*. We have therefore these two facts which we must assume without proof; both close to abstractions, but both inevitable, and both true, for the same reason,—i.e., that there is no alternative.

THE ORIGIN OF MOVEMENT:

We have been thinking of things and conditions while space was slowly filling with the earliest forms of matter, but now we come to picture the response of human sensibilities to its earliest *movements,* as again we find ourselves afloat in it. Every nerve is intent—every faculty strained; we await we know not what. As yet, though apprehending an approaching change, we see nothing, hear nothing, feel nothing. This is the second stage. Matter, though vaguely present, was quiescent; but was that not at last a thrill of *movement* we seemed to feel? Where, we cannot tell; whence, we do not know; near or far, we cannot decide; faint and tremulous; breaking in on the dead stillness and the dead silence with something like an indication of life; not a rumble; not a jar; not a sound; merely a shaking of the nerves; a deepening tension; a touch of conscious movement, dimly reaching the senses; a thrill of comprehension, suggesting a coming change; then a soft and quiet movement about us, and around us, not felt before. New power has been applied, but our senses have not seen it operate. Have "currents of air" begun to rise? Whence, and where? Can this be the "breathing" we read of in Moses,—that touches us so softly?

And what is that dim, distant brightening—faint and remote—slowly becoming visible? Is the dense blackness fading out to gray? Are we becoming conscious of a whispering, as of wind blowing; do we feel increasing pressure of the ether? Do we see clouds of gas breaking into flame? Can we observe streamers, in clouds, floating higher and wider into the circling currents of ether? Surely the light is growing brighter; there is a touch of warmth we had not felt before; more and more strongly swells the pressure of the wind; still warmer and still lighter and brighter grows the ether; and here at last is our *third stage,*—vibration; movement; a new activity; circling and whirling nebulae of flaming gas; the grip of gravitation; the swift and swifter movements of shifting particles;—and now the rise of the universe is under way.

This is much like authentic history, and in some such manner, as science teaches us, the world arose. There was a time when space was spread abroad but not occupied; another when the substances of matter rose from somewhere and filled it; another when movement began. Aye,—but what next?

YES, IT WAS CHAOS:

But that needs explanation. The word "chaos," as a state through which matter passed, may convey a wrong impression. It does not here mean tumult, but only a lack of organization. There was "confusion," in the sense that the ninety-two elements of matter were intermingled, though each preserved its appropriate character. Law and orderly force crowded it into action, and action ("vibration") was the earliest source of energy. But energy is a *cause* of vibration, as well as an effect. We have no occasion to consider which was first. It is a philosophy, which easily falls into casuistry. At least we know that out of these developed light and heat,—all orderly, as law must be. The changes after movement began were continuous and successive, and they ended in our present system, where law still prevails. Speculation might exhaust itself on such a theme, but we are held down by the uncompromising steadiness of natural laws, in which every movement had a cause. There is no room for accident.

THE FIRST CAUSE:

An adequate cause, either of matter or movement, could not have been absent unless we can suppose that matter, the existence of which is our present assumption, had no beginning, and therefore no cause. We shall see that if matter was eternal it must, without a new cause, have continued in its original form. No one, so far as we know, asserts that *changes in form or condition,* including progression toward the advent of the planets, *could* have occurred without a cause. On the contrary nearly all assert, as an abstract doctrine of science, that every event *must* have had an adequate cause; and also that a given cause, under like conditions, will *always* produce the same effect. This is a maxim of science, and there are many high authorities who stand upon it. Among them is Prof. Forest Ray Moulton, who says in "Nature of Earth and Man," p. 4:

> "A given cause under given conditions always produces the same result."

We will consider this further in another place.

THE CAUSE OF MOVEMENT:

Movement is a *result,* to which cooperating causes contributed. Matter, we are supposing, idly awaited, *first,* the pressure to move; changing the placid condition of matter to chaos; *second* came heat and light, results of vibration—which we may, without sophistry, call energy; and *third,* persistence, and increasing power, enough at last to guide and maintain motion and progression to its climax,when the planets emerged. Analyzed, such a series of causes must include a starting pressure, to urge the inert, formless matter into activity. This could not have been automatic, unless what we may call the *instinct to move* was incorporated into it from the beginning; but such a supposition would not change the problem of origin. It would only set back that query to the point where matter arose, and where its elements acquired their specific character; and this would raise again the question whether the intervention of a cause began there or earlier. This belongs in another place. As to *method,* it seems plain that the rise of those impulses, or the pressure to action, or both, may have been sudden, like the lighting of a fuse, or the striking of a match. It may have been gradual, like the development of heat, increasing to the point of fire. Dr. Jeans thinks of it as "currents of ether"; this is confirmed from other sources, and seems probable, if ether itself can be explained. The whirling motion of the nebula *could* begin that way.

It is our assumption that law existed first, or came into existence concurrently with matter, and that the course to be pursued was marked out in advance; without that we can find no explanation of advancing organization; and such is our formulation of the scientific doctrine. Matter was, from its beginning susceptible,—which means capable,—of being influenced in definite directions, and constantly under guidance; either originally pointed in a definite direction, and mechanically fitted to continue, appropriately changing as the end required; or always maintained under intelligent control. Law only, never changing in character or direction, could and did prevent confusion in development; and this has become an axiom of science.

SHIFTING AND CHANGING MATTER:

The writer cannot indicate a point or a stage at which the work of originating matter was at an end, and its elements were ready for action. Whenever that was, there the *static* period began; and this ended when the currents of ether began to play upon it. When these processes were complete the outcome was our system of rotating bodies, as they now are. It would be futile and not helpful, to attempt explanation of the intervening changes. The fact only is pertinent here. It is possible that there was no prolonged period of quiescence, but that from the beginning of creation the stage of organization was also proceeding. Thus the periods may have overlapped, and, in part at least, progressed together. This would affect the *time* required for development; but either method would conform to the known facts.

It may never be possible to know the details of change from one form to another, but we are confident that movements were in sequence, and pursued a normal course. The beginning and the end, however, are important, and both are involved in our narrative. It is enough to say here that the first cause must have been adequate; and this alone would solve many puzzles. The end involves destiny,—to be known only by prediction; and only knowledge of the past makes such prediction possible. Dr. R. T. Chamberlin, ("Nature of Earth and Man," p. 32) says:

> "The geologist and the astronomer try to unravel the past development of the earth and the solar system in terms of the processes which are in operation today."

External conditions have profoundly changed between that time and this; and the effort to estimate these will make up the history of matter. At present millions of celestial bodies, many of them of magnificent size, are moving smoothly and quietly on their ordained way, each returning at known intervals to its starting point; each turning on its own axis, so evenly and with such precision that its movements may be predicted and computed long in advance. Organization, therefore, is now complete; the system is stable.

Matter and force have changed in form and condition, but not in quality or kind.

We have thus pictured the stages of development broadly, but not in detail; but as we are following accepted science it becomes important to know how science is able to reach tenable conclusions. Assertions are not acceptable, for even scientists differ. A story of progression can only be scientific if explained by a corresponding chain of causation,—which here means law. How can this be known? This will be the subject of our next chapter.

CHAPTER II

SIMPLE TESTS OF VERITY

EVEN *a guide may lose himself. Yet, as in the case of the mazes we read of, there may be a ravelled thread to indicate the way out. There has always been in nature an orderly succession of events and conditions, and this may be found and traced. The present chapter seeks to plat such a course that the reason, as well as the outcome, may always appear.*

CHAPTER II

Simple Tests of Verity

THE nature of matter, at the stage we have called quiescent, and at every point on the way to full development, as well as since, was the same as now. Sensitiveness to the constraint of power and force,—as for instance to the urgency of the electric current, or to magnetism or gravity, or to the normal effects of other forces contributing to, or constituting,—some would say,—what we call energy, was part of that nature.

Philosophy could find openings for inquiry as to the earliest stage of motion, as it inquires whether there was an origin, or whether there will be a future. Most of these we pass, as tending away, at present, from our main point. There is an inquiry, however, apparently philosophy, but of real significance, which calls for attention. It has, on its face, the appearance of a puzzle, but it is more. Did the laws of nature arise *first?* i.e., was each element *bound* to move in methods already known? We must answer yes. Nothing else is possible. Otherwise it would be chaos from the beginning. An element starting as copper might develop the qualities of rubber; and every change would be an accident; but science affirms that there were no accidents. This will arise incidentally in discussion of other subjects. Here we are seeking evidences of verity.

JUDGING THE PAST BY THE PRESENT:

Physical history falls into four stages or conditions: Vacant Space; Quiescence; Organization; and Stability. We have already described them. Another is still to come, which we may call Anticipation; but it belongs in another group, since it is neither past nor present. It belongs to the period of the organic, and must be postponed to its appropriate place. Accepting the scientists' theory of comparative time, the present stage, (stability), is the shortest; but in it is to be found all we can know by observation, and its discoveries form the basis of both history and prediction. If we cannot judge of the past by that means we shall never know it. The theory is this:—

The facts and laws of the present are of a universal character. Essentially they have always been the same, and they always will be. In this is the basis of judgment of the past and future. This is true by common consent. It is well stated in a letter of Lord Byron, from which we quote:—"The best of prophets,"—said he,—"of the future is the past." We have had time enough, in this period of stability, to learn the qualities and characteristics of matter, and the laws and forces which govern it. The results have been formulated into a kind of code,—applicable always. This is our touchstone at every period of history. These are among the fundamentals:

(a) The law of persistence;—matter has never changed in essence, notwithstanding changes of form.

(b) Steps in the organization of matter into system have followed a predictable order.

There are others of importance, but they are chiefly subdivisions, and will appear in discussion. Having our code of the present, we can write history as correctly as if we saw it. Indeed we can do better, for, in spite of the familiar maxim, seeing is *not* believing. This is not so generally supposed, and it will need some enlargement.

If we were limited to the evidence of observers, testifying from what they have seen, we should never be free from doubt. We should have to discriminate between the things the observer saw, and the things he *thinks* he saw. We should have to accept as historical the negro's version of the shower of stars, which he saw; also Mr. Voliva's conviction that the earth is flat, which he confirmed by a voyage around it; and Brother Jasper's confidence that "the sun do move," for he saw it. We can better trust to *inference,* drawn from assured facts, for then we can follow it ourselves, and see the wheels go round. Observation, where it is possible, is important, since, when suitably verified, it furnishes the skeleton facts, from which inferences may be drawn; but even photography is at times misleading. Fish stories, though proved by photographs, are oftener evidences of sleight of hand than verity; and observations, even by the careful and competent, often need corroboration or correction. It is true, however, that, when assured, they are the basis of inference. The two (observation and inference) and their uses, may be compared thus:

The stakes on a surveyor's plat must be located by measurement, beginning with an established corner. Sometimes,—on the ground,—with stakes set, they look like "confusion worse confounded," but when they are mapped out, and the connecting lines drawn, we have a survey, which is the final result. It is both fact and inference, and neither would be complete without the other. You may trust it, and build your home with confidence,—and everybody does. The significant corners may have been located years before, and for a different purpose; but if true once they are true always, and you venture your money and your peace on the conclusion. Though the query be ages old, the facts are primary and permanent. When they are correctly known it is as safe to use your survey for the reign of Caesar as for yesterday or tomorrow. The first element in science, then, is the basic fact, *as known now;* and the fact that it also is in part inferred from known conditions, rather than noted by an observer, does not weaken it, or change the result.

Our second essential is the proper inference to be drawn from the facts. There may be errors either in the survey or the map; i. e., in the supposed facts or the deductions. The latter are logic, and may need correction. The facts, once correctly ascertained, are there permanently; but logic, though it may be corrected, requires frequent revision.

The period of the present, therefore, (stability), is the laboratory where our code is wrought out. This is in the hands of experts, and has, as yet, no history. For our purposes, therefore, we can ignore it. The pot is still boiling, and new or newer things are emerging. They will never be historical, to our race, for they will end together, but for our present purposes the code is persistent, and we will use and apply it when we come to estimate the future.

We are to consider as history the periods of beginning and of organization,—which brings us to the present. We must learn, if we can, how the earth arose; and as this involves not only the early stages of matter but the emergence of the planets, we must inquire what *could* have brought that about; and since different theories are offered to explain it, and there is no agreement, we must compare their several features, and justify the selection of the most probable. Evidently, if there is but one possibility, the inquiry stops there; but if there are two or more, we shall have gained nothing until we see the difference, and are ready to select the most probable, our code being the test.

Of the governing laws of nature enough which is primary and fundamental is known now to answer our needs; and we cannot anticipate a change. We can therefore proceed with some assurance.

THE BODY OF SCIENCE:

This means the aggregate of what men, interested in the discovery of truth, in astronomy and correlated physics, have learned about matter, and its laws, and their mode of operating. Our best test of soundness is in the fact of general acceptance. The probability of verity is greater where scientists agree, or do not disagree. This does not exclude the correction of errors, and this is constantly going on. Truth in this field is not found in question and answer, nor in the encyclopedia, but the fundamentals are accessible. The *application requires intelligence, but not expert knowledge.* The links are in general closely woven, and not easily mistaken. No mere assertion by a scientist,—however wise,—can be taken as verified unless it is supported by tested facts, or accepted by common consent. This only means that while we may base conclusions on the facts we know, or think we know, we cannot forget that careful reflection or new discovery may change them.

THE WANDERING HUMAN MIND:

Differences between able scholars in respect to things capable of verification may indicate an error of fact, but are much more likely to indicate a slip in the reasoning. Perhaps both are involved in the differences between Newton and Einstein. This writer regards philosophy as of value in sharpening the human faculties, and sometimes as a kind of analysis, to point out the course of inquiry, but he has never been able to see that it leads to dependable results. The sciences, however, especially astronomical and physical, have no function except to deal with facts; and these must be verified, by every practicable test. Some, philosophising also, have left their subject as vague as they began.

Illustrations could be given, but they would prove nothing to the philosopher, and are not needed by the others. An application of the use of materials, for the purposes of history, may give illumination and point to our preliminaries. When we seek to know the truth about matter, as of a remote time, of which there were no observers, we should be wholly in the dark without known laws, unaffected by time; and also without a correct knowledge of the pertinent facts of nature *now*. Those which are true now we may safely say were true then, in the faith that matter and its capacities and qualities have never changed. There may be error in judging of a time so remote, but if there was then a governing law, which is the same now, and if we have a fact now, which was the same then, any supposed error can be tested as of the present time, and the result applied as of the earlier date. We can do nothing without the conviction that these laws and forces, as well as the characteristics of matter, are perpetually the same.

This is a starting point for sane and reasonable conclusions. For this our normal senses are no reliance. To indicate how true this is let us consider briefly the limitations of the principal human senses, and compare their uses and their inadequacies, as well as their efficiency.

VISION:

The physical faculties of humanity, while ample for ordinary use, have limitations. Vision furnishes the simplest comparison. It pictures to the brain things and events by reflected light, and does not serve us in the dark. It can operate only during that half of every day when our face of the earth is turned toward the sun, and even then only vaguely in haze, or heavy atmosphere. By artificial light it is useful at night, but not completely, because colors are distorted in most lights except sunlight. By the microscope the ordinary view is extended, and we see things and kinds of life not visible to the unaided eye; but some things are out of the range of vision,—though aided by all known facilities. No one has ever seen electrons or protons. Photography, by intense light, holding in a single position, picks up some of their movements, which, partly by reason of speed, and partly of extreme minuteness, would escape the eye. Indeed it may be said that the electrons and protons are theoretical; which means that they are only inferentially proved. The world of things "infinitely little," comes thus only partially within our ken; but anything visible, and some things only inferred, may be confidently known. Before the discovery of our aids, mechanically speaking, the observations of experts,—though ever so diligent,—were within a limited area, and many of them required correction. For ages mankind got along with the naked eye, but it is since the discovery of instruments of precision that much of our tenable body of science has accumulated. Prior to that there were errors which no breadth of vision or soundness of logic could correct.

HEARING:

The sense of hearing also is limited, for similar reasons. Sound comes to the brain for analysis and interpretation by reason of concussions, large or small, which jar the tympanum of the ear in varying degrees. Even this is not now always conceded. It is now said by some that correct hearing must have another explanation; but in the common belief the tympanum varies in sensitiveness, even when normal, and many are the real noises which it is not able to catch. This sense also is greatly aided by sound magnifiers of various kinds, so that even the footfalls of a flea on a sheet of paper may be caught. The growth of a plant, it is said, may be *heard;* and some have said that the primary colors may be distinguished by the ear, with its delicacy enlarged and expanded by such aids. This is said to be the reason for the common description of red as a "loud" color. Certain of our very great poets have implied that a flower may be heard as well as seen. The present writer uses these instances without verification, by way only of illustration of the knowledge that our common organs of perception may be so expanded as to discover uncommon things.

TASTE, TOUCH AND SMELL:

Within limits, partly by training the normal faculties, and partly by mechanical enlargements, worlds of action unrevealed to the normal senses have been brought, or may be brought, within the field of assured knowledge. The not uncommon spectacle of a man with educated taste inspecting, classifying and valuing numerous grades of tea, which would be all the same to the most of us, indicates that some of our senses may be aided by attention. Such training of the unaided faculties is needed in specific investigation which is, in science, the root of progress.

THE USE OF INFERENCE IN HISTORY:

We show elsewhere that one of the disadvantages the scientist in literature must suffer from is that his investigations are in items, often without continuity. Research is, in its nature, scattered. Not only so, but by reason of the delimitation of fields, and the divisions of function, they must often stop at the verge of a great discovery because some of its facts are to be proven only by tests not physical. Thus, even if conclusions are inevitable, they cannot draw them. In the course of such a history as this there are many examples of this, of which a suggestion list is found in the next paragraph.

CERTAIN ASSURED FACTS PROVED ONLY BY INFERENCE:

We have no occasion to criticize scientists for limiting or defining their field. There is an appearance of reason for it, but much is lost. One fact often leads inevitably to another. In such a case proof of the one proves both, though one be tangible, and one not. A few scientists seem disposed to admit one, and deny,—or at least doubt,—the other; but not so the historian. He accepts them both, willing or not. Below is a number of illustrative instances where writers on science have left gaps which the historian feels bound to complete. He also thinks that in each the facts are sufficiently known to indicate a sound conclusion. In some instances the materials to fill gaps are derived from sources not professedly scientific; and some are inferred, as facts must often be. He believes, however, the answer will spring to the surface, when the incomplete case is stated. The historian would not know how to answer a query as to either, without including both.

1. The origin of matter, and the origin of vibration (movement).
2. The cause of the unchangeable nature of the elements of matter.

3. The source of the impulse which put matter in motion.
4. If this was a current of air, (or ether, or their equivalent), how and where and why it arose.
5. The cause of the *whirling movement* of matter, which it is conceded was vital to the result.
6. The nature and origin of law.
7. The nature and origin of force.
8. The nature and origin of electricity.
9. Of gravitation.
10. Of energy.
11. Of magnetism.
12. The apprehension of the future, involved in prejudgment.
13. The origin and nature of the electron. This is a true instance, because its *existence* is provable only by its *movements.*
14. The origin and nature of heat.
15. The origin and nature of light.
16. The origin and nature of life.
17. The origin and nature of human mentality.

Other facts could be furnished, which nobody denies, but which must (if tangibles only can be proved) remain outside of our accepted body of truth. This is one reason for believing that many things are scientific, because inevitable, though not capable of scientific demonstration. Even if the scientist could, on account of his limited range, justify omitting this category, the historian cannot fail to admit a logical proposition which proves itself.

It ought to be said that the historian need not carry back to the past the *very facts* of the present; indeed frequently he cannot; but only the *conclusions* about them, or the rule or principle which embodies them. For example, if we are seeking to know whether currents of ether, under pressure, will start motion in a cloud of suspended matter, it is not important to show the processes involved. The broad fact is enough. The same is true of the rise of energy. Vibration,—friction,—will give rise to heat, and heat will melt, and liquify, and eventually change matter to gas. The ultimate fact may, for our purposes, skip the intermediate stages. The significant principle is, that a given cause will always produce the same effect.

This is our meaning when we say that the physical senses have no part in reaching the conclusion that the past, in a given case, is determined by the present. The brain is the active factor in judging; but the memorial facts must be taken from the "body of science." Individuals do not attempt to verify them for themselves.

It is significant also that the human faculties used in forming such judgments are not the five physical senses, but those faculties considered in later chapters, which are superior to those of the body.

We are right therefore in saying that the senses play no very large part in the logical process of formulating judgments by inference or deduction.

Among the maxims of science are a few of marked individuality, which we recognize when we see them, and which play the most vital part in our conviction that the past can be truly discerned from the present. One is the quality belonging both to matter and law, which we may term

CONTINUITY AND PERSISTENCE:

Whatever essential qualities matter has now it had at its first appearance. On this point we quote Dr. Rollin D. Chamberlin, of the University of Chicago, "Nature of the World and of Man":

> "The foundation of science is a belief in the orderliness of the processes of nature, and the firm conviction that these processes have operated in orderly fashion throughout the billions of years of the past. Guided by this belief the geologist and the astronomer try to unravel the past development of the earth and the solar system in terms of the processes which are in operation today."

From Dr. Jeans we quote:

> "In the gaseous state each separate molecule retains all the chemical properties of the solid or liquid substance from which it originated."

Scientists of authority seem to agree. Thus the *solidity* or the *mass* of a given substance, compared with a *pulverized* or attenuated state of the same substance, does not affect any question involved, for matter, though it may change its form, does not change its characteristics. The electron and proton, and also electricity, which is their motive power, exist and operate alike in large and in minute bodies. There was, of course, a time when they had no operating function, because they are kept in motion by opposing charges of electricity, which itself must have had a beginning. We need not wonder when or in what form either began. However perfect singly, both were idle until brought into contact. Then motion began, and the effect, under like conditions, has never varied. We can conceive of no dependable physical science without this doctrine of persistence. By so-called "modern alchemy" it has been announced recently that elements have been changed, but it has always been otherwise explained. *New* elements may be found. Already those known have increased from six to ninety-two; and errors may be found in classification; but never a change from one to another. If the reader finds one,—duly verified,—he may as well lay aside all scientific books, and speculate at will, for science will be reduced to mere prediction.

We pass on then to our next fundamental, which is this:—

A LIKE EFFECT ALWAYS RESULTS FROM A GIVEN CAUSE:

In this, as an abstraction, scientists do not differ. Dr. Forest Ray Moulton ("Nature of the World and of Man," p. 4) says:

> "In popular terms a given cause under given conditions, always produces the same result."

Prof. Jeans, "The Mysterious Universe," page 15, says:

> "A cause which could be completely isolated in its action was found invariably to produce the same effect."

If there have ever been speculative doubts about this they have been discarded; and it has become, among competent scientists, an axiom. We have therefore only to discover what act or cause would press those substances into activity *now,* and what would be the effect of *motion.* This would lead us directly to the answer to our query (b), relating to the processes by which matter, from a static condition, moved toward and eventually attained the condition prevailing now.

The foregoing states sufficiently, we suppose, the object and subject of our chapter topic, and affords a preliminary view of the mode of proof. We must now go further, and see how these were applied in the progress of development.

CHAPTER III

THE RISE OF THE PLANETS

THE *writer invites you to study with him the spectacular rise of the planets,—one of which was the earth. It must have been magnificent,—perhaps without compare; and yet orderly, each reaching and retaining its permanent position in the mechanism of the system; each moving in its appropriate orbit, and revolving at a steady rate,—calculable and predictable*

CHAPTER III

The Rise of the Planets

THE universe, as a whole, is the theme of the astronomer, and to a large extent of the physical scientist. Their eager desire is to apprehend it as a mechanism; to trace its movements, and learn, more and more, the laws which govern it and keep its elements in their places. Those observers, of other pursuits, who admire and wonder at its serene loveliness, its thronging galaxies, its immense spread, its uncounted stars, its dim remoteness, see it casually, with no apparent concern about its problems. But none can see it without a desire to know how it came about, and whence, and when. Nearest to us, and easiest to apprehend, is the unit of the whole known as our "Solar System,"—comprising chiefly the Sun and its nine planets, of which the Earth is one. It is this to which our attention is chiefly turned.

The primary things the layman wishes to know about it are part of a body of known science, gathered up by experts over long periods, wrought out with infinite pains, tested by available methods, and recorded for the use of humanity. It will be enough to mention here a few of the most significant facts about it. First is its origin. Of this technical science speaks but faintly,—preferring to stress the features of its history capable of being tested by tangible means. It has learned, however, and proclaims as a basis for theorizing, that it was once unorganized matter, of varied elements but simple forms, and that it advanced by stages to its present state. Somewhere and some time it had an origin, and a cause; and this has become a maxim. Here and there, however, are men of standing holding by a hypothesis, as to which evidence is wanting, that matter was probably eternal. If so it had no origin, and no cause. Since our chief test of truth is its acceptance by the scientists as a body, and this theory is sporadic only, we might well ignore it altogether; but as we deem it capable of an answer, we prefer to give our reasons for deeming it untenable, and this is our next topic.

IS MATTER PERPETUAL?

We understand the contention to be that matter was, when its history begins, in its primary form, as known to us, and that it never was other or different. We have assumed otherwise, and have described original space as empty. Sound reasoning, we think, leads to no other conclusion. For this we can see numerous reasons, but present here only a few.

First:—The particles of matter are not alike. Its ninety-two elements have distinctive qualities and functions. If they were ever identical there must have been an important change somewhere. If this was ever otherwise there must once have been a single particle, with ninety-two complex functions; and this fact alone would answer the present query, for later history would require a large number of changes, none of which could be without a cause and a beginning.

Second:—The ninety-two elements would liquefy or pulverize or combine at different temperatures, and under different conditions. How could this come about without a creator, or a series of changes which imply a creator?

Third:—Subsequent events show that, as a whole, matter was inherently ready for explosion and did explode; but not by accident, or without a cause. If matter was perpetually like that,—always delicately poised,—with nothing lacking but a light touch on the hair-trigger,—the question seems to be already answered, for the human mind cannot conceive of such a combination, or such a state of preparation, without a creator or a cause.

Fourth:—Co-operating with these particles, and existing at the same time, were forces,—such as electricity, gravity, and heat,—vital to any change, and utilized in later changes; and the theory does not explain whether these were also perpetual. Had these forces no creator and no cause?

Fifth:—Beginning with what we know of its later movements, puzzles innumerable arise which we cannot hope to solve if we must suppose matter to have been perpetual. Its elements being so unlike, and so differently endowed and influenced, we deem it impossible to conceive of them as always ready, at the drop of the hat, to spring into harmonious action, and continue, without a new cause, to a completed and perfect organization.

Assuming then the verity of our maxim that matter had a beginning, and a cause, we go on to consider what science teaches as to the manner in which the planets emerged. Speculation might exhaust itself on such a theme, but here we assume that every movement was controlled by law,—always the same. There was no room for accident, but there was room for the operation of varied causes, in sequence, (which in law we call "remote" and "proximate"). They appear at times to conflict, but no,——they are working in cooperation, toward an inevitable end. Some profess to think that the laws of nature are not definite, because,—looking to the future,—they cannot, with certainty, anticipate them, or their results. Human attention is often fixed on one, and if another intervenes men incline, without reflection, to regard it as an accident. This however is impulse, and not reason. In the present case, the planets are here; all apparent conflicts are over, and the result is known. Because we are aware that every stage was governed by appropriate laws we should be able to trace them. In writing such a history, we begin with its first condition, which is known, and close with the last, which,—the laws being known,—is predictable. We have only to inquire what were the intermediate steps. Of these we have no record, and to infer or deduce them we must apply our established doctrine that what would accomplish it now would have done so then,—and probably did. We are well assured that the stages hidden from our vision,—in which emerged the nine planets,—were as steady and orderly as the rest. We apply the theory already stated, and inquire what would accomplish the same result now. This leaves room for the projection of different modes, and as to such the test of verity is, first, *possibility,* with a presumption that only one could probably fit the requirements. They all begin with a great nebula, filling space to the limit of the present orbit of Pluto, or beyond. It was, or had become, a blazing body of white-hot mist; but there vision fails, and there intervenes a period of delay,—supposed to be immense. What went on behind the scenes was the essence of organization. Then the curtain rises, and again we see the sun, much as it is at present, but, tied to it by the firm hold of gravity, is a cortege of nine planets, one of which is the earth. Each has its own fixed orbit, circling around the parent sun. They are in succession, but at varying distances from the sun. The most distant is Pluto, but though capable of measurement its distance is in doubt. The next is Neptune, nearly 3,000,000,000 miles away. The nearest is Mercury; and the third, in distance, is the Earth, some 93,000,000 miles away. The problem is to explain this, in harmony with known law. Three main theories are presented, and these we must explain and compare.

THE APPLICATIONS OF REASON:

The celestial system,—as a whole,—consists of myriads of orbs, all in motion, each turning on its own axis. They are tied together, and their movements controlled, by balanced forces, some constraining, some repelling, but all steady and persistent, in movements so uniform as to be predictable for ever so long in advance. They weave through space, and interweave, each in its own path. They cross other orbits, but broadly it may be said they do not collide. These movements have, it is said, continued for ages, so constant and so sure that a body of laws has been deduced from them, and these have been found to conform so closely as to be deemed dependable. Scarcely anything in human ken has offered so *many* opportunities for test and comparison. Our solar system is but a unit of the whole, but the laws are the same. Our planets are part of that unit, and there our special interest is centered. In material and movement they are alike, and beyond doubt they had been a single body.

A HABITATION FOR MANKIND:

One only of the planets, and that among the smallest, was fitted to be the abode of humanity, but even there life was slow in coming. The question how long is not vital to anything considered here, but it is significant for its bearing on other questions in which science, as such, has no great concern, but individuals have. We are making time the subject of a later chapter, where the discussion, though brief, may be segregated. There have been guesses that life might be found on some other planet, but it is now common opinion that nowhere else are the conditions suitable. Dr. Jeans, in "Universe Around Us," speaks clearly to that effect:

> "There is no definite evidence of life, and certainly no evidence of conscious life, on Mars,—or indeed anywhere else in the universe."

Dr. Chamberlin thought there was a possibility that life was indicated by the atmosphere of Venus, but Dr. Jeans answers that the oxygen in that atmosphere is only one per cent of that on the earth. Life here, and not elsewhere, could not possibly be an accident. If anyone thinks it was, or might be, he will have to abandon the scientific fundamental that law prevails.

Dr. Frost, of the Yerkes Observatory, recently stated, as an axiom, that there are no accidents in nature. If, theoretically, there could be such, it could not, as a practical question, have been so here. So long a series of concurring events and conditions, all tending to the same end, can only be explained by the operation of inevitable law, or intelligent supervision,—or both. The most striking result is the arrival of life, *adapted to the conditions it found here,* and on no other planet. This we would suppose to add the final element of assurance that this was no accident. The highest intelligence, informed of the nature of the life that was to be, and of its needs, and capable of moving it with certainty to the only place where these could be met, could not have fitted them together more perfectly. If you wish to substitute law for that high intelligence, you may do so correctly enough. In this connection they mean the same thing; but someone may ask where the law originated.

A single error,—such, for example, as putting a suitable atmosphere on Mars and none on the earth,—would have changed the history of the world, and probably would have left the universe uninhabited.

THE STEPS IN THE ARGUMENT:

It is important to remember, when we come to consider the theories of emergence, that the body of science to which we refer is not continuous or consecutive. It has been built up from items, here and there. It has been gathered at times and places far apart, and is not yet wrought into patterns. Leading scientists have referred to it as the scattered elements of a picture-puzzle, incomplete, and full of perplexities. We will not therefore expect to find them fully elucidated, but *usable as materials for creating theories, and also for testing them.*

The discoveries of modern times have enabled scientists to combine, in many forms, the elements of matter, and again to separate and distinguish them, and reduce them to simpler forms; and even to acquire adequate knowledge of their inherent qualities. As now and then new light breaks, one is tempted to think he has *created* something, or some new combination or process; but on reflection it is seen that he has only *discovered* it. From the beginning it lay there, accessible, but undiscovered. The Cro-Magnon might have discovered it, and made the same application, if he had known how. Man may add or subtract; multiply or divide, but he can create nothing, and destroy nothing. Dealing with metals, for example, he may produce greater endurance with less weight; or guard against the destructive features of the atmosphere, and make articles rustless or stainless. In fibers he may produce greater delicacy, without loss of resistance; or greater elasticity with equal or greater permanence. These are but illustrations, for the variations of form or combination he may produce are limitless; and yet, by smelting or analysis, or by dissolving or distilling, he may *reduce* them again to their simpler forms. The scientific conviction of persistence is that this may be done again and again, with no loss of substance, though elements may vanish in one place to appear in another.

Some have supposed natural laws to be mere *modes of motion,* discovered after action began. For reasons given elsewhere this cannot be true. We can only know by inference whether law *preceded* matter,—existing somewhat like an abstraction,—but both effective and efficient when called into action. Indications, not easily mistaken, help to strengthen the conviction that both law and force came into existence with the origin of matter.

Gravity, electricity, magnetism are illustrations. These take hold of matter with which they are qualified to operate whenever the proper conditions exist; and these are known, or can be. The fact that the effects of such contacts may be broken and renewed strengthens our assurance, and leads to the belief that the contrary, though sometimes accepted, is a sophistry.

If, therefore, we accept these common conclusions of science,— (a) that all things had a beginning; (b) that before matter came into being space was empty; (c) that after matter had come into existence, but before the first stage of the development of our sidereal system, the constituent elements of matter were the same as now; and (d) that on given conditions the same cause will always produce like results;—we must conclude that the *forms* of matter did not and could not develop automatically, or result from mere identity of substance. If not, then science, applying its normal tests, must conclude that every change in character or efficiency was intelligent, and was brought about by some adequate intervention *from the outside.*

This leads us to the stroke of twelve, on the clock of the universe;—the last stage of development, and the first stage of measured time. It is the climax of physical history, and the first visible step in specific preparation for the coming of man.

CHAPTER IV

THE MYSTERY OF THE PLANETS

CELESTIAL *organization was complete, and the system stable, before the advent of man; but man can follow (by inference), most of its stages,—as yet not all. A network of floating worlds, moving in intricate patterns, evolved out of nothing visible or tangible, is like a dream, but the human mind is all the more eager to solve it. Many have written in explanation, and one clear voice captured the attention of men, and has held it for a century or two. Now it is challenged, and again we must consider and compare*

CHAPTER IV

The Mystery of the Planets

THE writer was on a railroad train with a newspaper in his hand. His eye fell on a group of dots,—apparently without meaning, but it was a puzzle, and the instructions were to draw connecting lines. On a margin, on a greatly reduced scale, was a reproduction, with certain lines drawn,—incomplete, but suggesting the outcome. He drew tentative lines and erased them, but at last saw before him a picture of Uncle Sam, in his high hat, with heavy curled brim. He would hardly have known how to begin without the reduced scale drawing in the margin.

This suggests,—does it not,—the spacious heavens and their host of stars, out of which, if we knew how, a true picture could be drawn, by the application of known laws, which we are assured govern the entire system, and known facts as to the identity of materials and of their individual characteristics. But here the dots are all in motion, moving in differing courses, and at differing speeds; and our footing, to observe them, is also in motion, rotating and floating. On the whole the complexity is so great, and the distance of many of the orbs so incapable of calculation, that if the system be considered as a whole,—or even as the whole *excepting* our solar system,—it would be out of the question now,—

and perhaps always,—to frame a credible theory of the stages by which it advanced to its present state.

But, as in the puzzle of the dots, we have, in a reduced scale, a smaller unit, isolated, and capable of separate estimation;—suggestive, at least,—like the picture in the margin of the puzzle. This is our solar system, governed by the same laws as its greater counterpart. It is near enough to be observed, measured and charted. Its main features are its central sun and nine planets, in full and harmonious operation; each having its independent orbit, and its own rate of speed and rotation. Knowledge, even as to that smaller unit, is not complete; there are gaps which can only be filled by inference from the known qualities of matter, and known laws and forces; but supplementing these, and helping to construe and apply them, there are known stages of progress, earlier and later. It is not, therefore, impossible for humanity to frame,—eventually,—a sound theory of the mode by which the smaller unit came to pass; and when this is done it would seem that the key would be in hand to explain the total system,—extending through space.

Ignoring, then, for the present, the greater complexity of the celestial empire, our attention is to be directed here to the smaller unit. If a study of our solar system has no larger effect, we may still rest content, for the present, since the narrower field will include the earth,—the residence of our race. The rest can wait.

As to this men of trained minds have offered differing explanations, agreeing in part, but differing in important respects. These we hope to explain so that the layman may apprehend them, and the phases of difference, sufficiently to judge between them. The present writer offers nothing of his own, but will apply his judgment,—trained in certain other fields,—as best he can, to the mere question of credibility, the fundamentals being the same in all.

HUMAN EFFORTS TO REACH FINALITY:

The earth is small, but it has features not found in others bulking larger, and it is an ample vantage ground from which to view the universe. From it our eyes may look out on the widespread mechanism of cooperating worlds, and our minds may reflect,—perhaps in pride, perhaps in humility,—that in all that stretch of space, and all that aggregate of worlds, there is no wonder like man, and for him no other home. Except himself there is not, in all its expanse, so far as we know, a trace of organism. His own foothold, as he stands there, is a background for life, but in itself has none; and it is curving, revolving, and swaying like the rest, under the operation of laws it cannot control. He looks on the central sun, and sees it "a vast gaseous mass," the seat of tremendous energies, and torn by violent storms; but his chief wonder is how his own world came about. Laplace, about a century and a half ago, recognized the wonders of the developing universe as a spectacle; but probably caught but little of its sentiment. To him there was not involved a gracious gift by a kind God to or for a race having qualities themselves almost divine. He was an atheist, professing a view which then prevailed in France much as it does now in Russia; and he saw in the sky only an automatic mechanism, working out a long story of development.

When Napoleon asked him what room he left for God, he answered that he had no occasion for that hypothesis. To him there was no head and no hand, below it, or above it, or behind it, and of course no paradise beyond it. He began his inquiry with matter and its laws fixed, and ready to go forward; and he stopped when the system was organized, and before deterioration began. He limited himself to the period affected by his theory; but the historian must begin farther back, and carry his investigations farther forward; and to us the earliest and latest stages seem most important.

We must realize, at the start, that no mere *conclusion* of a scientist, merely as such, is sacred, though he be ever so wise. The case of Sir Isaac Newton is an example. Lords and commoners united to bury him in Westminster Abbey. The learned proclaimed his high mentality, and carved his praises on his monument. Pope's lines at his death averred that the world would be bare without him; but today men are saying that some of his firmest convictions were erroneous. We can take Laplace, viewed on his personal standing, for granted. Scientists praise him strongly and sincerely, but now many are doubting his conclusions. Well, it is the way of the world,—not wholly because it is fickle, but it is gaining in certainty, and we know nothing more surely than that much of the science the world trusted a while ago is scorned now; and that the same is likely to be true tomorrow, or the day after. We have to admit that the best men can do is apt to be wrong, or seem so, for no one knows all the facts, or how to weave them together in a single strand; and yet even things that have once been turned down may turn back. No one can be sure that in another century the world will not be sifting the dust heaps of the past for things beginning again to seem worth preserving in fragments of the art of thinking, as they are now in fragments of the art of living.

Here then we come to consider what scientists now are saying about that theory of world organization which men held true for a century and a half. We value the teaching of those we deem wise, and would prefer to follow them; but if, after full opportunity, they cannot make our their case, we, or at least those who aim to be historical, must choose others. We know the Laplace theory. To us it has been attractive, but perhaps we were wrong, and perhaps he was. Here we will try to find out. We will reconsider, from the standpoint of a layman, with the field before him, its alleged defects, as they are urged at present by those whose business is science; but the burden of proof is in its favor, having been so long believed; and since we desire to leave no gaps, we are disposed to hold to it until we find it wrong.

The principal criticism of Laplace,—adequate if true,—is that the fundamentals of his theory are *not* physically *possible.* It is this, chiefly, which we wish to examine. We shall not attempt to cover the whole field. If the leading objections are not sound some competent person will answer the others.

LAPLACE'S THEORY; ITS MERITS AND DEMERITS:

To begin with, we must remember that we are thinking here only in terms of our own solar system, which, though small compared with the universe, is our unit. From Dr. Jeans ("The Stars in Their Courses") p. 19, we quote:

> "Our earth belongs to a small colony which is almost completely isolated in space, so that all the planets and other objects which belong to it are enormously nearer than even the nearest of the fixed stars."

It is said that the latter are about 270,000 times further away from us than the sun ("Stars in Their Courses," p. 20).

Prof. Abbott, in "Earth and Stars," puts our isolation in the following startling terms:

> "It would take ten journeys around our world to reach the moon; four hundred journeys to the moon to reach the sun; twenty-eight journeys to the sun to reach the planet Neptune; ten thousand journeys to Neptune to reach the nearest star."

Although Laplace, in his day, knew nothing of the great universe, accurately, beyond our solar system, (lacking our facilities for long projection), he probably meant to include the whole in his hypothesis; and we are supposing that, with modification to fit the great spaces, it can be adapted to both if it has merit as to either. The perfection of the far-flung mechanism of the celestial system, its certainty and permanence, and the accuracy of every movement through all these eons of duration, will answer, before it is put, any query whether as a whole, or within our narrower solar system, it came into being by accident. If so we would be well justified in hoping we may never have another, for it might be adverse, and one acknowledged accident,—certainly two,—would destroy our faith in the possibility of an ordered system. The unit of which we are thinking began in simple form, and has progressed to its present complexity with never a mistake. We must assume, as science does, that in every stage it was governed by law. Somewhere will be found a true solution of our present problem, which is to discover *how,* and also (in later Parts) *why*. One theory after another to explain these long processes and their outcome has been presented, tested and discarded; others still pressed upon us are doubted, and seem to some inadequate; and thus at present we have nothing left unless it is that of Laplace. *Precise* conformity, or at least evidence of it, in a story of events so complex, of which there was no spectator, is not to be expected; but we ought not to be content with any theory founded on known errors, or unsound reasoning.

Our unit—the solar system—is small, when compared with the great spaces, but in extent and distances as these are reckoned by humanity it is very large; yet the planetary system is, comparatively, not complex, and what we need to know, for our present purpose, need not involve the whole. Our inquiry concerns its origin, and its progress to completion; and yet there are many features, even in that restricted field, to excite our admiration. One is the differing speeds of motion. If all the planets swept around their orbits and returned to their starting point in the same time period the outermost would evidently have to travel at the greatest speed. If all traveled in their orbits at the same speed per mile the innermost would of course return to its starting point in the shortest time; but their speed is not the same. Thus Mercury (36,000,000 miles from the sun) moves around in its orbit about four times a year, of our time, and travels at the rate of nearly thirty miles a second. The earth (93,000,000 miles from the sun) is the standard in time, and with it all the others are compared. It requires a year to travel its orbit, and moves at about 18 miles a second. Jupiter (483,000,000 miles from the sun) completes its orbit in twelve of our years, and moves at a speed of about eight miles a second.

Some experts suppose that no theory of origin can explain the planets unless it also explains these variations; but, following many very able scholars, this is not the opinion of the writer. These are governed largely by the extent of their orbits, and this is chiefly because of their varying distances from the center of the sun. We shall see that by the Laplace theory, they were thrown off the sun's mass one by one, or left behind, as the sun passed on, and long periods probably elapsed between. At these datings the sun's speed of rotation must have greatly varied. This and differences of temperature, may help to explain it. We need not inquire into this further than to say that no explanation of these differences has yet been discovered.

The *first* problem in any such review is to discover the origin of *matter;* the *second* is a true version of the origin of *movement* in the solar nebula; and the *next* is the course it took in its long history of advancement. To all these we think there are tenable answers, elsewhere stated. Other stages and conditions, which followed those, (not material here), bring us to the period of casting off, or thrusting off, or pulling off, the planets, one by one, from the unit mass.

Our solar system has only two dimensions—length and breadth. All the bodies composing it lie within the periphery of a disk or wheel, whose thickness is comparatively small. There are, since the planets, minor variations from a flat periphery, and these are stressed as a part of the argument against the theory of Laplace. In other respects they do not affect our present inquiry. Dr. Chamberlin, who has presented one of the comput-ing theories, says:

> "Our planetary system is a closely appressed disc of revolving bodies, centered on an invariable plane."

A brief summary of authorities on this point may make the conditions clearer and surer:

Prof. Jeans, in "The Stars in Their Courses," p. 104, says (quoting portions):

> "The system of stars retains the shape of a disc or a wheel because it is revolving around the hub; * * * The solar system is also shaped like a disc or a wheel. It retains this shape because the planets are revolving around the sun; * * * It is the same in the farther system of stars; their motion saves them from falling into the hub."

Abbott, p. 231:

> "Just as the sun and planets lie nearly in one plane, and all rotate and revolve almost without exception in the same sense, so the individual planets and their satellites lie nearly in the plane of the rotation of the planet."
> P. 171: "The crowded galaxy (the milky way) is like a flat ring, symmetrically placed among the stars."

Jeans, p. 45, gives us a vivid picture:

> "The nine principal planets move round the sun

in almost circular paths, rather like circus horses trotting or galloping round the ringmaster. * * * The traffic nearest the center moves fastest; that further out more slowly, while that at the extreme edge merely crawls,—at least by comparison with the fast traffic near the center. * * * Even the furthest and slowest of the planets cover nearly three miles every second."

We have then the evidence of able scholars, writing on the subject of the basic rules of natural law, on which they are agreed; and these furnish the tests to be applied in our examination of the merits of the Laplace and other theories. They constitute in part,—so far as they agree,—the body of accepted science to which we have often referred; and in them, or among them, we find these:

(a) The close connection of cause and effect:

We have stated above that we would furnish further authorities for this, and can appropriately do so now. It is, abstractly, an axiom, accepted in science everywhere. It enables us to find any given point in the succession of stages of development by following along the line of proven fact. No proposition is more serviceable in these lines of investigation.

Abbott ("The Earth and the Stars," p. 209) says:

"All the host of heaven seems to bear one allegiance to and be governed by one principle of order. Though there is infinite variety of detail, there is entire unity of organization throughout the whole visible universe. The universe is one."

Prof. Jeans ("The Mysterious Universe," p. 15, 16) says:

"A cause which could be completely isolated in its action was found invariably to produce the same effect. * * * So that the whole course of events had been unalterably determined by the state in which the world found itself at the first instant of its history."

Prof. F. Ray Moulton ("The Nature of the World and of Man," p. 4) says:

"The basis on which science rests is the orderliness of the universe. This means that similar initial conditions are always followed by similar sequences of phenomena;—in popular terms, a given cause, under given conditions, always produces the same result."

p. 5:

"There is abundant evidence to support the conclusion that there is orderliness in all of these fields; and to emphasize the fact that the scientists universally hold such a belief."

Dr. R. S. Chamberlin ("Nature of the World and of Man," p. 32) says:

"The foundation of science is a belief in the orderliness of the processes of nature, and the firm conviction that these processes have operated throughout the billions of years of the past."

Our next element is factual,—i.e.:

(b) The earliest state of matter was nebulous, and in its heated state gaseous:

We have already furnished the evidence of this, and refer to it here because it is a step in the argument, Abbott, p. 93:

"The sun is * * * a tremendous globe which, containing almost all the chemical elements that have been found on earth, is so hot that all of them are gaseous."

Our next is inferential:

(c) The movements of sun and planets required power:

This also is one of our important assumptions, and should be proved by evidence accepted among scientists; Abbott, p. 71:

"In the solar system * * * there is neither resistance of the air nor friction to overcome. The planets swing along around the sun age after age without any expenditure of power at all, for the simple reason that there is absolutely nothing tending to stop them.

"It did take an enormous quantity of power some time in the unknown past to put them into this state of motion."

Another is fundamental:

(d) Space is large and movement swift:

This is so plain from what has been already said, that but little need be quoted:

Dr. Harlan True Stetson ("Man and the Stars,"):

"He (man standing on the earth), travels on a moving earth which whirls about the sun a turn a year; and earth and sun together pursue a flight through space of 40,000 miles an hour, 400,000,000 miles a year."

In comparing the theories of organization it is important to know the standing of the proponent of the principal theory, and his rank as an expert in his field.

We therefore quote from others of distinction. With the stakes thus driven, we can draw the connecting lines. We can then start with an assumption common to all, where theories are to be compared and weighed:

HIGH PRAISE FOR LAPLACE:

Even the supporters of adverse theories agree in giving Laplace a position of exceptional honor.

Sir James Jeans says ("Universe Around Us," p. 226):

> "Laplace was a very great mathematician, and there was nothing the matter with his abstract mathematical theory, so far as it went. More refined modern analysis has confirmed it at every step, and observation does the same."

And Prof. Stetson (after reciting a series of "harmonies"),—"Man and the Stars," p. 95, says:

> "All the above data appear to be entirely consistent with the Laplace theory, and to substantiate it."

Dr. Stetson says of Laplace's theory, p. 95:

> "The Nebular Hypothesis was one of the greatest ventures of man's mind, and one can but marvel that such a flight of the imagination could be made in the eighteenth century and preserve so great a consistency with the observed facts."

Other scientists, of the highest standing, depart from Laplace's conclusions only where they feel bound to do so by difficulties they regard as insurmountable. While these are few in number they are serious; but on examining them it may be said, balancing probabilities, that while Laplace might be wrong, his critics are also human, and the error may be theirs.

The objections we are to consider, in our historical review, may be condensed thus:

(a) It is said that the rings of matter essential to the Laplace theory *could not* have been thrown off by the sun in the manner he described, because it is now turning very slowly, whereas by that method, to conform to certain rules said to be law, its rotation ought to be much more rapid;

(b) That if they could, and were, they could not have rolled up into spheres, with rotation and orbits;

(c) That the inclinations of the planets' orbits do not harmonize with the Laplace theory. They should be parallel with the plane of the sun's orbit, it is said, but are not;—at least not precisely:

THE MODE OF APPROACH:

The story of world-building begins in a placid spread of velvety blackness, immeasurably great, but hollow and empty, and ends, after unknown stretches of time, in a world of shining order and steady movement. It is calm and quiet now, but it attained that stage after long periods of increasing action. Though there was no eye to see it, and no ear to hear it, it must have been magnificent in its flaming progress. Perhaps it blazed like a furnace, and roared like a hurricane; but without an atmosphere, and in the remote distances, it must have appeared silent. If anyone thinks reason does not justify such a display we can smile him down. What are our combined faculties of fact and fancy for if not to see and paint, if only from description, a picture like that. Black and white cannot picture it, and the scientist, to make others see it, will need his box of colors, and the art to use them.

LAPLACE'S PROJECTION, AND THE FIELD IT COVERS:

His picture,—right or wrong,—is art and poetry as well as mechanics. Beauty is hard to describe, for words are feeble things. Perhaps Laplace dwelt on its magnificence less than he might. Perhaps he thought of himself as a mathematician, working out equations. It is called the Nebular Hypothesis, which suggests no vision of beauty, but only mechanics. His narration of its stages of progress seems to have been to him only history, to impress the mind; but to us it goes far beyond this, and fires the imagination. Even those most impressed now with its difficulties are equally impressed with its pictorial character. Certain astronomers of the present who seek to correct what they deem its defects are evidently,—more than he,—aware of its spectacular features; and yet there are others, with dull ears and hazy vision,—acute enough in perception, but lacking in the art to picture nature for others,—to whom the multiplication table, a symbol of bald truth, is finer, and goes deeper, than the sheen of gold on a background of blue. Think what they lose. With the right colors on his palette, the artistic sense, which every man whose imagination is active and who loves fancies carries with him, can paint a picture of chaos, for example, out of a strong wind, a tossing ocean, a roll of thunder, a flash of fire, and a sullen cloud; and such a picture may serve us for a starting point. We may not be able to reproduce chaos at its height when under way. It may have been at first only the confusion of intermingled elements, and this is probable, but at this point we want a picture. Like some other examples of recent art our picture might be equally like the original if hung upside down; but we can, at least, tell you what we mean by it. Chaos was never orderly, in the philosophical sense, for the laws which make for visible steadiness had not arrived, but if stormy it must have been pictorial. If left to itself, with the substances of matter tensed and torn, and troubled with conflicting forces, it must have remained rolling and tossing, but not progressing, from the beginning to the end; but it was not left to itself. Somehow forces with power behind them were led to cooperate, and under adequate guidance chaos of matter lashed itself through the struggle to combine and coordinate until, in calm serenity, it rolled up into spheres, and filled with beauty and wonder the lovely setting of our quiet sky. Power, in all that period,—long or short,—never grew less, but more. Matter was compressed into order, and stretched out into continuity. Hung there in the sky now is our sun and its body of planets. Among them is the earth, the home of our race. Each has been taught to turn on its axis, swing in its orbit, and mark correctly the passage of time. They all arrived; they fitted; they linked up; and the system was complete.

THE PUZZLE OF THE PLANETS:

As the interests of human beings are centered chiefly in our earth, and more than anything else we wish to know how it came about, we watch especially for its first appearance. We are aware that the planets, of which it was one, were originally part of a parent mass, now the sun. Somehow, they, or the mass or cloud from which they emerged, were drawn or thrust away; they became worlds, each for itself, and one by one swung out on their permanent paths. It is that process we wish to trace;—to discern how and when the earth can first be recognized, and how and when it became beautiful and fit. Action did not stop. No link is broken. No break occurs. No law is changed. Matter remains the same. We have traced our nebula to a position on one side of that gap, and found it in a condition of whirling white heat; and there its substances began to condense. Here for a time vision fails, and then the curtain rises. On the nearer side of that gap we find the sun a little smaller, and around it are gathered its family of planets, equal in the aggregate to the mass the sun had lost,—each independent, physically, but all composed of the same materials. Logic assures us that this was only a change of form. There was no real *hiatus*. Behind the curtain motion went swiftly on. Everything in its long course *must* have conformed and fitted, and therefore it *did*. What happened in those periods of development must have been without departure from the things known, and the laws which governed them,—and therefore within the *possibilities;* and if suggestions for sounder explanation differ we must select the most *probable*. When, before the curtain falls, we look out into space the chief phenomenon to impress us is the nebula,—then a cloud of gaseous matter,—to which currents of ether (see Jeans) have given a whirling movement. Nothing else is visible, prominent enough to demand attention. Off in space are stars, and other nebulae, by reason of distance appearing very small and faint.

In space, but for the remote nebulae shining there, there is silence and darkness. Here a gap is left,—in time and history, the facts of which are missing, only to be filled by inference. A long *hiatus* passed. It is better to say that we cannot clearly read the signs. Where vision again picks up the succession, there hangs in the sky a series of planets, composed of the same materials as the sun. Evidently these are the result of withdrawals, in some form, from the sun, for we know of no other possible source, and on this science is agreed. Except for dimensions, their orbits substantially conform; they move in the same direction; they are maintained in their several positions by the sun's gravity. To all appearances the sun is the same as before. It appears to be as large as before, and is in fact 744/745 the same in mass. The problem is to discover how this came from that. The method only is in debate. This is to be settled by a single test, viz:—what course, *if applied now,* could *produce* that result; and if more than one is *possible* which is *probable.*

THE PROBLEM, AND DIFFERENCES IN SOLUTION:

Inquiries to solve this problem have settled into four theories, behind each of which stand, as proponents or defenders, able and distinguished scholars. We may be, from our historical standpoint, dissatisfied with them all, even if unprepared to suggest another. They disagree. Somebody is wrong,—perhaps all. The aids which the historian must use, to find a sound solution, are not his, nor even theirs; they belong to the world, so that even a layman has them at his command;—what then?

The argument must follow these lines:

Where the trail was lost, development had reached a point where matter was a white hot, whirling, tenuous "cloud of mist"; gaseous,—beyond the condition of substance;—and perhaps minor masses, in varying conditions of solidity. Matter is, at least, no longer so tenuous as to be invisible,—nor "evenly spread through the universe." Here we seem to lose our sense of definition; but this we know;—one by one huge spherical bodies have fallen away from its mass, swung into the great spaces, and started on their perpetual journeys round and round the central body. Nine of these we are sure of, and we think we vaguely see others. Individually and in the aggregate they are small, compared with the parent nebula. They lie in a series of nine circling rings, having a common center, all in motion in the same direction. They are in fact, as we learn afterward, only 1/745 of the total mass, and the rest remains in the central sun, white hot, and floating alone. In that interval somehow the planets were born,—not in a group, we are supposing, but one by one, each with its own place and function. How can we picture that or explain it? Vision has failed. We must take knowledge from one connection and apply it in another. This is the opportunity for differences. We must judge how, consistently with known facts and laws, the planets *could* have left the parent mass. Those who have set conflicting theories before us are very able men, of outstanding learning. We wish we could take their word for it, as many others have done, but they disagree. One only can be right. The earliest theory is that of Laplace, the eminent French astronomer and mathematician of the eighteenth century. For a hundred and fifty years, or thereabouts, it was accepted as sound, but it is now controverted. Prof. T. C. Chamberlin of the University of Chicago in recent years devised a substitute theory, and now Sir James Jeans, of Cambridge, presents another; indeed two others, for he also suggests an alternative, which is on a different footing.

Here then three proponents, all of high standing, not only present the results they individually approve, but frankly lay before us the evidence, and their mode of applying it, leaving us to consider and judge. Their differences are not in respect to the facts, but to the inferences,—i.e., the *mode* by which the known result was reached, in view of the known facts,—and of what they deem the governing laws. No reader would be helped much without a comparison of these theories, and an effort to decide which, if either, is sound. Some one must weigh them, and at present this falls to the historian.

FUNDAMENTALS BEHIND ALL THE THEORIES:

1. The substances of matter were in fact carried in nebulae, as already described,—at first loosely, and in minute particles; and we recognize these as the same materials which now make up our floating worlds.

2. The planets rotate on their own axes, and all turn in the same direction.

3. They move around the sun in orbits nearly circular, all in the same direction, and practically in the same plane. The differences in inclination are small,

though by some considered significant; the contention being that if portions were thrown off as supposed by Laplace all the orbits would lie parallel.

4. The nine visible planets appear, when in suitable position, to be in line with the sun, but at varying distances, and they differ in volume and mass.

5. The sun remains the center orb, but its rate of rotation is lower than that of any planet.

These facts are common to all the theories. We have taken them from a statement by Prof. Stetson in his book "Man and the Heavens."

The theories of Dr. Chamberlin and Dr. Jeans are alike in respect at least to a supposed Tidal Wave of liquid or gaseous substance, gathered up on the surface of the sun, and later said to constitute the planets. Its cause is said to be the gravitational effect of a passing star. It will be convenient to state first, for comparison, the substance of each theory.

(a) *The Laplace Theory, (in the language of Dr. Stetson):*

> "The whole solar system developed through eons of time from a widely diffused mass of gas or fire mist which extended far beyond the orbit of the outermost planet. * * * This highly attenuated nebula would gradually contract presumably slowly rotating as it contracted. With the process of contraction came a quickening in its speed of rotation. Revolving faster and faster, * * * a stage would be reached when the centrifugal force would offset the gravitational force. Just as water would be thrown from the rim of a rapidly revolving wheel * * * the outermost particles of the revolving nebula would be thrown off in all directions into space. This ejected matter would form a rim which would partake of a rotation in the same

direction as the rotation of the major mass. Some of the particles thrown off * * * would be larger than the others, and therefore form a center of attraction for surrounding particles. Soon * * * a lump of considerable size would result, which would be revolving about the central mass, and at the same time spinning on an axis of its own, in the same general direction of rotation as that of the primary nebula. This whirling lump would gradually assume a spherical shape, and become a planet in embryo.

Meanwhile the great primary nebula would go on contracting. The increase in speed would result in the detachment of a second ring, which in turn would contract into a second spinning planet. Thus the process would go on. * * * At last the innermost ring would be dropped and the planet Mercury formed."

(b) *The Tidal Theory of Dr. Jeans; (his own statement in "The Mysterious Universe," pp. 1 and 2):*

"We believe * * * that some two thousand million years ago * * * a second star wandering blindly through space, happened to come within hailing distance of the sun. * * * A huge tidal wave must have traveled over the surface of the sun, ultimately forming a mountain of prodigious height, * * * and before the second star began to recede, its tidal pull had become so powerful that this mountain was torn to pieces, and threw off small fragments of itself much as the crest of a wave throws off spray. These small fragments have been circulating around their parent sun ever since. They are the planets, great and small, of which our earth is one."

But Dr. Jeans, ("Stars in Their Courses," p. 42), presents another, different in some respects, which must also be considered. As to the withdrawal of part of the mass of the sun by a "tidal wave," caused by a passing star, they are alike, but as to the development of the planets unlike. He states it thus:

> "The jet (of matter) which has already come off forms a long filament of hot, filmy gas, suspended in space. In shape it is rather like a cigar, pointed at its two ends. * * * It gradually cools, and as it does so condenses into detached separate drops, * * * colossal structures; their size is on the astronomical scale. * * * These detached drops of matter begin to move about in space as separate bodies. * * * After thousands of millions of years they move around the sun * * * just like the planets of today; * * * indeed these bodies are the planets."

Dr. Jeans seems to treat both of his suggestions as phases of the same theory, but to this writer they seem to present inconsistent positions, as we will elsewhere indicate.

(c) *The Chamberlin or Planetesimal Theory:*

This differs from Dr. Jeans' theory chiefly in the *mode* by which the mass withdrawn by the passing star settled into independent bodies. We take our statement of it substantially from Dr. Jeans' book, "The Universe Around Us," p. 228, where it is condensed thus:

> "They (Dr. Chamberlin and Dr. Moulton) supposed that a passing star exerted a powerful tidal pull on the sun, with the result that the ordinary solar prominences temporarily attained an extraordinary violence; the ejected matter was supposed to rise to unusual heights and condense into small solid bodies."

It is more fully stated in an article by Dr. Rollin T. Chamberlin in "The Nature of the World and of Man," p. 34. We can summarize the other particulars in our own language, viz:

By the Chamberlin theory the planets result from "knots" of the liquid substance of matter shot out from the great nebula, the sun, in "eruptions," (sometimes called "bolts"). These respond to the gravitational attraction of the passing star, about as stated by Dr. Jeans, the "bolts" or "eruptions," being larger or smaller, according to the pull of gravitation, varied by the changing position of the star in passing, and thus according to the distance each was propelled, and the pull or pressure involved; and these in turn are supposed to vary between themselves as the star approaches, passes, and disappears. We might suppose its passage swift, but it is probably to be timed in years. The difference in size of the planets, and their differing distances from the sun, is said to result from the varying sizes of the "knots," as affected by the force of gravity. The condition of the matter of the sun's mass, at the time, under both theories, is thus stated in Dr. Chamberlin's book, "The Origin of the Earth," p. 136:

> "When the immense belches of sunsubstance were about to be lifted from their places deep in the sun they must have been gaseous, or potentially gaseous, and they must have contained all the chemical substances that were present in the horizons of the sun from which they came."

This is affirmed by Dr. Stetson and by Dr. Jeans.

PRECEDENT CONDITIONS, GENERALLY ACCEPTED:

By common consent the separation—in whatever form—occurred while the space now occupied by our solar system was filled with "hot mist," which was then the condition of the sun. It is so stated by Dr. Chamberlin and by Dr. Stetson in the passages quoted above; and such also is the opinion of Dr. Jeans, who states it thus, in "Universe Around Us," p. 12:

> "Our home in space came into being as a block of intensely hot gas on which no life of any kind could either gain or retain a foothold."

Dr. Eddington says, in "Stars and Atoms," p. 38:

> "The sun's material * * * is a perfect gas. * * * The feature of a true gas is that there is plenty of room between the separate particles—a gas contains very little substance and lots of emptiness. Consequently when you squeeze it you do not have to squeeze the substance; you just squeeze out some of the waste space."

Dr. Forest Ray Moulton ("Nature of the Earth and of Man," p. 17) says:

> "The sun cannot be a solid, nor even liquid body. It is a vast gaseous mass."

By what we have called his alternative theory (see Mysterious Universe) Dr. Jeans described the process of initiating the planets out of the materials of the sun as matter concentrating in the spots where they severally settled, in spurts or gushes, similar to sea waves, where "splashes of matter" are cast up, "as water from the crest of a wave"; and *"these,"* he says, *"became the planets."* Just how this could work out to form the whole series, either at once or consecutive, but in orderly positions, is not explained.

There was a time when, as between the learned and the unlearned, the scientist's mere word was proof enough, although he might himself be off his base, or out of his depth. It did not seem possible that anyone having that dignified title could be wrong, and in this the scientist himself usually concurred. Some of that spirit lingers yet, especially in those places where degrees can be picked out of the atmosphere; but now there are scientists and scientists; often expert in different fields. Occasionally they assume to be broadly authoritative; but frequently their generalities are challenged. At times we have been shocked to find that even a scientist of real distinction comes to a point where knowledge fails him, and he is reduced to guessing. Some frown on this, for "science is verified knowledge," says Dr. Jordan; and Dr. Jeans, after a page or two of interesting speculations, all without any basis of fact, asserts that "guessing is no longer in fashion in science." The discussion of these alternative theories is complex, since a case has to be made for nine planets, of different sizes, and in widely differing locations. Since both must meet the same obstacle, we may fairly regard their proponents as challengers, and limit our comparisons to the contentions they make. Admiring their scholarly attainments and standing, we question them only because a historian must.

By the Chamberlin theory the soft matter of the sun is supposed to have been shot out in "belches," just far enough to perpetually hang between the sun and the passing star; and of differing mass, to form the individual planets; and so timed as to locate them far enough apart to operate freely in independent orbits. Thus, as we have seen, they will vary in mass, in form, and in the power behind,—or before,—the propulsion,— determined by the location of the star.

There is no occasion for us here to judge whether *either* of these theories has merits not mentioned by its own proponents, and the reader will forgive us if his own favorite argument is not mentioned. It would not necessarily follow that we are right, but only,—if we are right,—that the proponents are wrong.

INCONSISTENCIES AND OTHER OBJECTIONS:

The "Tidal Wave" theories,—which means all except the Laplace theory,—are not agreed upon by scientists in general, and thus, according to our rule as stated above, the historian cannot accept them without new proof, since common acceptance is conspicuously wanting.

Dr. Jeans does not agree with Dr. Chamberlin's theory. He states his objection in general terms, thus ("The Universe Around Us," p. 228, 229):

> "These various theories were all purely speculative. * * * The results I obtained seemed to me to demolish the Planetesimal theory of Chamberlin and Moulton, and led me to put forward the present day 'Tidal Theory,' which I believe a large proportion of astronomers now accept as giving the most probable origin of the solar system. It can of course make no claim to finality or certainty."

While some of the writing scientists, with no investigation of their own, have taken one or other of these theories to be tenable, this is not universal, as it ought to be if they are to find themselves in the body of accepted law. Among the distinguished writers is Dr. Thomas, who, using gracious language, as a gentleman should, declines with firmness to commit himself to Dr. Jeans' theory:

> "There is much that is attractive in the hypothesis, and we may possibly find that we should have to accept it; * * * We should be the last to hold Jeans' hypothesis as the only possible explanation."

Dr. Chamberlin, and his associate Dr. Moulton, were not convinced by Dr. Jeans' theory, and they have never assented to it. Some mutual criticisms have been, in a measure, severe. Not only, then, do the proponents differ among themselves, but neither has been able to secure confident support among the leaders of his own profession.

Dr. R. S. Lull, of Yale, while polite, is unconvinced. He says, of the Chamberlin theory (Ways of Life, p. 6):

> "As a substitute Chamberlin and Moulton have offered their planetesimal theory which, while not of universal acceptance, seems to meet the objections to the older hypothesis. It will, however, require years of testing and amendment before it can be accepted as final."

An alien star is common to both the Tidal and the Planetesimal theories, but it seems to us that no such star *could* have been "blindly wandering" near the sun. There is no such star in the solar system, and unless by a very rare accident there never was one within hundreds of light-years beyond it. The distances, actual and comparative, were immense. The nearest fixed star is 270,000 times as far away from our earth as the sun. We have quoted elsewhere Dr. Abbott's comparisons of distances, which are positively startling. Thus the *mere presence* of such a star in such a position was not physically possible, unless we misunderstand the authorities. This the proponents themselves assert, in definite terms; and, so far as we know, nothing of the kind has ever occurred, nor can, unless by accident, which is not predictable. The writer supposes the law to be specific to the contrary. Dr. Jeans says, in "The Mysterious Universe":

> "They (the stars) travel through a universe so spacious that it is an event of almost unimaginable rarity for a star to come anywhere near another star."

This is enough to leave both of them *tentative;* or even less, since accident only can explain them.

Without minimizing this sound principle, we may suggest for consideration certain other difficulties which impress the historian.

SPECIFIC DIFFICULTIES WITH THE TIDAL WAVE THEORIES:

1. That part of the original mass which became planets was a "white hot mist."

The withdrawal of a part of a mass so loose in structure would not, it would seem, sever a specific portion, but would only divide the nebula. Both would be parts of a mere cloud. Such a withdrawal would do no more than reduce the total by a corresponding fraction; whereas the substance squeezed out at the equator, (by the Laplace theory), would come from the center, and could and would,—would it not,—be of a density like the central substance. Dr. Abbott in ("Earth and Stars," p. 93) so explains the construction of the sun;

> "At the surface the pressure is very small * * * Pressure increases rapidly downwards, so that only a tenth part of the way (from the sun's center) we may suppose the pressure to reach a thousand atmospheres."

It is not for the historian to insist that a separation of a misty cloud is impossible, but he is now comparing *probabilities;* and he can see difficulties in a theory by which nine solid worlds are wrought out of the surface "mist" of a heavy cloud, as compared with a theory under which they result from the heavier concentrations of substance withdrawn from the sun's center.

2. It is hard to conceive that a star could be in that position at any time,—even by accident; yet this is of the essence of both the "Tidal" theories. Dr. Jeans, who presents one of these theories, is of opinion himself,—as we have seen,—that a "blindly wandering star" could only be so far out of its course "by a rare, and almost unimaginable accident." Since such an event was not predictable, it cannot be law, for this is the accepted test. If it happened at all it must have been by accident, and this would be enough, we suppose, to take it out of the field as a scientific theory.

THE CRITICISMS OF THE LAPLACE THEORY

We confess to an admiration for the Laplace theory, but it would be folly to deceive ourselves. The most formidable objection to it is the rule that the rate of the sun's spinning should *increase,* as matter is thrown off, but it has *diminished.* If the rule is invariable, that result would follow; but there are other rules, equally sound, which may affect the result. In Chicago the weather man predicts a cold wave from the northwest. His prediction conforms to the conditions known to him, but Lake Michigan contributes a new factor, and the day is warm. Light on the present question may be had from several directions. Note these:

1. Since a rule must operate uniformly, the rate of spinning would be reduced in a just proportion. But the mass which became the planets was only 1/745 of the whole. If the reduction in rate conformed, the rule would seem to explain it; but the total reduction is far greater, and,—for the excess, at least,—there must have been another cause. The nebula, when substance was crowded out of it at the edges, was spinning *at its maximum,* for only thus were the stars born; ("Universe Around Us," pp. 199-203). Thus the loss in speed must have absorbed the whole increase which resulted when the rings were cast off. The fractional effect of the casting off of the nine rings,—with long intervening periods, in which to recuperate,—if such there was, can only be guessed at; but guessing is no proper basis for a theory.

2. By the supposed rule the time ought to come when the reduced mass would fly apart, and this is a part of the argument, but of this no instances are known. The scientists teach,—no one more vividly than Dr. Jeans,—that all the stars, and even the sun, were the result of similar discharges, but the system *has* moved on. There must have been, then, in case of the sun, a different cause.

3. Changes of temperature, which are frequent, may account for the changing rate of spinning. It is agreed, we suppose, that higher speed and increasing heat went on together, in the development of the system. We need not decide which is cause, and which effect, but do we not agree that they would rise and fall together, and at approximately the same rate? Dr. Nordmann of Paris shows that changes in temperature

are in the regular order, and are to be expected:

> "One and the same star passes through the same temperature at two different moments,—for the first time, in the initial phase of its condensation, where the temperature is ascending, and a second time when the temperature falls."

Dr. Jeans thinks the rate of rotation would *rise:* but not if the temperature *fell,*—as Dr. Nordmann thinks it does. The historian cannot reconcile these. Perhaps the expert is himself misled. It does appear, however, that there may be other features than the reduction of the sun's rotation to consider. The historian looks to the experts; but what if they differ, or if one suggests a material fact which another controverts?

RESULT:

Dr. Jeans and Dr. Chamberlin have failed to convince each other; and others, of equal standing, doubt both. Thus either is speculative, and neither proves itself. A technical discussion might widen the field of difference, but the *fact* of difference,—especially on grounds which even the layman can understand, leave them in the field of suggestion only. It has not been proved that either is possible,—much less that either is probable. The historian is loth to lose the pictorial Laplace; and he cannot see, as yet, why he should. The question awaits further expert investigation. Some time we will know. The planets *did* arrive, and the earth's history would be the same if some other explanation of the emergence of the planets would be better,—or even if there is none.

We close this subject with a brief summary of features outside its technical merits, which impress this writer:—

1:—That the planets were once a part of the sun is universally accepted, and this much is historical.

2:—The Laplace theory had the support of the wisest scientists for a century or more, and this gives it a commanding position now; it can only be displaced by something affirmative and explicit to the contrary.

3:—The dissents now are negative, and are founded on supposed laws, themselves unformulated; and which would not apply if circumstances varied,—as they well might.

4:—If all scientists should agree that Laplace was wrong, (some on their own investigation; some not), each giving a different reason, this would not be unanimity, such as the case requires.

5:—The rule mentioned would be equally fatal to the Tidal Wave theories, for the like amount cast off, by either method, would have the same effect. Thus we would be, even at this late day, without any explanation of our most significant fact; and this we would all deplore.

6:—And lastly, if the historian should leave it as an open question we should have that anomaly of history, a fact, the most significant of all, on which even our own existence turns,—capable of explanation, and not explained.

CHAPTER V

THE PAGEANT OF THE PLANETS

PERHAPS *you can imagine yourself in a different form, or under conditions where perception has a wider reach. Perhaps you could see ethereal things, and hear celestial voices. This need not daunt the trained imagination. Here we present such a picture, and you are invited to see it hung. The artist departs a little from the true order, as artists will, and applies some high colors, perhaps not found in the original.*

CHAPTER V

The Pageant of the Planets

HERE we wish to present, as on a screen, a picture, or series of pictures, of the emergence of the planets, following, in general, the Nebular Hypothesis of Laplace. If that be not truer than others, it is more pictorial, and probably approximates the facts. Three substitutes proposed for it have been considered in the previous chapter. To the writer it seems that a satisfactory case has not been made for either; and this, if true, leaves the Laplace theory with the weight of long approval in its favor. It is therefore a proper subject for our picture, whether itself ultimately found wanting or not.

In a world of busy activity, where scenes and events move swiftly, and where life is short; where a century is an age, and a third or a half is the average of life, nothing would ever be known of the spectacular development of the world we live in and its companion planets unless some one ventures to relate it, as best he can, as it *must* have been,—using the soundest materials that science furnishes. It will be all the better if it proves true, but many a sound thing has been very dull, and a tale which touches so closely the memorials of the past and the hopes of the future, though truly stated, ought to be so pictured as to cling.

THE SPECTACLE, AS THE OBSERVER SEES IT:

The nebula was like a flattened ball, lying in space, with a wide extension much like a wheel, the periphery of which reached sharply out and almost disappeared in the remote distance. The first ring cast off was the outer rim of the gigantic wheel, and this, when rolled up in a ball, was probably Pluto. As the great cloud shrank away and left it there, it was a wide ring, hung in space,—alone;—a circle of glowing substance, which, though at last losing its identity in the planet, continued for a time to mark its orbit; and when eight others had been formed, in like manner,—wheels within wheels,—each an independent orbit, the system was complete. If we can imagine them all in place at once,—each shining with inner fire, and touched with color like the rings of Saturn, how wonderful the spectacle. The sixth from the outer edge was the earth. The artist and the poet, and even the historian, may, perhaps without loss of literary standing, play with the idea of time, and space, and color and mass, and dream a system of successive rings, spreading in a wide series, so that our observer would see it from a central point. Looking through the series, stretching out in diminishing succession, with the white-hot sun in the remote distance; each ring hanging in the atmosphere where it fell, he would see, from Pluto to the sun, a blazing path, arched by nine ribs, each shining with the fire carried from the sun. Oh, but,—a scientist cries,—"it is upside down"; so it may be,—but what of that. It is a picture. To be sure it would never, at a single time, look like that,—even from the top,—for each ring, as it cooled, would roll up into a sphere, and float away; and ever afterwards,—though the orbits stood for the rings,—only in imagination could they be seen in their original sequence; but there they are,—even now; and the historian,—whose taste for poetry and pictures is more attractive than the bald sense of reality,—sees it so.

Playing with items of the whole, like children with blocks, and coloring them to suit our taste, we can gather them into patterns; and let no cold scientist say us nay.

ANOTHER PICTURE:

In our gallery of paintings is another, old, but not dim. In painting this, or reading it, we must not forget that. Thus, leaving the masses of substance hanging there in rings, we may well review their story, as older people trace the lives of children. Starting then at the very beginning, we see the particles of matter as they hung, real, but invisible as they were in the placid stage, awaiting the coming of power; and, still watching and waiting, we see the changes which occurred when the currents of ether began to blow. But did they? could they? Yes, at least for us. The "ether" may be dreamed, and the rising "currents," but the wide-spreading cloud tossed and rolled, in ripples, as the pressure swelled; then waves of impulse crowded the particles into vibration; and out of the cloud rose light and heat; then fire and flame; and at last the substance of the planets broke away, far apart in time, until Mercury appeared, and our system was complete. The curtain fell as the process began, and there were no witnesses, but the march of new conditions, and the flash of new members, added one by one as the procession moved in ordered course, is not hard to apprehend. The changing spectacular phases, from the white-hot mist to a series of worlds are pictured by a recollection from childhood. We see, what we well know, that a small thing may be the true image of a great one. Memory carries the writer back to a day when, for the first time, a wheel of fire was to be shown on the crest of the hill at the edge of town. It was the Fourth of July, and all that day preparations had been going on for a surprise at night. A post had been erected at the exhibition field, but to the boys it had no meaning. A wheel hung idly from a peg, with still no meaning; but curiosity grew strong. A scaffolding of laths and wire was equally hard to explain; but in the semi-darkness a man approached with a torch, and touched with it a pendent fuse, and set the wheel in motion. With a hiss and an explosion it began to turn. How it whirled,—faster and faster,—spreading into a busy widening circle of fire, with showers of sparks curving around it. Shortly our little wheel of fire darkened and went out;—but not the magnificent one it serves to picture. The greater one filled visible space. Our solar unit extended to Pluto, and there it filled that circuit with streaming fire, and threw off ring after ring of white-hot substance; and it never ceased until out of it had rolled or broken away nine planets, each curling off, first into a fiery ring, and then into a floating orb, which sailed away alone. As each ring was completed the sun gathered itself together to repeat the process, and again moved on; and when the quota was complete it calmly settled to its quieter function of radiation for the whole family of nine, including the earth. Are you tired now of our row of pictures,—so much alike,—yet so different? If not, let us carry it further:—

THE OBSERVER PONDERS:

Though the sun has cast off her rings, she has not abandoned them wholly or finally. As in the familiar picture of the mother of a family keeping her children under control by tying them to her apron strings, so each of these was bound to the parent sun by gravity, firm, yet elastic; and so they continued to move around her, each in its own orbit, in a sequence of circles, beginning near,—as Mercury,—and ending far out in Pluto. There is Jupiter, the largest of all; and Saturn, with her triple rings; Venus, the most highly reflecting; and the earth,—then small and dull,—but destined to be great; and the other five, none of which attained greatness, nor more than a name.

Now the universe, or so much of it as concerns ourselves, is complete, and stable, and uniform. Never again will the sky burn as that has burned, until the final cataclysm; nor will it ever shine again with such intensity, or roar with such fury. Is it too strong a picture? But who can tell? Much like the little fire-wheel,—in kind if not in degree,—was the turmoil out of which the planets emerged. The little wheel had small resources, and burned out. The other,—far greater, and as we suppose, newly supplied,—burns on. In the greater example it was neither sudden nor swift. Ever so much had been done, in the processes of building up, before that magnificence was reached; and other spectacular features had occurred here and there in history, almost as wonderful. There must have been many a meteor, and many a comet, and many a "shower of stars"; but their remote splendor was lost in the greater display.

It is said the individual planets arrived after long, slow intervals; and perhaps there were such, but how long these intervals were is hard to imagine, and harder still to prove. Each came when it was ready,—in what we have learned to call the "fulness of time." We are to consider this in another place, and there we shall see that nothing needless ever happened, and no condition arrived too soon or too late. "Ample," with no waste, is our test of time. We have drawn our pictures together as a snapshot photograph shows what appears to be continuous movement. Even plants, in the act of growth, are shown by the new photography in slow succession, as they advance. Here we have no camera, and no screen, but we can see a world system rise and stretch itself, and go on, in due stages, to maturity. Laplace was apparently not himself impressed with the wonder of the scene he described. He was more concerned with it as a venture in mathematics. Such is the meaning of his reply to Napoleon, quoted elsewhere. Perhaps he had no eye for the beautiful. He would probably have been a happier man if he could have caught its splendor, as well as its fitness. Can one not apprehend the earth's capacity for service, without losing the wonder of its swing and power, its easy roll, and the smooth persistence with which it weaves its path in space.

Here then are our pictures of the pageant of the planets. The outlines are drawn from the neutral rules of science; and the details are as correct as science knows them,—perhaps touched up a little, and colored, partly by memories, and partly by dreams,—but, as we believe, far below the wonders we have tried to describe. If you can see one ring in space, where it once was, you can as well see nine. You can even see them glowing with fire, as they first appeared, or perhaps touched with faint color, like the rings of Saturn. And you can see the broad highway up the long series, arched over by those lofty ribs, and running directly toward the sun. Oh, you cannot see it? Then some of your faculties are lacking, and you should ask a more sensitive friend.

What a difference,—can we not see it,—if humanity had been cast upon Neptune. A year there would have been the equivalent of a hundred and sixty years here, for so much longer is its journey around the sun. Man's maximum of life,—now three score years and ten,—would have been exhausted two and a half times in a single year of Neptune, measured by the time prevailing here. There still hangs Neptune, today and yesterday, and many a year before, patiently swinging in its long orbit,—so far from the earth that with difficulty can even the telescope bring it within our vision. It was not even found by humanity until 1846, so long was it completely hidden. And not only Neptune but all the rest, as they arrived, took their places in the cortège of the sun, and there they swing to this day. What is their function now, in the celestial economy? Who knows? Were their positions assigned? Was there ever crowding or confusion? Did law always prevail? What is law? We ask these questions because our function covers the whole field, and we hope for an answer whether the emergence of the earth was an accident; and what it would have been called if life had fallen on Neptune.

THE PLANETS; THEIR PRESENT AND THEIR FUTURE:

No life appeared on any of the planets, nor ever could, excepting on one of the smallest, where it might be least expected; but on each there was day and night, and light and shadow;—divisions of time, precise and predictable,—but signifying nothing; for there were none to care, and even none to know. Here closed the spectacular progression of the universe; here was its climax; and now the pace is set for a long future, precise and persistent, never weakening, never failing, never changing, until time shall end. Was it indeed to continue, as the casual scientist seems to suppose, two thousand millions of years before there should be conscious beings anywhere capable of seeing and knowing it? We cannot think so, unless the whole could be accomplished in no less. Would the planets roll and turn, and turn and roll; set to provide for a known result, but indifferent and wasteful; almost unavailing;—fitted for service, but not serving; "lucus a non lucendo." Does such a supposition,—imagined, but not proved,—throw light on the problem of time, and its just estimates?

But was this long sequence of planets a mere spectacle, without significance? One of them, we know, had a function, for the coming race of men was to find its home there. If it had failed, the scientists have found no place where humanity could survive. What then? To the time of the advent of life the system of the universe personal to man, and his future home, physically complete as it had become, was inorganic. It was as dead as it had always been, and as merely automatic as when we took our tour in space It was no longer even a spectacle; but time and adventure had made its story memorable. Among themselves the nine knew no difference, but one became great. and the others did not. Was this anticipated? If life had never come, or had never found its place, the whole system, so complete and perfect, and capable, would nave rolled on and on, until time should end, and all should fade away in ashes. If indeed there was an adequate intelligence behind it we cannot imagine it making no provision for man; or originating such a system, with nothing to be accomplished by it; even more is it unthinkable, if there were no conscious being to know it, or know of it. Was the earth anticipated? Was there a dream of life? May our solar system be accounted for without it? or this, at least, of the smaller planets? Science has, as yet, found no occasion for the other eight, unless to add their gravitational support to the rest of the system, as men plant supporting pillars, or flying buttresses, or attach guyropes. Without man,—anticipated and provided for,—we can only say that no purpose or use which the universe could serve is known; only to come and go; to shine and fade away.

THE SUN:

What of the sun, after the loss of each planet;—there it hung, still whirling,—still blazing,—still radiating light and heat; until, after an unknown period, another ring is cast off, and rolls up into a sphere. We *call the third Uranus. After that came Saturn, and, in their turn, Jupiter, Mars, and the earth.* We need not lay out a table of the planets, or describe them in detail. It is their *arrival,* and its *method,* that puzzles humanity.

THE EARTH:

But still our picture is incomplete, for the earth had not only a present,—then and now,—but a future; and our impersonal observer, who reports for us, had a long view. He must have shifted his unit of time again and again, as he passed through the succession of arriving planets. Was this confusing? Not yet;—for the nine units, each capable of beating time for the universe, meant nothing to the inorganic world. Neptune, when it came, brought with it the first unit of time; and each had its special day as it arrived. Each added a new time unit,—for they differed in rotational periods, and also in comparative time; and none ceased when a new one came. When all were there there were nine,—all beating time, but no two alike. Neptune had the honor of breaking the eternal silence; but it lost precedence when the next arrived; and so each added its new calendar, and hung it in the heavens; and at last the earth, the royal residence, was given the honor of the master clock. Even now there are nine,—all fit and capable. If each could strike a gong for noon, to be heard through space, how they would ring, and keep ringing, ringing. What clanging; what confusion. The thought recalls the story of the prince who killed himself because he could not make all the clocks of the palace keep similar time.

The earth has now far the greater honor. Humanity knows but one clock-beat, and we poor mortals, of limited senses, hear no other.

We may then summarize these reflections:—

Among all the wonders of the universe we know, the emergence of the planets is far the most significant. Our impersonal observer,—seeing all,—sees this beyond comparison; sees in it provision for everything,—lacking nothing. He saw the earth approaching,—brown, and empty. He sees it now clothed in silken clouds, of tender coloring; crowned with fruits and flowers; laughing with waterfalls; having light enough for work, and shade enough for rest.

Even then, when the earth was new, our observer, looking on it, saw it as it was to be. He saw its inorganic mass move on its quiet course;—but he saw more; for though it had as yet no inhabitant, life was on the way. With his acute vision he could see, from the beginning, fitness approaching from one direction, and life from the other. As earth gathered equipment and made preparation from this and that, he saw an occasional leap of fire, as a volcano burst through its crust; he saw flashes of lightning, and heard rolls of thunder, as storms broke over it; he saw rising hills, and deepening valleys. No other planet was like it, and he foresaw for the earth the prospect of a wondrous future.

Our observer did not fail to look out into the deeper sky,—toward the broader spaces, where many another system floated; and there he could see what you or I may see on any fine night; there was sadness in it also, for none of those great orbs appeared to have a function;—not one,—unless Arcturus,—which, all unknowing, was even then marked for a service ever so many centuries away; but here and there, in the literature of all ages, there is found mention of a signal from some remoteness which man in doubt took to be encouragement or warning.

Here then is our effort to draw together the stages of the developing planets so as to picture to the reader, as a whole, that wide-stretching sweep of events which no single life could compass.

But we have not yet reached the question of time. Many are the estimates of years,—often stated in hundreds of millions,—as of a period when there were no years, nor other measurements to reason by. The writer has anticipated a layman's method of reasoning by events, and thus fixing in the mind the succession of periods,—which he thinks is all any untrained imagination ought to hope for. He regards this as equally true of those later times when there was a basis of measurement, but no human mind to take account of it.

We have now reached a point appropriate for considering this, and our next chapter will have comparative time as its topic.

CHAPTER VI

CONTRASTED VIEWS OF TIME

TIME, *in this connection, means equivalent time, by which all the periods of history may be compared. In the developing universe there were three distinct periods, in one of which there was duration only, without divisions: in another there were facilities for time divisions, but no being to whom they would have a meaning. In the third there were both. Constant efforts are made to compare them, but without success. This chapter will seek to show why*

CHAPTER VI

Contrasted Views of Time

BEFORE the arrival of the planets, time, by divisions, as we know it, did not exist. Rotating and circling orbs are our unit of measure, and thus far there were none. Mere duration had no standards,—of measurement or comparison,—and needed none, for this was before the advent of life, and the processes of formulation were still ahead. When the first planet appeared, and had settled into its periodic rotation, and was constantly turning on its axis, and time began to beat in steady intervals, the conditions were only superficially and mechanically alike. Time by measurement would mean nothing in the first period, and everything in the second. We can measure time now, but cannot apply our measurements to the period of mere duration; thus we are driven to use another basis of comparison, measurable,—the writer believes,—only by *results*. These are vague, and their verity has no accepted tests; but they are not hard to apprehend.

To human eyes, though the emergence of the first planet was a point of importance in world history, as initiating a new stage, it furnished no dating points comparable scientifically with the present. Humanity requires, for its uses, accurate measurements, in its own period; and eagerly seeks to apply definite tests to the past; but it is driven to approximations. Dead substance was then still rolling up slowly into form. We observe, however, that all footprints pointed forward, and passing events seemed to indicate the coming of one qualified to use the new facilities. Man may indeed turn his units backward, and apply them there; but only inadequately, and only for comparison by estimates, as to which individuals may fairly differ. He cannot be explicit in respect to dates or periods, as he can now. We hope to illustrate these distinctions further on under this head.

The earth was the sixth in the order of arrival of the planets. We know but little about the first—Pluto,—and therefore we begin our comment on the subject of time with the next, which is Neptune. Each planet, as it turned on its axis, and floated in its orbit, was a practicable unit of time from its arrival, and obviously is so yet, although men have made use only of the one they live on. Each had its rate of rotation and revolution, and their time periods were of differing lengths. This, and its effects, has been mentioned in another place. When man arrived there was at last an observer, and, as he knew the earth, and not the others, the day, as we know it, became the accepted standard of measurement, but chiefly applicable in human relations.

MERE DURATION:

Whether, in the progression of the celestial system, the periods between events were long or short we cannot know. It is of consequence only to furnish analogies for comparison. If, after the coming of the first of the planets, and before the advent of man, there was, as some scientists suppose, a long period unaccounted for, there was no observer or recorder; and no unit of time relating to those periods has a place in history. All estimates then, must be in analogies, and based upon incidents in nature which are apropos. A few such we will suggest, and the reader may see others.

Among the tests of the lapse of time which have been used in making estimates of periods in the past are these: *a,* the time it took for the sea to become saline; *b,* the time required to build up the stratified rocks; *c,* the time consumed in depositing certain depths of substance in the ocean. We shall consider these in respect of their certainty, and attention will there be drawn to the narrow scope of the materials for judging, so as to indicate how little is really known having significance or pertinence. When we read such statements, though made by scholars of standing and experience, we smile, for we realize that they are all offered in a Pickwickian sense. Nobody knows, or can know, with any approach to certainty, and only far enough to aid in approximating. Even those whose methods seem to have a substantial basis differ so widely in results and are so vague and speculative as to be hopeless as criteria.

This writer holds in high esteem the eminent men whose inquiries have extended into this field, but feels bound to insist that their results are, at most, mere hypotheses, and incapable of demonstration.

It is plain, the writer thinks, that, prior to the coming of the planets, time, as such, had no existence; and it can only be dealt with in terms of comparison between similar conditions existing then and in the present; and he holds that there is to guide us nothing definite or tangible; and that in the later period,—after the earth was here, but before the advent of man,—while new features had arisen to enter into the comparison, yet so much is lacking that there can be found *no* elements of certainty. Time periods, instead of being great, may well have been small; and of this there are many indications. It seems to him that the evident purpose of the whole is the only safe criterion, and this cannot be expressed in years. Instances of error and inconsistency will be mentioned; and to these the writer refers.

The sounder scientists frankly concede that elements of accuracy are lacking; and that, without these, current results are not reliable. Nothing therefore is gained except the development of a sound *process*, for use when, if ever, the elements are better known. We must conclude, we think, that most of the assumptions of fact on which estimations are based are guessed, for the facts are unknowable. This writer is as eager as any to know how much time elapsed between the coming of the planets and the advent of man; but he knows of no adequate tests, and he has not been able to find anything trustworthy, which can be stated in figures. Seeking only to compare with things we know, or to find convincing analogies, we must either suppose a high intelligence at work, with defined plans, or a persistent and predictable law, acting in a similar manner, neither hurrying nor dallying; but even this goes no farther than to convince us that time was not wasted. We have not even a comparison for the period prior to the arrival of the earth, for only one universe ever arose. It is highly artificial for a mere man, with only a third of a century to live, to speculate about how long,—measured by years,—the world mechanism would require in building. We can only suppose that a power competent to build it would do so as rapidly as his facilities permitted. *Could* he do it quickly? Then probably he did. From that time to the advent of man we have a set of analogies, but even these are imperfect, as we will see. *After* the advent of man the criteria are somewhat more dependable, but not much until we know how far the changes regarded as criteria were normal. Yet scientists of standing and reputation are accustomed to estimate such time period, by millions of years. If we ask why, the answer generally given is in terms of the time required to accomplish something supposititious, occurring in the meantime. The defects in some of these assumptions will be mentioned below.

Involved in this problem are not merely questions of casuistry or curiosity, but of historical soundness. A valid solution would have a bearing on several important questions,—such as the origin of man; his outlook for the future; the verity of the scriptural account of creation; and perhaps also certain convictions about the present. Such comparisons are not the exclusive field of the scientists. The historian, or even a curious layman, can as well examine them. We have already seen that where scientists differ, or where they have no factual evidence, the question may be deemed open, and anybody may intervene. This writer, in the interest of sound thinking, presses on inquirers, here and elsewhere, the doctrine that in science nothing can be deemed proved except by evidences of verity, or by common acceptance; but where the elements of the comparison are known, reasonable inference will answer. The scientists, however, whose learning is along the lines of natural law, are not the only ones concerned. There is a well-known school of thought which has come, not without reason, to regard science with a measure of distrust; and which derives its independent information from authority, which it considers not only dependable but final. We are affirming nothing here on that point; we are dealing only with the question of sound estimates of time. With both these in mind, let us see which presents the soundest theory, or whether something partaking of both will nearer approach the truth. We regard it as useless to even guess as to a period prior to the planets, for we have no tests, and this we eliminate. As to the period of the earth's existence, prior to the advent of life, however, there are known facts which would justify guessing, but not much more. All the elements become clearer after man arrived; yet even there the differences between scholars indicate that we know too little to be sure.

In what we may, for convenience, call the Biblical school, men differ about the starting point. They are all convinced of the verity of the Mosaic theory of creation, but they do not agree about the time involved. One understands the Bible to teach an instantaneous creation; the other, admitting direct creation, does not think any time period is taught, and deems that question open. For our present purposes, we pass over the first, and make our comparisons with the second. Time *periods* are to be examined. For the first evidently time was not required. The differences we are to consider are between the supposition of a short time only, on the one part, and the immense periods supposed by estimating scientists on the other. There are guiding facts to illustrate both, but not of equal weight. If one is right, the other is wrong. Compromises or concessions for the sake of agreement are impossible.

Facts of nature, of which we are all aware,—such as the existence and probable age of sedimentary rocks; or the depth of the heavy sea deposits; or the character of the bodies of coal, assure us of a considerable lapse of time, but do not tell us with certainty how much, nor how long, nor when; nor do they furnish a basis for computation. Deposits may have begun before or after the advent of life, or existed partly in both periods. If humanity began with the Cro-Magnon,—which will be a later subject,—all the great ten periods were in the inorganic condition, and had no observer; and lapse of time would be still harder to compute. For the present this will be ignored.

DIFFERENCES BETWEEN SCIENTISTS:

The fields of science pertinent are geology, biology, astronomy, and physics. In all these fields the conditions of nature are regarded as the best tests, and this might be true if we can be sure what they are. They fall into different lines, but the criterion remains the same. Precision is not possible, but some things are known. At this point we are not comparing theories, for doubts about these may result from errors of fact. The method may still be sound. The geologist tests time by comparing the conditions of the earth at different dating points, and estimating the time necessary to bring them about. We should begin by inquiring whether we have at present facts enough to make a tenable comparison. We can assure ourselves of the conditions today, but we must also know the conditions at the earlier dating; and of course the changes in the meantime, and the time required for them, is the point of our inquiry. Every estimate of time assumes such knowledge, at both dates. Here we pause to examine and inquire,—and we find, by the testimony of the scientists themselves that conditions were *not* the same. Dr. Osborn knows what others know, and he frankly assures us that this cannot be proved; and this conforms with other things we know. He says:

> "The present chemical composition of the terrestrial matter, of the sea, the air, the water, and the earth are by no means the same as its primordial composition."

Probably far less time was needed to bring about those changes than the estimators have supposed, even where they agree,—which is rare. The estimated time is far too long; the geologist must try again. Here are a few reasons:

The physical changes,—revulsions or convulsions,—may have been swifter and more frequent;—more sudden and unaccountable. Normal changes are estimated, but abnormal ones occur. Immense tracts of land have been suddenly overwhelmed by oceans. New islands arose; continents were extended. The time allowed for the changes is very long, but the time actually consumed, in instances known to us, was very short. What then must we say of the basis for estimation? Only this; that in spite of the ability and good faith of the scholar who makes them; and in spite of the soundness of his method; his result is without proper support. Even more are we impressed by the *variance* between estimators, of equal character and capacity, and using the same method.

This is stated here in general terms, but the figures themselves, collated below, confirm it.

What assumption can the investigator make that would carry safer elements of assurance? Of those presenting estimates, scarcely any two begin with the same facts, or come out with the same result; and we who read or listen can not judge between them. If we are at a loss to explain the diversities, can the ambitious estimator do so? He evidently can not. The wisest has here no advantage, for no one knows. Such estimates are therefore only interesting; they are not informing; and certainly they are not science.

Dr. Osborn collates the results of many such studies in his book on the "Origin and Evolution of Life"; and this, for convenience, we use here. He recalls that Lord Kelvin,—equalled for diligence and capacity by few,—made an examination, using the geologic test, and reported two estimates,—wide apart; one was 20,000,000 years for the total age of the world, based on the time required for cooling; and another of 400,000,000 years, by a different method. He had no confidence in either, and suggested 98,000,000 years as a probability. Rutherford, Dr. Osborn says, made a similar estimate, based on radium content, and fixed the period at 599,000,000 years; and Geike made one based on sea deposits, setting it at from 199,000,000 to 500,000,000 years;—a difference between his maximum and his minimum nearly equal to Lord Kelvin's maximum. Dr. Osborn tells us that Mr. Darwin fixed the age of the world at 500,000,000 years or more,—on the theory that it would take that long for the evolutionary processes of life to work out. If he meant "evolutionary processes" of living things, he was without a tangible basis, for he had no data, even if the theory were tenable. It is said that the whole process is repeated in the period of gestation. Dr. Dade, in Encycl. Amer. says that the estimate of the physicists, based on building up the sedimentary rocks, is 800,000,000 years; but there was a long period before there were any sedimentary rocks; and for these he allows a vague period which he was unable even to estimate. The confusion would be greater and not less if one undertook to allow for differing dates of beginning. For example, geology would begin when the planet emerged, but evolution only when the cooling process was over. Dr. Osborn sums it all up in these words:

> "The life period of the earth is credibly reckoned at 1,000,000,000 years."

Is it not reasonable then to say that, though having the best facilities, and a trained capacity for judging, the scientist *does not know,* and cannot possibly find out. His *method* is defensible, but he reaches conclusions by unsupported assumptions. Dr. Dade adds to the confusion by giving, as the judgment of the geologist, the time required to salt the ocean at 70,000,000 years; and the time required for building up the sedimentary rocks at 800,000,000 years.

The biologist is worse off than the rest, for he uses two factors, both imaginary. One is the theory of evolution from an original unit, which he cannot prove; on this he supposes immense periods, which he has no facts to sustain. A familiar rule of logic forbids the building of one inference on another. To be worthy of confidence the basic facts must be either verified or generally accepted; and of course the inferences must be both logical and tenable. If indeed the universe had no purpose, and if laws cannot be judged by their outcome, then no sound test can be known, and we must content ourselves to be ignorant. Precision, or anything approaching it, being impossible, are we not driven to our preferred comparison of broad periods by analogy,—where facts are available.

There are analogies which may suggest an answer,—not in years, but in *comparative periods;* but they can be helpful only if we begin with confidence that the course was *planned in advance;* and if we find the laws of nature so sure as to be predictable. Such analogies may be deemed significant on the ground that the universe operates by the same methods, and under the same laws, *in all its parts,* and always did. We mention a few, which will serve to illustrate our meaning.

ANALOGIES FOR COMPARISON:

(1) Man is now traced back by the archaeologist some seventy centuries. During that time he has learned both to combine and to separate the elements of matter quickly. In the estimates we have mentioned it is supposed that it took a very long time to *combine*

the elements of matter, but this depends on the method. Pressure may be slow; but high temperature will combine them quickly, or separate them quickly. Every smelting furnace is an example. Why should nature, working by the same laws, and having at command far greater heat and power, take millions of years to do what man can do in a few hours or days?

(2) Evolutionists contend, as their strongest argument, that the processes of development of living things are recapitulated in the short periods of gestation. Why do they estimate 500,000,000 years when the longest known period of gestation is one year, in the case of the elephant, and in certain insects one day.

(3) The planets, coming out of the sun, are said to have cooled quickly. They had no heat of their own. Dr. Jeans says:—"The smaller may lose heat so speedily that they liquify and perhaps solidify *almost immediately* after their birth." And another author of importance (Dr. Abbott), says they probably cooled within a few years. Why then allow 20,000,000 years?

(4) Why so wasteful? Dr. Jeans says the sun has always been pouring out radiation at a rate 650 times the speed at which water flows over Niagara; yet he fixes its age at 2,000,000,000 years. If 500,000,000 years were enough for the full period of building up evolution, why four times as much for wearing it down?

(5) Two billion years are the equivalent of six hundred thousand generations of humanity. Did it take that long for the earth to cool? If man was part of a plan, or had any relation to the developing universe, this was an awful waste. If he had none, and only matter is to be considered, it was still more wasteful, for in

that case nothing but final destruction was contemplated. It was not even a picture, or a toy, and had no significance; and thus for *all* its history that magnificent system of orbs would hang there until it burned away in ashes, with no function at all. No one is bound to say *why,*—but there is no one who could not say *why not.*

(6) Compare a little further;—Julius Caesar died sixty generations ago; Abraham, a hundred and twenty; the rulers of Ur, or others to the limit of archaeology, a hundred and eighty; the Cro-Magnon man perhaps fifteen hundred. The man who estimates so bravely the time of this great waste must believe it himself, and have a desire to convince others; but can he tell us why one was so short, and the other so long? According to these the universe possessed every orderly law, and every persistent force, known to science,—except *one,*—i. e., it was *not* adapted or equipped for its only possible function. Are we to so suppose? It is a good deal to ask. *Credat Judaeus Apella,* said Horace, of a simpler proposition.

TIME, UNDEFINED:

It is an absorbing theme. The human mind cannot even grasp the idea. Duration, the time measurement of which we are seeking, is an abstraction. The problem is not less if we call it eternity. Duration is only a name; it is not a description. When we attempt to comprehend it, it projects farther and farther in both directions; and the universe itself is easier to realize. When man seeks to comprehend it it fades into a philosophy, in which the mind loses itself. We can only symbolize it, as ancient people did, by a circle; and that also we are unable to comprehend. There is nothing with which we can compare it. Again time, in a historical sense, if carried as far back and as far forward as the mind can reach, is not more than a mental exercise. It begins, not with an event, but with a condition, and it ends with another. This also is a kind of philosophy, on which we may whet our teeth, but it defies solution. Easier to grasp is time by stages, or periods, each with a character of its own. This began when the planets arrived. Though still vague and ill-defined, it began then to have a human cast; and one finds himself reaching out to characterize each stage by something human, or known to humanity, and to link them together by a tie he can recognize. Abstractly it floats away; but when tied up to facts it narrows and links up into a chain, which we may comprehend. At times it seems that, though not resolved into units, it carries items, of much or little independent meaning, into the waiting mind, one by one. Here, then, since time and man are synchronized, we find ourselves at home; and we now accustom ourselves to compute time by tokens which we can understand. We dot it, here and there, with things done, or felt, or known. Years are neither as definite nor as comprehensible as periods,—measured by events. It is hard to figure up by years the lapse of time from Washington to Lincoln, but we can apprehend it; and so from William the Conqueror to George the Third, or from Napoleon to Hitler.

We have been dwelling chiefly on the age of the earth; but now we come to consider the almost unimaginable periods which, prior to that time, slip out of the hot minds of certain scientists, too busy to think.

Rarely does any writer venture even to guess at the wide reaches of mere duration which he thinks must have passed before the planets came. Since that dating point we have acquired our familiar time standards. In some multiples of present time periods, then unknown, and unknowable, events floated by, during the period of mere duration, and then, with the new orbs, came certainty; and years and days came and went, while the inorganic planets rolled and turned; and in due time came the human family. That period of time we have considered; for time it was, though of unknown extent. Many items of history are mentioned as dating points; but it is a museum of fallacies. We wish to know the truth, but have only analogies and comparisons to guide us. We find these interesting, in the broader lines, but, comparing with the life of those that think about this, they give us no basis for figures, and if they did we could not grasp them. Those we have cited we invite the serious to consider with us. To do so, however, requires a reasonable apprehension of their theoretical bearing, and to this we now come.

TIME BY INFERENCE:

We expect the thoughtful reader to infer, as we have done, that the period between the arrival of the planets and the advent of man was comparatively short. The same, we think, must have been true of the time between the full preparation of the earth and man's full maturity. The immense periods of time assigned to this by the proponents of Evolution have no basis except the needs of that theory. If it is erroneous, no lapse of time need,—and probably none did,—occur, beyond the steady course of nature in preparing the earth for man. It is not the historian's function to argue that question, but the writer has done so in his book,—"The Theory of Evolution—An Inquiry"; and this it is needless to repeat. If it be otherwise supposed, the result would be no more convincing. In another chapter it will be shown that even if there ever was such a course of development, it came to an end *before the advent of the first man;* and therefore does not, and never did, affect our present race; and thus the 500,000,000 years assigned for that purpose had no cause, and no reason. Science only teaches that the period we mention was *long enough;* which has suggestions of its own. We have learned that while time is always ample, whether under intelligent direction or merely governed by law, it is not likely that there was a wasteful excess; and this any sound inference must take into account. An inference must be based on facts, and must also bear scrutiny as to its logic; and these immense multiples of mere atmosphere do neither.

Let us consider briefly whether the *purpose* of the universe, as we judge it, will not help to illuminate the proper field and occasion for inference. In human experience nothing is more generally the governing factor in such a problem than the *purpose to be accomplished;* "What is it for"? "What is it intended to do"? etc. Dr. Eddington, in a recent book, suggests our point:

> "We know the prodigality of nature. If indeed she has no grander aim than to provide a home for her greatest experiment, man,—it would be just like her methods to scatter a million stars, whereof one might haply achieve her purpose."

This writer does not view nature's ampleness as "prodigality,"—but on the contrary deems nature an example of thrift;—but the point is the same. If we can see behind nature a high intelligence, coupled with supernatural power, or an equivalent in predictable law, then we may know its purpose with assurance. The reason for omitting this feature in scientific thinking is not that *it is not true,* and also evident, but because it is supposed not to be within the proper domain of science. We do not agree to that, but even if so its *probability* is strong. If it is true that the thing that happened *had* to happen, we cannot ignore the *subsequent* events and outcome. Purpose and plan, together with the origin of life, and the origin of matter, are often grouped together by the writing scientist without an answer, and turned over to the theologian, who himself can only deal with them by delving in science. By halting at barriers of his own construction the scientist is compelled to begin his tale in the middle, and end it with his pen in the air. If there is a gain in this, there is also a loss; for a vital element is left out.

Another basis of inference is the *shortness of human life.* If man was an accident, this might be omitted; but even here persistent and continuous laws, which lead up to man, and can lead nowhere else, may take the place of a supposed intelligence. They operate alike. Man, being inevitable, stands in the place of a purpose; and if so the shortness of life has its lessons. One is, that we cannot well conceive of a wasteful loss of power; on the contrary, comfort and convenience would seem to be contemplated,—not for one here and there, but for all alike. This cannot be omitted without deeming humanity an accident. The benefits of nature or its products, if man were anticipated, could not have been intended for the few only. This would imply,—would it not,—that those benefits, in spread and character, would be answerable to the human need; and radiation would be cast into the atmosphere no longer than due preparation required. Certainty in detail may be hard to attain, but reason suggests that *comparative time* would be distributed on the same principle.

THE CONTRASTING THEORIES:

We present no theory, but are seeking the truth. It is written that, on his visit to England, Mr. Emerson reported to Mr. Carlyle that Harriet Martineau had decided to accept the Universe. To this Mr. Carlyle responded, "She'd better." We propose to accept the facts, when discovered, and adapt ourselves to them; but we cannot suppose an enterprise so magnificent to be an accident, or to have no purpose or plan. If it had none it is scarcely worth writing about. Its benefits to man may be withdrawn as suddenly and aimlessly as they came.

Science, where its followers are not indifferent, or unduly partisan, is sane and sound; and we are eager to have its considered judgments; but here its feet are not on the ground, and we only get dreams and visions. What then can the historian do? The scientist, writing, spreads his expert inquiries far and wide, though he only professes to deal with a fragment of the story. Thus Dr. Jeans:

> "We may well admit that science cannot at present hope to say something final on the questions of human existence and human destiny."

and in another place he repeats this, in other language:

> (Of the plain man who),—"recognizing that it is impossible for the human mind to comprehend the full plan of the universe, decides that his own efforts shall stop short this side of the creation of matter."

Others have used similar language. This is sad, and also absurd, the writer thinks, for it diminishes greatly the aid science could furnish; but it is also incomplete. Science is not, it seems to us, so narrow, notwithstanding the protestations of some of its proponents; nor could it be, without reducing its field to futility. By its name it purports to be and do more. What then, we ask again, can the historian do, when he wishes his narrative to conform to science? Certain inferences are inescapable; there is, behind matter, a cause, and equally behind man. That cause, not being natural, *must* be supernatural. There *is* a plan, and it is plainly branded on the things with which it deals; for nature,—itself governed by law,—marches on that very path, and into its mysteries and out again, into the future indicated on its face. If physical or astronomical science would consent to go straight on, from beginning to end,—as mathematics does and must,—it would meet, at or near the end, the so-called contrasting theory; and they would have no remaining differences,—for methods would be over,—and they would finish the journey together.

On this fascinating subject we have only remaining to consider the period of

TIME BEFORE THE PLANETS:

Even if there was no such thing as time when there were no standards,—speaking technically,—yet there was duration. This is a dreadful word, with terrifying implications. It is awe-inspiring,—like space. The writer has an electric clock, modified from a very ancient one, which he values greatly; but he is afraid of it. It is silent; it is like a ghost in the room. It is a little like death. He wants it changed; he wants to hear it strike; he wants the pendulum to swing; he wants the clock to tick. Time, or even space,—deadly quiet,—is alarming. We cannot see it move, or hear it, and yet we can compare time, *by proportions,* with the other things we know. The rule in science is that the past in nature was of the same kind as the present, and governed by the same laws. It may have moved silently, but it moved. It is a relief when,—on the arrival of the planets,—it begins to tick and strike. It is fair to suppose that the course of events, after the planets arrived, did not speed up or slow down. It was the same program,—the same cause and results,—the same persistent purpose, looking to the same end. Was this not the good of man? Certainly there has been no other suggested; and that,—considering what he was and might become,—was enough. Minor items had changed in minor respects,—each with its own cause,—but if law, or its operations, could change we would have no assured basis for either a forward or a backward look. Since predictability is the best test of law, (as Dr. Bather tells us), if, for any reason, nature ceases to be predictable we shall have lost not only confidence but law; and we will be on the way back to chaos. The development of our celestial world was, all that time, under way, with the same urgency, and no more, that we have observed since. The worlds were on their way, but they were incomplete,—yet the clock ticked on, at the same rate, and with the same regularity, and the same persistence; and so it will until the law changes or time ends. Then it will cease, and never tick again. It had, as it were, not only a function but a duty to perform. It was indifferent to persons or interests or intervals. It was mechanical, and had no hopes, no fears, and no aspirations. Neptune,—if it was the first of the planets,—introduced the first standard of measurement; but, so far as we know, made no other change. One thing seems certain,—that eventually all theories will take account of the adaptation of all existing elements to the ends it cannot avoid; and this also is true of the steady rate of movement; and we can be sure that the results of all sound theories of matter will be alike.

We find, then, as we think, that the universe was built around man; was adapted to his needs, and fitted to his present and his future uses. What that future is likely to be we have,—we think,—a sound basis for prediction. We will consider that question in a later chapter, and it seems likely that there we will find the key to most of our mysteries. If there was or is another reason for the universe, man, it seems, must have been at least a part of it; and for this reason, as well as those already given, his coming was not either incidental or accidental; and it must be true also that time, even if not always capable of computation, was always steady and invariable, and must be reckoned, adjusted, and explained to the same end; and we feel that this may, consistently with the settled rules of science, be duly inferred.

Historically, we may add that at last the earth arrived, and man took his place in the seat of authority; and now the units of time are ticked off for us by a clock which will not cease, nor even hesitate, until it is lost with the rest of the universe in the overwhelming cataclysm. In the meantime man will steadily pace his way until it strikes twelve.

AN INTERVAL

SCIENCE VERSUS AUTHORITY

●

"YE'LL *tak the high road and I'll tak the low road; but I'll get to Scotland afore ye." A sad song of farewell by friend to friend: both bound for Scotland on the way to Paradise; one by the highway, the other under sentence of death in the Tower of London. The words are heavy with pathos; the air is sweet with melody. Does it not teach the very thing we are about to think of together?*

AN INTERVAL

Science Versus Authority

AND now, on its way, the earth moves quietly in its own orbit; turns on its own axis; into the sunlight and out again; all unconscious; never hastening, never wearying,—on and on,—with no one to see, or know, or wonder. Silently it keeps its place, but in its mass the forces of nature are always busy,—combining, re-combining, kneading, dissolving, swelling, shrinking; not needlessly nor wastefully, nor merely consuming time; all to the end that the seeds of life, when sown there, may grow and fructify. Whether behind the laws which kept it in motion there was a personality equal to or greater than his task, with his hand on the wheel; or whether such a belief would conflict with science, is to be considered in this "interval,"—to be judged by laying the two side by side, and observing whether they agree, or how far they disagree; and whether their divergencies, if any, are vital.

AGREEMENTS AND DIFFERENCES:

There are before us two codes, both purporting to explain the mode of world organization,—often regarded as conflicting. Both,—as we find them expressed,—the products of human thinking; and both,—as they stand,—were devised after the event, which had no observer. One is the handiwork of science, wrought out by human research,—from knowledge gained now,—on the theory that neither matter nor law has ever changed, and that a code of laws framed out of experience now would be correct then. The other code is found in the Bible, which a large constituency regard as authority,—*"ex post facto"*—for the past and also for the future. Our comparison is not intended to examine either critically, but only to ascertain how far they differ, and whether they are really two, or only one; and if they disagree,—how far. Science has accumulated a series of observed facts,—ascertained as of the present;—from which it has drawn a series of conclusions; and these it is accustomed to apply when facing a problem,—without reference to dates. The other does not controvert these,—as a whole,—nor ignore them, but when they seem to differ it presents, as conclusive, a definite authority, which it deems final. The active forces behind the earth's movements bear to one the aspect of law,—indifferent to persons. The other postulates,—everywhere and always,—the head and hand and heart of a divine personality,—wise and kind,—and concerned about the welfare of humanity. Are these alternatives, or are they both true?

It is not to be expected,—the writer thinks, that two codes framed for such widely differing purposes, would follow the same course, or be traced by the same landmarks. This is not our present inquiry; and such is not our supposition. We suggest only that the starting point and destination are not essentially different. The *incidents,* however, may be so unlike as not to be compared. They would more resemble,—the one a railroad train, and the other the air mail, both leaving Chicago, and, by different routes, both bound for St. Louis.

Another illustration would be this: From Nashville there are two good roads to Florida, one leading through Knoxville and running among the mountains; the other following the lower levels. Travelers might differ about the scenery by the way, and the obstacles encountered, but if they go clear through they will meet at Miami.

This illustrates, measurably, the point we are making; and so we are putting the problem.

It is not to be understood that in the opinion of the author science is religion, or religion science; but only that their ultimate convictions about the facts out of which we build our theories, are not different; and that those are mistaken who consider them essentially hostile. But even so, one is not a substitute for the other. Both require a willing spirit. Nothing here calls for a definition or analysis of either, but it may be said that science requires only intellectual assent,—and is subject to correction; but with like limitation, religion,—as understood by the author,—is this also,—*plus* a complete commitment, involving the whole human personality.

THE FIRST CAUSE:

As to the organization of the universe both agree that it had an origin, and also a cause; but science,—at least by some of its leading representatives,—omits these, and begins with matter, ready for action.

It cannot be said,—without limitation,—that all scientists admit that matter had an origin, for a few hesitate; but as a class they must admit an origin if they hold to the doctrine of evolution, for that doctrine has no other essential basis. It begins with a living unit, and grows, but the first stage must be conferred.

No one ought to complain of an arbitrary limitation of an expert field, but where the question put can be answered by a simple inference, this has the appearance of evasion; for inference is the greater part of the scientist's code of verity. Why should it not accept the inevitable, and admit that natural law does not explain the beginnings of matter or force, and thus they *must* be supernatural. For like reasons the writing scientist stops with the *end* of things tangible, although there remains much beyond which calls for answer; and inference can as well be employed there also. Is it hard to believe that the same being who "breathed" on the particles of matter, and they became a world, could have, in a similar manner, "breathed" on man, and made him live? The first is the story of science, and the other the story of the bible. The subject matter is much the same; the method is much the same; the purpose is much the same. There was a first cause in both,—unnamed, if not unknown,—exercising similar powers, in a similar manner, and with a similar result. At least they *might* both be true. It would be weak,—would it not,—for a man who lives by that ether, and could not live without it, to argue that one competent to endow the atmosphere with the power to sustain life is limited to one method of using it. How much farther would a power have to go,—having made an automaton *capable* of voluntary motion,—to make it live?

When then, in our picture of the last man, we suppose him to be confident of a future life,—is it unreasonable to so interpret science?

As to the origin of man, both schools have the same basic facts, though they often make a different use of them, putting the emphasis in a different place, and shading the facts a little by predilection, leading to needless suspicions of hostility, which the facts do not justify. Man cannot be explained by anything found in natural science, but manifestly he is not denied; nor is it seriously denied that he had a beginning, and a cause; but what this was is not,—by some,—regarded as science. To the writer this is incomplete, and invites misunderstanding. Since it is conceded that life has no natural explanation, why not admit the inevitable, and call it God?

Thus far, then, we find no expressed differences. It ought not to be supposed that the scientists, as a body, go even so far as to avoid the subject of origin, or even supervision. Some of its greatest exponents,—of the past and the present,—are candid on this point. Humboldt is quoted as saying that he was thinking God's thoughts after him, and Sir Isaac Newton was equally explicit. So are many of the leading scientists of today,—older and younger. Among these are Dr. Pupin, of Columbia,—Dr. Milligan, Dr. Compton, and Dr. Frost, who are as frank about that as about other features of science. It is not therefore because he is or is not a scientist that he is this or that.

THE ORIGIN OF MAN:

There are, among the scientists, some who contend that man is the outcome of a long series of changing forms,—beginning with a single unit. This is not a general scientific doctrine,—though asserted so often, and in such broad terms, as to so appear. It has no proofs to support it, and has never got beyond the stage of what some call a "working hypothesis"; and today it is scarcely that. As we expect to show in another place, it is now an abstraction,—no more than a philosophy. On its face it appears hostile to the view that mankind was created by an exercise of divine power; but it is scarcely that, since its own primary stage possessed life, which no natural power could confer. The chief question open now for discussion regarding man is not, therefore, between science and authority, which begin with a like assumption, but between groups which both accept the doctrine of direct creation; some of whom think it was instantaneous, and adult; which carries with it the conviction that the earth and stars also had no earlier history. Others,—equally confident of direct creation,—believe the scripture consistent with creation in the living cell, as it is at present, and of the physical universe by gradual growth, which must have had a supernatural start. Whatever then is the sounder doctrine, we find, as yet, no conflict with science.

THE PERIOD OF WORLD-BUILDING:

Religion and science are sometimes supposed to differ about the period required for world-building. This, being historical, would mean little if it does not involve the question of instantaneous creation,—including both world and man. This, however, is a difference between two schools of thought holding the same fundamentals. Yet it is often cited by science writers as the doctrine of the Bible, but to this writer it seems that they have not read it carefully. Since this is a question only of method, science has no part in it; but even so this writer regards it as turning on sound interpretation. Its true meaning, as to physical creation, will be considered in another place. As to man it is the understanding of this writer that while it teaches *direct* creation, this is not necessarily *adult;* and the slow maturing of a living cell, through gestation, infancy and adolescence, would conform to its requirements; and this would not depart from the method prevailing ever since. The due protection of the cell would be the sole departure, and this is involved in other doctrines of both schools, and therefore is not new. No one who accepts the doctrine of evolution, where this is accomplished in a much more complex way, can doubt its feasibility; and the birth of the first generation,—which no one doubts,—does not differ. This question then is no real issue. In view of the fundamental assumptions of the descent of life, it seems that they are alike, except in method.

The *time required* for the organization of matter has other elements. Science, as the writer understands it, does not deny an origin or a cause, nor even that it is supernatural; but proves, by the laws of nature, that the stars were shining in brilliant splendor long before the advent of man. The earliest processes of organization may have had their origin,—as a very eminent Bible student said, in the preface of his book on Physical Geography,—"far back in the absorbing periods of eternity," where he said the forms of matter began. The application of mathematics,—itself fundamental truth, reduced to formulae and tables,—to the measurement of star distances and star ages, if soundly done, cannot be denied or ignored. This has been a growth, but is now common. It was never precise, for reasons mentioned below, but it can be checked in numerous ways, so as to make it practically true.

MATHEMATICAL TESTS:

Time, or time periods, if not defined, may have any of three meanings;—light years, as the term is used in astronomy; there it means the years of our time required for light to travel to us from its source; or mere duration,—as it was before the planets arrived; or elapsed time,—computed by our standards since the arrival of the planets. We have had to do, thus far, chiefly with the third; but here we are to consider the first. It is the third as to which the geologists and physical scientists have made their principal estimates of time; but astronomers reach farther, and wish to know the distances to the stars. These vary immensely. How deep they sink in space; how wide the field; how great are many of the orbs; the problem is to measure their distance from the center of the earth. It would not be too great a task for mathematical science if it could find a base line, but this has its limitations, as we will see. It recalls the despair of Archimedes, who said he could move the earth with his lever if he could find a fulcrum. We have no occasion to consider this except as tending to prove that the stars had been shining an indefinite time before the earth appeared; but the effort to know how long, by multiplying years, is useless, for there were no standards. We have shown elsewhere that the only fair test of duration in that period is by analogies:—instances of which have been there mentioned. It can be pictured by comparison with later periods, but can not be measured.

Star distances are different. Theoretically they may be computed, to the point where, by reason of remoteness, one of the elements is lost; but even there the figures are so large as to mean nothing within human comprehension. Dr. Abbott illustrates this by his astronomical rule for the computation of star distances:

> "To know the distance in miles of a star whose parallax is given in seconds, divide 19,200,000,000,000 by the parallax."

The parallax is the angle between straight lines, projected from a given star to meet each end of a base line. Manifestly it diminishes in relative spread as the distance increases; and thus the enclosing lines from the remote stars lie so close together than the human eye can not apprehend the angle.

We can thus understand what Dr. Abbott means when he says that certain enclosing lines appear to the eye

> "about the same that the width of a telegraph wire presents at four miles distance."

Both angle and base line are required elements of the computation. The rule has therefore practical difficulties; and this explains why only a few computations have thus far been made.

The earliest base line was probably a fixed distance on the earth's surface; the next was the earth's radius—which was sufficient in the case of the moon. It is now the radius of the earth's orbit. In any measurement the difficulty is increased by the fact that the earth's orbit is elliptical, and thus its radius differs by changes in direction; also by the fact that the earth is rotating, and the relative position of a given observer is shifting. Thus, while the distances of some stars,—being nearer,—can be known, progress in making complete tables is slow, and a large field is left for future approximation.

We can compare the comparable; but time standards exist only in the period *since* the earth came into existence; and there would be no record until the arrival and equipment of mankind. We can draw from Dr. Abbott therefore no more than a statement of the astronomer's *method* of testing star distances.

The application of this discussion here is only this:—every true theory of creation must assume that the celestial system was of gradual growth, and that its development extended through an immense period. History, as mere sequence, may be traced, but time periods have had a recent beginning. There is rather constant disputation about this, but to the writer it seems to merely waste time, and exhaust patience. He thinks that,—at this point at least,—it ought not to be possible for two explanations of a visible outcome to differ,—especially if emanating from the same source;—and he cannot think they do.

An investigator, unable to deny the truth of the story, as one sees it in nature; and equally sure that it may be known by authority, thinks he needs not be put in a position of defense as to either. Unless we *must needs* interpret the Bible to teach an instantaneous creation of everything, including man, there is no necessary conflict within the field covered by both. Some scientists are inconsistent, and make assertions beyond their special fields. These are within their personal privilege, but they are not science.

PART TWO

THE MAN HIMSELF:

WHO AND WHAT

●

CHAPTER I

THE FIRST EXAMPLE

HISTORY,—*which is a combined biography,—has often to be made interesting artificially. Sometimes great names are not great enough to create interest, or maintain it; but here we have the story of the very first man. He had no name, no home, no telephone number, no teacher, no companion; no post office address. He was his own gardener; his own butler; his own scientist; possibly his own lawyer.*

Let us introduce Mr. Cro-Magnon, of Cro-Magnon

CHAPTER I

Man: The First Example

IN THE verbiage of the evolutionist some of us have been saying that man is on his way upward, but now we are finding that he can only with difficulty keep his original level. The highest authorities in biology are now agreed that he has never been down. The error arose in part from the persistence of the theory of evolution, which was supposed to rest on a basis of fact. The scientist is beginning to fear that this was never more than an attractive dream; but this need not be considered here; it will be the subject of our next chapter. Another reason for the doubt is the demonstrated fact that even if evolution was capable of proof, it never applied to our present humanity. We may keep the theory, if we like, as a pleasant morsel to whet our teeth upon, but as applied to humanity, at least, if it ever lived, it died with the Neanderthal, more than fifty thousand years ago. As to that period it is an abstraction which we may play with, but it solves no problems. Literature dealing with mankind, to a considerable extent, still keeps on friendly terms with it, and, while doubting its conclusions, is inclined to talk its language. In the next chapter its difficulties, even as a philosophy, will be summarized, but here we are to consider the scientific fact that our present race did *not* grow up from lower orders, but began at the top.

The physical head of the race is known to science as the Cro-Magnon. The name is not personal but racial. It is descriptive, as for instance Nordic, or Anglo-Saxon. What his friends or his wife called him we do not know. We know him by his fossils, and these were found in a locality in France known by that name. He was a veritable man,—so evidently a maximum of his species that, as the wisest believe, all the eight or ten thousand generations that have followed have done no more than equal him. Enough complete skeletons were found to justify a full description; five were found in one place, and seventeen in another; and there is of him now an ample literature. His character and tastes are indicated by his own drawings and sculptures on the walls of the rocks around him. If any one should see fit to call him, or his father or grandfather, Adam (which only means red), we know no reason to say them nay. From the sources which the experts use to build up individuals from fossils they have made of him a striking personality, which will be found in the descriptions quoted below. One of the skeletons was of a man six feet four inches in height. A very competent sculptor has made an idealistic bust of him, which is used in all the authoritative books of evolution, and is therefore vouched for as almost the equivalent of a portrait. It is found on the opposite page, and we venture to say that no one can find in it the suggestion of an animal struggling on the way to become man.

In another place we will furnish a fuller description, and collate some of the leading scientific au-

THE CRO-MAGNON,
BY J. H. MCGREGOR OF COLUMBIA

thorities verifying the facts. At this point we merely state them.

Passing then the fact of the Cro-Magnon, we come to consider his character and quality.

EARLY AND LATER MENTALITY; A COMPARISON:

We wish to show that the development of the human mind was not recent, and also to compare it, as far back as we know it, with that of the present. This is to be verified by a series of facts, and also by the conclusions of competent scientists. It is curious that this, though the proofs are so full and so definite, is disregarded in the discussions of the evolution theory. It seems to the writer an insurmountable obstacle. The case seems clear that the disappearance of the Neanderthal, and the rise of the Cro-Magnon, reduce the theory of evolution to a mere abstraction, unless proof can be found that development continued in fact since, as well as before. None has been furnished, nor even suggested, except vague contentions that increases in mental activity are of that nature. This would be off the point if it were true; for evolution is physical; it means the shifting of type, by which a creature of one species is changed to another. But one of the objects of this chapter is to prove that there has been no such advance, even in mentality. It is the voice of science that if there has been a change since the Cro-Magnon it has been a retrogression.

It is at this very point that evolution is weakest. Physical changes, of the kind just mentioned, are vital in evolution. How else could a speck of protoplasm become a man, or even move a single step? An immense number of steps would be necessary to advance from one species to a million; and even more to leave by the way enough, unchanged, to mass, by millions, in the numerous offshoots comprising species as we find them. Mr. Darwin realized that the doctrine could not be maintained without proof of transitions, but he knew of none. This disturbed him, but he could only explain that the records were incomplete. (See Descent of Man, p. 274.) This is equally true of human history since that time. The story of the Cro-Magnon is told in every book of authority in biology, with all its particulars. It is in Sir Arthur Keith's "Human Antiquities"; in Dr. George McCurdy's "Human Origins"; in Dr. Osborn's "Men of the Old Stone Age"; also in every compendium; and the best-informed experts, some of whom are quoted below, aver that evolution is not at work since the Cro-Magnon. We have here no occasion to discuss differences between humanity and other living beings,—if such there be. We are dealing with humanity alone. No argument would convince us that evolution could be still at work, with its most vital feature omitted. There is no evolution now. If there ever was, it must have been before the coming of the Cro-Magnon. To us the effect is the same as if it once did exist, but ceased. It is not very surprising that those who are pleased with the development theory as a picture should be so easily convinced of its verity. Mr. Darwin appealed to such for support, notwithstanding the weakness of his proof. He said:

> "This objection will not appear of much weight to those who,—for general reasons,—believe in the general principle of evolution."

If, then, anyone still adheres to that delusion, seriously, his difference is not with us, but with the most distinguished of his own brotherhood.

Before passing to the evidences and authorities to establish the verity of the Cro-Magnon advent, let us look at some known conditions which seem significant. and observe how accurately they fit in with the result we are describing.

It is not material here whether the Cro-Magnon, as a family, survived, or was ultimately lost in the intermingling of races. We do not know. Neither would affect his dominance as the first of our race. No one of importance, though supporting the evolution theory, contends that after the Neanderthal became extinct there was a revival of an animal link in the human line. Present day humanity had been inaugurated, and it never ceased.

The writer regards the theory of evolution as both unprovable and unintelligible, and believes that it is bound to go the way of astrology and mind-reading. His reasons will be summarized in the next chapter. Yet there remain serious men of scientific pursuits who are still discussing the Neanderthal, and treating his condition and capacities as a problem of today. Within the past year imaginary pictures of him have been painted on the walls of the great Field Museum. Yet it is no longer to be doubted that, regarded as a candidate for humanity, he is dead and buried many a long year ago.

Here, in the midst of our chapter, we pause to shake off the haze which seems to have been long gathering; to re-define query and answer, and to distinguish between what might be, and what is. At the time of which we write, the earth was ready, but life had not arrived; the inorganic world had reached its maximum, and become stable; the human element, for which it was adapted, and for which it seemed to be waiting, was about to enter. Looking at the universe from that standpoint, we note that off in the distance is approaching the new Lord of the Manor. Is he not new? Is he not both master and man? captain and crew? automatic and controlled? having a will of his own, and yet wrecked and ruined if he does not obey what he finds there when he comes. We cannot describe him, for there is nothing with which to compare him. He is unique; the first of his kind. It falls to the historian to introduce him, however, to his new world, and the world to him. We wish to paint his portrait, or to approach it, and to outline him so that we ourselves and those who read may recognize him. Science,—broader than any narrow field,—holding in its custody the truth, the whole truth, and nothing but the truth,—should help us to better see him and describe him. Science should, in this, as in other connections, be another name for truth, and truth another name for science. Thus it is to be our recourse, for other sources fail. With its aid we may eliminate and discriminate, until truth emerges. Nothing is true if it will not bear examination. We think the theory of evolution does not meet this test, and never can; but if it can it must not aspire too high, nor run ahead too far. It must be patient with its status as a philosophy of what might have been, but is not; or at the most, of that which was, but has ceased to be.

Here then we come to show where the line is drawn.

A few earnest scientists still hope to find evidence that man will go on to something better, though to the present no one hints what that may be. This they still regard as evolution, but it is only mental or moral,—whereas the Evolution theory, as urged on the world, is physical; but if mental progress would meet its needs it could not be proved. From Professor Edwin G. Conklin's book, "The Direction of Human Evolution," we quote briefly:

> "The size of the human brain has not increased since the time of the Cro-Magnon."
>
> "Does anyone think that in the past two or three thousand years there has been any increase in human intellect comparable with the increase of knowledge."

Dr. Vernon Kellogg says:

> "If the human brain has not increased perceptibly in size since the time of the Cro-Magnon,–and it has not,— * * the anthropologist cannot say positively that the evolution of the human mind is still going on."
>
> "Change in man due to biological evolution has been slight, and apparently not at all progressive or advantageous, perhaps even retrogressive, since the time of the Cro-Magnon twenty thousand years ago. Cro-Magnon had a body in every way as well developed as ours, a brain as large, and probably a mental capacity as great as ours."

Dr. Lull, of Yale, says:

> "As Cro-Magnon man of twenty to twenty-five thousand years ago had reached a degree of physical perfection as fine as the finest of modern men, there can have been no evolutionary advancement from that day to this.
>
> "Intellectual evolution, no less than physical, has

slowed down until it has almost stopped. * * * Our race can be improved not by the evolution of superman, but merely by bringing the average up to the head of the best."

The two questions, i.e., whether there has been an upward change since the Cro-Magnon, and whether evolution has wrought at all in our race, seem to historically run together; but evidently, for our purpose, they need not. Adverse proof, in respect of either, positive or negative, would be as conclusive as proof of both. The evidence does not discriminate, as we find it expressed in scientific opinion.

THE CRO-MAGNON,—HIGH-WATER MARK:

The almost unanimous voice of science is, that where the Neanderthal disappeared there is a rift in history, wide and deep, which has not been bridged. Present humanity *began on this side* of that rift, and the Neanderthal, whatever he was, *died on the other.* An eminent author, writing on the subject, says:

> "The Cro-Magnon had no known predecessor to account for him, and was at his best when he first appeared, mentally and spiritually. * * * The Cro-Magnon represents, in all aspects, the highest point to which the human race has ever attained."

Dr. Henry F. Osborn is regarded as the leading American biologist. He is called by Prof. Vernon Kellogg "Dean." He is the head of the American Museum in New York, and has for many years been teaching, lecturing and writing on the subject, and he knows full well the settled view of the body of scientists. He says:

> "In the whole racial history of Western Europe

> there has never occurred so profound a change as that marking the disappearance of the Neanderthal race and the appearance of Cro-Magnon."

and in another place:

> "It (Cro-Magnon) was a race in no way connected by any ancestral links with the Neanderthal. * * * After prolonged study of the works of the Cro-Magnon one cannot avoid the conclusion that their capacity was nearly, if not quite, as high as our own."

Prof. Vernon Kellogg, who has written much on the subject, is Permanent Secretary of the National Research Council. In "Evolution" he says:

> "The human body and its inherent mental capacities have almost certainly retrograded rather than advanced since the time of the Cro-Magnon."

Dr. R. S. Lull, of Yale, is an eminent authority. In his book "Ways of Life," p. 288, he says:

> "Splendidly erect * * * these men represented in many ways the finest type the world has ever seen."

and on page 294: (quoted above, in another connection):

> "As Cro-Magnon man of twenty to twenty-five thousand years ago had reached a degree of physical perfection as fine as the finest of modern men, there can have been no evolutionary advancement from that day to this."

Can any one suggest authorities in science better entitled to respect? But many might be added to these. From them we select Prof. Marion T. Weber, who wrote the article on "Prehistoric Man" in Encyclopedia Americana, from which we quote:

> "Plainly the Cro-Magnons are of our species, * * * the race appeared so suddenly, and is so different

physically from the Neanderthal as to preclude descent from the latter."

But even prior to the coming of the Cro-Magnon the leading authorities show that if the Neanderthal was ever in the human line he had long since reached his maximum, and must have been, at that time, to reach the condition his biographers describe when he became extinct, *descending,* instead of ascending. At least nine hundred thousand years before his latest appearance, the "Dawn Man," who was either Neanderthal or stood for him, if Dr. Osborn is right, needed no further progression. He had already attained a status far beyond any ever reached by the Neanderthal, as the books picture him. In "Man Rises to Parnassus," p. 23, Dr. Osborn says:

> "Even in the inconceivably remote past man was a relatively superior being, walking erect, with very capable tool-making hands, guided by a very superior order of brain."

and on page 23 he says:

> "We now know that man is unbelievably ancient in origin. * * * Just as the whole life period of the earth is credibly reckoned at a billion years, so now man and his ancestors are being traced back over a million years to the Stone Age."

If, then, the Neanderthal was, a million years ago, or thereabouts, a gentleman and a scholar; or if the "Dawn Man" was different, but occupied that position; and if he (whoever or whatever) long afterwards died, a mere animal, his course was certainly not in an *ascending* line. It was a *descent,*—but not very rapid, for it took him a million years to emerge in the poorhouse; but the way was easy: *"facilis decensus Averno."*

In this open field the human mind, whether dreaming or supporting a theory, has ample space for roaming,—and it has roamed. For illustration,—in a recent number of a popular magazine an able and interesting writer,—described as a "writer on scientific subjects,"—fills in this gap,—or rather supplies material to make the narrative continuous, in a manner highly interesting, and which would be informing if it had factual support. The Cro-Magnon man himself seems to be real enough, but estimates, even of his dating point, vary by nearly fifty thousand years; and of his origin or prior history not the least thing is known. That writer's tale purports only to be fiction, and not history. Scientists can only say, and they do, we think unanimously say, they do not know. No one of authority asserts any defined ancestry for the Cro-Magnon. We are using the story we have mentioned only to illustrate the intermingling of fact and surmise by which a continuous narrative can be built up of imaginary materials;—and no doubt the magazine instance mentioned above fairly shows how easily a prepossession may avoid an obstacle. Though an interesting tale, its fundamentals are assumed, and are incapable of verification. In that instance it is true they need not be verified, for they are only used to support the author's theme,—which is "The Lost Atlantis,"—itself as vague and uncertain as any thing can well be. There the question of human descent is merely a link in the chain of argument, and might be true or not, without affecting the result.

So common is, in general literature, the use of assumption or presumption to fill gaps that in supposing any given chain of human descent from a primary original the absence of proof, or the physical difficulties in the way, are overlooked. Of course if the magazine author's supposition *could not* be true, then it *is not;* and it is no more scientific if it *might* be true but is not proved.

A PROFESSOR SEES VISIONS:

A distinguished professor is reported in the papers to have used in a recent address, as a kind of slogan, an epigram like this: "Man's progress in the past has been *in an ascending line.*" Perhaps he thought so; perhaps he remembered the floating phrase as he remembers the Westminster Catechism. In any event it is, if to be taken at its face, a plain error. If he meant to say that man's facilities and opportunities, and also his skill in using them, were in an *ascending* line, no one would deny it, though even in that limited application we would need to know whether he means the human race *as a whole,* comparing the present with the past; or an average throughout; or the wisest now, compared with the wisest then. As he may be referring to the general spread of civilization, and the increase of available facilities, we must construe his slogan, if we can, to mean no more; but it is not sound if applied to what may be deemed a *typical line of descent,*—bodily or mentally. If he meant to say that man has been *rising* from a lower order of life, and if he applies this to our present humanity, he is not supported by his own brotherhood.

Assuming that he also begins the story of our lineage with the Cro-Magnon, the professor's assertion must, we suppose, have been intended to challenge comparison between the Cro-Magnon *at his best,* with the man of the present day *at his best.* We have quoted in other connections the language of Erasmus Darwin to the effect that such comparisons, to be sound, must be between faculties, or perceptions; and Dr. Conklin, of Princeton (quoted above), is to the same effect. There were many in remote times, doubtless, as there are now, who, endowed with competent qualities, made inadequate use of them; or, even worse, unless limited as we suggest, we might find ourselves comparing the wisest of that day with the native African of today, or with the Digger Indian, or the Esquimaux; or perhaps these reversed. Humanity, notwithstanding fundamental quality, is and was of all grades, and there are and were great inequalities. This writer wishes to construe the professor's slogan to mean no more than we have suggested.

But even if the *language* of learned scientists could be construed to support the professor's statement, their approved *illustrations* do not. Dr. McGregor, of Columbia University, has produced a series of well executed busts (ideals, of course, but said to be in line with the climax of an evolutionary development, as he apprehends the theory), and these are used in practically every book on the subject. The photograph we have produced on an earlier page is taken from Dr. Osborn's book, "Men of the Old Stone Age"; and is used by Dr. Conklin, of Princeton, in his book, "The Direction of Human Evolution." It is therefore authentic in source, and proves itself. Our description of the Cro-Magnon conforms; and, taken together, his position at the head *of human civilization needs no further evidence.*

Our next chapter will deal with the evolution theory, and show how far it has advanced,—or has not advanced,—in this generation; and will also show its essential limitations. If it has attractiveness as a picture,—which some suppose,—it may maintain itself as such; but it is not history.

On even terms, then, we must be assured that man is *not* now, and never has been, in an *ascending* line, but a *descending* one, if there be a change; and this is the opinion of the present writer.

TRACING ANCESTRY BACKWARD:

The Cro-Magnon bones were found in France, but are supposed by Dr. Osborn to have come from "the east," without much to indicate what that may mean. The bones of five individuals were in the first find in France. Evidently they did not constitute a single family. There was an old man, a woman, a young man and two children. Others were found later, somewhat widely scattered. It seems plain that there were generations behind these. It is enough to know that to reach the original of their race a tracer must be run back, in the manner usual in such cases. At some stage we would reach the original couple. It is usual to assume numbers increasing by geometrical progression. Here we may do that in reverse order.

If there were a hundred in the latest generation,—found buried in France,—and we assume two children (or any other given number) to each pair, we find ourselves shortly in the presence of the first couple, who had no ancestors. We are thus face to face with a miracle. Where did they come from? The conditions would be parallel if we follow development by evolution. When,—on our way back over that path,—we reach the pin point of protoplasm, we will have found the original unit; but it also contained life, and could not move without it. In some manner it arose; but how,—or whence? We have no explanation; but here also we face a miracle; for there must have been an origin.

Where did the Cro-Magnon come from? We put the question, and get no answer. We do not urge it; for it makes little difference on the point in question. The important thing is that he arrived, and we recognize him for our own.

Origin, then, is inevitable; and so is cause; and it is this which is yet lacking in our narrative. We can at least trace it to something definite, even though not defined. If it is not natural it must be supernatural; and that means God.

THE HOME-LAND:

Dr. Osborn's authority for fixing Cro-Magnon nativity "in the east," we do not know. His suggestion implies a resemblance in the shape of the skull to peoples native there. Probably the common belief that our race first appeared in the Mesopotamian district had its place in the argument; but it is to be remarked that this makes the evolutionists' line of human descent even harder to reconcile with the fanciful "instances" of fossil bones which constitute the physical evidence. We will learn more of these in the next chapter. None of them had an eastern history or ancestry, so far as known. One was found in Java, one in Africa, one in

Germany, and one in England. All, or all but one, were of the Neanderthal race, now extinct. The wide distances separating them in locality, and the many centuries of time intervening; as well as the fading out of the Neanderthal race, make it impossible that the lines of descent could connect. If they were indeed human, or on the way, they must have belonged in different lines of descent. The Cro-Magnon, arising in the "east," would fall in still another line. Dr. Keith thinks the strongest resemblances to humanity are to be found in Australia, and Mr. Darwin looked for them in Africa. As to the fossils lately found in Palestine (the Mount Carmel find), they were rejected *in toto* by the Congress of Research Biologists last summer, as we shall see, and even Dr. Keith, who was actively present, regarded them as being in a line of descent quite distinct from present day humanity; and no one has contended, so far as we know, that the Neanderthal had a racial connection with any such. This makes nine distinct lines of supposed humanity, having not even a remote connection with each other, nor any indication of a common origin. They did not even approach each other as they progressed. How this proves, or tends to prove the rise of humanity from an inferior order, or from a single unit is not clear to the common mind—or at least to the only common mind with which this writer is familiar. It seems easier to believe that if the Cro-Magnon who appeared in Europe had an ancestry in Mesopotamia,—which may be true,—the race began there, with no other ties to the past. There are many who so believe. Certainly the possibility of so varied an origin, of which no one knows anything in common is inconsistent with a progression upwards, and leaves it with no explanation except a supernatural intervention. Since this is equally true of the origin of the unit of protoplasm, or at least of its nucleus of life, it seems to lead rather to the question which, than whether: but this is frowned down, and smiled down, and frozen down, by many claiming to be wiser. The misfortune is that they suggest nothing tenable to the contrary. As we have seen they offer a choice between nine lines of suppositions, but with no evidence that any of them did or could reach us. Vagaries like this are not history.

Coming back then to the question of origin,—geographically,—we find nothing proven, and nothing to suggest an origin different from that appearing from the locale of the bones, and we must leave the question there.

We close this inquiry as we began it;—Let us introduce Cro-Magnon, of Cro-Magnon,—the first man,—and his wife,— the first lady. Would that we could paint their portraits; but our best will be but a sketch in black and white.

THE FIRST MAN,—HIS WIFE, THE FIRST WOMAN:

We begin by recalling the hope and the opportunity which lay before that earliest pair when they made their first appearance. The fit and finished condition of the earth has been described. It was not in their power to change it, if they would. Their chief interest must have been to see what they could make of themselves, in such a setting.

We glance backward to see it as it was, and them as they were, and to compare that condition with this, after so long a period of testing. Our readers can judge as well as we whether thus far there has been a gain or loss. We need not attempt to describe their sensations, but they began life without sorrows or regrets, and without inherited weaknesses of the flesh. They had behind them no history of life, and before them no apprehension of death. The things that disturb us most were unknown to them. Probably individual life was longer in those fresh days of the earth, when nothing was worn, and no one was weary. Yet they must soon have become aware of a limit of life, for among the family fossils we have found were the skeletons of children.

It is the testimony of science that humanity began with a single pair,—at their highest and best. They could not gain in perfection of physical being. At most this could only be maintained. Nor could they hope to improve their mentality, or its power or reach. Some differ with us on this point, but the error has been proved, and this we here take to be a fundamental. It is no more difficult to apprehend a complete intellect than a complete life, or even a complete body: though in sweep, and vigor, and grasp much was still to come.

Learning, however, was all before them, and this would grow in mass and quality if they merely absorbed and retained what was, as it were, thrust upon them. The senses could observe,—the intellect analyze, and the memory retain it, and growth was inevitable. Doubtless every sense was in fact intent, and every nerve sensitive, to the new things pressing upon them from the outside.

Language was still to come, and thought, and reason, and recognition of sound conclusions. All their faculties were to be wrought into an easily working machine. The responsibilities were great, and constant. They had come into a world which they were to conquer and subdue, and their own training would be first.

Whether the first man was Adam,—as Milton describes him,—wandering and wondering in his vast garden, or the Cro-Magnon, standing magnificent on a hill-top, he was an evident master, newly introduced to his kingdom. Like Alexander Selkirk,—he was monarch of all he surveyed; his right there was none to dispute. His position, however acquired, or under whatever theory explained, would not be different. He was ruler, and fitted to rule. This was his starting point, and it is ours; and now we go on to indicate something of his gains or losses since.

THE FIRST MAN:

As we trace him lightly before you,—your ancestor and ours,—you shall see if you do not recognize in him, as we do, a masterly personality; courteous, manly, confident, strong,—as a man ought to be who is to hold the headship of a great race;—set also to govern a world of inferior but active creatures. In another place we have reproduced an ideal bust of the Cro-Magnon, as Dr. McGregor of Columbia sees him; but to the writer this seems to do him less than justice, for it seems that much more could be written on his countenance; and so,—not his person only, but his mind,—we will try to paint. In our portrait of him we are not without guidance, for there were some details found with his fossils, and others in the drawings and sculptures he left on the walls of caves, and prominent places. However he came, he had no known ancestors to be proud of or sorry for,—and no early home to compare with;—no neighbors,—no friends,—and, thank God, no enemies. The earth spread about him, in its fresh beauty,—not now new, but new to him; and never before had human eyes rested on it. The birds sang; the wind whispered in the trees; the brooks and waterfalls rippled and tinkled; and below him the earth hid under its green mantle secrets which man might, by diligence discover,—so many and varied that in all the centuries that have passed they are not yet exhausted.

But you are waiting for the portrait. It is not easy, and yet not hard. Milton had that trouble with his picture of Adam, and he did what he must do,—he *described* him, but did not paint him. Michelangelo painted his great picture of Moses, but he also was an ideal, and it was not surprising that the artist mistook him in one particular, and painted horns on him. Angelo's figure of David was in marble, and made a great impression on the world of art. It is full of beauty and power, but it does not express the pioneer functions of the first man. Such also are the shortcomings,—for our purpose,—of the Greek conceptions of Apollo and Mercury; they are far too slender and feminine to represent a man who starts with only his hands to conquer a world. Where then shall we begin? Our world is full of statues and monuments, but the most significant are military. We cannot so picture him. He was no warrior; he wore no armor or breastplate, and he carried no sword. The Homeric figures were men of war, but not so this one. He was the founder of a race, and he alone could peacefully control the beasts and reptiles. He had no competitors to challenge or defy him, and he had no enemies. Neither was he a huntsman; bow and arrows were not for him. Hunting to kill must have been far from his thoughts, for the animals and birds were in his charge, to cherish, and not to destroy. The pictures of developing man as a hunter, inferred from bones, and supposed implements of flint, are wholly erroneous. We have proved, in our book on "The Theory of Evolution; an Inquiry," that even the Neanderthal was not a meat eater. His teeth were like those of an ox. If ultimately man came to be a destroyer of living things he was not such at first. He is to be pictured as a man of majesty, of dignity, of self-control; and the desire for wreckage or destruction was,—as yet,—no part of his nature.

As to his bearing and his countenance, Cro-Magnon must have been more like a Viking than a Greek god;—a figure of courage and enterprise. The fossils tell us of a stature of six and a half feet, and breadth and development to correspond. In appearance we think of him as of Saxon type, with wide open blue eyes, and flowing fair hair. He had, we suppose, a countenance of power, like that of Agamemnon;—a stride covering the earth swiftly, like Ulysses; and speed like Mercury. What more? Do you remember the words of a distinguished judge, who, when advised that no support could be found for a decision he contemplated, said,—"If there is no precedent we will make one." But how of his voice; oh, it could not have been weak or tremulous, nor a high falsetto, nor low nor sharp; but deep, rich, resonant; a singing, swelling, commanding voice; fit for the man he was,—the master of his own soul. What think you of a masterful voice like that of Daniel Webster,—of a past age,—or of William J. Bryan, of ours. Of course he had a communicating language, from the beginning, though he made it himself. It is a trivial notion that he got it from the apes. Such as the apes ever had they still have, and we need not confess to a Tarzan for our racial head. It is hard to guess what language he had to begin with, but we can be assured that it was not foolish, and that both he and the queenly one who stood with him, were in all respects worthy.

THE FIRST LADY:

Would it be *"lese majeste"* to inquire her name, or the name by which she called him? This would help to personalize both; but no, we know them only by their race. She may have been gracious or otherwise, but she was certainly,—as history writes her down,—a woman of parts and capacity,—worthy of her spouse. A recent writer, of eminence, writing of her, used these words:

> "They (the Cro-Magnon) were very erect and well-proportioned, the women no less than the men; and it is noted that the brain capacity of the Cro-Magnon woman exceeded that of the average man of today."

Her history and his are wrought together, and their place in the world became what they made it,—even as it is today.

THE MIND:

The man who would greatly impress his contemporaries must combine two outstanding qualities,—learning and judgment, and this was true then, as well as now. Learning our first man had not, when he first stepped on the earth, for the world was empty, and he was himself to be the first contributor to that common fund of knowledge which is now a vast body,—at the disposal of him who will. He had a fresh, keen, ready apprehension, out of which grows completeness, and eventually a code,—in sprout and bud and fruitage. He had native judgment, sound and sane. Learning is fundamental, and precedes the *act* of judgment, though not its quality or faculty; it is a *fuel,* and not a *fire*. It is first, but not last; and it cannot stand alone. It would be of no avail without its quieter sister,—the capacity for judgment.

Here we hang our picture on the wall,—not too high, and not too low; and we will not forget it, as we move on.

CHAPTER II

THE OUTLINES OF A FALLACY

IF MAN,—*any man,—could be always right, he would be a dull companion. Even his wife would not love him. If all men were always right conversation would fall dead at the first remark, for everybody would know everything, and there would be nothing to argue about. If the historian wrote only of certainties, history would be as dull as a novel. Even fallacies, therefore, are grist for his mill. This is our apology for writing, even briefly, of evolution*

CHAPTER II

The Outlines of a Fallacy

MANY-FACETED minds, brilliant, but often with more sail than ballast, have dreamed of things they hoped for, but never could see. This is what keeps the bookstores busy. Most of us,—even without the many-faceted minds, find this our happiest occupation; but it would be high praise to call it science. It is not strange that men who aspire to be unfettered should have dreams about other men, sometimes beginning with nothing, but ending with everything. It is not even strange that cold history was never popular; or that Lewis Carroll and Jules Verne had more friends and readers than Gibbon. Nor is it strange that in the course of time those highly colored dreams should begin to look true. This suggests the historian's best explanation of the theory of evolution. This writer finds no fault with the dreamer, but he may beg to be excused when he is invited to accept the dream as a rule of life. The dream of man's development by evolution from a single unit has attractions like "Alice in Wonderland," but it is now becoming known as a fallacy. It has no factual support, for no one knows much, and what he does know is all to the contrary. It is built up by piling one inference on another. This has been demonstrated, this writer thinks, most clearly by the admissions of its proponents. If the reader is not familiar with them, he can find a few collected below. The historian ought not to expect his mere assertion to be accepted; he might be wrong, even against his will; and therefore he cites a few, out of many, to the same effect:

1. As to a method of finding the facts, we have said the evolutionist does not *know*. He cannot, for proof is not to be had. He admits this himself. Dr. H. H. Newman, of the University of Chicago, says:

> "If a biologist wishes to discover the ancestry of a particular species he studies numerous other animals more or less like the one concerned, in the hope of finding some traces of character among them that suggest the ancestral condition of these species."

Prof. Roemer, of the same institution, says:

> "In the treatment of animals, other than vertebrates, the evolutionary story is mainly based on evidence obtained from living creatures; since the greater part of the evolution of those forms seems to have taken place before the fossil record becomes at all clear."

Prof. Gregory, of Columbia, says:

> "As yet there is an immense *hiatus* in the paleontological history of man, covering at least several million years, in the Pliocene epoch."

Prof. Lull, of Yale, says:

> "We speak of the Archeozoic as the period of unicellular life, both plant and animal. This, however, is entirely inferred, as there is no direct evidence of their existence."

2. As to the total lack of facts:

Dr. Osborn says:

> "During this period of 3,000,000 years the entire

plant world, the invertebrate world, the fish, the amphibian and the reptile world, have all remained as relatively balanced, static, unchanged or persistent types."

Dr. Lull says:

> "Practically all of the invertebrate evolution, the establishment and elaboration of the great stocks, lies beyond our ken."

Mr. Darwin had troubles of the same kind. In "Origin of Species," he says:

> "Is it possible that an animal having, for instance, the structure and habits of the bat, could have been formed by the modification of some other animal with widely different habits and structure."

His sole answer, given on another page, is this:

> "I will only state that I believe the answer mainly lies in the record being incomparably less perfect than is generally supposed."

What else can any man ask, to define and isolate the tenable fact, if he is looking for light? But even if it could ever have been true, it is an abstraction now, for the last phase of its supposed approach to humanity became extinct fifty thousand years ago. The evidence on this point is ample, as has been seen.

We come then to gather up the facts about man, as he was and is; and to examine sufficiently to see the nature of the case that is made for the evolution theory of his rise. We are only concerned here with man, and therefore he is to be regarded as distinctive. Our facts will hardly be controverted, for they are all furnished by the wisest science. This ought to be a warning that a portrait not shown to be authentic, or to resemble the original, or differing from those presented by others, is not convincing in an argument,—in law or science. It is not hard for a man to deceive himself, but when he advises others he should be sure of his facts. Our next topic heading is

DREAMING YOUR HISTORY:

We are thinking of man only. Other forms of life are within the argument, but there are so many, and so different, that we are ignoring all but man; and we mention only briefly the contentions about his early history because no one tenders affirmative proof; and this raises the point we are to stress. The case of the evolutionist, in its full extent, is based on discoveries of fossil bones, fragmentary and widely scattered, geographically, as well as ever so far apart in time. The particulars are to be found in standard works, such as "Human Origins," by Dr. George G. McCurdy, of Yale; "Human Antiquities," by Sir Arthur Keith; "Men of the Old Stone Age," by Dr. Henry Fairfield Osborn. No extended discussion of that question would be appropriate here, but we will cite the standard instances, (or exhibits), which its proponents rely upon as proof, and let the reader judge. Those instances are only three in number, but after describing them we will also, to show that nothing more definite has since become known, mention others which certain investigators have found convincing, though they have *not* satisfied the general body of scientists. It is remarkable, we think, that the instances cited to support the theory are so few. Dr. Osborn says:

"In more than ninety years of exploration only three skeletal relics of man have been found in the ancient river drifts" (mentioning those we describe below).

And Prof. J. Y. Simpson of Aberdeen computes that sixty fragments, in all, have been found, from which particulars of man at different ages of the world can be observed, "and complete skeletons are very few."

By the end of the last century, at three generations per century, there must have been approximately *five billions* of individuals who had died and left bones capable of identification; and perhaps a similar number in each preceding century. Why are there but three individuals found which are capable of being used as evidence?

There is not a single instance mentioned in the books of bones or fragments of any animal *in the act of emerging into* the form of manhood, *or in course of transition* before the stage of mankind. If there *was* a transition why do none of the fossil bones show it, *in stages?* If any, they were many. They must have been numerous, even multitudinous, then and now, and they could not fail to be recognized. To this we find no answer.

The three instances relied on as evidence are these:

1. THE JAVA-APE MAN:

The discovered bones in this instance are only "the upper part of a cranium, two teeth and a left thigh bone."

From these it is said we may infer not only a *person* but one *on the way to become human.* If it were *human already,* manifestly it could prove nothing. If it were an ape or a gorilla *already* it would prove nothing bearing on our present question. Fossils are offered to prove that man, as a race, was once *animal;*—in other words that a *lower* order was *on its way* to become man. This can only be judged by comparison with other instances, but nothing comparable is suggested; and what is offered is inadequate to prove identity, even if the supposition were itself credible. If your proposition has but one element, you must fill it out with assertions; and this has been done. Nothing but the cranium bone, in this instance, is original. The thigh bone was found *in a different place,* and may as readily be *inferred out as in.* As evidence, on such a point, it requires confirmation. It does not prove itself.

On the opposite page is a reproduction of this cranium bone, and we invite the reader to use his own judgment. Can he see in this, or can he infer from it, *an animal emerging* in man? We cannot so suppose.

2. THE HEIDELBERG MAN:

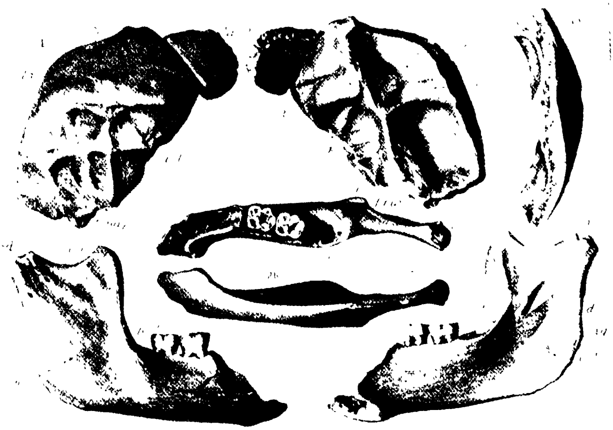
The only bone in this example is a *jaw,* with teeth; (see the same page). Yet in the description and argument it is *called a man.* It is a single item, and the "man," and what he was, as well as what he was on the way to become, are inferential. The man is inferred from the jaw, and the line of ascent is inferred from the man. This would be weak, even if the jaw was authentic; but not so. Even the single item has always been questioned. Dr. Osborn said of it:

> "The jaw had evidently drifted down with the river sands, and had become separated from the skull."

Dr. Vernon Kellogg dates the owner of the jaw

SKULL CAP OF JAVA APE-MAN
(FROM "MEN OF OLD STONE AGE.")

THE HEIDELBERG JAW



PILTDOWN FRAGMENTS
(FROM "HUMAN ORIGINS.")

back four hundred thousand years; but Dr. Osborn sets it nine hundred thousand years back.

What does the reader think of it as evidence? Can he not judge, as well as another? Would the conclusion be aided by details,—even when construed?

3. THE PILTDOWN MAN:

Nine fragments of bone were found in a refuse heap in England,—not in contact, nor all at the same time, *nor even in the same year*. They are shown on the opposite page. These were selected from many intermingled. Several years elapsed between the finding of the first fragment and the last. They have now been combined with others, from unknown sources, to constitute a complete skull, and this is presented to *prove* that man *ascended* to his present estate. (The find is described in Dr. McCurdy's book, "Human Origins," Vol. 1, p. 324.) In the group of fragments at first found there was no lower jaw. Some time in the following year one was found, somewhere near, and it forms a part of the exhibit, but its verity has been doubted by able experts. Dr. Osborn says of it in "Men of the Old Stone Age," p. 144:

> "Very recently the jaw of the Piltdown Man has been re-examined, and referred by more than one expert to a fully developed adult chimpanzee."

And on page 50 he says, of another fossil:

> "The jaw, it is true" (of a certain ape), "resembles that of the Piltdown Man."

It is fair to say that Dr. Osborn is now of a different opinion, and accepts this "reconstruction,"—not on its own merits,—but because he finds supporting arguments in another connection;—but he dates it back nearly a million years. If this is right, then the period elapsing between that fossil and the advent of the Cro-Magnon would be nearly *fifty times* the whole period from Julius Caesar until now. And yet, by the theory, the second of these is to be inferred from the first. The interpolated jaw is still there, not in any way identified with the owner or owners of the other bones, and still with its defects as evidence. Dr. Osborn was not the only doubter. Dr. McCurdy, of Yale, says of this reconstruction that the expert who performed the work "had difficulties with the articulation."

Some of the scientists, adhering to the theory of development, even in humanity,—or it might better be said especially in humanity,—add to the three primary instances we have mentioned as supporting evidences, another, called the

THE BROKEN HILL MAN:

This was found in a mass of animal bones, in a cave in South Africa, around 1922, and was proclaimed as new and important evidence to the same effect, but facts soon developed which met these arguments so completely that many scientists have since ignored it altogether. Sir Arthur Keith gives it some forty pages of the newer edition of his work on "Human Antiquities," but it is said by Sir J. Arthur Thomson that these bones were "not even fossilized," and therefore not ancient; and that this was also the case with the other bones found in the same cave.

Strong reasons are given by other distinguished biologists, writing at the time,—among them Dr. Arthur

Smith Woodward, writing in the Atlantic Monthly, to show that it may have been a gorilla. The facts on this subject are collected in "The Theory of Evolution," mentioned above. Evidently this must be disregarded, if not for lack of merit, then on our proposition, elsewhere explained, that it is only admissible in evidence *if approved by other scientists.* This would leave only, as the outstanding instances cited to prove the development of man from a lower order, the three above described.

There have been recent finds of fragmentary bones, at first supposed by their discoverers to be authentic, but the body of scientists has not been convinced of their verity, and this should and does eliminate them. To avoid the appearance of suppressing them here, we mention the cases thus far presented. One of these is

THE OLDAWAY MAN:

This was a skeleton found in East Africa in 1914 by Prof. Hans Reck. It was proclaimed in news publications as being a million years old. It was described, on the occasion of the Congress mentioned below, with a drawing of the skull, in "Time" magazine, of April 4, 1932, and was discussed somewhat in an editorial of about that date in the New York Times. It has not been found convincing, and had not become, by the lapse of time, any more so when it came up for consideration at a session of the "Congress of Prehistoric Science," in London in August, 1932, and was not even respectfully received. The details of the discussion were not given in the report in the New York Times, but it was said that the "legend" of the Oldaway Man had been "shattered," in the three days of the Conference. Other remains, more recently discovered, were also considered there, but they did not advance the doctrine of an animal ancestry for man. These were:

THE MOUNT CARMEL FOSSILS:

Eight skeletons were found in excavating at Mount Carmel, in Palestine. Of these it was said that at least four were "well preserved." These also were discussed at the Congress at London. Sir Arthur Keith invented for them a long Latin name, hard to pronounce, and harder to remember; but he said of them, as reported in the illustrated London News, that they represented "a distinctive people, *unlike* any other race of prehistoric men." He added, however, that "if not the ancestor of any living race *they must be nearly on the line of modern descent.*" In his own article in the same paper he said, "These people *were not our ancestors.*"

THE LLOYD SKULL:

At the same meeting the Congress was informed of still another skull fragment, recently found in London, designated as "Lloyd's Skull." Prof. C. Elliott Smith,—almost, if not quite, of equal scientific standing with Sir Arthur Keith,—expressed the opinion that this skull was "ten times as ancient as any known specimen of *homo sapiens.*" Sir Arthur differed from him, arguing that only untrained men had taken it from its deposit; in other words it was not sufficiently proved to be evidence at all. Prof. Smith quite outdid the others in enthusiasm, saying, according to these reports, that while "Lloyd's Skull" was "tantalizing," because "it lacks most of the parts necessary to determine the species," he believed that it belonged to a woman about fifty years old, "who apparently was left handed." Acuteness like this,—or was it credulity,—might have expected a favorable reception; but the report goes on to say that "Prof. Smith's beliefs were received with the utmost skepticism." It does not therefore fall within any test of "accepted" truth. Apparently the Latin language had not held out, for one of the "Palestinian Neanderthals" was called "Arthur"; another "Dorothy," and a child form "Wilhelmina." Somebody was credulous, and disposed to guess, but the Congress was not receptive. Thus the case of development from the animal state has not been factually proved, and still remains no more than a "working hypothesis," if it carries that far.

We have not attempted in this chapter to carry the study of evolution very far. It is here only incidental to our main theme; but for the convenience of those of our readers who have not examined the subject for themselves, and who have not had access to the author's book, "The Theory of Evolution," where the facts are gathered and classified, we may wisely mention here a few of the reasons why we do not regard it as tenable. A few paragraphs will be enough, and these we can frame as an analysis:—

1. Evolution is a change of type, or a succession of changes, by which a speck of living substance became a million species, emerging at last in man. Of this there is no known instance, and this reduces the reasoning to a guess.

2. There are now nearly a million types. That the changes occurred is inferred from the fact that it *must* have been so. This is called a hypothesis, of which the definition in Webster is,—"a comprehensive guess."

3. Nine tenths of our present types are invertebrates, and of these nothing whatever is known. Dr. Lull, of Yale, says that "practically all invertebrate evolution is beyond our ken."

4. Leaders in biological science see no evidence of evolution in humanity, at any time. The authorities to that effect are quoted above; but if the question were still open it would make no difference unless evidence could be found to prove that it existed in the lower creation.

5. The supposed original speck of protoplasm was *a single sex*. Every new generation now is of two. This was a vital change, and must have occurred nearly a million times before the present stage was reached, but no one ever saw an instance. Why not?

6. All the alleged changes occurred before the human period, and therefore no one ever saw one; but there ought to be a multitude of fossils showing the transition. Yet none has been produced.

7. The proponents of the theory assert that it sometimes operates backward, and this they call "reversed evolution." For this there can be no law; science cannot concede that anything occurred by accident; for law is the essence of science. Dr. Newman, of the University of Chicago, says: "We would be shocked if the young of a given species of sparrow were anything else but that of the same species as the parents."

8. Evolution therefore has no law to sustain it;

and this fact completely negatives the theory. Mr. Huxley, whose authority will not be denied, says:

> "No physical geologist now dreams of seeking, outside the range of known natural causes, for the explanation of anything that happened millions of years ago."

The foregoing ought to be enough to show that the theory of evolution has no standing as a part of the body of science; and this is all a scientist should need to bid him pause, and wait, at least, for further light.

Feeling assured that our race began at the top, and not at the bottom, we can see no answer to queries about its origin except in the conviction,—not alone of religion but of science,—that it began with a pair, of the same quality and character as those we see about us now; and our history proceeds on that assumption. Taking up the thread of our story at that point, we will now go

BACK TO THE HEAD OF OUR RACE:

Returning to the Cro-Magnon, described in the preceding chapter, we find that he was, when man first appeared, gifted with qualities of discernment and apprehension at least as efficient as ours; and the facts from which he might judge were spread out before him on every starry night.

The following considerations might fairly be said to support, if they still need support,—these conclusions:

First: No scientist supposes that the two racial lines,—Neanderthal and Cro-Magnon,—if projected ever so far,—could meet. Sir Arthur Keith (Antiquity of Man), p. 199, says they could not. We quote:

> "The one theory we are now certain of is that he (Neanderthal) was *not* suddenly converted into the modern type of man."

Second: No lapse of time between the extinction of the Neanderthal and the rise of the Cro-Magnon could make them alike. In our preceding chapter we have given able scientists' descriptions of the Cro-Magnon, the true head of our race; we give now a few of the Neanderthal; to complete the picture of his purely animal body.

Dr. J. Y. Simpson, "Man and the Attainment of Immortality," p. 106:

> "He (Neanderthal) certainly diverged into a line which ended with itself, and did not develop into any modern race."

Dr. Osborn, "Man of the Old Stone Age," p. 234:

> "What seems certain is that there is no recent type which can be considered even as a modified descendant of Neanderthal."

Dr. McCurdy, "Human Origins," p. 313:

> "Even a monogenist must admit that *Homo Neanderthal* is a separate species from *Homo Sapiens.*"

It is therefore the doctrine of recent science that the Cro-Magnon stands alone, and the history of humanity or the earth is all subsequent. The quality of the race is becoming better known, but it may be that the attention even of the reading public has not been attracted to the evidences of its high standard of attainment in the earlier stages of his history. This therefore is the subject of our next chapter.

CHAPTER III

EARLY HUMAN HISTORY, IN BROAD LINES

TIME *and distance are relative. Not so many years ago the Seven League Boots were the symbol of speed on foot, and "Around the World in Eighty Days" the miracle of speed by water. Thought was always instantaneous; but now we are told that if a speaker addresses an audience in London he can be heard by electricity in Australia before his voice reaches the ear of the man in the back seat. It need not startle anyone then if, in a few minutes, we can journey backward, air-wise, seventy centuries, and touch the earth only once in a thousand years*

CHAPTER III

Early Human History, In Broad Lines

We have now,—largely by the aid of archaeology,—gained a certain acquaintance with the past history of humanity over some seventy centuries,—a hundred times the lifetime of even the favored human being,—(the rare one who reaches his three score and ten),—perhaps as long as that before the Christian era. Datings are uncertain. Starting with the sharp lines of the present, we find the shadows growing deeper as we trace history backward, until it all but vanishes. There are landmarks a part of the way, but in the remoter ages it is hard to distinguish, for written records are missing. Sounding as we go,—at thousand year intervals,—until names are lost, there are outstanding individuals easily recognized;—William, of Normandy; Julius Caesar; King Solomon; Abraham; but back of them, while able men are evident, they are not easily identified. We become aware of outstanding people, and of new contemporaries, and the story of life is lighted up by evidences of human industry and capacity, in Egypt, Babylonia, Assyria; and at last, leaping over a large gap at present unknown, but supposed to equal another seventy century period, we land again, and find ourselves at the regnancy of the Cro-Magnon, whose position in history we have already considered. From ancient time to the present, moving forward, we are led by the discoveries of archaeology, but now anthropology takes us by the hand, and points out her own discoveries. If science is not mistaken our knowledge of the Cro-Magnon is definite and historical, though limited. His story reaches us from sources the authority of which no scientist will question. No race or individual in early history, where observation is lacking and inference is necessary, has a clearer case made for him. In that assurance, wherever we have occasion to compare the characteristics of humanity,—whether by dates, or degrees or periods,—the Cro-Magnon is one element, and man of the present is the other. Such a comparison we are now about to make. Scientists are in doubt about the date of his appearance, as they may well be, and their estimates range from fifteen to fifty thousand years ago. We need not go into details on this point, but a brief explanation may be helpful.

There are always errors possible in such a case, but the method of ascertainment is as sound as circumstances will permit. The fossils in the case of the Cro-Magnon had an unusually fresh appearance, and this suggests a short burial period. The conditions of the soil seem to be consistent with this. We have, in other cases, discovered that, (though the passage of time seems slow at best), in the computations of years of inference the fact of conditions indicating age seems to be lost sight of in the glamour of numbers. It is what one might call a semi-scientific inference. Writers,—ordinarily sane and competent,—find it fascinating to throw around years by millions,—as freely as McCawber scattered his promissory notes; and apparently,—like him,—the writers often disregard the fact that, sometime, somebody will add them up. The immense differences in their estimates, taken from the same data, are mentioned elsewhere, and are evidence on this point also. This writer has a more thrifty tendency, perhaps derived from his Scotch-Irish forebears, and his conviction is that the greatest stress should be laid on general *conditions;* but these only justify analogies, frequently found too tame to be interesting; yet these are in many cases the soundest criteria available. These also are generally available when more specific data are not.

In applying supposed facts as to the effect of time on buried bones, and the relation of the particular instance to others, both usually unknown,—so that the facts and results are both estimated,—we suggest therefore that *minimum time,* determined by analogies, is more likely to be right. In the present case fifty thousand years is small in comparison with the three hundred thousand estimated by one writer, and a thousand million by another; but even the difference between fifteen and fifty is so large as to make that estimate look weak; and this tends to discredit estimates altogether. We therefore leave the figures to some other conscience, not legal, and therefore not trained to be sensitive. If the smaller number is enough the larger is too much. Even the minimum is more than twice the time we have thus far been able to trace history in archaeology;—but we are progressing, and on our present point we have some elements of certainty; the rest we shall have to wait for.

In illustration of the incapacity of scientists to locate the Cro-Magnon accurately in time, we add that, between this point and that,—at three generations to a century,—we would exhaust more than two hundred before reaching him, on the lower estimate, and twice as many on the higher one. Some of our readers will be sure to compare this with the time period fixed in the Bible, which some interpret to fix a limit of six thousand years. In making such a computation, we would suggest that the Ussher numerals, which furnish the only specific dating, are only three hundred years old, and found in the Bible only as marginal readings; and therefore its figures are not authentic. Thus it would not depart from that narrative to carry the course of creation back to the point where it is confirmed by science, and there the two might unite. The truth does not admit of differences, and two sound methods ought to produce the same result. Even the archaeologists, whose operations are largely conducted under auspices seeking to confirm the Bible narrative, believe themselves to have reached and passed the six thousand year period, and have found men in abundance at that stage, active in the world; thus proving, we suppose, that Bishop Ussher's estimate was inadequate. Much of the early history which we are now digging out of the earth must have been contemporary, or nearly so, with the writers of the early Bible narrative, and we would expect to find, at last, that both were true, and therefore they conform.

The climacteric of history is the arrival of humanity, but man was not the first in order, even of living things,—but last. He was preceded by all the other orders of life. If progress had ceased without him, the swarming life of lesser things would,—even if those are right who accept the theory of evolution,—have made no further progress. What a tragedy that would have been; what inadequacy; what waste. What would the universe be for, and what would it accomplish; what a loss of power and capacity. There would have been, among those minor creatures, a measure of instinct, but no intellect; a measure of consciousness, but no thinking; a self-seeking, but no self-surrender; a sense of power, but no sense of kindness. The songs of birds would reach no ear tuned to catch their loveliness; the color and perfume of flowers would rise and fall, with no taste competent to apprehend them. But when, with all things in full swing of movement and voices, man was introduced, the significance of the rest appeared; and all could be appraised, enjoyed and used. We may say, may we not, that thus they would be explained.

The man, when he came, made a striking addition, and produced a striking effect, as in the case of the handful of pebbles on the crest of the Rocky Mountains, which, small in size, but great in significance, fixed the direction of the main watershed. If man, when he arrived, possessed the high qualities we now perceive in him,—and history indicates he did,—when and where did he gain them? Were they a part of his endowment at birth, or embedded in his life cell; or did he acquire them afterward? As to this we cannot doubt nor hesitate. They were part of the human essence. As faculties there could not have been a time when he *had* them, and a time when he had *not*. They operate together, and therefore they arrived together.

FOLLOWING HISTORY BACKWARD:

Our proposition is that humanity *began at its maximum,* in respect of capacity and quality, as well as physique; and thus its later course would *not* be upward. The evidence to this effect has been cited, and experience confirms it. The poems of Homer, though perhaps not more than thirty centuries old, (from the present), are one illustration. Whether they originated with an individual or a group, or a succession, their approximate dating is not affected. By common consent they have never been equalled in pictorial quality, vividness of description or flexibility of style. The adaptability of their author never failed him. If he lacked a suitable word he made one, or adapted one. His "*polupholoisboio thalasses*" and other comparable examples are even yet almost the last word in "onomatopoetica." Even if his lengthy poems were not written, but only remembered, as is said by some, he must have been possessed of a memory as marvelous as his imagination. In these qualities there is, in our day, none to approach him; and this would be no different if they were the work of many. There are modern instances of extraordinary tenacity of memory, as in the case of Scaliger, who is said to have committed to memory the whole of the Iliad; but these are accidental and rare. The best indications of intellect and taste, of which this is an illustration, are the farthest back, in faculty, in phrasing, and in perfection of idea.

In architecture and construction, theoretical or practical, the builders of the Egyptian temples were far in advance of the present. They originated, having nothing to copy; whereas our best is by way of reproduction. In their very wreckage their works are magnificent, and the capacity to dream them and build them is a marvel of marvels. In the ruin of the Temple of Karnak at Luxor there is a mass of solid rock,—a mere fragment of the original roof, as any one may see,—which lies in a passage meant to be open, and now needed for the use of visitors. Efforts have been made to remove it, and heavy threaded bolts are driven into it now, intended to lift it, but in vain. Except for being raised a foot or two, it lies there still. But it was part of *the lofty roof,* thrown down in some disaster of the past. We might, with modern facilities, be able, sometime, and by some means, to remove it out of the pathway of tourists, but as for lifting it to its original position any observer can see that both brains and labor of an extraordinary sort were required.

Human brains and art and industry and power all carry back through a period of some seventy centuries;—perhaps far more, but this is the limit of our present information. In a later chapter these will be more definitely traced. Our stress here is on the man.

MANKIND, ANCIENT AND MODERN:

Our present theme requires a comparison between men of the earliest known ages and men of the present,—i. e., the *men themselves,* as distinguished from their works. Our education has led us to suppose that the standard of manhood, physical and mental, is at its peak now; but the soundest thinkers and the most convincing evidence are otherwise. Whatever one may think of the ultimate *source* of humanity,—if there was a man earlier than the Cro-Magnon it is not known now; nor is it material, for every line of descent which could possibly connect with his was extinct when he began,—the most distinguished scientific evidence being the test. It is certain that a totally new order arrived with the Cro-Magnon, *not* descended from any known lower, or as far as known, higher condition. Thus the whole period of human evolution, if such there was, must have come and gone before his day; and if so it could not have affected us. Thus,—notwithstanding gaps in our known line of descent,—our comparisons must be between *fully developed men* of earlier ages with men of this age, and to test this we may sound the depths at any interval.

By the standards the scientists have themselves created, and for which they have furnished the criterion, the question of superiority therefore stands alone, and the theory of evolution has no bearing on it.

No one seriously supposes that, when last heard of, the Neanderthal, with whose fossil bones all others are compared, had developed a human mind *of any grade,* much less one comparable with that of the Cro-Magnon; and since he became extinct in that condition he could not have improved. Again we say, therefore, that comparisons helpful to us must begin with the Cro-Magnon. This has been forcibly expressed by Prof. Vernon Kellogg in "Evolution," p. 260:

> "Anthropologists are often asked—whether they claim that man of today is natively superior to the early

> Greeks and the earlier Egyptians and Mesopotamians six or seven thousand years ago. And the question might well be broadened to include Cro-Magnon man of twenty thousand years ago. The answer would have to be the same. It is 'no'."

We come then to examine the *grade* of human capacity in those early days. We distinguish between knowledge and wisdom, which are in quite different fields. *Knowledge* is the accumulation of facts on a given subject, but *wisdom* is the power to correlate facts on any subject, and deduce true results. Probably the mental operation necessary to advance from one to the other can be no better expressed then in the words of the Marquis de LaFayette, engraved on a monument erected to his memory:

> "I read—I study—I examine—I listen—I reflect;—and out of all this I try to form an idea into which I put as much common sense as I can."

Illuminating authorities on the point of upward progression will be quoted in another connection, but a few may be mentioned here. Dr. Conklin, "Direction of Evolution," p. 67, says:

> "Do the best minds of today excell the minds of Socrates and Plato and Aristotle? On the contrary it is the opinion of those who have studied the subject most that no modern race of men is the equal intellectually of the ancient Greek race."

and on the same page he says:

> "It is most important to distinguish between knowledge and intellect, between things known and the capacity of knowing."

Our discussion of the capacity of mankind, as developed in history, is no departure from our principal theme. It bears on it from these directions:

1. Our story of the earth, having now reached a point where it is ready for the coming of man, it is appropriate that the earliest example, and his quality and origin, should be pictured for the reader, as he was when he entered on his inheritance. This is being done.

2. If man was really great, in personality and power, when he took up his residence, and if he is supposed to be part of a plan, it is easier to judge whether the preparation of the earth, and its equipment, was deliberate or accidental.

3. If man was at his highest and best when he first appeared, the supposition that he grew up from a lowly order is seen to be erroneous.

4. The early literature of our subject is thus placed, as to rank and quality, where it belongs.

Facilities for a broad understanding of astronomy and physics were of course then lacking, but fundamentals are not mechanical; and since nature and its laws were the same as at present it ought not to surprise us if the attentive human mind probed then as deeply as it can do now into many of its facts and causes. Some examination of the conditions under which men of intellect wrought, in the remoter periods to which our knowledge goes, will help us to appreciate the confidence with which the writer,—whoever he was,—of the first pronouncement of science on the rise of the universe,—quoted and construed in our next chapter,—perceived and recorded the operations of nature. We therefore go on now to consider more fully what man in general was, from earliest time; and how he was equipped.

VERIFICATION OF FACTS:

We recur briefly to the difficulty of proving our facts. Few events occurring in the past are related to us by observers, and experience suggests that we ought to distrust even these, at least until they have been re-examined. Frequently our own senses deceive us. Every sleight of hand man is an example. Much of the argumentation among scientists grows out of partial views or distortions of various kinds occurring in the narrative, and even direct observers may not see the same thing, or may not see it alike. It is said that Sir Walter Raleigh, while he was in prison, heard a street fight under his window. The particulars, as related to him by observers, differed so much that he threw on the floor the manuscript of his history,—exclaiming,—"How can a man hope to write a history of the world when he can not get the truth about a fight under his own window." Lawyers know how hard it is to reconcile the stories of well-intending witnesses.

The personality of the writer frequently makes a difference. Sometimes he dominates his tale, so that we appear to be seeing him, instead of his subject. Ludwig was not an observer, but from the stories of observers and records at his command he wrote a careful study of Napoleon, but he garnished it with his own personality, and his story of Napoleon is more truly a story of Ludwig.

Some of our information is gathered from books and papers written in other languages. In these errors are often found, particularly if the language is not now in general use. Ancient manuscripts or inscriptions may also be difficult because symbolic, or pictorial or ideographic. Some one must translate these, and they may and do differ. An example is a passage in a book by Fenimore Cooper, translated into French. He said of the hero that he dashed up and tied his horse to a large *locust,* in front of the door. This was translated "grass-hopper." French scientists might easily get from this erroneous views of insect life in America.

In examining the history of writing, we find inscriptions dating back to the early days of old civilizations, such as that of Egypt,—carved in stone, impressed in clay, wrought in sculpture, or cut in jewels,—some of which are the braggadocia of kings or generals, and, as history, must be taken with a grain of salt.

These illustrate the difficulties of the historian, of which his reader must suffer the consequences.

It is through archaeology, chiefly, that ancient countries and peoples have become real to our present generation. We have long been familiar with the classic periods of Greece and Rome, and with their literature, back at least to Homer, and by this we have come to know much of their great ones, and others near great; but behind that the shadows were heavy, and we had to grope. Recently, however, light has shined, and now it is growing brighter, and we have become aware of peoples and individuals whose names a little while ago we did not know. We will follow it back here as far as the story is now known, toward the time when the first man learned to think, and also when he began to write. Such a search will, we believe, show how real and how natural was the apprehension of the earliest writer on the physical origin of the world,—to be considered in our next chapter,—though on a subject so abstruse; and this, if adequately shown, will convince us that his history was not an accident, nor a good guess, but the outgrowth of profound perception and intelligent understanding. Whether or not it was aided by a still higher intelligence is interesting but not essential, for we are following science, and not defending any pronouncement of theology. The mere existence of that document seems to show that man was *not,* then at least, slowly rising from an animal state, or struggling upwards toward the early phases of brain power; and it will also appear, we think, that at the very first man's capacity for vivid and correct statement was a part of his endowment.

SOURCES OF ANCIENT LEARNING:

The evidences cover an extended field. They emanate now from the extreme limit of the known past, and continue in increasing detail, as investigation proceeds, and with increasing conviction; and conditions over the probable period of writing or rewriting the passage to which we will refer are becoming so well known that doubts of authenticity, or at least doubts of favorable conditions, are artificial. Allowances are frequently made, by casual writers on the subject, for possible errors growing out of an undeveloped state of civilization, but this would be needless here, since we have ample tests of verity, of a kind with which we are familiar.

If comparisons are needed to verify our ancient author's status as a learned man, they are now, largely by virtue of careful archaeological research, available. Were there not,—even before the historical period of Egypt, or Babylon, or Greece, or Rome,—men with mental powers as great as the wisest of the wise men who held the stage later? Were there not men having powers of observations;—powers of reasoning;—powers of reflection;—powers of thinking consecutively;—power of writing sanely; minds mathematical; minds eager; minds logical; as well as minds practical and picturesque? These are queries to which we seek an answer. At intervals, as we proceed backwards, dug out of the dust of ages, a new name rises; but there are many, known by name, but not famous in literature, now becoming sources of new knowledge. Nature was not new, even then, and the sky, and its story and movements, was as interesting as now. We have made the distinction,—frequently overlooked,—between intellectual capacity and a mere knowledge of facts. All the *facts* of the science of astronomy, physics, mathematics, are applicable to *inorganic* matter only, and were part of its organization. They were in existence, awaiting human apprehension, when the time should come, before the advent of any kind of life. We have been slow in reading the signs of those times, but they are now no novelty. There are those who say that the first to write down, for other men to read, the facts of the origin of the earth got them by divine revelation. Perhaps so; assuming an intelligent creator, means of communicating knowledge could not be lacking; but science seeks a natural explanation, and this we are here seeking. As throwing light on the mental equipment required, omitting the theological purpose, we must remember that the record to which we refer must have been first written when men were fewer, and differences newer. Nothing then was theological. Everything was true or not true;—sound or unsound. As to many things there was evidence close at hand, as there is now; and it took then, probably, as high an intelligence as now to apprehend the truth of science, as such; and no less power of apprehension and expression to write it simply and clearly, when known. Have we been misunderstanding the men of those remote days? Though we have been learning lately much of early human history by archaeological research, we have still far to go; but each new discovery leads us further. Step by step we are moving into remoter history, and though we are finding intelligence equal to our own, each step is a fresh surprise. We have found, many centuries back, probably not far from seventy, and constantly progressing backwards, men endowed with high intellectual powers, to whom modern scholars are greatly indebted, and with whom they may well be proud to be compared. They wrote little, but left visible signs of great discernment. We can no longer rest on our prejudgments. New information about the long past though recent, is becoming ample.

Let us carry our investigation, stage by stage, further back, beyond Moses,—whose name is identified with the written history of his race and times. A suitable marking point for our first stage would be the time of Abraham, which was about the time of Hammurabi, and near the greatest ascendency of the Sumerians, about the twentieth century, B.C.

EARLY LITERATURE AND ART:

As the Bible is by far the most explicit and consecutive narrative of ancient literature, as well as far the oldest, one might be inclined to look there for information, especially as its historicity is being at present confirmed by nearly every new discovery of the archaeologists; but it is customary in science to ignore it, and as we are depending on science for our facts in this discussion we also must look elsewhere. Archaeology, as we have said, furnishes most of our information on this subject, and discoveries in ancient lands have been frequent and progressive. It seems certain now that the earliest known writings were largely inscriptions on buildings, monuments or pillars, and these were not uncommon among warlike populations;—but there was little occasion for it in communities not engaged in wars of conquest, for conquered nations were not tempted to proclaim their own weakness. Palestine, however, in Abraham's time, seems to have been a kind of pioneering territory, in part occupied by remnants of once powerful races, such as the Hittites, who were there before Abraham; (Burton, Archaeology, p. 73). It was, as we now know, occupied by adventurous colonies of many races; but monuments or even tablets are rarely found there; yet it is evident that reading and writing, by methods then available, were well known and used. The important Tel-el-Amarna tablets, three or four hundred in number, found in Egypt, originated chiefly in Palestine, and covered many subjects. They were mainly directed to the King in Egypt, and were curiously human,—even from our modern standpoint. Often they were,—(from active politician to rather reluctant statesman),—urgent for money; and many passages indicate that neither political shystering nor espionage were unknown. They were in part reports from representative agencies to their foreign principals; but some were gossipy, and conveyed information outside the lines of business. They were chiefly of the fifteenth century, B.C. Moses was of the fourteenth; Abraham of the twentieth. New openings recently made in Egypt have much enlarged the available writings of this character. There are many indications of wide intelligence in Palestine and elsewhere, and inferably of free and competent communication, which involves education in reading and writing. Illuminating is the book recently published by Dr. John Garstung, entitled "The Foundations of Bible History," published recently in America. Its research is directed especially to the biblical period of the Judges, but its discoveries throw light on a much wider field.

Illuminating also is the recent book (1934), by Sir Charles Marston, F. S. D., entitled "New Bible Evidence." That author's rank as an archaeologist and author has been long established.

In Genesis it is said,—how long before the time of Abraham we do not know,—"the whole earth was of one language and of one speech." This is illuminating, and apparently proving to be correct, but it is not vital here. The lines of human descent, however, do seem to be narrowing and converging as we reach backward in time. This is also indicated by the reducing number of nationalities, of which we treat in another place. The art of writing seems to have been slowly acquired. At early dates some, at least, of the *writing* was pictorial or ideographic. A recent cartoon, representing a man of the stone age, with hammer and chisel, and a flat stone, writing a letter home, suggests that the publishing business must have been restricted, and three volume novels rare. *Learning*, however, was different. It is, in its first aspect, personal. It is hard to trace, after a race of people disappears without leaving accessible literature, but as far as we have gone the indications of high intelligence do not diminish. Whether land in Palestine, for example, where Abraham lived, was, in any general way, the subject of private ownership or not it would be hard to say, but the right of possession, and changes of possession, pursuant to contract, were recognized. There was money,— partly, at least, in precious metals, and in coins of standard value; and there were tables of weights and measures; also there were customary, if not prescribed, methods of passing titles, which at least conferred the right of exclusive occupation. Abraham "was very rich in silver and gold," says Genesis. He purchased the cave of Machpelah as the burial place of Sarah, his wife, and the transaction is thus described in Genesis:

> "And Abraham weighed to Ephron the silver which he had named in the audience of the Children of Heth, four hundred shekels of silver, current money with the merchants."

This, supported by what we know of the later history of that purchase, indicates a standard of mutual respect, and a recognition of private rights, as well as a system of coinage, and a body of influential merchants. The right of private ownership of cattle and moveables evidently prevailed, and the institution of slavery, with its correlative duties of service and protection. This, and other indications of a classified society, is proved also by the discovery, especially in Babylonia, Assyria and Egypt, in the tombs of royalty and nobility, of the remains of slaves, evidently buried with their masters. Abraham brought with him from Ur both stores and cattle, and probably slaves. The narrative states that he "brought with him the souls he had gotten in Haran." On one occasion he gathered his forces together, including slaves, and pursued certain robbers who had taken property belonging to his neighbors. It was recovered and restored. The efforts of multitudes, near and far, to aid in the recovery of the Lindbergh child, suggest that human sympathy and human modes of expression are still very much the same. We do not know that the original writing of the first chapter of Genesis was done in Palestine, but so assume because we know nothing to the contrary. As Palestine was on the direct road between Mesopotamia and Egypt, and caravan traffic was constant, the conditions of intelligence and education prevailing in those countries could hardly fail to be also in effect there. We might safely infer, if we had no other sources of knowledge, that Abraham and his associates were possessed of an equivalent degree of civilization and education. We should therefore look into the conditions existing among the greater peoples of the world, which are easier ascertained, to trace the learning then practicable on the subject before us.

Archaeology now reveals that as far back as 3500 B.C., which was fifteen centuries before Abraham, the Sumerians were in the ascendency in that part of the world afterwards divided between Babylon and Assyria, "and the parts of Elam on the east, toward Persia." Reckoning back from the present time a similar period would carry back to the fall of Rome, and the chain of important events since suggests a parallel in earlier days. Hammurabi succeeded to power among the Sumerians at or near the time of Abraham. He is apparently to be identified with Amraphel, and he was known, at least by name, to the writer of Genesis. His code of laws was carved on pillars of stone, and these have now, after these many centuries, been found, in a different country, hidden in sands and clay, probably carried away among spoils of conquest. There can hardly be any doubt that they were known to Abraham, and almost certainly to Moses. It is commonly supposed that a part, at least, of their substance was carried over into the laws of Israel. The advances of the Sumerians in art and skill, and also in architecture, as far back as 3500 B.C., are astonishing to us of the present day, because we have been accustomed to regard the people of those ages, without pains to distinguish, as inferior to ourselves in respect of art, science, learning, and the higher planes of living. Dr. Leonard Woolley, the archaeologist, in his little book entitled "The Sumerians," shows how serious that error is, and in this he is confirmed by other dependable authorities. The conditions of cultivation developed by the spade of the antiquarian, described in Encyclopedia Americana, Annual, 1928, are vividly put as follows:

> "The excavation of a cemetery of great antiquity in (Ur), 3500 to 3000 B.C., yielded many objects of great interest; ornaments of gold, silver, lapis lazuli

and other precious materials. The workmanship of some of these demonstrates the existence of a high degree of artistic skill in Sumeria, contemporary with the First Dynasty in Egypt."

The same is true of conditions in Egypt around the same period. Tut Ankh Amen was later—not far from the time of Moses,—but the art and skill of his day could not have then been recent.

> "In the tomb of Tut Ankh Amen there have been found furniture, fabrics, vessels and jewels, the exquisite texture and workmanship of which have dazzled the gaze of Egyptologists."

Barton, Archaeology, p. 30.

No one who has seen the extraordinary articles of vertu, now in the museum at Cairo, which were found a short time ago in the tomb of Tut Ankh Amen, could fail to apprehend the taste and skill of the workmen of that period. Only a highly developed sense of beauty, coupled with unsurpassed skill in workmanship, and knowledge of workable materials, could account for them. The Egyptians and Sumerians of that day, in these respects at least, could not, we suppose, be surpassed now. In an article in Americana Encyclopedia it is said:

> "The oldest group of jewelry in the world is doubtless the four bracelets of the Queen of King Zer, (4366 B.C.). * * It is 1500 years earlier than any other jewelry thus far identified. The bracelets show a wonderful perfection in the soldering of gold."

It might well be supposed that in literary capacity they would rise to a similar level; and so, to the extent that we are familiar with the facts, they did. Dr. Woolley, (Sumerians, p. 27), shows that the Sumerians of around 2000 B.C. (Abraham's time) undertook to put on record the history of their nation and country, and portions of that work are known to us now, through the excavations of antiquarians. Dr. Woolley says of this:

> "They must have had at their disposal a mass of documentary evidence, and from this they compiled on the one hand the political history, and on the other the religious traditions of the land."

Of this work there still remains the "List of Kings," which goes far back beyond the flood. Of the date of this we have no definite knowledge, but no intelligent person now doubts that there was such a writing, and that it or its sources were in existence long before Abraham. The authors name ten kings before the great flood, with the periods of their respective reigns, and nineteen dynasties after the flood, to the Third Dynasty of Ur. So also in Egypt a list of ancient kings, running back into a period of history otherwise unknown, is carved on the walls of the Temple of Abydos. These are said to be of the age of Rameses II, but the sources were much further back. There are other evidences of a known history, both in Sumeria and Egypt, running back to approximately 5000 B.C.; but as the art of general writing is not yet traceable that far back it is not recorded, and the conditions then, in respect to learning and the capacity for learning, cannot be confidently asserted. The new discoveries now being made indicate a high state of civilization much further back than Abraham, of which we can expect hereafter to acquire more detailed evidence.

Art, literature, mechanical skill, and the knowledge of natural laws and materials, which are the subject as well as the object of them all, do not grow suddenly.

It is now known that in the time of Abraham, and prior, back at least to 3500 B.C., the people of both the main kingdoms then prevailing possessed a high degree of mental acumen, even in the field of astronomy.

> "The civilization of the Mesopotamian plain was the first, * * * Its astronomers gave us the division of the year into months, weeks and days, the signs of the zodiac, the constellations, the division of the circle into degrees. Its art was the foundation on which Greek and Moroccan art was built."
>
> Archaeology, Encyl. Americana. (Article revised by Charles Conrad Abbott.)

The fact of the extended and explicit law code of Hamurabi, which has been a standard of comparison ever since, supports this view. So also does the existence of great poems, preserved to the present, one of the creation and another of the flood, undoubtedly originating long before that time. These have been highly regarded as literary works. More details are given below.

The comparative datings of the so-called Babylonian Epic, and of the Genesis narrative of physical origins, are not entirely known; nor can it be known whether the earliest record of these came through or from people of the same race, but this is most likely. Abraham came from Ur, (in the territory then of Sumeria), into Palestine about the period of Hamurabi, and as that was a time of high literary and artistic development it may be supposed that both those narratives were first reduced to writing long prior to that time. They have marks of similarity, but are evidently far apart in time, and worlds apart in essence and in implications. It would be too much to say that there is any similarity between them in respect of accuracy, or literary merit. The statement that a high grade of literature was produced as early as seven thousand years ago does not imply that all writers were of equal merit, nor that they all wrote true history. The Babylonian poem has no beginning, and no clear meaning, to which a dating can be applied. It pictures not only trivial but foolish divinities, quarreling over their preposterous miracles. Its earliest suggestions of the origin of humanity deal with divinities and others as then already in being, and capable of communication. From these we can draw just inferences of capacity, which is our present theme. As dignified literature, however, the Genesis story of creation can be compared with them only as one would compare Paradise Lost with the Spoon River Anthology.

A few of the opening lines of the Babylonian Epic are as follows; (Quoted from Barton's Archaeology, page 251):

"Time was then above heaven was not named
Below to the earth no name was given
Then the primeval abyss their begetter
The roaring sea who bore them
Their waters together were mingled

This is an insignificant portion, and might, or might not, be deemed a fair test of its literary quality, but it will at least refer an interested reader to the place where it may be found in full, as far as the discovered originals are preserved.

We have not attempted to appraise the intellectual capacity of mankind, of that day or this, but only to show the error in supposing that human mental capacity was recently acquired. We come now to consider the written record of physical origins to which reference has been made.

CHAPTER IV

THE EARLIEST PHYSICAL SCIENCE

DO YOU *think in pictures? Can you see an ancient scholar thinking? No;—at least not like Rodin's figure of "The Thinker," who seems struggling with his first thought. Why not see him elderly,—grey-bearded,—of serious forehead, but kindly eye. Perhaps in a long robe, sandals, turban; his writing pad a strip of papyrus; his pen a brush, or stylus. Have you forgotten how wise he was,—how profound, and yet how simple?*

CHAPTER IV

The Earliest Physical Science

WE HAVE said that, judged by science, the earliest man was the equal of man of the present. Unsupported, this would be mere opinion, and could be balanced by an opinion to the contrary; but it is not unsupported. We have presented ample evidence of his high capacity, in the remotest ages reached by expanding archaeology. Here we will consider a particular instance, in the field of physical science, in which one of the most ancient describes the developing universe, in terms so simple and accurate, and also so pictorial, that no modern scholar has excelled it. It not only weighs heavily on the question of human intelligence in that day, but excites our amazement that he could have so correctly known the facts.

A true story of the origin of the universe, in four separable stages, each correctly stated, and all in due order, could not have been an accident. If on consideration you find it very ancient, and also very true, you will wonder about the sources of his information, which you may believe,—as many do,—to be supernatural, or stimulated by the supernatural; especially if you find it to be superior to the learning of his day. Since it is found in the introduction to a series of ancient writings the simplest test for such a comparison, having no theological implications, would probably be with suggestions on the purely historical subjects in those collected writings, especially in so far as they are the production of varied persons, and found in different connections, or written at different times. Here is an "if" and an "if,"—but all within, and bearing on the question of assurance. Now let us consider the document:

AN EARLY MANUSCRIPT:

An ancient manuscript,—supposed to be the oldest of all,—dealing, though but incidentally, with the subject we are considering,— (physical origins),—describes an order of creation which conforms to that of present day science. In clearness, accuracy and vivid expression it is beyond comparison with others not relatively modern.

In a few words it covers the subject of the origin of matter, the origin of movement, and the processes by which matter was pressed into action, resulting in that energy which carried it on to its present stable condition. The story is greatly condensed, but it is not obscure. It was no part of a text book of science, nor of an essay on the subject of origins. On the contrary it was written by way of introduction to a narrative of which the subject was different. The part pertinent here is in thirty-nine words, and is at follows:

> "The earth was without form, and void; and darkness was upon the face of the deep; and the spirit of God moved on the face of the waters; * * and God said let there be light and there was light."

(The author is aware of the suggestion of certain critics that the passage we quote was written late in the history of the Jewish people. He leaves that debate to others; but he deems it not maintained. He thinks the weight of the argument is the other way; and considers this proved by the results of the discoveries of archaeology. But if true it would not affect our point, for it was still far earlier than Aristotle, and the other Greek authorities often quoted in science; and this is right, and they were wrong;—showing that in an age, one far older than theirs was far better informed,—which is our present point.

You will recall our *third* stage of development, where matter moved from static into chaos; and thence, by our *fourth* stage, into ordered forms. You will also remember that space had expanse, but no content, and no limit, and no shape; also that it was dark,—"velvety black." A recent authority informs us that the first *motion* was communicated by "currents of ether,"—(in the language of Dr. Jeans), described here as the "spirit" ("breathing") of God. You will also remember that the first effect of movement, "vibration," was *light,* and the next *heat.* If you compare these with this you will find them all included in this single paragraph.

It would be artificial to construe this passage to relate to the earth as mere matter. It plainly means the *source* of the earth; for the sky was full of orbs, and all were evidently a part of the same system. That author had, however, the earth specially in view. He was not inventing, but describing. Certainly it would require extraordinary insight to devise, out of a writer's own inwardness, a statement, on such a theme, which would be acceptable to newer science, as it should come to be known so many centuries away. It is quite true that anything that is or happens can be described, but only by one who knows. If he did know, it would be simple,—as it would be today. The facts to justify conclusions as to origin and progress are neither numerous nor complex. They were then, as now, within the capacity of a competent mind; and we have learned, and are now having it confirmed, that minds in those days were as fit as ours. Modern facilities have aided human *perception* in many respects, both then and now, but in some cases the best *judgments,*—the most fundamental and helpful,—have been framed without their aid. Mechanical devices have added greatly to the bulk of knowledge, and errors of the past have, in many respects, been corrected by wider information; but they are not knowledge, but only aids to discovery; and it is not the accuracy of knowledge, nor the numerous items, which are a test of mental capacity. Our present inquiry relates to the *man himself.* If he was right in his conclusions, without the aid of modern devices to confirm them, he has taught us two things;—at least;—i.e. that the best equipped astronomer is not necessarily the most acute or efficient; and that the sanest inferences are drawn by the sanest minds. As we have said,—the fundamentals, applicable as tests of verity, are few; but, then or now, they included these:

1. *Law prevails,* and has always prevailed; and the qualities of matter have been *always the same.* This long since became an axiom of science.

2. There *must* have been a *first cause,*—of origin and also of movement. This is not an axiom, but it is

as *inevitable* as the multiplication table; a *sine qua non.*

The physical earth,—which was the subject of that writer's inquiry,—was, in his day in a state of flux and change, as it is now, but governed by laws capable of being known. The totals were as stable as now;—and thus a competent mind had then before it the same fundamental we are applying here,—towit, that the governing laws of nature and the qualities of matter do not change, and therefore the past may be known by the present. Thus world history could then,—as now,—be traced back to a condition of simplicity. It would be easier now, for we know present conditions better; but the principle and the method would be the same.

That writer states, what every scientist knows,—i.e., that only supernatural power could have initiated either the substance of matter or its movement, or the laws and forces affecting it, which were so evidently uniform. It is admitted that these have no known natural cause. It must therefore be supernatural,—and this that writer knew as well as we.

Whether this describes the mental operations of that writer we can not know, but we know that he *could* follow these or similar lines, without the aid of modern equipment.

The *origin* of the earth, and the course of its development, were that author's theme, as it is ours. It was correctly known and truly stated in the first known bit of human literature. That version may not have originated with the writer of it, as it stands. It may have been formulated long before, and the facts recited may have been common consent among the wise men of his day. It is enough to be convinced that it was *capable of being known, by the use of human faculties* and powers. Modern methods *may prove it, or confirm it, but the fundamentals were the same. Dr. Jeans wrote the* story of the universe; Laplace wrote the story of the solar system; Moses, (we know him by that name), wrote the story of the earth. Each narrative is to be judged by the field the author sought to cover, and the verity of his account. We are citing this instance to prove our proposition that the human mind was, at the earliest traceable date, of high capacity and insight, and was *not* advancing upward from a lower level. His record of the facts may be questioned; but it is sound, if ours is, for they do not differ.

No one can furnish a dating for that record. We attribute it to Moses, but it was probably old in his day. If it originated with him it would be some 3400 years old now.

THE MOST ANCIENT THEORY OF ORIGINS:

It is impressive, not only because, as a curiosity of literature, it gathers up the story of physical origins into a single pungent paragraph of thirty-nine words, but because, by the tests used now, it is found to be veritable history, true for all these centuries, and true now. Mere brevity and condensation would be a merit, even if it were only fiction, but, whether in few or many words, truth,—scientific truth,—is our ultimate aim; and rare is the writer who can accomplish both. A mere shot at a mark,—as it were in the dark,—would mean little. An accidental hit, with so many elements involved, is inconceivable, and if we could imagine such an instance it could not be a precedent. Accident, then, does not explain this, and any one who really wants to know how it could have come about must look more closely. In these days of stenographers and typewriters, brevity is rare, and, where not at the expense of clarity, is admirable; but it is difficult. It is reported of Daniel Webster that he said in writing to a friend that he had written a long letter because he had not time to write a short one.

When the great editor Charles A. Dana was publishing the New York Sun a fire occurred in a little town up-state which destroyed its chief buildings. A citizen telegraphed Mr. Dana to know if he would accept a full description. He answered yes, in *four hundred words.* The correspondent said he would need two thousand. Mr. Dana telegraphed: "The Bible tells the whole story of creation in six hundred words."

This will serve to introduce a closer examination of the passage in question.

The same story, as told by the scientists of today, is much more extended, but not more intelligible, and not more correct. It is often complex; whereas the statement of this document while brief, is explicit and complete. They agree; i.e., the meaning is the same. Evidently it was intended to be taken as true, and the author believed it himself. It would not only weaken his history of humanity if it were untrue, but would discredit its author at the very beginning. The wonder is the greater because in those few words the writer did not state an isolated fact, but a *series* of distinct but connected facts, amounting to a description of several stages of development, and all correct, *and all in due* *order. Other writers along the course of history have* supposed the facts to be otherwise. Most of them proved to be wrong, but this author was right. He and they had to meet like difficulties. Either might well have been puzzled by the half turn they daily saw in the heavens. Something unknown was always occurring in the darkness. Observers, supposing the earth to be flat, invented explanations altogether erroneous, as we know now, though often artistic and poetic. They read like fairy tales, but at last the evidence has become complete; the facts are known; and the world has come back to that simple narrative.

A paraphrase, in modern terminology, may make its meaning clearer.

> "The universe was without form, and empty; darkness was on the face of the chaos. Currents (winds) of God began to move upon the face of the chaos, and there was light."

That both are scientific, by modern tests, is plain. The picture thus painted so long ago has never grown dim. Dr. Charles Nordmann, the distinguished astronomer of the Observatory of Paris, in his book "The Kingdom of the Heavens," page 183, interprets it, in general terms, somewhat as we are doing. He says:

> "Genesis for instance teaches us that the Creator formed the world not from nothing but from chaos. One may conceive chaos as a state in which things were not mobile, not organized nor differentiated—where there were no forces and no active energies."

The conclusion of present day science, stated in its diffuse language, might read thus:

"The universe had no boundary, and no contents except matter, as attenuated as gases. It was densely dark,—intensely cold,—and it was without movement. Currents of air, somehow put in motion, began to play upon the deep—and there arose spinning clouds called nebulae, and soon heat; then light,—at first dim, but increasing with the speed of movement; thus the celestial system began, and proceeded to completion; and the earth was one of its products."

Science, on such a question, can not wisely ignore the views of what we have elsewhere called the contrasting school. Our construction, in the language of science, conforms to that of expounders of the Bible also,—writing from differing points of view. They examine it in its original tongue, and are in a position to detect errors. See Hastings' Bible Dictionary, from which we quote: (Cosmogony, Vol. 1, p. 502):

"The narrative in Genesis 1: 2, opens with a reference to a dark chaos (tohu wabahu); how long the pre-existing waste and emptiness of chaos existed, and how long the darkness prevailed over the primal waters before the quickening spirit or breath of God breathed over its surface we do not know."

From Elliott's Commentary, Vol. 1, p. 11 (generally taken to represent a different viewpoint) we quote:

"Literally *tohu* and *bohu* * * * signify *wasteness* and *emptiness*. It expresses here the state of primeval matter immediately after creation, when as yet there was no cohesion between the separate particles. * * * It existed only as an incoherent waste of emptiness."

That early writer (Moses or not) evidently meant to assert that the world of gaseous mist had *not* been perpetual, and had not always contained the capacity for development. Therefore it *had a beginning,* and also a cause. There has been argument to the contrary, but to the straightforward view this is inevitable. The particles of matter, suspended in a cloud of gases, after, by adequate means, it had been brought into being, lay inert until adequate power ("currents of ether," in the language of Dr. Jeans) put it in motion; and this also ("the spirit,—breathing—of God moved upon the face of the waters") is a part of the Mosaic narrative; and such was, according to science, the first stage of physical development, stated in almost its technical language. It begins with origins, which very often the narratives of the present day omit;—not always because the writers doubt it, but because they deem themselves restricted, by the nature of their profession, to natural causes. Such a restriction we deem unnatural. We have shown elsewhere that if it were strictly applied physical history would be a weak thing, by reason of its omissions, and would tell but a partial story. We have not deemed it necessarily evasive, though on its face it looks so. But coming back to the passage in question, we further note that the time when it first appeared is not known, and as years are added to years it is more and more likely we shall never find out. It seems probable that Moses, who is supposed to have gathered up the materials for the record in which we now find it, copied it from some earlier work. A history of Rome, or of Babylon or Egypt or Assyria, written now, would be composed in that manner. We would expect to find that it originated when human populations were small, and nations, if any, few, and therefore before there was any occasion for conflicting stories of creation. From the earliest dating to which we can trace it, it arose, as we suppose, in a period of high intelligence; and its origin may, for all we know, have been before the broader racial lines separated into nations, and the Hebrew race emerged. The argument, therefore, that it was part of a racial theology has little weight.

It is not stated in the terms of modern science, but facts are first, and formulae follow, and here they conform. It is not hard to interpret. The pressure of currents of air (or ether) is the only means we know, even yet, adequate to start movement ("vibration") in such a body of laden gases. What Dr. Jeans calls "currents of ether," which he says were "set up," are, in the Mosaic recital, "winds of God," which set in motion the waiting substances of matter. The word "spirit," means breath, or breathing. In other places in our English version of that document, where the words that writer used are found, if similarly translated, the meaning is the same,—i.e.,—"ether," "spirit," "breathing," as we can see:

> "The spirit (breathing) of God moved upon (pressed into action) the face of the waters (the deep)."
>
> Psalm 33: "By the word of the Lord were the heavens made; and all the host of them by the breath (breathing) of his mouth."
>
> Job 28: 13: "By his spirit (breathing) he hath garnished the heavens."

It would be futile to assert a difference between an intelligent creator, "breathing" on the nebula, on the one hand, and thus giving it power and direction; and a mere impulse, itself without power, accomplishing a like result. One can, and the other cannot.

No writers, even of the present, surpass these words in simplicity, directness, clarity or strength. We cannot regard it as accidental.

There were early Greeks, who, having no efficient instrumentalities, believed the earth to be a sphere, when, by the general scholarship of the world, it was supposed to be flat; and some supposed it to be moving around the sun, when others believed the sun itself was in motion. The error in either does not indicate inadequate mentality. Such, in both cases, was long a prevailing view. Ptolemy's view, which satisfied the world for fourteen centuries, was no sounder. Homer thought the earth flat, and so pictured it on the shield of Achilles. The author of the document to which we now refer may have so supposed, but this is not probable. There was a long succession of ancient worthies, familiar with that record, who, though not in explicit terms, but in words so implying, indicated a knowledge conforming to ours. This may be implied in the passage in chapter 27:7 of Job, where the writer, speaking of the wonders of creation, said:

> "He stretcheth out the north over the empty place,
> and hangeth the earth upon nothing."

and such may have been the supposition of the writer of Psalm 102: 25:

> "Of old hath thou laid the foundations of the earth;
> and the heavens are the work of thy hands."

These are pictures, and may be apt in respect to either the old or the newer beliefs on the subject of the shape of the earth; but we cannot forget that even the wisdom of today may come to need correction to-morrow.

PART THREE

HUMANITY IN ACTION

MATTER AND LIFE CO-OPERATING

●

CHAPTER I

LIFE: ITS ARRIVAL AND ITS EFFECT

THE *human body must keep close to the earth, but the mind can leap in an instant a thousand years or a thousand miles. A man is strong or weak, or large or small, or gross or handsome; but these are physical, and relate to the body; the spirit is kind or unkind, harsh or tender. A man's physical reach is a yard or two; but his memory and his aspiration are boundless and timeless. The body is visible and tangible, but the spirit can neither be seen nor touched. This chapter draws important lessons from these differences*

CHAPTER I

Life: Its Arrival and Its Effect

SIDE by side in the universe are now the organic and the inorganic. In the great system, as an operating mechanism, the earth, though progressing, made no change. All went on as before, and so it has continued since; but life, arriving, made many changes,—introducing new beings, with automatic functions, to play a new part on the ancient stage. To us and our kind life is everything, and promotes everything. Our race is inquisitive, and it had no more than alighted when it began to inquire. The fitness of its new home was so evident that the story of its past raised immediate questioning:—how long in the past? how long in the future:—how deep and how high in the present?

Our chief purpose in this chapter is a part of that inquiry. We seek to learn whether life is separable from matter, or is bound to it by ties so close that they must live and die together.

The completion of the earth, equipped for occupation, is our fundamental. Even in its inorganic state it had atmosphere and floating clouds, and running streams. Plainly it had come about in a manner governed by law, in orderly stages, one following another in some normal order of precedence, each leading on to a point of preparedness for the next; but it was very hard and very bare, and it was cold and unconscious. The stages of its progress thus far, we may call, for convenience, the "order of creation." Such an order is described in Genesis. Nothing is here staked on its correctness, but it does not in any important respect, we suppose, depart from the order approved by science. The celestial system, as a whole, had reached its final stage, and by a consecutive series of steps the earth was ready for the entrance of life. Day was succeeding night; light followed darkness; and so, one by one, as now, came other periods. The fact that the earth did become a suitable abode for living beings, and that it had not always been so, is scientific, and is not denied.

Dr. R. S. Lull, of Yale, in "Ways of Life," p. 17, says:

> "Life could not always have existed on the earth, for, from the nature of things, the earth has not always been a suitable environment."

THE DESCENT OF LIFE:

It will not be unscientific to feel sure that life did not descend until the earth was ready. Indeed it could not, for science asserts that life could not have survived if it had been premature. Here then conditions were ripe. It was at the close of the third period in the order of Genesis; night was overhanging, and it was dark and heavy; the fourth period was about to begin. In earlier stages the earth had not been different from Pluto; but it became different, and Pluto did not; yet it was very dull, and very dead. Have you not observed the bleak, barren, unpromising soils of many semi-arid localities before the introduction of moisture. "A barrel of water to a spear of grass," they say in Denver, and nowhere is the effect of the water more richly shown. Such or such like we may picture the earth to be before life entered. The climax of history had arrived. Everything worth while, from a human standpoint, was in the future. Nature was all unconscious. The darkness of night hid the world. Clouds were gathering; quiet showers were filtering down, and softening the hard earth. Then came, or this was, the call of life, and life heard and responded. But how; was it only a speck of protoplasm? Even so, no one can explain it, and thus it would be a miracle, no less than if it fell everywhere at once; but if, as evolutionists say, life began with a pin point of protoplasm, yet someone, with the prepared globe before him, must have *chosen* a starting point, for accidents are excluded. The earth was ready everywhere. Life was to cover it *all,* the highest hill and the deepest ocean. The rain was falling everywhere; the sun was shining everywhere; the winds were blowing everywhere; but the evolutionist insists that life began in one modest cell, somewhere, perhaps in Mesopotamia; and to admit of an adequate spread the world must be barren everywhere else, though ready and waiting for life to reach New York or Chicago. If it "began in the water," as some say, the effect would not be different. It must, in either case, begin with a pin-point, and expand to cover the globe. According to the theories of those to whom time is nothing, this must have required ages upon ages. Why? For no reason, so far as we know, except to justify a theory, or create one. If it was so we might have had men full grown around the Persian Gulf before there was a spear of grass in America. Does this look frivolous? Perhaps, but is it not sound in principle? No one has suggested a reason for the supposed slow spread of vegetation on the earth except the unit theory; and no one mentions a supporting fact. At least the fall of life *wherever conditions were prepared for it* would accord better with the general laws we are familiar with. But we need not here discuss the merits of that theory. It is enough to remember that, starting with nothing, space came at last everywhere to be filled with matter, but not at first with life. And when the earth was rounded into form, and soil and water were ample, life had still to come. Whether it was waiting somewhere, or was created for the need, growth was conditioned upon contact; and if we may suppose that sentient being was the one great object of creation, we may also suppose that, approaching from different directions, there was neither haste nor delay. A minimum start was to be expected, but we have supposed this would have been in degree, and not in spread. *Human* life had to be the last in order, to survive. Food and water must be here first, and therefore they were. This much, at least, was governed by law. Any theory which would make the order of events an accident would encounter this obstacle. Animal life did flourish, but it could not if foods were not first; and if foods came first in Mesopotamia living creatures must also have come there first, or all animal life, having arrived, must have awaited the general distribution of plant life. It would be hard to say how the order could be different.

We must at least suppose an *orderly* succession, under which each kind of beings would find the necessaries of its life already existing, and in adequate supply. A different theory would make the order an accident, and the wrong accident might have befallen first; as, for instance, the arrival of cattle before grass. The mere existence of law would eliminate accident; but if that were all there might have been life on the other planets also. It looks like control,—does it not? In science law reigns, and there are no accidents.

The order of precedence in life is not in controversy in our discussion, but few subjects are more interesting. We have here gathered up a few familiar conditions which seem to indicate a definite order, and inconsistent with anything else. Let us briefly summarize these:

(a) Dr. Merle C. Coulter, in "Nature of the World and of Man," p. 218, says:

> "There is rather general agreement that the plant kingdom made its start in the water. Certainly our simplest plant can live only in a medium of water, and fresh water at that. Water is by far the most important of all factors in determining the distribution of plants over the surface of the earth."

(b) Light is also vital. Dr. Coulter, in the same volume, says:

> "Light, in the form of solar energy, may be thought of as the mainspring of all life."

There being already water and light and soil for nutriment, the grasses could maintain themselves; and this is the order of Genesis. "The Lord said, let the earth bring forth grass." When that arrived the browsing animals could survive, and these followed the command to the earth to "bring forth the living creature." This will be enough to prove our present point, i.e., that there is, and always was, an order of precedence, recognizing and following need; and this *excludes* accident. This is law, as well as reason, and it seems inevitable.

These, therefore,—light, water and nutriment, on which plants may feed,—were waiting, in sufficient quantity, and suitably located, when plant life arrived, (which was, for like reasons, the first order of life). We are painting our picture of the arrival of plant life on the earth believing that it conforms with what we know of the growth of plants, and of the adaptation of supply to need which we find everywhere; and a theory of spreading from a single cell, embedded in the earth, or floating on the water, seems artificial and unnatural. We may be able to picture the descent of life by either method, but one is true and one is not. The first endowment of a single living cell, in a single spot, with automatic capacity for spreading, has no better natural explanation than the dawn of life in one wide descent, like a shower, on the whole of the waiting world, according to climatic and other fitness. Either, however, is to us only a picture, but the fact was ever so real, and ever so astonishing. It is simpler, and certainly far less artificial, to suppose that life arrived everywhere at once; at least wherever the subsequent orders of life were going to need it,—perhaps in a period of darkness, like descending rain.

Somehow, under this supposition, the cells in which life would develop were there, or brought there;

and in the morning, when the darkness lifted, and the sun rose, the hills and valleys were green with grasses and mosses, and bright and glowing with blooming things which no human imagination could have dreamed. It would not change this if "night" and "morning" were periods. Man came later, and even if it took a million years to cover the earth, the eyes of the first man saw it as a whole, at least within his range. Evolution does not deny this picture, but only its suddenness. The *fact* is beyond doubt, and the *method,* so long as it harmonizes with essential requirements, any one may judge for himself. Life did come,—slow or sudden,—and the earth smiled and shone and glowed in response. Its barren surfaces hid themselves under blankets of flowers and grasses and blossoming fruit trees. Nothing was ever so lovely as the bare earth became in its fresh verdure; and for the first time there was growth. Oh it was a marvel, whether it occupied a million years on the journey or arrived after a showery night. Of course it had a cause, and, if this was not natural it must have been supernatural. It was *life,* and every blade of grass was burrowing in the soil for nutriment, and waving in the air for moisture and light. The nourishing gases were there, oxygen and carbonic acid gases for the blades and leaves; nitrogen for the roots, hydrogen for the veins and cells. The atmosphere was there, and the scudding clouds; and here and there grew shrubs and vines, and flowers and fruits; and here and there were trees, some leaning over the water courses, some digging deep in the body of soil for moisture. If they were not there in their completeness when the sun rose they were on the way.

PHASES AND CHARACTERISTICS OF LIFE:

While life has a distinctive general character, recognizable wherever it appears, it has quite different phases. Even in individuals of the same group or family it exhibits differing qualities, but these are ,of less significance in this discussion than its adaptation to different *classes*. Some of these have been mentioned above, but they are so illuminating that this writer believes they should be opened out more fully. Broadly these classes are (a) unconscious,—as plants are; (b) conscious, with discrimination, including memory, sense of location, direction, etc., as birds are; (c) conscious, with some degree of recognition, and sometimes affection, etc., as in the case of dogs or horses. All these possess life, but they are far below the grade of humanity, which has all that the others have, *plus* judgment, will, reasoning power, reflection, sensibility, apprehension, ambition, and a long outlook. It can be seen at once, but all the more clearly on attentive consideration, how sharp these distinctions are, and how widely the classes differ, not only in the expression of life, but in its essence.

We need not debate methods. A barren world this had been; a lovely world it had become; waving and gleaming with life; glowing with brightness and color; shedding everywhere sweet perfumes; and growing,—growing. But this was a stage only. "The evening and the morning were the fourth day," says Genesis. At least life *followed* preparation. If the events or their order were accidental they could not have been predicted, nor could they have been expected to continue. If any one thinks science would admit of such an occurrence by accident, he is welcome, but his scholarship title ought to be withdrawn. Science is not blind, and does not mean to be inconsistent. The occupants were of course to be later, and were. Man, who used them all, and ruled them, was last. Life, in its elementary stage, had come to that part of the world that was ready, and only one of the innumerable heavenly bodies possessed it, or ever could. Only one stage of preparation had been reached at the time of which we are writing, and only one order of life at a time arrived; but even so, in many of the smallest hiding places, in the quiet valleys, and along the running brooks, plant life was beautiful, though there were no spectators.

By the voice of science, almost uniform, though not without argumentation, especially in reference to the *order* of arrival, the stages of advancement on the earth are correctly stated in Genesis, but "day," they say, is to be interpreted as an indefinite "period." Supposing it to be so, there was much to come. By common consent plant life was the vanguard of the millions of living things of different orders which were on the way. It could not have been otherwise, whether our authority is scientific or not, for the means of nourishment *must* precede the life that is to feed upon it. Was it slow; was it swift; was it created complete, or did it grow? Science believes the *preparation* of the earth was very slow and gradual. Perhaps so, and perhaps it was a long time before life could find a footing; but growth or development could not be true of life. Of itself it took no time. No one has ever suggested that life grew, from small to great; or that it was ever partial. The living plants were doubtless its first visible appearance, but life was ample, from the first, for every need. Its expansion was always in response to need, as the more complex forms of matter were ready for it.

LIFE AMONG THE PLANTS:

The living plants were earliest of all, because first to be needed, but they were unconscious. Life was fulfilling their requirements. The plants were not intelligent, but they were not inert. Their phase of life was adequate, though limited; and we must apprehend and recognize the differences in the qualities and manifestations of life in the world if we would acquire anything like a true understanding of its elastic nature. There are two hundred and fifty thousand known species of plants, of which one hundred and fifty thousand are seed-bearing, says Dr. Coulter. These are distinctive, and each automatically withdraws from the soil, without mistake, the elements appropriate to its own type. If you plant a tomato you will not produce a potato. If you plant a phlox you will not produce a rose. If you plant a sunflower you will not raise an American Beauty. It is so also with colors, and combinations of color. There are minor variations in the same bush, or from the same root, but except temporarily and by pressure they do not depart *in type;* they can all be accounted for without that. Whether the capacity to select a particular color, or shape, or odor, out of the soil or the atmosphere, so that two plants, of differing character, set in the soil side by side, will not err or interchange, is a quality of the soil, or inherent in the seed or cell of the plant, while interesting, is not, at this point, significant. No one has ever supposed it to indicate a faculty of intelligent reasoning, in the plant or the soil. At least it was new. There had been nothing like it in the inorganic soil.

It is plain therefore that among the plants life is limited in scope. It is ample and adequate, but it does not even resemble, except in quality, the life of humanity.

LIFE AMONG THE BIRDS:

Among the birds the type of life is still physical, but, more than that, it is conscious. This implies a certain power of choice, which varies in different birds, but includes a limited discernment; a power of comparison; a sense of direction; something much like memory; but it is, at best, greatly restricted. These capacities, whether small or great in the individual case, are not found in plants. The details and exceptions, of which there are many, are not important here. Those we have mentioned are illustrations of our point,—i.e., that life is of a variable character in different fields. Probably its nature is narrowest in plants, and rises higher and wider in conscious birds. Yet even the song of the birds, so-called, is in a narrow field. It consists usually of a series of a few notes, repeated over and over. A few birds can imitate the songs of others, but they cannot invent, much less compose, and their songs are characteristic in respect to type.

LIFE AMONG THE FISH AND FISH-LIKE:

Life is of a similarly restricted character among the fishes and reptiles. They differ from the plants in being conscious, but they differ also from the birds, for they are not, in a proper sense, vocal, and physical existence is supplemented among them by a very dull form of intelligence, chiefly exercised in self-defense, or in attacking their prey.

LIFE AMONG THE ANIMALS:

Animals differ greatly among themselves, but as a class they are not only conscious, and in differing degrees intelligent, but some have a capacity also for affection and attachment, in a very limited degree for their own young, but often far beyond that for human beings. Credible stories of this faculty among dogs and horses are illuminating. Some animals develop remarkable acuteness and a perception having an appearance of intelligence; but not always. To this writer one of the most absurd occupations which we find reflected in some scientific books, is an elderly scholar, in spectacles, trying to discover signs of human intelligence in a pet monkey. There is a story of a French naturalist who spent weeks in a cage in an African forest, hoping to get from the monkeys an intelligible language. He did not succeed. One of the funny papers reported that the only word he could recognize was "pa-pa." We need not discuss the animal qualities here, or attempt to classify them, or to distinguish between instinct and intelligence. We are only concerned with the fact that, as a class, they add another phase to the manifestations of the quality of life.

THESE COMBINED:

In the *plants* then we have physical life, with certain inherent qualities adapted to their type, and also to their distinctive character, but not conscious.

In the *birds and fishes* we have physical life, having certain qualities of discrimination; but here it is *plus* a limited consciousness, and certain defensive or characteristic capacities which approach intelligence.

In the *animals,* especially those most closely related to man, we find all the lower phases of conscious life, *plus* certain other capacities, quite superior, including strong and persistent affection.

LIFE IN MANKIND:

Highest of all is *humanity,* which is, now at least, in a class by itself, possessing qualities quite beyond comparison with any other. If in fact they arose from a lower order they must have attained from some independent source faculties which they could not have inherited, even if all the others were predecessors in a direct descent. These, however, are easier explained if we suppose humanity to have somehow arrived complete,—not necessarily adult,—as we are taught by science our earliest ancestor, the Cro-Magnon, did. These comprised, on first discovery, two children, a young man, a woman, and a mature man. They might have come in the same manner if we set it back still earlier.

These summaries will help us to grasp, and in a measure apprehend, the very *diverse* characteristics of life. It seems plain from these familiar examples that life was *devised for the purposes* to which it is found to be applied, and thus was a *plan,* flexible and adaptable, looking towards the formulated and defined uses to which it was to be put. The plan may have been embodied in the law,—for all we know. It may, as many believe, have been always under superior direction. It might, as many are convinced, have been both. The uses and applications of life, in so many variations and phases, present in a more striking aspect its wonderful elasticity than if considered in the abstract. If it had the characteristics of an accident we could hardly fail to find in one class some qualities better fitted for another. They have, on the contrary, maintained their distinctions. We have known instances of a man being called a shark, or a rat, or a pig, but these are epithets, more or less descriptive, but no one supposes them to be scientific.

ILLUSTRATIVE INSTANCES, FOR COMPARISON:

It seems desirable to pause here to mention certain elementary comparisons, which may lead us to a more definite conclusion.

Life in its working consumes nothing, and wastes nothing. It requires no new supplies of fuel, as the other forms of nature do, for nothing feeds upon it, or tends to reduce or consume it. It loses nothing and gains nothing when the body dies. While very real, it is ethereal, somewhat in the nature of an attribute,—or an essence,—as well as a personality. Certainly it is not matter. While the *body* survives, on the contrary, it must be continually charged or fed with appropriate fuel, as the furnace is, in which heat separates the constituents of matter; but it is well known that bodily supplies, being matter, are only changed in form.

"It is believed that matter as such is indestructible; that is, however it changes its form, or whatever reaction it undergoes, a portion of matter preserves its mass unaltered."—New International Encycl.—Matter, p. 248.

If any of the fuel supplies of the body were consumed by life it would have or acquire weight and substance, and there would be a loss of weight when it departs. There being none, even the least, it follows that life is independent, and can and does subsist, in some character or form, apart from the body.

THE HIGHER QUALITIES OF HUMANITY:

The human mind and spirit are, as we have said, independent of the body, even while united with it. These comprise, as we show elsewhere, the *personality* of the human individual, and operate with him and through him. They are not life, but, like it, they do not consume or feed upon or waste the bodily substance. They inhabit the physical body, but in their nature they are not perishable. This would be equally true if they were no more than an *attribute* of the body, but this would not fully describe either. It is one of the essentials even of the evolution theory that the mind and spirit were *supplementary*, and arose *after* the body was fully organized. It is this only which can support an intelligible theory of man, as distinguished from other living things not possessing these faculties. That such is the understanding of the evolutionist is stated by Dr. Julian S. Rumsey:—"Finally in man come the *new steps* in brain power which we call reason." Whether the theory of evolution can be maintained or not, no scientist who accepts it can doubt the existence of this feature, even if he does not know how it was attained. At the death of the individual, life, with the mind and spirit, ceases to function *there,* and cannot be transferred to another. We might here be easily led into discriminations and distinctions of a philosophical nature, which could not be decided; these would avail nothing, and elaboration is needless. We are considering life and its concomitants, the phases of personality, which are as real as matter, and we cannot permit ourselves to be diverted from the point—highly practical—as to what becomes of them when the body dies. If life survives the body, and gathers up with it those characteristics of personality which, in the living man, cannot be separated from him, where, how, in what condition do they abide, and in what association? Why cannot these, being distinct features of personality, and not dependent on the body for supplies, live apart when the body fails; and why, life and the qualities we call personal, being for adequate living in the earth each incomplete without the other, do they not both survive; and why should not their habitual companionship continue when the body dies? If they may not operate independently here, why should they ever separate, while both survive?

We may draw from science another illustration of the superhuman functions and qualities of life. Our sun, the parent of our unit system, is now extremely hot,—60,000,000 degrees of temperature *above* zero, at its center ("Stars in Their Courses," p. 36); but outside, apart from that radiating heat, 486 degrees (Fahrenheit) *below*. The scientists estimate the sun's age at millions and millions of years. This, it is admitted, is not supposed to be accurate; but it is not without a basis, though it is inferred, and not observed. Astronomy is a mathematical science, and its estimates of time are founded in part on geologic conditions, such as computations of the time required for the ocean to become salt, or for the mountains to be lifted up; and partly on measurements of the speed of light, and the positions and distances of the stars. We are asserting nothing about the sun's age, but take the astronomers' estimates as a starting point. Different estimates of time, larger or smaller, would not affect our present point. The sun must feed upon fuel, which it must consume with immense rapidity. It is white hot now, and is expected to continue to radiate light and heat at about the same rate for millions and millions of years still to come. This is Dr. Jeans' conclusion, set forth by him at length in "The Universe Around Us," p. 334. Where does the sun's fuel come from? Not from the gases outside, or the whole of space would be aflame. A fragment of a broken star, or a floating body, or a meteor, of which space is full, falling on the sun, is burned up at once, and converted into gases. Even our own earth, 93,000,000 miles away, would be burned to a cinder or liquified almost at once by the rays of the sun, but for its atmosphere and clouds. From Dr. Abbott, "The Earth and the Stars," pp. 43-44, we quote:

> "If the sun shone as it does now, but on a cloudless earth, without atmosphere, the earth's surface temperature would go to boiling by day and below frozen quicksilver by night, as it does on the moon. Our equable climate is produced by the tempering effect of air and water, vapor and clouds which it always contains."

Dr. Jeans ("Universe Around Us," p. 174) avers that the sun has a source of continuous fuel supply which has enabled it to survive, as he reckons, "a million million years"; and yet it has been, he thinks, all that time radiating away its mass at a rate 650 times the rate at which water pours over Niagara Falls. And he computes that if it had no supply of fuel outside its own mass it would exhaust itself "in a few thousand years at most."

Whether there be a tenable explanation or not for the sun's supply of fuel, the fact of its own continuance, and the continuous supply of its fuel, makes it hard to say that life and personality could not also be fed with "food convenient for them," even if, while in the body, they found supplies there. This is only an analogy, but it could not be even that if it were not supported by authority and reason. It is beyond dispute that there *is* an adequate supply, and therefore a *source* of supply, of the sun's fuel; and no one admitting this can deny, we would suppose, as a proper inference which any intelligent person could draw, that this may also be true of the high personality of humanity.

CHAPTER II

MAN AND LIFE: IN COOPERATION

A LIVING *man has,—or is,—two kinds of being; he is flesh and bones, which are matter, and destructible; and he is alive,—which matter is not. He has faculties quite beyond the bodily senses, and these we call personality. So far as we can see none of these is destructible. When the body dies they do not return with it to inorganic substance. What becomes of them? This chapter is intended to discuss these questions*

CHAPTER II

Man and Life – in Cooperation

MAN and Life,—or rather Man-Living,—took up a residence in the earth as one might enter a mansion prepared for him, complete, with its furnishing. You will remember that when the friends of Admiral Dewey, after the battle of Manila Bay, desiring to present him with a residence in Washington, approached him inquiring whether they should buy one or build, he said he would rather buy one complete, "so he would have nothing to do but walk in and hang up his hat." So perfect was the condition of the earth when man arrived, and so complete its equipment, that it would be hard to conceive of anything lacking. It would be equally hard to conceive what further advance, as an inorganic body, it could have made if life had not arrived. It would have hung there, perhaps until the great cataclysm, whenever that should be; ready and equipped, but never used. When man came, the adaptation was so perfect as to answer, we might suppose, those who think of it as an accident. There was no room for an accident. There was at stake a valuable use, if life arrived; a total waste if it did not. But it did.—Life had a function, and it found the earth fitted for it. The converse was equally true. It suggests the tablet, broken, one piece handed to each, to be used for identification; each half fitted into the other; and yet some hesitate to draw the inference which seems inevitable.

There are those who doubt, if they do not deny, a previous plan, a current control, or guidance from without, either in preparation or use.

It must be admitted that either is hard to apprehend; but any suggested alternative is harder. Only three occur to the writer. They are these:

1. A law made in advance. Even a law, so endowed, would be a marvel in operation; but this leaves open the intelligence required to prepare it. It may not require supervision, after it has started; but some provision must evidently be made to set it going. This includes a *first* cause, and also a *proximate.*

2. Supervision. This means a plan to begin with; a purpose to be attained; constant guidance, to maintain direction, and constant pressure to maintain power.

3. As an alternative, *no* purpose, *no* defined outcome; *no* supervision; but even this must contemplate an origin; for if all had been left to chance motion would never begin.

Possibly we have overlooked something. Let some one else try.

If we are thinking of life as having no law, and no guide, we will meet at least one more embarrassment, i. e., life itself is very complex, and has many faculties, but in practice we find it directed by the will. Seeking to know its quality, we can best judge what it could do by what it did. It *must* put forth efforts to find the earth, and it did. Since this was no accident, it was either intelligent or intelligently controlled; *secondly;* it required *pressure* to acquire the necessary movement and it was found: *thirdly;* it was capable of moving in every direction, but only one would be right, and it found the right. Could these, and the multiplied changes requiring choice be maintained,—or even initiated, without a plan or a planner? Direction, speed, location would be difficult. The right turn, at the right place, would be a recurring problem. It would be sure to err and stumble if it had no supervision; and our experience shows that maintained perfection would not avoid error. In the ordinary changes needed to find the fit place to fall, the fit contacts to make, the fit distinction, life, without a plan, would not have had a gambler's chance to emerge at the one place where it could survive.

What conclusions do we draw? Perhaps we had better not draw any. Had we not better go back to our fundamental, mentioned on an earlier page, which we did not make, but found ready to our hand. There we reached the conclusion that everything *had* a cause; and that every cause not found to be natural must be supernatural. It is a comfortable doctrine. Why should any one wish to evade it, unless he could suggest a better? Yet the temptation seems great, even in science, to look for an underground passage, for,—to the reluctant,—the surface sometimes appears stormy.

With this preliminary, we take up again the story of the most significant incident in our history of development,—i. e., the advent of life. Man, physically, was built up from inorganic matter, and if life's coming had been later he, in spite of his mechanical perfection, would have been, in the meantime, no more capable of self-impelled movement than the body of dead substance from which he came. He never stood alone, and never could. His body is unique. Many a man has tried vainly to describe his complex of flesh, bones, muscles, nerves, blood,—his wondrous mechanism for seeing, for hearing, for touching;—which, in a blind man, often serves as well as sight;—all inactive until life came, but afterward self-impelled. The body is no more flexible than before, but it moves now. It answers the will, and the will follows the persuasion of desire; and desire that of emotion; and emotion works in with other faculties which were not there before. Some are involuntary, but mould themselves upon other patterns which one cannot explain. Can you tell a blind man how to smile? No, but you may call up the *wish* to smile. He cannot even imitate a smile, for he does not see it. The desire moves from within. Can we tell you how to distinguish between flesh and spirit; no, but you know; and this is the difference between matter and life. Both are true, and yet distinct. Do you wonder that the scientist labors in vain to explain life. Dr. Newmann says no one can, but he can describe what it does. This is only a picture, and very inadequate. The body, which was inert, has become alive. Well, we can't describe it; we can't even picture it; but it is very real. Where did life come from? Dr. Jordan says of it:

> "All life, so far as we know, starts from life; and every living being had some living ancestor."

This is true, and it looks learned; but it explains nothing, for it ignores the start. Body and life are different essentially, and they differ in expression;—but in humanity they are launched together. There never was a man not thrilling with life; in degree they may differ, but not essentially; and life was never visible or tangible without the man. If they did not come together, they, at least, became conscious together.

It means something, then, when we say that body and life *cooperate,* while the body lasts; but the body is *perishable,* and life is *not.*

Even this is not all; we have been doing man a measure of injustice in speaking of him as but *two.* He is *three.* He, as a body, cooperates with life, but life has *two* characters. One is mere existence, and the other is the sum of those qualities of humanity which are neither matter nor sense, nor mere existence, and these make the man individual, and also unique, for there never were two alike.

MAN HIMSELF; A SKETCH IN BLACK AND WHITE:

Man is therefore a triple entity. In a sense to be, perhaps, easier apprehended, he may be said to be a partnership of three; one is the carrying capacity; one is the managing director; and the third is the cheery salesmanship. Every normal man is so compounded, but these elements vary in quality, and in distribution, if not in kind. No two are alike. In the world there are at present some 1,800,000,000 individuals. All have the same number of limbs, arms, fingers, and toes. They average five and a half feet high; they have about the same features, set in a countenance of about the same area; a "benign countenance,—seven by nine," the wit called it. Dr. Lull, of Yale, says, in a passage quoted elsewhere, that no two are in fact alike. He is speaking of form and feature, but they are different equally in those qualities we have called "personality";—strangely different. Some are stern, some are kind; some are generous, some miserly. Perhaps you read of a recent burlesque, at which an eminent congressman, of variable manners, was introduced,—by proxy,—as temperamental,—95% temper, 5% mental. Yes, they differ by fractions, and alas also by those things not reckoned by fractions; and, more by these than by those, the man is generally best known. You admire him, or you don't; you trust him or you don't; you hate him or you don't. Says an old catch,—differently phrased:

"I do not love thee Doctor Fell;
The reason why I cannot tell;
But this alone I know full well;
I do not love thee, Doctor Fell."

THE NATURE OF LIFE:

Every individual person or item, plant, man, animal, bird or insect, has all the life it can contain, and no one makes gain or suffers loss by division of life with others, or by comparison with others. When a man dies his life ceases to operate visibly, even if it does not cease to exist, but it does not pass to his neighbor. In this respect it is specific. It is general in the sense that while the human population of the world dies three times in a century, life is uniform everywhere, with no visible increase or diminution.

In the past there must have been a time when life was not, and another time when it was. Before that time, matter, though ever so complex, had no function except to exist, and its perpetuity, or its long or short life, would make no difference. It was not even aware of its own grandeur. But with the arrival of life, matter also, not only the flesh and blood, but the body of earth which sustained it, was raised to an enormously higher level. It now had a call, a significance and a purpose. Its continuity and persistence became important; and now we, who are of that combination, want to know what we may still expect. We have no direct evidence on the question of the perpetuity of life, but in science there are analogies which may throw light upon it; and these, and the results to which they lead, must be considered.

The story of life and its quality of persistence seems to indicate perpetuity. Life is not dependent for power to act on pressure from the outside. It *initiates* motion. It *adds* to matter the automatic quality, as well as the element of consciousness and personality, which it lacked before. A prolonged existence, which means nothing at all to mere matter, becomes an earnest desire in fully constituted humanity. Such a future, though not certainly known, is not beyond even the purview of science, for life and its companion qualities are not material. This may, like the nature of matter in its earlier stages, be best judged by deduction from the experience and observation of the present and the past. Conclusions must be inferential, but so must our most assured beliefs as to the origin and destiny of matter. Evolution, as a theory or a fact, has no bearing on this. The one thing science is least sure about is life,—its origin or its nature; but this is not to say that it has no laws, nor that their future operations cannot be judged by the past. It is governed by its own laws. We see it in action, and find that effects follow causes as inevitably as in matter. Thus its future is predictable, and continuity and persistence, according to its nature, are as certain as in matter. This is our basis of judgment in both cases. Starting with the present, science, as well as religion, finds in the things that *are* and have been a basis for an estimation of the things that *are to be.* The laws of nature were not altered by the arrival of life. They were expanded, to meet the new conditions, but nothing has become more certain than that law governs in both fields, and the will of man can neither compel nor resist it.

MATTER AND ITS PROBABLE FUTURE:

Having a beginning, will matter also have an end? Is it longer than life; or is life longer than matter? must both fall together?

In the abstract, matter and life *may* be conceived of independently, but not completely, for as we observe them they are always related,—even intertwined. Considering matter *first,* we observe that in a continuous succession of changing forms, up to the body of man, it *existed* first. While in its independent existence it contained the same elements as now. The forms have changed, but in essentials matter is the same, even since the arrival of life. Flesh and blood and bones are in a new *combination* in man, but they are still matter, and the elements are the same. In its form, as flesh and blood, we know the body is mortal, for we have seen it die, and it never returned. At death, in the course of time, it was again dust. Its form changed, as it had often done before,—but it took nothing with it. Continuity therefore, as applied to man, means continuity of *law,* which persists as long as any of his triple elements continue. Continuity of substance is temporary; it terminates at one place; continuity of that which is *not substance* terminates,—if at all,—at another. Law governs all, but the law differs in endurance. The body, which is matter, has visible form, and tangible substance. Life has no form and no substance. It is not recognized by the senses, but it is equally real, and equally individual. It has no form, nor dimensions, and we have already seen that it has no weight. It has, so far as human observation can go, only essence. For want of a better description it may be called ethereal. Without casuistry, therefore, and using only the human faculties of observation, we note these differences between matter and life:

a. Physical man is a re-formulation of elements of matter previously existing, *selected* and *organized,* and *equipped* with facilities which we call the senses, for selection and coordination on his own behalf.

b. A *time limit* was built into his body when it was organized. He was mortal from the beginning; so that the law of prolonged continuity and persistence applies in full only to his essence, as we have described it.

What then do we know about their union? Did life exist first, and await the arrival of the body of flesh and blood, or were they concurrent? This is not hard to answer. If life came *later* there must have been a time when man, though mechanically complete, was inorganic, and incapable of self-impelled action. He would be flesh and blood, but inert, and as dead as he would come to be when life departed. If life came *first,* and must await the arrival of man, it is the unanimous voice of science that it could not have survived. There was therefore no *hiatus.* Whether life descended on man as an adult, as some say, or began with his beginning, in a single cell, and inhered in every stage of his growth, they were always inseparable, except in a kind of philosophical casuistry. We have dealt with the question as if it were one of logical solution, but only because others have done so, and because we wished, by elimination, to show that while the two cooperated to make man, as we know him, they never merged into one entity. With this in mind, it is easier to see that life *might* continue after the body had returned to dust. If so it remains to be seen only whether, judged as science judges, it *did* and *does.* We therefore reduce the proposition to three queries, all of which may be answered:

One: Will the material substance of the universe ever go back to vacancy, where it began?

This is important because we are aware that when the body dies its substance falls back into the general mass.

Two: Our second query involves the same question, but in respect to man *as a whole,* including those higher qualities in which other beings do not share. If we are right, life is *released,* but does not die.

Three: This inquiry relates to life *after* the body dies. Does life continue, and do those higher qualities we have described also continue?

On these subjects we must not speculate, or at least we must not slip away from our anchorage. Yet we may and must *infer*. History, always living in retrospect, is built up by interpreting known facts. We must always keep close to the course of nature, and we may depend on the inevitability of laws. So to a large degree the future may, though in *anticipation*, be correctly judged; for there also what we know of the present and the past is fundamental. This writer, as reviewer or historian, is subject to certain limitations of which he is aware, but he ventures to believe that he has ground enough to press his queries into the long future; and hopes to find in the facts of the past and of the present a basis for helpful inference; and he believes that his conclusions will not be out of harmony with the known facts of science; and so he goes on, with courage and hope derived from the past, to pry into the future. This, even if not research, will not be unscientific. Scientists of eminent standing have not only sought to judge of the future, but have, in terms, claimed that subject as a part of their field.

Dr. Jeans, in his Introduction to "The Universe Around Us," p. 9, says:

> "A considerable part of the present book will consist of an attempt to foretell the future, and predict the final end of the material universe."

Dr. Eddington, in "Nature of the Physical World," frankly ventures into the same field, and discusses it freely, considering not only matter but life.

A COMPARISON AND A CONCLUSION:

If man consisted only of matter the question of his future would be no different from that of the mass of the universe. When the body dies it falls into the total mass, and ceases to be distinguished. Its substances combine with others, and recombine, as the elements are crowded this way and that, and they will so remain until the body of matter disappears, if it ever does. But such is not the case with life. Man, as a being, did not subsist at all until life came. Out of the general body of matter was, somehow, sifted and selected the portion adapted for him; but this would have availed nothing without life, even if we can conceive of due selection and shaping into form. The details are not significant here, beyond the suggestions on preceding pages, except enough to show that the living man is a unit, composed of matter and life; but life, in this connection, is more than a description. In it all the faculties of mind and heart of which man is conscious arise and inhere. None of these is found in mere matter:—will, judgment, intelligence, the capacity for affection or hatred, the apprehension of the beautiful, imagination, memory, and many other qualities which we all know and recognize. These came with life, and belong with it, as found in humanity; they never existed separately, and we cannot tell where one stops and the others begin. Some suppose them to be a part of life, in its human aspect, and this may be true. It does not affect our present question. They are all as invisible and intangible as life itself. Nothing to compare with them, or even do more than suggest them, was ever found in matter, nor in lesser beings, except in the limited aspects we elsewhere mention. These are a part of life,—bound in with it, and by it contributed to the union. Will death separate them? This discussion will be later continued to a conclusion.

LIFE AND ITS PROBABLE FUTURE:

Life has many aspects in which it differs from matter. Some have been mentioned. Others may be considered here. When separately considered, whether alone or in combination with the higher faculties of humanity, it has a limited field for action. It is never found in simple, elemental matter. It often clings to substances with which it has affinity, lodged, for example, in the crevices of a mass of matter; or spread like lichens upon its surface; but the lump of metal or crystal or rock remains inorganic and lifeless. It is said that carbon always accompanies life; and from this some have argued that carbon *explains* life; but this does not follow, for nobody claims that life is *found* in carbon. A living plant or animal may gather up inorganic substances, in highly triturated form, and build them into its own frame in manifold ways, but when it dies the matter will remain, inorganic as before, and again and again combine and recombine, with the same effect; but the life these helped to support, or which supported them, is gone.

The death of a *man,* once living, suggests still another characteristic of life; i.e.—It is not individual, or separable, although found in many scattered living things. It is not only no part of a man's body, but no part of his estate. It is not gained by the residue of humanity. The total is not diminished nor increased. Even when a generation has died and been buried, life as a whole has lost *nothing*, *either in quantity*, *in its* universal spread, or in its quality or power. The human body weighs not a hair less when life has departed.

> "A given bit of protoplasm weighs precisely the same after death as when alive."
> (Prof. Newman, "Nature of the World and of Man," p. 166.)

In the spot where a man died and was buried there may arise living things, of a different character, mosses or grasses, or flower or shrub or tree;—perhaps smaller or larger,—but certainly not the same as the human decedent whose body is laid there. No human body will grow again that way. The same is true of the body of a beast or a bird or a reptile or a fish. We must note here the distinction in the case of plants. When a plant dies, in which the nucleus of life is in its seed or sprout or root, it *carries into the soil with it* the cell of new life, and from this will, normally, spring up another of *like kind*. This distinction we think does not affect our proposition that in humanity, life, and all the qualities that accompany it, unique in the fact that no two are alike, survives somewhere and somehow, after the death of the body. The plants, by reason of their different nature, each repeating its own life, which man does not, are merely left out of the analogy we are describing. Perhaps a more extended reference to it will help to explain the different characteristics of man.

THE PLANT AS AN ILLUSTRATION:

There are one hundred and fifty thousand species of seed-bearing plants, says Dr. Coulter. These and others of similar character, by spores or roots, carry with them into the soil, when the plant dies, the cell of a new life, *of the same order as the dead one.* This is condensed from an abstruse subject, but is enough to serve our purpose. Aside from its bearing on the present question, does not this help to answer the contention that plants and animals had a single origin? When carried out to a logical conclusion, which we cannot do here, it becomes evident that they *had not.* But here we return to our inquiry into the effect of combining matter and life.

We quote Dr. Huxley's explanation of the relation of the organic to the inorganic, to which we have referred above. He says:

> "The plant gathers these inorganic materials together and makes them up into its own substance. The animal eats the plant and appropriates the nutritious portions to his own sustenance, ejects and gets rid of the useless matter, and finally the animal itself dies, and its whole body is decomposed and returned into the inorganic world. There is thus a constant formation of organic life from inorganic matter, and as constant a return of the matter of living bodies to the inorganic world."

But there is still another and even more striking quality in life. It fills entirely *the capacity* of every living thing, however they may differ. If it be a plant, normally healthy, this is especially noticeable. If it is a fruit bearer life permeates it to the very tip of its leaf and bloom, and is visible in the color and texture of its fruitage. If it is a flower it furnishes the beauty of the coloring and the perfume it breathes forth, and the reproductiveness of its pollen. If a mere weed, with neither fruit nor flower, life is still visible to the very tip of its leaves. So with the bird or animal. While it *lives it is exuberant; its eyes flash, its voice is lusty, and in its general habit its activities are peculiar to itself. But when it is dead this is gone; nothing remains but substance, which is swallowed up in the mass of* the earth, and in due time may attach itself to another round of life, not necessarily like the first. In the non-human individual life has no function when the body is gone, for it never possessed those qualities we here call "personality." The mere continuance of life, in such a case, would be an abstraction,—somewhat, we might suppose, like the abstract power of electricity, with everything forever gone on which it could operate.

ANALOGIES AND INSTANCES:

Life in the human being, with its coordinating qualities, has a resemblance to a faculty,—a property,—an attribute. Like these it does not necessarily lose its function when the body dies. Everything that made the human individual characteristic is gone, and it certainly will never return, but somewhat like a force or faculty, as magnetism in relation to matter, it is not dead. The body at death has lost visibility, and may have lost activity, but no other living man is greater, or wiser, or better by reason of it than before. What has become of that mentality, that affectionate spirit, that memory, that inspiration, that will, that purpose, that power? So far as we know, no one else has succeeded to them, and the case is not different if the body is not dead but weak or feeble, for they do not rise or fall with the condition of the body. We have seen, by many instances, that life and all its cognates are often at their best when the body is frailest.

Man has, like other living things, five physical senses, which are his means of contact with the world of matter; but they can go no farther; their scope is limited. Behind them, and coupled with them while he continues, is the thinking capacity, which interprets them somehow to the will, and this alone can utilize their conclusions. Man's hearing or his vision may fail, or his touch, or taste, or sense of smell, but the man himself, in those superior faculties, loses nothing while life survives. Since these have their visible expression in muscles and nerves, their conscious use may be reduced, but we have evidences that their *capacity* remains. In the writer's book, "The Theory of Evolution,—An Inquiry," this topic arose, and instances were mentioned where several of the human senses were wholly lacking, but the loftier capacities were developed to a high degree. Helen Keller was named as an example. They are referred to here to show that life has in humanity a stronger affinity for its sensibilities than for its senses, which are of the flesh, and must perish with the body. If they, reckoned in groups, for they so belong, can be so independent that they can function alone, may we not soundly infer that not only life, as an abstraction, but those higher faculties with which it interweaves, do not, or need not, perish with the body? This is not physical proof, to be sure, but it is a sound analogy, and shows, we believe, that as life did not rise from a lowly stage, but descended on each man complete, it may be independent of the body at the end also. Neither life nor these higher faculties can follow the flesh and bones to an inorganic state. We are safe in saying that neither can die. At most they can only cease. While in operation they are to be judged *by what they do;* and this is no harder to apprehend than the nature of the electron, of which the universe is built. It can be recognized by results, but not by the physical senses, even when aided by our complex devices.

Visibly, even in inorganic substance, there are properties and qualities *not destructible.* Magnetism operates with or upon certain substances, but not all. Applied to others it is inert, though not dead. It is hard to describe. Dr. Osborn treats it as an "ultimate" faculty, which cannot be traced or described, and he ranks it with life. Some substances are ductile, and others fragile. Some are easily converted into gases, and others not. Some, sensitive to electricity, are known as conductors; others are obstacles to the flow of electricity. Electrons are charged with positive electricity, and protons with negative; and neither will show its effects without both. Those qualities are not matter, but only *properties* of matter. In important respects they differ from life. Electricity and magnetism may shift from particle to particle, but the human qualities cannot. Where and what are they when the conditions are adverse? Are they *dead* when action is suspended? Our answer must be no. Whatever difficulties we may find in definition and explanation, the fact remains.

If then the superior human faculties *must* die with the body, it is by virtue of some different law; and it would be not only most unfortunate, but most out of keeping with the other laws we have mentioned, for there will remain undeniable powers and processes of nature, unused, and unexplained.

THE QUALITIES AND CAPACITIES OF MATTER:

Electricity, magnetism, centrifugal repulsion, centripetal attraction, energy, light, heat, et cetera, all operate only in connection with or out of the elements of matter. While alone, matter does not *produce* energy, nor light, nor heat; and no force or quality is evident on the surface. These are the *effects* of vibration or friction, and thus may cease if the force ceases. The cessation of operation, in such a case, if permanent, is analogous to the death of the body. What becomes of the *qualities* of matter when severed? They are not dead, nor their capacities altered. A renewal of the vibration or friction in matter starts again these intangible forces, and if one body of matter is removed another may take its place. A new contact between cut or broken wires opens the way for a renewed flow of electric current.

Electricity, a quality of matter, having become inactive in connection with a specific body of copper, may, as suggested above, be set up again in connection with a wholly different mass of any matter which is a good conductor. Something much like this is true of gravity, or magnetism. In other words there is no *personal* reaction between any particular force or quality of matter and an identifiable *mass* of matter, however easily they may work together. They evidently do exist apart.

These instances in the world of matter illustrate our proposition that life has an independent sphere of its own, and *may* (at least) survive without the body. But life and these qualities of matter, though similar, are not alike. Electricity will operate freely through a different body, if only it be a conductor; but life, in my brother, or my friend, or my enemy, is not *mine.* It cannot leave *him* and operate happily in *me.* In respect to man it is individual and personal. While *his* it is *him;* while mine it is *me.* This is equally true of those human qualities we call *personal.* The qualities which constituted Shakespeare, as the world knew him, could not, at his death, be divided up between Nero and Judas Iscariot.

THE FUNCTION OF LIFE:

The burning bush of scripture, which it is said Moses approached in wonder, "to see why it was not consumed," has its counterpart in science, which does not deny the facts, but can find no explanation. The effect of these intangible forces is visible, but not the cause. Dr. Millikan is investigating now the possibility that "cosmic rays" supply the wastage of fuel in the sun and stars; and this is furnishing to the speculative a basis for a theory that even matter is eternal, and capable of constantly supplying its own fuel. Nothing but a miracle could explain that, if it is found to be true. Something must be added, if so much is to be subtracted. But life is a greater miracle than mere continuity in matter, for it persists and operates without food or fuel, and has no time limit; and equally, and in this respect altogether like it, are those higher qualities which color and adorn it. We cannot conceive of an answer as to life which would not also answer as to them.

Let us summarize briefly:

1. In normal humanity life never appears alone, but always accompanied by, or associated with, the group of faculties which we have called "excess," or superior. These are equally intangible. They are like life, in that their nature can only be judged by what they do.

2. Normal human personality begins at birth, and continues during the whole period of physical existence. The things life and its coordinating faculties *do,*—being the things by which alone their character and quality may be recognized,—lie within that period.

3. Nothing we can see in them, during that period, indicates or even suggests a time limit, and many things convince us that they are not mortal,—but the body is, to them, a mode of expression, and not vital.

4. Physical *existence* may be said to begin with the earliest life cell, but the *functions* of the body begin at birth. Life is present in both; it is ample for the infant's developing and advancing needs; but it is mature only as the individual progresses. The "higher" faculties enlarge and expand also, as progress is made toward maturity.

AN APPLICATION:

This doctrine is broad enough to cover the question of *identity;* so that the *group* of these higher faculties combined with life, can be expected to remain afterwards, *in like association.* Must they, or *may* they, drift apart, and settle as it may happen. Individuals are not alike, in form or quality. My neighbor in the next block has tastes and habits of thought and aspirations different from mine. Life operates in him as it does in me, but the grouping of faculties and desires is not the same. If we should die on the same night would they,—could they,—intermingle. If so, thenceforth the individuals, assuming their essence to survive, will not be the same. These are answered if we are right in our proposition that *all* the qualities of humanity which we have called *personality* are grouped with life,—or are a part of life,—in every individual, *peculiar to himself.*

RESULTS:

1. The human individual is a combination of qualities,—one material, and the others conveniently called ethereal. At death the material, which is mortal, with an average life of a third of a century, is *withdrawn,* taking with it the mechanical system, *in toto,* but nothing else, for the intangible faculties are fitted to survive.

2. If the death of the body be instantaneous, as by a gun shot or an accident, life and the higher personal qualities may have been at their highest and best. If the latter did not survive it must be because they *could not exist* apart from the body; but this would make them a mere *property* or *quality* of matter; and even this with a restricted effect; for, as we have seen, the "properties of matter" merely cease to operate, temporarily, *until conditions change;* they may operate with equal efficiency in a new relation; whereas the others have acquired a group identity. While the two therefore can be compared, it is only for illustration.

3. If the "personality" (with all that it comprises)

survives, it can only be under *conditions favorable to that kind of life.* What these are is not now before us, but this is no more difficult to apprehend than the original existence of life, and its adaptation to surrounding conditions.

4. It is the "ethereal" qualities that especially characterize the human individual; and these are not likely to die unless by some cause, or some disease, *applicable to life of that kind.* Of this science knows nothing; but science does look for laws applicable to matter, which are analogous. Such are these:

a. The movements even of the heavenly bodies do not, of themselves, slow down and cease. Dr. Abbott (quoted elsewhere) says they continue in motion, at the same speed, *because there is no friction to oppose them.*

b. Dr. Einstein thinks the movement of light rays is round and round, never reaching an end. This is persistence and continuity.

c. Dr. Millikan hopes to prove that "cosmic rays" furnish the sun with new fuel; he may find that they need not wear out, nor even cease.

5. Law governs, in all the fields of nature. Physical life is mortal by its nature, and even under the most favorable conditions it has a maximum; or so it seems at present. But gravitation, magnetism, attraction, repulsion, electric influence, and other forces are continuous. They may be interrupted, by disturbing or removing the substances with which they are related; and yet, even if so, their essence is not destroyed. Their physical expression may be changed, but not their quality or character, which will be equally efficient

when again united with any appropriate mass. Continuity of a *force,* therefore, after its tie to matter is broken, is a scientific fact, with its inherent qualities and characteristics. Is it hard to believe that this may be also true of humanity?

6. If there is anything deadly to life, or its concomitants, it is not now known. Nothing, so far as we know, *can* destroy it, or injuriously affect it. If it was not *dependent* on the body in life it may live without it.

It results,—does it not,—that the high qualities of life, and of those its high companions, survive somewhere, under favorable conditions, notwithstanding the death of the physical body.

CHAPTER III

LIFE IN ITS HIGHER ASPECTS

AN AUTOMOBILE *has, it is said, several thousand parts, all working, or capable of working, together. Each has its own function, but behind these must be the gasoline, whose vapor explodes when touched by fire. Still behind this must be the driver, and his operating mechanism. If you have one, and especially if you drive one, you will not find it hard to discriminate between the human body and the life which inhabits it. In this chapter we seek to apply this to humanity*

CHAPTER III

Life in Its Higher Aspects

ONE by one the units of humanity reach their maximum and disappear. As a whole they pass away at the rate of three generations in a century. New individuals appear, and fill up the ranks; and fewer individuals are likely to die for a long time hereafter, compared with the new ones born. The world was long without anything approaching a general census, and we had no dependable basis of comparison. The total population now is about 1,800,000,000 (Chicago Daily News Almanac, 1930). It seems to have been increasing during the last century or two at the rate of around 8,000,000 a year. "At no time since recorded history began," (says one authority), "has the increase in population been so rapid as during the nineteenth century."

> "The population of the earth's surface at the beginning of the twentieth century was proably about 1,500,000,000." (International Encyclopedia, "Population")
>
> "The population of the world in 1830 was but 800,000,000; today the world's total is 1,700,000,000." (Americana—"Population")

Some years ago an article published in one of our magazines stated that the total population of the world, as known to the Romans in the time of Hadrian, was 11,000,000. Outside of this were others, as we now know, but to an extent unknown. China, for example, had probably a civilization at that time ancient, but its population then can not even be guessed. It has now some 400,000,000, and all Asia about twice that. Whatever it was two thousand years ago, the earth is becoming crowded. With so large a number we can not only make better comparisons between now and then, but we can better observe what are the common human qualities. When the world populations were small, and only in part known, generalizations of this kind were speculative, but now the results are from known factors, and in substance dependable. Beginning with two individuals in the Cro-Magnon days, there would be now a very large number daily with wondering faces turned to the sky. In twenty-five generations, beginning with two, doubling each generation, the total would be about 20,000,000. In the 50,000 years since the Cro-Magnon sixty times that many generations arose, and a corresponding number of births. The present known population would probably fairly represent the survivors.

The number of those who have died is almost beyond computation. The point is that, in form and feature each was distinct, and had no analogue. This was equally true of the group of personal qualities each possessed, which could not die.

"My mother died while I was young," said a man of years. "Her face is before me now, though fifty years have passed; yet it was not her countenance that I loved. I loved *her,* and she loved *me.* If her higher qualities survive has she forgotten me? Is her affectionate spirit lost in the multitude of others whose bodies have also died? Why should her identity, which was so distinctive while she lived, be lost in the throng of those who never knew me? If the group of those qualities had no personal ties they might have shifted while she lived, and new ones been substituted, strange to her and strange to me. But they did not. Why should their character change. No, she is still herself, and unchanged, though she died also, and ceased to be. I was young when she died, and now am growing old. My countenance has changed, so she would scarcely know me; but my memory and my affections float away and linger around the old home, a thousand miles away. Has her spirit changed, while mine holds fast? Not unless it *must* have perished with her body. They were hers in life; why not now?"

Is not this a common experience; and does it not support our proposition, often stated, that when specific and conclusive facts are lacking we can and will *infer,* more or less justly and sanely, from other facts?

HUMAN LIFE IN TWO PHASES:

Every human being, whether his faculties are trained or not, possesses the best physical features and powers of the animals, *plus* a mentality and a capacity for spiritual apprehension not found in the lower orders. In the higher grades of humanity these qualities are the most conspicuous. All are individual, in main characteristics alike, but even in the flesh, in appearance, voice and manner they are almost totally unlike. We cite elsewhere Dr. Lull's striking statement to this effect. But their likenesses are as impressive as their differences; and in spirit the same is equally true. Every newcomer is endowed at birth, or even before, with life according to his needs, and the uses he can make of it; and this is without reference to his character or condition. There is not the slightest reason to believe that any one receives a *new* endowment of life for any emergency. This would be impossible; but everyone observes that life *expands* and *enlarges* to fit the growing body and mind. It is not unlimited, but the individual finds it always the same, and always ample. Human knowledge, which supplements and adorns his personality, is derived by education and experience,—but not so his life.

The resemblances between individuals of the same family, in summary as well as outline of features, are marked. This is usually the basis of recognition, yet each one has his own. The distinctiveness of voices, coupled with family similarities, making individuals recognizable, has given rise to the admission of telephone conversations as evidence before the courts.

It is not hard to see the bearing of this on our present theme. The differences or resemblances between individuals are not only physical. In the same family, in spite of striking resemblances, qualities and capacities and temperaments vary. Each individual has his own tastes, pursuits and preferences, but all have the same needs, and also all have the same or similar sorrows and griefs. All are affected and influenced in a similar manner by kindness and affection; and all are susceptible to hope and fear; but the symptoms and evidences are as different as the bodies. The group of faculties not physical is characteristic. They answer the call of their owner, but have only a family alliance with others. Thus every individual life is not only accompanied by but *includes* its own familiar group of personal qualities, and would not be the same if endowed with others of a different type.

THE "EXCESS" HUMAN FACULTIES:

These are not merely enlargements of the lower faculties, which might exist in other orders of life, but different in character, and supplemental. We have above dwelt somewhat upon this. Some scientists, perhaps to fit the theory of evolution, but more likely without noting the difference, treat these higher qualities as a mere *expansion*. This of course they could not be unless the rudiments were already there; and nobody knows how or why they came to exist in men and not elsewhere, or why, among them, they are so individual and so persistent. They can be trained, and have been. They can be indulged or neglected; minimized or exaggerated; but in an individual they are no less personal. An apt and competent mind was found in the Cro-Magnon at his first appearance; but this was then new, as he was. One may argue that if that break had not occurred a human mind would have been found developing; but this is casuistry; at most it is philosophy. It certainly is not science. Even this, however, is round about, and does not affect our present proposition, which applies to man, however he came to be. It must be admitted that mere *existence* is not personality, within our meaning of the term; and certainly *matter* is not. In all the true history of man it has been found possible to consider beings having these higher faculties apart from their physical bodies. One need not be, and ought not to be, lost in the other, though undiscriminating minds sometimes confuse the two. Both are very old, and both also very new. The divinities of the ancient myths are described as, in a vague way, including both. They were ethereal, and only partly human. They were at home in the air, in the water, or on the earth. They could appear and disappear,—anywhere,—on the mountains, among the clouds, in the closed rooms of houses— (penetralia) ,— in any form, or in changing forms. They could be worshipped anywhere, at any time. They could command the future; change the weather; give might to weapons, and health to sick bodies. On the whole it was these spectacular faculties, (beyond the physical), that distinguished them, and gave them character. With these were often intermingled traits conspicuously earthy. They are not a true example, but they indicate the mental attitude that conceived them. Yet each was distinct; each had his own name; was assigned his own functions; and only in the later years of paganism were they confused. Our point here is that the mental, moral and spiritual life has always been distinguished. The union with the body is temporary. The earthly part *may* die, and the higher survive. Though not alike, nor equally developed in different individuals, they have a similar *capacity* for permanence. They cannot be fed or clothed, and neglect does not destroy them. They may be sluggish or warped, or otherwise comparatively inefficient; but the important differentiating fact is that *they find no sustenance in the things* *that feed the body,* and are imperishable by any of the means which will destroy physical life.

We have described the phases of life enough to indicate our present point. We need press the comparison no further, if our picture has been truly painted, without excess or mere imagining; but we must apply this to our present inquiry. Science is *truth,* and if not limited in plain terms, its rules must apply in the field of the higher personality, as well as in that of the senses. We find no occasion to discriminate between the natural and the supernatural. The facts as to both are open to observation, and they can not be denied or mistaken.

We assume then that life was not an accident, in either the physical man, with life flowing in his blood, or the less tangible man, seen in those higher qualities which we call personality. What then, and of what nature, are these excess qualities? Are *all together* a part of a single endowment? We take it that no argument could prove that those faculties were a part of the life cell, and grew up like a feature of the body, as a wart, or a wen, or a roman nose. Evolution itself, it would seem, could not so suppose, since only one type possesses them, and the rest of the million types do not. Not a suggestion of evidence has been pointed out that such faculties could or did develop with the body. On the contrary they are described as "new steps in reason," as we have seen. If then they did not grow, where did they come from, and how does it happen that man alone acquired them? The Cro-Magnon, our earliest human ancestor, possessed them, and as he had no known ancestry he could not have inherited them. The writer of

Genesis also supposed them to be new, for he said that God "breathed into man's nostrils the breath of life, and he *became* a living soul."

But the *manner* in which man acquired his superior qualities, though important to correct thinking, is less important than the qualities themselves, and their relation to man's physical body.

SENSES, COMPARED WITH SENSIBILITIES:

If the reader will compare for himself his affections, his dreams, his hopes, and his aspirations with the staple things that satisfy his senses, he can hardly fail to agree with us on this point; indeed he is likely to travel ahead of our slow developing exploration, and have our question answered almost before it has been put. We have found, without proof, or if proof was needed, we have found the evidence more than enough, that beyond its senses humanity has *sensibilities,* and that these comprise and include many the hand cannot grasp, nor the eye see, nor the ear apprehend. The power to think, to consider, to compare, to judge, to decide; the warm impulses of affection; the love of the beautiful; the sacrifices of friendship; the joys of music; the appreciation of literature and art; all these are beyond the realm of the senses, and have no vital tie to the body; they comprise a unit, supplemental to the physical, but in close relation to life. They dwell with, and are tied to the body, but do not inhere in it. They operate independently. They have and are a type and character of their own. These are what we call the superior faculties, but they are sometimes described by the single word "personality." The most striking human differences are within that field. Our senses are our means of contact with the world, but the results of this contact, and its effect on the individual are wrought out and wrought in through those which are not senses. Each is conscious of his individuality, but no man can doubt that, as between the faculties he possesses, the intangible life is the master. A remarkable evidence lies in the capacity to think in terms of music and art, without the aid of voice or instrument; and even without full control of the physical senses. Beethoven was deaf, but his music charmed himself, though he could not hear it, and it has never ceased to charm humanity. Milton became blind, but he saw without vision more than his eyes had ever told him. Every great picture has been seen by its artist, with his higher faculty of apprehension, before his brush has touched the canvas; and every great composer has heard his own music in his consciousness before a note was written. None of these higher sensibilities has any close affinity with the bodily senses, nor are they mutually dependent. On these the death of the body, or the inadequacy or weakening of bodily powers, can have no effect. Blind Tom, the negro pianist, was an imbecile, but his sensibility to the charms of music, and his power to reproduce it, were the marvel of his day. As a man he was only an animal,—"it,"—but in certain apprehensions quite beyond the average man with all his senses acute. The life of most poets is lived chiefly in that higher sphere. Oliver Goldsmith was an example. "He wrote like an angel," said Garrick, "but talked like poor Pol."

Many live almost in ecstacy in that higher sphere, though the body may be ill-provided. Mozart, at the age of seven, got up in the night to play on his father's piano the musical phrases which sang in his mind. He produced the most captivating music, and his life floated in those higher reaches, but his bodily senses did him poor service. He lived and died in poverty and neglect, and was buried at public expense. Even his grave can not now be identified. His body received but slight recognition, but his higher life was in the clouds. Yes, it seems plain that the higher joys of humanity are not physical, and that life may, and we believe it does, furnish to human beings a hope for long survival of their sensibilities, after their bodies have gone to dust. Is this unscientific? Not if science is truth, and not unless we are deceiving ourselves about the underlying facts. We are aware of the possession of the high qualities we are calling "excess,"—beyond the senses,—and no one could convince us to the contrary. Tarzan is fiction;—the creation of an overheated fancy. No human being, we suppose, would like to be reduced to the state of a beast; still less to the status of both beast and man. It is not easy to apprehend the mental attitude of men who accept, without impelling evidence,—even at times without any,—the theory that they arrived by that road at their present high estate,—still less since they do not, even thus, avoid the miracle of life, or the miracles of special gifts by the way, conferred on them, but denied to other living beings.

When existence becomes a drag, and the strong body has failed until it is no longer equal to the ambitions of the eager spirit, many a man dies patiently, if not cheerfully,—hoping,—perhaps only vaguely, not for rest only, but for greater activity. Only a few,—if any,—could submit consciously to extinction.

"His bones are dust, his good sword rust, but his soul is with the saints, we trust."

Such and similar inscriptions are found everywhere, carved in stone, or engraved on the tombs of the dead. They indicate a widespread belief that there is a difference *in kind* between sense and sensibility, Apprehension is often more convincing than argument, and such a belief is itself a kind of proof.

Science must take things as they are, and judge them according to their nature, and this often includes physical effects which can neither be seen nor felt nor traced, but cannot be ignored. There are conditions in things physical and things not, which, the writer thinks, operate in a similar manner and teach this same lesson;—intangible but real. The words of Jesus to Nicodemus state a very simple truth, as certain as physical existence, and equally well known, though often forgotten:

> "The wind bloweth where it listeth," he said, "and thou hearest the sound thereof, but canst not tell whence it cometh nor whither it goeth."

It is no departure from true science to recognize the existence of high qualities, the *effects* of which we can see, and to know them as certainly as we know our friends and ourselves. We are very dull if we do not recognize mere sensibilities as comprising a new enfolding unity, with every element complete, capable of living on in conditions and surroundings adapted to them, of which we may know nothing now. How could the questions which science itself asks be answered otherwise? No one except the temperamental cynic, who is an anarchist by choice, could fail, we think, to catch the spirit, at least, of the man who wrote this:

"Life we've been long together
  Through pleasant and through cloudy weather.
'Tis hard to part when friends are dear,—
  Perhaps 'twill cost a sigh, a tear.
Then steal away, give little warning,
  Say not 'goodnight,' but in some brighter clime
Bid me 'goodmorning.' "

ILLUSTRATIONS:

There are various instances which may be used in illustration. Abraham Lincoln's body has been dead and buried these sixty years, but probably he was never so real in life as he has been since. His signature authenticated his proclamation of freedom for the slaves, after many postponements; but his personality, his mental and spiritual faculties, had acted first. Experiences required delay, but the world of sentiment and sympathy had caught the idea, and waited impatiently for its embodiment. Yet only a few had ever seen him, and many who had seen him knew him so slightly that his death was a mere incident.

He was shot at the height of his powers. In his heart he cherished "malice toward none; charity for all." In his spirit glowed the patriotic fervor that emerges in his Gettysburg speech. The bullet that killed him did not touch his mind or his heart. None of those high qualities which made him personal, and which we deem immortal, are with his body in Springfield. Where are they? He expected them to survive. The uncertainties of life, and the prospects of a long hereafter were often in his heart, and on his tongue. These elements of his being were never in fact dependent on his body, and of this he was aware. It is quite true that his beliefs are not evidence of verity; but in him, more than in most of the great figures of history, the distinction between matter and spirit stands out in clear outline. He staked his own beliefs on revelation. We are contending that the same is taught by science.

So with Napoleon, as illustrated in the familiar story of the wounded soldier, under operation for a bullet wound in his bosom, who said to the surgeon:

"A little deeper and you will find the Emperor."

It was not Napoleon's unimpressive exterior that the soldier loved. Perhaps he had never seen him in person. Was it not then the superior qualities, not earthy, which drew the soldier's affections close to the Emperor. Napoleon did not know the soldier, but the soldier knew him, and that was enough. Men have sometimes differed about the explanation, but not about the fact, of separate continuance. Mark Antony said, speaking over the body of Cæsar:

> "The evil that men do lives after them; The good is oft interred with their bones."

Euripides was of a different opinion, but used a like simile. He said:

> "When good men die their good does not perish, but lives when they are gone. As for the bad, all that was theirs dies and is buried with them."

Good deeds, merely, would continue no longer after death than before. Their effects would,—and their influence, but there could be no such thing as gratitude or appreciation if there was no continued mingling of spirits; and this, we take it, interprets those passages to intend rather the personal quality, which outlived the actor. Even more than this is the commendation of the dead in the familiar language of scripture:

> "They rest from their labors, and their works *do follow them.*"

Perhaps it is sound and true to say that what they do and what they are,—both evil and good,—live, and outlive them, when their bones are buried. Thomas Moore, writing of memories and enduring qualities,—which we suppose to be of common knowledge,—said of the rose jar,—not itself a rose;

> "You may break, you may shatter the vase if you will,
> But the scent of the roses will linger there still."

Warfield, the actor, in his play "The Return of Peter Grimm," pictured in a striking manner not only the life of the spirit after the death of the body, but the continuation of the deepest and profoundest affections. How earnestly Peter, in his heavenly aspect, strives, though without success, to break through the barrier separating the two worlds,—the flesh and the spirit,—and to warn his beloved grandson of the perils of his course, and the distresses that await him. He fails, not because either is without the power of apprehension, but because their conditions are different, and he finds no method of communication.

It is quite true that instances such as these are not proof,—certainly they are not *scientific* proof,—that the sensibilities may live after the body and its senses are dead and buried, but they illustrate the conviction of humanity, possessing both, that the double or triple phases of life are not alike, and that one is ethereal, and can flourish in a field where the other cannot subsist. Science can only formulate what men already know.

Here then is our proposition: The time will come when the human body must die, as all the earlier ones will have done, and the physical faculties cease; but the qualities we have called sensibilities are of a different kind. The life which pervades them is not perishable. It would follow,—would it not,—at least it is not inconsistent to suppose, and science does not deny,—that when the physical world comes to an end there *need* be no total destruction, carrying the spirit with it. We can easily conceive of another form in which these ethereal features can survive; and if so we may expect it to be of such a kind as to expand and magnify, and not reduce, their natural exuberance.

In science facts properly inferred are often more satisfying than those observed by the senses, or testified to by witnesses. Everyone is conscious, without proof, of two, or perhaps three, kinds of life. This is seen not only by inference, but by observation. That these are related in the human body is visible; but the differences in character and permanence, can be known only by inference. Even in science this is enough. The celestial system is turning in space without the application of new power; and, as Dr. Abbott shows us, it can never need any, because, as he thinks, of the *total absence of friction;* but there may be a better reason, for new power may be continually supplied. It is not visible, but neither was the original power which put it in motion. The sun is perpetually hot, but is not consumed; and it is perpetually radiating away its substance, but so slowly that it may be sound to say it is *without measurable waste;* and many of the ablest scientists contend that it is perpetually renewing itself. This is only inference, though of a nature most trusted in science; and where the known facts are consistent with nothing else, we may not hesitate. Science itself insists that there is a cause for every effect, and that the same cause will always produce the same effect. The provision of new fuel for the sun is not within any known law of nature, but though unseen it may operate effectually, and this is a better test.

THE DISSOLUTION OF THE PARTNERSHIP:

We have now, we think, sufficiently considered the differing functions of the human body, and the inner essense of living man. Some of the materials for judgment are furnished by these, but not all. The fact of a double or triple nature in humanity has been dwelt upon, and need not be repeated. We are now approaching the separation of these functions in the case of the "last man," who illustrates it best because he stands alone. Again we mention the nature of these separate functions, and the inevitable end of the union. It is not the body, but the *will* that decides; it is the *mind* that commands; it is the *heart* that persuades; it is the *intellect* that discriminates; the body responds and obeys. As we picture their relative functions, the physical senses deliver over to the mind what they observe; the *mind* picks up the chain of facts, and *reason* carries it on to a conclusion. It is the higher personality that compares, accepts, refuses, weighs, judges. The senses neither hope nor fear nor desire. They neither hate nor despise. They neither love nor pity. Even while the senses and the sensibilities both remain, the higher personality is master at the helm, and captain on the bridge. It waits for no decision from the body;—no command;—not even a request. Though they cooperate, they live apart; and if they have done so, and do, they also can.

The individuality of man has been considered in other connections. Here it arises in our summary, and is seen in new phases.

ANOTHER COMPARISON:

We have already seen that among human beings there were never two alike,—either physically or in essence. Everyone of the 1,800,000,000 living now is an individual, differing from all others in many ways, but markedly so in respect to the intangible qualities we have been considering. The will, for example, is altogther personal. Two cannot have the same will, nor the same desires and preferences, which we call *tastes*. It used to be said that "manners make the man"; but manifestly one habit of good manners cannot make two men, nor *vice versa*. Dr. Lull ("Ways of Life," p. 82) says, speaking of the body, but describing as well the spirit:

> "It is not now so much the inherent tendency to vary as the utter impossibility of two organisms, with the almost infinite complication of structure, to be alike."

Characters and personalities, tastes and aspirations, differ as much as physical forms. A man's *character* is his own, and would and could fit no one else. Adaptation and taste are distinct and personal. One may be an inventor, like Edison; another a musician, like Paderewski; another a scholar, another a poet. We need scarcely put the question whether the personal qualities, modes of thought, temperaments or tastes of Edison and Paderewski could intermingle. The answer is already made; not unless compelled; nor could they make one satisfied inventor, nor one contented musician.

For all these reasons we conclude that at the death of the body personality survives in a realm of its own,—not as as abstraction, but as the man himself. The physical senses through which they have operated during life are no longer required. In other conditions persons and things will know and be known by tastes and tests of a new order.

Dr. Nordmann, in "Kingdom of the Heavens," p. 173, avers that life is not all of one quality; and that the highest may continue, when the lowest has ceased to be. His words are:

> "The light of a star can be compared with that of a living being which first arises in power and ardent beauty, then declines and returns to the original nothing at the end of its life.
>
> "But let it be distinctly understood that I exclude from this comparison the beings which have the privilege of an immortal soul. The 'nothing' of which I speak in this case is but the molecular disintegration and annihilation of that perishable edifice which gives to an organism its individuality."

If indeed life in the beginning was an accident, its future may be equally uncertain; but if there was an intelligence behind it, and a plan, then we may justly expect the future to be forecast by the present, and to be logical and predictable. If so it should last *as long as its qualities fit its surroundings.*

CHAPTER IV

THE WRECK OF THE MANOR

THE LORD *of the manor is the last to leave the ancient mansion, now breaking up and breaking down. He pauses only to bring down the flag; then walks slowly through the mouldering archway, down the hillside, sloping toward the west, where the sun goes down. Behind him the manor and the manor house are going to decay*

CHAPTER IV

The Wreck of the Manor

ULTIMATELY humanity will disappear. The last man will die. Probably he will die alone. The human population, now so rapidly increasing, will dwindle away to its vanishing point; by what manner we do not know,—nor need we know,—but we are aware of possibilities. The last man, whoever he is,—may he rest in peace,—is the one whose fate is most directly involved if the world explodes, or sinks away; but every individual man is concerned for himself; for the ultimates of which we write apply to the race. The limit of human life approximates three score years and ten, for the many less, for the few a little more; but to the individual, living now or later, as he sees the end approaching, though others remain, it is as if the race consisted of one only, and when he dies he learns the solution as if there were no more. Men will come to that climax one by one; but to each the chief question is the same, and its solution the same.

The historian is unable to separate the end of humanity on the earth, as affirmed by science, from the end of the earth itself. Personally he anticipates one event when the race will disappear, or will have disappeared, and another when the earth itself will disintegrate and melt away; but both may come together.

Our chapter topic,—"The Wreck of the Manor"—suggests either. At the death of a man his physical body will fall into the general mass of matter, and be so intermingled as never again to be recognizable; but life, which has mastered, controlled, directed that body in every movement, as it looked out and reached out upon the world through its physical senses,—what is there in that to die? And those higher qualities,—invisible, intangible, but definite and real,—which characterized the man, and composed the rounded personality by which he will be remembered, what of them? The experiences and the hopes of "the last man" will, we suppose, be no different from those of individuals who will die in the meantime, and so his picture, as we paint it in our closing chapter, will serve for all.

But now the mansion is being wrecked; the flag is down; the end is at hand. Our first attention is to that. We shall then consider who and what and where is, or is to be, now and hereafter, the Head of the Manor?

THE DISINTEGRATION OF SUBSTANCES:

Eventually the total mass,—those condensations which had become worlds; those powdery substances which are yet supported by clouds of gases; the gases themselves,—with that selected portion of substance which had been flesh and blood, all will cease to be; otherwise they would be perpetual in the future, and by the same token must have been perpetual in the past. We do not forget the axiom of science that through all changes of form the total of matter has not changed, nor the qualities of its elements; but this, we think, can apply only while it is in the performance of its ordered functions, and is not inconsistent with its fading away to nothingness when this is past.

It is quite otherwise with life, and also with those coordinating faculties which made the man personal; but the earth and the body are our present theme.

THE VANISHING OF MATTER:

Can we predict an outcome, limited to matter, in which the teachings of religion harmonize with the facts of science? Probably; at least we can suggest alternatives, and these may throw light on the question. We shall compare these in our "Interval," following this chapter. The custom is to make the application last; but the nature of our discussion is such that it becomes us to apply at this point the results of that comparison. Let us begin with this:

Life on the earth lacks permanence. This fact will give significance to what we must say about it. Here are gathered some two billion human beings, and multitudes of living things of other types. Since these are not only dependent on the earth, but on its continued fitness to maintain them, it is plain that they must die first, or that all must go together.

Most of us have accustomed ourselves to the thought of a grand catastrophe, and find it hard to think of slow deterioration,—a gradual return, as it were,—to the condition in which the whole began.

There are many ways in which humanity may dwindle away until the earth is depopulated. If, perchance, the succession of *new* individuals should, for any reason, cease, a century—perhaps more, perhaps less,—would see the end of it all, and the earth would be back in its barren state. Waning or diminishing foods, long continued, would have the same effect; so may a shifting of balance in the earth itself, accompanied by a sudden change of seasons; caused, perhaps, by the mistakes of mankind,—such, for example, as the project to fill the wastes of Sahara with water from the sea.

It is true that if my life, or yours, should go first, it would mean nothing to us to know, if we could, how long the earth, or the stars, or the other bodies, could survive us; but our inquiry is not so narrow. We seek to know all that science can teach,—without respect to persons,—ourselves or others. We have mentioned three possibilities. As all are in the future, and probably far away, if we seek to select the probable end of the material universe we can only compare and infer. On a scientific, as on a scriptural basis, the picture by St. Peter may describe it. It deals rather with the fact than the method, but it is there assumed that it will be "burned with fervent heat." If so the last remnant of availing life, and the last world of matter, may break up *together* in a cataclysm of fire. In our picture of the Last Man we assume a similar finality, where all but one are gone, and paint it as we see it. It harmonizes with one of the alternatives of science, but we do not understand it to be specific, and any one is at liberty to differ.

The climax in which the great experiment will end is of more interest to us at this point than its condition afterward; but both have been discussed; and here we note that the possible outcome must be one of these alternatives:

1. A perpetual universe, as it is,—without inhabitants;

2. A recession of *form* to original tenuous substance, and perpetuity in that condition;

3. A return to mere space,—unoccupied; or

4. The equivalent in a new creation, of the same or like substance, over and over, perpetually.

Of these (1) and (4) are impossible, and only (3) seems to be in harmony with known science.

Limiting ourselves, at this point, to matter alone, and the method of extinction by a casual catastrophe, as by mere cessation of function, there is a basis in science for prediction, and there is some reason to support it in either form. As to the latter, we may call it

AN EQUIVALENT OF EXTINCTION:

In other chapters we consider possible alternatives more fully. Here the question is incidental, and the connection and purpose are different. Conclusions will be enough.

There are hopes in some fields of proving that the sun, and possibly other radiating bodies, have sources of fuel supply to keep them going for an indefinite time. The weight of authority is, however, that every radiating sun or star is gradually exhausting its energy, which of course tends to extinguishment. It is said that the whole celestial system may reach a state of *balanced power,* which means that radiation may simply cease, and movement stop, or become ineffectual. This is explained by authoritative writers in the passages we quote below; and it is worthy of attention.

Dr. Nordmann, in his book so often cited, says:—

"A material system, abandoned to itself, must tend to a final state where all visible motion and also all differences in temperature will have disappeared, to give place to a uniform heat, and complete immobility. * * * If we can extend Carnot's principle to the whole universe the latter necessarily tends toward a sort of normal death, * * * which would fix it irrevocably in a dull and corpse-like immobility."

p. 167:

"When the density of the star thus formed (out of nebulae) becomes too great to allow the work of condensation to proceed, its temperature falls until it ceases to radiate any light, and the star floats freezing and invisible in space, while other nebulae give rise to other suns."

Jeans, "Universe Around Us," p. 317.

"Energy cannot run down hill forever, and like the clock weight it must touch bottom at last. And so the universe cannot go on forever; sooner or later the time must come when the last erg of energy has reached the lowest rung of the ladder of descending availability, and at this moment the active life of the universe must cease."

Dr. Eddington, "The Expanding Universe," p. 82:

"When at last, by the thermo-dynamic degradation of energy the universe, with the same gradualness, again reaches undifferentiated sameness, that is the end of the physical universe."

p. 71:

"Suppose that a slight disturbance upsets the balance, * * * the Newtonian attraction is slightly weakened. Then repulsion has the upper hand, and a slow expansion begins. The expansion increases the average distance apart of the material bodies so that their attraction on one another is lessened. Thus the balance becomes more and more upset."

The foregoing relates especially to the loss of *balance,* which in its effect is described below. But the subject will be clearer if we state the purport also of the alternatives.

Just how the climax can come about; as by the wearing down of the *activity* of worlds, or of substance of matter, to a point where their functions will cease, has been debated. The last surviving star may blaze out, or wear out, leaving space vacant, as at the beginning; or occupied only by powdery substance, which itself will continually tend to disappear, and nothing would be left; or radiation may *cease,* for the purposes of effective operation, leaving the orbs in their present form, or perhaps reduced to ashes or cinders. The cessation of operating function by loss of radiation is analogous, but different. While their present relations continue, radiation between bodies, creating energy, is mutual, in both directions, one stronger, one weaker; for radiation will only continue while the exchanging bodies differ in energy. The higher will exhaust the more rapidly. Thus they may finally reach a state of balance, in which, while still having radiating power, to a degree, they will be too nearly equal to support movement. The result may be that world *forms* may lose their *efficiency* without ceasing to exist.

The writer does not find this reasoned logically, to the last term, but the result seems to be implied by the reasoning of scholars of high authority. But this does not take account of the result if the power to radiate is so diminished that the bodies, though retaining essentially their form, can no longer keep their places in space; as when the gravitational support of other bodies fails. The result, as one body after another would slip away, can well be imagined. It could not be less than a grand crash, and utter confusion. It is, of them all, the most highly pictorial, and it is this which we are using in our picture of The Last Man. Of course it is theoretical, as the rest are, for no one ever saw them happen; and it carries the memory of the writer back to the acute observation of Professor Lull of Yale, in "Ways of Life,"—where, dealing with a different proposition, he said:

> "These theories show how far the minds of scientists may wander when opposing facts are not obtrusive."

If, as described by one of these, the celestial bodies should become disintegrated; or if the orbs should burn away to cinders, there might remain the original powdery substance, "equally distributed through space"; but when this also has disappeared, space will be empty, as it was in the beginning. In that case the organization of the celestial system will be a closed incident. Life, in every grade, below humanity, will have had its day. If, however, our prediction of perpetual life for the spirit is sound, then that new world must, and doubtless will, furnish for renewed humanity a residence adapted for its new condition, and free from the sadnesses or sorrows of life in the flesh.

APPROACHING THE CLIMAX:

The historian ought not to leave, however, an open series of alternatives, without indicating his judgment of probabilities, and his reasons; so that the reader may weigh them for himself. The question therefore is,—deeming the experience of the past to be our best guide in judging of the future,—what does science see, or think it sees, of the future, both of matter and of life?

If the system should meet its end in a cataclysm, which is one possibility, it would be preceded by changes in living conditions which would first bring life to a close, and leave the world empty. This would doubtless be of slow operation, as the processes of growth were. If, by the one method suggested, essential supplies should fail, life could not survive, but the course of physical disintegration might be prolonged.

It may well be supposed that there will be a "Last Man," holding for a time to the diminishing earth, but closing, in his own person, the history of mankind. If such there be, with him to the end will remain those faculties which we have called superior. That side of his manhood has its own characteristics and its own resources, which nothing physical can interrupt. His body will yield at last; and in and of a place or condition which those "excess" faculties find congenial, some binding unity, fit and adequate though ethereal, and as individual as before, will continue indefinitely, in the same grouping as when tied up to his body.

The earth will probably endure to or beyond the last man; but we like to picture its close and his as occurring together; and deem it not inconsistent with the postulates of science. In our "Closing Episode" we so present it. To the writer it seems neither unnatural nor impossible. Every star that blazes up (says Dr. Nordmann) and shines beyond the normal, is in the nature of an explosion; and one such may ring the last bell, and draw the closing curtain on the last of our race.

Having followed thus far the way science, as the writer understands it, points, deduction and inference may reasonably carry us farther, although the light is growing dim. If we are sure that life is not perishable, and that, whatever its future, it will be as distinctive, in quality and kind, as at present, it will follow,—will it not,—that in those new conditions it will find, as it found in the body, equipment and supplies for its suitable maintenance, and an atmosphere and also a companionship, in which its powers may expand.

Here the prediction justified by science pauses, and the historian has no details.

Since in a mere history the significance of a feature may be slighted, or may not make its due impression, we break into our narrative with a brief discussion of the effect of our outline of facts, if true, on the nature of the prolonged life of humanity. For convenience we call this "An Interval."

AN INTERVAL

COMPARING SCIENCE AND RELIGION IN THEIR BEARING ON THE LIFE OF THE FUTURE

THE *object of a scientific formula is greater than its language. The thing sought is deeper than the seeker, or even the eagerness of his search. The swell of the sea is mightier than the lift of its surface waves. Persistent Life,—whether proved by science or by religion,—or both,— is of greater significance than the pathway to it. But to be sure we must read the signs by the wayside*

A Comparison of the Trend of Science and Religion in Respect to the Life of the Future

It seems appropriate, before entering on our closing picture of the earth and its inhabitants, to gather up what we have learned in respect to this,—which concerns humanity most. Science does not assert that the life of humanity will cease when the body dies; it clearly implies,—the writer thinks,—the contrary. Those who think it does not reach so far seem to forget that its laws and maxims project throughout human experience, in all fields.

Religion has its own methods of reaching conclusions on this subject. Carried out to their last terms, it is remarkable,—the writer thinks,—that both should agree so closely. The doctrines of science are not stated in terms. Its chief theme is different; but, having no limits in either direction, their verbiage is not important. In another place we have considered the differing modes by which conclusions are reached by science and religion, but here we limit ourselves to their finalities. Science, as we have said, affirms nothing in terms as to the future, but its finger points steadily forward, and its footprints lead that way. The nature and operation of its known laws, if so read, are intelligible.

Religion is specific, since the life of the spirit, here and hereafter, is its principal theme. While interpretations may differ in detail, its general meaning and effect cannot well be misunderstood. The fundamental rules of both are not only consistent and harmonious, the writer thinks, and they seem to point not only to one origin for our race, but to one outcome or destiny. While physical law seeks only to explain the tangible, its facts require, at almost every step, to be fitted together and interpreted by logic and inference, which are not tangible. In other words it is unable to limit itself to matter and its laws, but to be understood at all is obliged to deal as largely with the intangible as religion itself. Of this many instances have been already mentioned. Both have the same factual basis, but make a different use of it, and prove and illustrate it differently. Science is essentially an inquiry into fact, but it confirms their meaning by the intangible; whereas religion arises in the intangible, but confirms itself by the facts of history. The distinction is largely in emphasis. They ought to be equally true, and provable by the same means. Even in the inorganic state, matter,—or its forms at a given time,—has been wrought out in a complex fashion which requires, to explain it, facts inferred, as well as facts observed, and in general those inferred are the clearest. By either test the results attained could not have come about by accident. Everywhere are found gaps only to be filled by the projection of a long plan, which goes further than the senses carry, in both directions; and both involve logic, as well as evidence. There is visible, in both fields, the handiwork and footprints of a supernatural being, capable both of creation and providence. The simple elements of matter have, it seems, been so led and guided, or so originally endowed, that automatically they have changed from form to form until they emerged in a completed universe. Those movements never departed from law, and matter never varied in its characteristics: their movements can be traced, and have been traced; and now the results are imbedded in the body of science.

We have learned that the same laws move on into the domain of the organic, and there they have dealt also with life, when it arrived, so plainly and efficiently, and in such modes, that the movements of life also could be traced, and they have been traced. It would be a great misfortune, if these inquiries should halt, as it were, at the height of their effectiveness, on the theory that where they develop into the intangible they are no longer a proper subject for scientific inquiry. Surely this is an error, for it leaves the tale half told. The distinction is too artificial to be sound. Heat, light, gravity, gases, electricity, magnetism are all as intangible as life or thought, but they have always been treated as within the domain of science, which could be nothing and do nothing without them. We are not mistaken therefore, in supposing that these two lines of truth,—one pertaining to the senses and the other to the spirit,—one of the mind and the other of the heart,—are closely interwoven, and incapable of separation, and that they both operate under laws not merely similar, but the same. Why should they be supposed to conflict,—

and how could they? Their mode of approach, and to some extent also the qualities to which they appeal,—are indeed different; but when projected they begin at the same point, and lead to the same conclusion.

Religion puts its emphasis first on thought, and then on action. Science emphasizes first action, and then the thought behind it.

The laws and forces which prevail in science are not different in their application to motive and emotion. No one can reason intelligibly in either without using not only the forms of thought but also the facts which apply in the other. If therefore anyone has been thinking that these, or the laws which govern them, conflict, or differ in their fundamental assumptions, he is wrong, and must face about.

With this to stand upon, we may justly believe that the outlook for the prolonged life is benevolent throughout, because everywhere tending to accomplish a benevolent result, and thus its opportunities and privileges are high, and not low, and tend upward, and not downward. It may also be inferred that if there be rebels or dissidents, who resent the common restraints of such laws, normal penalties,—inevitable and impersonal,—will follow as certainly there as in the operation of the organic world. We have already learned that the slipping of a star from the control of gravity,—wilful or not,—is certain to be followed by the loss of its position in the universe; and this is incapable of cure. Such an event is involved,—many believe,—in the cataclysm which is expected to befall the physical world, where the distortion of gravitation is the first stage in destruction. This is taught also in religion. In one case it is a natural result, as where one digs away the foundation of his own house. In the other its result is partly the mere result of a broken law, but partly also to rebuke wrongdoing; and partly, perhaps, to punish the offender. We only know of this what others know, but since in both fields the laws operate in the same manner, and produce the same results, how can it be said that they are different? We believe they are not.

There is another parallel,—helping to prove that the fundamentals are alike in science and religion. If life is really persistent, as we think both lines of thought teach, then a vast number of human beings,—perishing since the race began at the rate of three generations to a century,—have already entered on that wider reach of power or privilege. It is true the climax,—i.e., the actual entering by our race, as a whole, on that new condition, has only been begun. As yet there are some two billions of human beings on the earth, and perhaps many more to come, all of whom will pass away, one by one, until,—reduced to smaller and smaller compass,—one only will remain,—the last man,—who is to be the subject of our Closing Episode;—and he, on his departure, will leave the earth bare of humanity, and with no function, and no destiny, except eventually to break its own bounds, and go to final destruction. What then of those already gone? Where are they,—and how do they subsist? Is it too much to hope that the joys of happy association which made life attractive here, while they lived,—though saddened daily by death and parting,—may be renewed and maintained where sadness is not, *and nothing is mortal?* Anything else would be a rever*sion, and* would involve a new set of habits, for which the law does not now provide. It would be so wholly new as to be incapable of explanation, either by science or religion, as we know them.

In our Closing Episode we are to depict the Last Man as hoping for a renewal of happy ties, equal to the best of those of earth, but made perfect and permanent. Does not that conform to the predictions of both science and religion? If we interpret them correctly do they not promise peace, as persistent as life, at least to those who do not,—by their own acts,—break the connection? And are they not branded on the laws by which the universe is governed.

Science affords us only the vaguest basis for judging of the future condition of those who, by choices which even a creator could not control, have cut the ties that bind them to their companions, and waived and lost the privilege of satisfied and peaceful activity. To instances of this science points, by the experience of errant stars; and it explains its meaning by events occurring even among the inorganic bodies, by reason of which they have broken away, and drifted into outer darkness. Religion carries in its sacred books sad stories of such cases; and this record is available, and the instances familiar. This is only incidentally within our theme; and of such cases it is not our function to predict, and we would not if we could. Thus much will serve to make clear the point of essential similarity between them,—and help to prove it. We have, of course, no criterion in science to demonstrate the soundness of our deductions. Others may deem them erroneous. We can only be sure that they seem to us to follow. We have weighed the alternatives, and find them wanting.

And now, before the writer lays down his pen, he is moved to add a few words by way of comparison between science, as an abstraction, and religion, which is nothing if not definite and personal, as we have come to know them. If both are true they complement and supplement each other, though one deals with the tangible,—without sensation,——and the other with human sensibilities, delicate and responsive, played upon, like the eolian harp, by every wind that blows. While religion is not our theme, yet it is not extraneous, for it is akin to science, and touches it in many places. It hangs over the subject of the future life, and around it, like an aura or an atmosphere. They belong together, and are only with difficulty separable. They move in the same direction. They weave and interweave. Science approaches from the outside. It is history, description, painting. It must have an object, and cannot stand alone. Religion is heart and life and experience; it is light, and logic, and not a mere wandering reflection. It presents always new aspects, new conditions and colorings,—like the changes in the evening sky in spring; or like the blazing and glowing of the coal fire in winter. It is courage and support. By its aid one can look even on the coming loss of the body without apprehension; for greater,—it hopes,—will be the joys,—sufficient for every outreach of the spirit,—which lie beyond.

If our "Interval" has helped to make this clear, it has served its purpose, and we may return to our theme.

PART FOUR
THE FAILING UNIVERSE
AN EPISODE

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CHAPTER I

THE FAILING UNIVERSE

MAN *and the earth present three somewhat similar phases. In both are youth,—the time of developing power: maturity,—the time of exercising power; and age,—the time of waning power. Time also divides in a similar manner,—a fourth for the growing stage; a half, or thereabouts, for the high level; and the rest for the close. We are now dealing with the third*

CHAPTER I

The Failing Universe

At a time as yet unknown, and by one of several possible methods, the great experiment of world-building and race-building will be closed; and whenever that occurs the elements of matter with which it operates will, we suppose, return to their original state. You will remember how they arose. Physically speaking, space was first, and it was empty. Matter arose, somewhere and somehow, out of nothing; and it will, when it has no further function, again become nothing. It is broadly agreed in science,—though with some dissent,—that it is not perpetual; but life, and those grouped qualities which we call "personality," have perpetuity written on every feature. They cannot be fed or starved; or lifted up or pulled down; or wearied or hurried; or wounded or healed. The body gained nothing when they came, and loses nothing when they go. They work with and by means of human qualities, but have been known to work without them, when some were lacking. Science is aware of their movements, and of the laws which govern them. It would be very narrow and inadequate if it was not. Volumes of psychology flood the market, and they have no other theme. Physical science,—at least, as often presented,—preferring to deal only with tangibles, disclaims knowledge of their past or future,—their origin or destiny; but most of its proponents are willing to speculate about both. They do not, in general, doubt that the principles of persistence, uniformity, orderliness and continuity apply to both. The historian, who sets no limit to his field, extends these principles indefinitely, backward and forward,—even when the scientist does not. But the scientist also,—in spite of his disclaimers,—does the same freely. Nearly all the recent books on astronomy and the physical sciences carry discussion of this subject far forward, even into the field of speculation. This is not said by way of criticism; on the contrary we deem it quite fitting; but we wonder at the fact that, while in the field of observation the lines they trace are specific, in the field of inference they usually ramble,—as if they had no tests, and no criteria;—a method they scorn in the field of tangibles. The effect is, as we have shown, to give professional support to part of their conclusions and none to the rest. Considering this as a departure from method, it is not remarkable that no two of them agree. They often seem unimpressed by the fact that, even in that shadowy place, still to come, of which we know so little with certainty, the laws are neither more nor less than projections of those they know so well here. There is no occasion for rambling or doubt. Logic is the same in both, and thus, using the same method in the science of living employed in dealing with the science of being, a solution can be had in the realm of ideas,—equally simple, sane and satisfying. Dr. Nordmann of Paris, without applying this test reaches this conclusion.

> "In the very heart of its revelation science, and especially the science of the heavens, enables us to touch the divine. Evolution and the constitution of the stars, rhythm which guides the cosmogony in a grand harmony,—it all obeys a uniform and inflexible law."

That this is true science can be,—indeed has been,—demonstrated. But this is only incidentally a part of our present theme,—which is the failing universe. It will help us, however, to predict and picture the hopes and aspirations of the last man when the crisis is upon him.

We come back now to consider *how* the tangible things we know are likely to pass away. Dr. Jeans throws a vivid light on the subject,—expressed in the clear English of which he is a master:

> "In some way the material universe appears to be passing away, like a tale that is told, dissolving into nothingness like a vision."

Men wise in science have suggested alternative methods by which the universe may end when the due time shall arrive. In our Chapter IV, of our Part III, this has been touched upon, more or less fully, but in a different connection. It needs fuller consideration, and this we deem its appropriate place. We mention first, the possible end of matter by

THE DESTRUCTION OF THE SUN:

On this we quote Dr. Nordmann:

> "If the sun were suddenly extinguished the earth would be immediately plunged into an eternal night, lit only by the twinkling stars. * * * The moon would be invisible. * * * Our atmosphere would soon cool down. All water suspended in the air would fall in the

shape of rain, which would soon change to snow. The rivers would flood, and then dry up. The entire ocean would congeal into ice, even before the gases of the air itself became condensed."

"Plant life would stop in a few days; then the animals would succumb, one after the other. Mankind would carry on its existence a little while longer, with the aid of accumulated provisions, and artificial heat, but soon these feeble reserves would be exhausted. Nothing would remain."

the next possibility is

THE WEAKENING OF GRAVITATION:

Dr. Jeans states this vividly:

"If the sun's energy were suddenly reduced to half, its gravitational pull on the earth would also be reduced to half, and the earth would move to a greater distance from the sun."

"The central facts which dominate the situation are that we are dependent on the light and heat of the sun; and that these cannot remain forever as they are."

Another possibility is

THE WEARING OUT OF RADIATION:

Other able scientists believe that since the creation of energy is largely by exchanges of radiation between bodies of unequal mass, and the greater exhausts power the more rapidly, there will be a balance reached between them,—with the effect that the production of energy there will cease. Dr. Jeans seems to concur in this. He says:

"Because the sun is continually losing its weight, its gravitational grip on the planets is forever getting feebler, so that all the planets, including the earth, are continually moving further and further out from the sun, into the icy cold of space."

One instance or two of this increasing condition—wherein the grip of power is loosened, would evidently not destroy the universe; but each would help to press the process to a result by shifting the balance of attraction and repulsion. The result would be as destructive, in the individual case, as if those bodies vanished in ashes; and a point would be reached where the rest could endure no longer.

We have elsewhere considered the probability of waning power by loss of radiation,—the end of which is the end of movement. Any of these methods is, we suppose, scientifically possible. The stars look tranquil now, and the loss of radiation, or the shifting of balance, or the weakening of gravitation,—tending to destruction,—may be slow, and far in the future; but we cannot forget that, by some method, it is certain. No thoughtful man would close his eyes to it. Though he may,—for a time,—quiet his apprehensions, we would not expect any one to be indifferent. Still less can any ignore the fact that long before the population of the earth has dwindled to the last man every individual is within a third of a century of a calamity equally serious to him; and time moves so swiftly, with only an individual in question, that it may seem that he hurries to meet it. It is the end of a long story, and its stages may be traced.

THESE MAY BE ITS MAJOR STAGES:

The first,—now long since ended,—was in the nature of a slope upward, beginning with the origin of matter, and ending where the celestial system was complete, and had become stable. In that period the elements of matter shifted into many combinations;—powdery matter melting into liquid, liquid expanding into gas; gas condensing and moulding into planets; and these, separating from the parent mass, and rounding into form;—finding their respective places, and floating off on their several journeys around the sun. This stage included nature's most spectacular phases, in which white-hot whirling gases, on the way to become stars and constellations, seemed to press on fiercely, with roar and rush and hurry; but even so, in their stages of advance, and their complex changes of mass and content, as they approached their final forms, and in their woven patterns afterward, none lost its due position, or halted or hasted in its speed, or departed from the steady control of law. If their movements were not indeed guided by some watchful intelligence, they must have been themselves intelligent. Man, with all his power of deliberation and foresight, never moved so perfectly or so steadily, even toward an end previously known. Do you remember the story of a gifted pianist who gave a concert in Boston. It was said that he played a very long number,—three-quarters of an hour,—without the notes. At the close an enthusiastic lady gushed over it, and said, "It is perfectly wonderful that you should have played so long a number without dropping a note." The musician answered,—"Madam I could play another concert with the notes I dropped."

But here the dropping of a note would have been fatal to the project. Is it an accident that there was none? Is not the wonder of the enterprise great enough to justify a pause to wonder at the result; and still behind that to wonder about the operating cause.

Here, at the close of our *first* great era, fell a wide interval of quiet. The planets were new, and hot with the substances of the sun, of which they had been a part. The earth,—one of these,—had a function, as later history discloses, which required a condition and a character it did not then possess. It is agreed in science that if the human advent had befallen then, even if waiting and ready, life could not have survived. The earth must not only cool and harden, but its surface must change in character. It must acquire somehow a competent soil,—which the mass of the sun was not. It must gather up somehow the chemicals which would make it fruitful,—first for the plants, and through them for the living things that would feed upon them. How long? who knows? Experts in mathematics and geology have compared and computed, but they had no proper basis, and no two results were alike. This writer has ventured to suggest that it ought to be long enough, but not too long; and he has warned others of sure failure in the attempt to make a closer estimate. Ours looks vague, but it has an intelligible reason,—which no specific computation has. Any conclusions, though of experts, *must* be unreliable, for lack of adequate criteria; and this is shown by their wide differences in results. Long or short; broad or narrow; the earth started where it *must,* and became, when it *could,* a fit starting place for a new era. If it was a plan, the planner knew, though we could not.

The *second* of our greater stages began with the descent of life,—at first only in the primary orders, of which plants were the earliest to arrive. To that time the earth was inorganic, dull and barren. What a spectacle it became when the living blanket was spread over it, and it shone in its glossy coat of green. Could you describe it? All these it was, and more;—brilliant, in color and sheen; glowing, blooming, lustrous, radiant. Its grasses, shrubbery and flowers were sweetly perfumed. They budded, blossomed, opened;—and it was wholly new. We find it hard to realize that it had a beginning, and how unattractive had been its past. Yet in all its loveliness there was no one to look on it, unless our impersonal observer,—dreamed, but not yet born. Yes, it was life,—plant life,—and it *was* alive; but all the conscious senses which afterward came with animal and man were lacking. It had no voice and no vision. There were faint murmurs, but neither speech nor song. There was the ripple of the brook; the falling of the cascade; the breathing of the wind; but otherwise silence;—not even the song of a bird. And so, as each order of life arrived, below Man, it added its quota to the music, or the confusion, but these were minor, and only a part of the preparation; but the head, to which these all were but hands and feet, was lacking. But at last came man, the latest and the highest of the orders of life. He found the mechanics of the universe completed and in action;—every element of matter had its particular faculties active in the performance of its normal functions, and all capable of being known and understood. Its governing laws and forces were as specific as they ever became. All the lesser forms of life were here, and in full action. When man directed his intelligence upon them the processes opened before him. Progress was slow, in classifying and formulating, but the truth was within reach, and errors could be corrected. If man was indeed at his best when he first arrived, he found the book of nature wide open, and amply illustrated. Here then man began to collect his facts, and formulate his code. Here were ascertained the varied uses and movements of matter; here also he drew his conclusions; framed his axioms; tested and applied his criteria; examined and re-examined his results, and consolidated his body of truth. Much at first was tentative, and errors required correction. The same is true today. At the present,—while we write,—Einstein is questioning Newton, and Compton questioning Einstein.

We are still amid the activities of the middle era, but we are conscious that in the future,—not so far away,—we shall see the approach of the *third,*—the downward slope. The margins of these periods are not sharply drawn, and we cannot tell the dating; but this will merge into that. Perhaps we will not recognize it until it is well on the way. The substances of the universe will begin to weaken, and the trend will be downward, until the end is reached. It may be hard for men to know when we pass the crest, and leave the table-land. Structural weakness is not yet visible, but we are estimating the future. The nature of law, the wastage of radiation, and the shrinkage in mass, give us sure reasons for expecting it. The theory of Dr. Millikan and others that radiation is being continually restored, from a source as yet unknown, may prove true; but even so, though destruction be long postponed, matter will not be perpetual, and the climax must be faced by a residue of our race.

THE MINOR STAGES:

Is it not clear then that there *are* landmarks in history,—on a very great scale? We have only indicated the wider and more distinctive divisions, but there are quite as clearly minor ones, not to be overlooked by the historian,—which, like stepping stones, mark the path, and distinguish the phases of change, and make them easier to remember. In his own reading the writer has found impressions more vivid and permanent if he thinks of events by groups or periods; and in that belief,—without detail,—he will suggest a method for this, impressive to himself, and illustrate it by a common experience.

If the reader has had occasion to travel from Boston to New Orleans he knows that he may take a sleeper for the continuous journey, without change. The only features of interest are the starting point and the arrival. It was different when the writer was a boy. The trip was made up of a series of connected stages. One might go by rail from Boston to New Bedford; by steamship to New York; by rail to Wheeling; by boat, down the Ohio, to St. Louis; and thence by river steamer to destination. Each had its distinctive features,—and the traveller had no difficulty keeping them in mind. At the railroad stations the locomotive backed and filled, and took on wood and water; its whistle blew; its bell rang; its passengers filed in through the narrow doors. At the boat docks long lines of roustabouts followed each other up the gang planks, under the lashing tongue of the traffic boss; and at St. Louis the great river boat was filled up, even on the decks, with cord-wood, sugar barrels and smoked meats. The passengers wandered about at will. A heavy roar of the whistle, echoing up the banks, marked the time of leaving; and, as the boat puffed along, on the open spaces of the lower deck negroes danced and sang to the plucking of the banjo.

Many a book, which might become wearisome if running along without interruptions, is broken into short stories, of differing adventures, frequently of the same hero. So we could do here, if time permitted; but it is enough to say that the downward slope,—like the others,—is a tale of sequences, following each other in order. Life will wane and cease; matter will disintegrate and waste away; the world and its occupants will fade and disappear; nature will weaken and fail; but to the last will continue the laws controlling the functions of matter and man. The same laws and forces are applicable to both, but longer progression for those that cannot die. We do not need Lord Macaulay's aphorism to prove to us that the future, of things real, but not mortal, will pursue the same steady course, and be as easily judged. There is no reason to suppose that accident or anarchy will ever replace sober persistence.

Here our history closes, our tale is told, our task is done. Nothing remains but the finale, and that is a picture.

CHAPTER II

A Closing Episode: The Last Man

THE last man has no companion, and no successor; yet his hopes and his apprehensions, in that unique condition, are well worth knowing and remembering; for they rise in his spirit without effort. If indeed they are truly painted they will help to make his nature historical. Here it is a prediction, but its soundness is to be tested,—as other inferences in science,—by the verity of its facts and laws. These have been already presented, and the historian believes them sound.

THE END APPROACHES:

The earth is about to go. Humanity,—one individual alone excepted,—is already gone, and the earth has a single occupant. In the sky the ties that have so long bound the orbs together are slipping. Many stars might be lost out of the great multitudes without being missed, but as the ties progressively weaken, and bodies are less firmly held, it becomes more and more certain that disaster is near. When, following a series of such demonstrations, a single star,—after long straining at the leash,—casts loose, all may go together in a moment. One,—small or large,—may start the swift flight to destruction. If the end is to be reached by mere wastage of radiation, many a century may pass before it befalls; but it will still be true that sometime man will find the world intolerable. They may both be lost in a common cataclysm, or matter may survive until it shall dry up and sift away.

When the wreck comes, and the ball to which men have clung is bursting into flame, or slipping out of the hold of gravitation, or crumbling into dust, what will it mean to the last man? Is science without an answer? It seems to us not. Framed in the doctrines applicable to the earth, man may hold to them, and look forward to a long continuance. If he be wearied with things as they are, and is confident that the future need not be dreaded, he may calmly await the climax. Thus for him his happiness,—now and also later,—is staked on a correct judgment or a well-founded confidence. If he thinks he sees, above the universe, a guiding hand,—wise and benevolent,—and wishes to give it a name, he may either call it faith or science, for essentially it is both. It is a fair inference from scientific postulates,—as we have seen elsewhere; for such is the nature of law. It is also a doctrine of theology. If he sees himself borne along by an irresistible current of power, the direction of which can be known, though he may not realize its cause, again he may call it either, for here also law,—as taught in science,—may appear to be the actor; and if man allows himself to wonder how it started, or how its steady course is maintained, again he may get his answer from either; but science will call it law; and theology will call it God. Science may pause at the brink of universal destruction, though its signs still point forward; but theology will carry through without a break. It is not the function of the historian to choose for the hesitating doubter, but he may properly describe and compare the alternatives. The choices of the last man are his own, but we may assume that he is a man of intellect and informed mind, and therefore can make a competent choice between them,—or perhaps reconcile them, and accept them both.

AN INTERPRETATION:

A thoughtful man, who seeks to find a path among the thorns and briars which beset his way in the world, or to wring out of its complexities a sense of direction, and wonders to find a maze so deep and dark, is glad at last to light on a clue to lead him out. Life is beyond explanation, but the most serious problem of humanity is to find out what at the last becomes of it. Is it short or long? Does it die with the body, at three score and ten? Is its average of continuance only a third of a century? Where shall the candid student find an answer? Stars are set in the sky, ("lights in the firmament" is the Bible language);—and man can measure the distances,—from them, and between them. Are there no clues by which he can learn the reach of life,—forward or backward, or upward; or the continuance of those intangible things which make up, or eke out, or supplement, human personality? The writer thinks true science furnishes a genuine clue. It may be speculated about, but it is not left to be guessed at. We have mentioned it above, but only as a possible method; here we are referring to it as a test. Law is the criterion. It is the key to unlock the mystery;

it is the solution of the puzzle. It is a compass, to show direction. It offers criteria to test the facts. It contains logic, to translate and apply them. These seem to us sound conclusions. Where they need support, we think they find it in reason.

If we have supposed law to be artificial and rigid, applying only to tangible things, and stopping where history stops; not willing to bend even when the wind blows; insisting on mere obedience; we then have some thing to learn about it. It must be true that it is inevitable and invariable; otherwise it would be no true guide; but here lies a distinction;—law was not *first,* but *second* to come into being. It does not compel movement, but illustrates and explains it. In the realm of matter it yields nothing, for it need not. There the elements are inert, and everywhere and always the same; they yield to pressure, but only when the law exerts it. Among the heavenly bodies,—made to float in space,—law is in its nature flexible and elastic, even without losing its definiteness or certainty. Here is an example: Gravity is always in proportion to mass, and in this it does not vary; but in the midst of a throng of similar bodies, of varying *mass,* it draws and is drawn from a dozen directions, with varying *stress.* Balance, and not rigidity, is the law of its being. Such bodies are not built solidly in place. They are hung and swung. Their mass is not always the same;—some increase,—some decrease. Here is another example. The pole of the earth does not point inevitably to the same place. It wanders over a considerable field, marking in space a line curving in loops and knots. Still another example. The orbits of the celestial bodies are not precise, or always exactly the same. Those of the planets were at first circular, but now they are eliptical; the sun is no longer in the center, but in one of the foci. Still another is this:—There are explosions among the stars, although it is not their function to explode. Gas accumulates abnormally, and under extreme pressure it takes fire;—but law is not thereby ignored, nor even challenged. And still another:—Astronomers have built up theories of celestial organization on the assumption that there are, and always were, departures from uniformity; although in applying this to the origin of the planets they have to make an extreme case. The so-called "Tidal-wave" theories of celestial organization, and of the emergence of the planets (peace to their ashes,—for they have no appearance of permanency) rest on the assumption that a "blindly wandering star"—far out of its orbit,—barely missed falling into the sun,—and did come near enough to draw away a substantial fraction of its substance. And this, they aver, became the planets. We have not regarded this as an authentic instance, but if sound it is very much in point; and very wise scientists are standing behind it. It may be sometime proved that the leash of the law is elastic enough even for that.

We are only urging that law is no less adequate as a basis for prediction because, though firm, it is elastic, within narrow limits. When then we seek to estimate the future,—of matter or man,—as to its permanency, or its condition, or the assurance men may have of reunion, in another sphere, with those who have gone earlier, we have reason to believe that law,—which describes, if it does not govern, such relations while in the body, will be the same when the body of matter is withdrawn; since the factors which made man personal have *not* died nor been diminished. We cannot tell what influences may intervene to hasten or prolong the end, but we can follow the path, and blaze the way, and indicate the direction; but details we cannot know, by any means available in science, until each man finds them for himself. Science cannot decide under what circumstances or surroundings that prolonged life will be lived; nor the nature of the ties between its inhabitants; nor the authority, if any, prevailing there; nor whether the faults or failings of humanity are eliminated there, or if not, how they are dealt with. Theology has rules to govern this also, but men's minds, unable to be sure, waver and wander. There is nothing in science to suggest death or sickness; and science is aware that the human spirit, as seen in the body, is susceptible of high satisfactions. If we cannot, from such facts, draw trustworthy conclusions, then many of our other most assured inferences are also faulty.

Our last man, or his historian for him, may,—if we are not mistaken in supposing that law is persistent and continuous,—judge with confidence that life will not fail *if it need not;* and it will not essentially change its nature, nor,—without compulsion,—change its course; and if not, then our last man may judge that behind it is a long projected plan,—with a climax adapted to its needs, elsewhere, as well as here. This gives the student of matter and of life a clue for correct prediction;—this is *law;* and a criterion for its application; this is *experience.*

It is not the historian's function to "make a case," or prove one. Here we are dealing with science,—the "simpler science,"—intelligible as well as sound;—not any individual's version,—least of all our own;—but gathered up out of world history, and human, or humanly known, examples. It is in this sense we have said that experience and promise are both scientific,—both paths to the same end; and that, when projected far enough, they will meet.

HAIL AND FAREWELL:

The last man calmly waits. His worn body hardly feels the bitter coldness gathering around him. He thinks. He remembers his long life, and its happy companionships, and these he hopes to renew. For the present nothing remains. For the future he has his convictions, but no fears, and no anxieties. He can abandon his body without regret, for it is now frail and feeble; but what of his life, which, with those its companion qualities, seemed to him so full and competent? He learned long ago that the body was frail and mortal, but the spirit was not. Life has still a function, and its aspirations and affections look forward. He can not expect the future to be less than good, and he is sure that, in a place and condition adapted for it, home and friends will be waiting. He had been so taught in his own childhood, and he had so taught others in his manhood. Perhaps something like this expresses the current of his thoughts:

No stately ceremony awaits him, or attends his burial, but the world about him breaks, with shudder and tremble and crash. Is this not enough? Others,—

no more worthy,—have had "taps" sounded over the memorial casket; or a military salute fired above it by comrades in arms; or a draped flag hung upon his tomb. The last man had not even friends to carry him to burial. He had no tomb, no casket, no carved inscription; and only the wreckage of the world to mark the place of his bones. Yet his farewell was a nobler spectacle than ever before featured a human burial, for above him was the blazing of a world on fire.

The sun breaks into a spread of flame, and scatters into the sky fragments of burning substance, like a burst of fire-works. The force which, for so long, held the heavenly bodies in restraint has loosened, and let them go; and the sky is filled with ruin. There is no sun; there is no moon; there are no stars. The elements have "burned with fervent heat," and matter and man have gone out together.

FINIS