In form, this skull was lower and broader or flatter than Phocœna or Delphis. The intermaxilla bones very broad, covering the maxilla's almost to the end. Posterior to spouting holes the nasal bones appeared higher than crest of maxilla's, which here covered the os frontis. Anterior to spouting holes, the intermaxilla's were very flat and concave. The teeth were all gone from the upper jaw but in the lower jaws there were only fourteen left. They were strong, conical, incurved and pointed, and of various sizes, the largest being one inch long. From the state of upper jaw it was impossible to say if the teeth had dropped out after death, but in the lower jaws there were seven alveola cups, showing where a tooth had been lost during life. Unlike the other genera, Phocœna, Delphis, and Lagenorhyncus, whose teeth have no alveola socket, their teeth seemed set in a strong but spongy alveola bone, extending seven inches on either side of jaw, and wherever a tooth had gone, there a shallow cup remained, as if during life, the tooth had been gradually pushed out by a bony deposit filling up the alveola process into a shallow cup. Thus counting the remaining teeth with the cups we could say the lower jaw had ten teeth on one side and eleven upon the other, which would give over forty for all. The palate was very flat and no vomer showing. The commisure of the lower jaw round, strong with no teeth inserted at its arch. The pectoral fin was four feet long and eleven inches in its widest part. In shape it was a very long oval with its long axis produced to a narrow point and depressed downwards.

Art. III. — Spontaneous Generation, or Predestinated Generation. By Andrew Dewar.

(*Read April* 12, 1875.)

In giving a paper on the above subject, we are well aware that we are treading on dangerous ground. The bare mention of the title is enough to arouse bitterness and contention in many whose minds have been trained in the strict theological schools of a past day; but, knowing well that we are addressing a Scientific Society

who look at and discuss the subjects brought before them from no other than a scientific point of view, we desire to claim your attention for a short time to the much debated question of spontaneous generation.

We do not come before you with any new experiments to illustrate the subject, for we are of opinion that so far as experiments are valuable, no new ones can be performed that would materially alter the position of affairs, or give a further insight into the beginnings of life. Such have been made scores of times and by as many different men. Besides, no one would put faith in experiments performed in such a benighted country as Nova Scotia.

Sceptics on the subject are of opinion that a microscope will yet be made which will enable us to see the very evolution of life; but it must be apparent to any one, that until we can see an atom separate and distinct as an individual—a result which of course can never ensue as the very atmosphere we look through is composed of atoms —we can never see two atoms coming together and exhibiting life; thus the birth of life will remain for ever a phenomenon buried in infinity. But this should be no hindrance to our reasoning out the *modus operandi* by analogy, a proceeding which, under the circumstances, is perfectly allowable and scientific.

The general meaning of the term Spontaneous Generation is, that matter of itself and by itself, without seed, egg, or antecedent vegetable and animal life, creates out of its own substance a living plant or animal.

Taking this as our groundwork, we proceed to state that we believe in Spontaneous Generation, in so far as that life may be originated in matter without seed, egg, or antecedent life, but with this essential difference that we believe in a power higher than matter or the force implanted in matter, and that it is *this power* which is the original source of life in matter.

Instead of Spontaneous Generation therefore, we would rather say *Predestinated Generation*, because when a new creation is formed, it has only come into being by the exertion of a law implanted in matter in the beginning, by which it was ordained that when certain atoms of matter came into a certain position and

condition, a plant or animal of a certain character would be the result.

Even in this statement, however, we go further than the Evolutionists, or the most advanced so-called materialists of the modern school of thought, for Dr. Tyndall (who may be taken as one of the leaders of the school) in his late Belfast address said: "They will frankly admit their inability to point to any satisfactory experimental proof that life can be developed save from demonstrable antecedent life." Of course Dr. Tyndall here means that they have no proof that life has been developed save from antecedent *vegetable or animal life, from the seed or the egg;* but if, as we maintain, and will shortly show, that magnetism, or the force which governs matter, is only a lower form of animal and vegetable life, any new creation, or instance of spontaneous generation, is only a development from this lower inorganic life (as we may call it), to the higher organic life; so that all life, in one sense of the term, *must be and is*, developed from antecedent life.

Darwin, and Huxley who supports him, have another theory to the same effect as Tyndall's. In his "Origin of Species," Darwin says: "I should infer from analogy, that probably all the organic beings which have ever lived on this earth have descended from some one primordial form." Again: "I view all beings not as special creations, but as the lineal descendants of some few beings which lived long before the first bed of the Silurian system was deposited." No explanation is offered of the origin of this primordial form. We not only say it is unnecessary that there should be any antecedent animal and vegetable life, but it is not even necessary to have a primordial form to father everything. We assert that out of the "dead hydrogen-atoms, the dead oxygen-atoms, the dead carbon-atoms, the dead nitrogen-atoms, the dead phosphorous-atoms, and all the other atoms, dead as grains of shot," which Dr. Tyndall speaks of,* (but which we say are all alive,) new forms of life are created and brought into being every day.

Furthermore, so much is this the case, that were it possible to translate all the living animals, great and small, visible and

*Belfast Address.

invisible, to another world, so that not even a primordial form was left, we believe that with the properties with which matter is endowed, and with the limitations which the Deity has imposed on the creation and propagation of monstrosities, that the earth in the course of a few centuries would be re-inhabited with animals and men that did not materially differ from the earth's present occupants. The only faculty probably which could not be evolved out of matter would be the divine mind of man, which the Deity alone, by another special interposition could restore.

To our minds the doctrine of special creation is an invidious, if not a very reprehensible one. To say that no new plant or microscopic being can come into existence without the special interposition of the Deity, is idolatry of a worse kind than that of the heathen; for while the heathen make their God capable of all things, from causing the rain to fall on their fields to saving their souls, we make a God for ourselves, and limit his powers to correspond with our finite knowledge. A man can make a machine which goes of itself if it is only wound up, and it does not again require his supervision, but our God who has made his machine, requires continually to superintend and interpose in its progress. A man may invent a kaleidoscope which gives a never ending succession of new and beautiful forms and figures long after he is dead and buried, while the Deity must be present at the birth of every new form of life in the earth which he has himself made and peopled. A God which endowed matter from the beginning with properties which enabled it when in a certain condition to form new life, is certainly greater than one who had to interpose in every new creation. The more grand, the more omniscient, and the more omnipotent our God is, the more worthy he is of our worship and adoration; it ill becomes any-one, therefore, to detract from His glory, or to put any limit to His Majesty.

It is denied by many that instances of spontaneous generation have ever taken place, but it is an undoubted fact, that wherever experiments have been performed, whether by Pasteur, Childe, Bastian or others, and whenever fair play has been given to the experiments and life has had a chance of budding, life has resulted.

There are of course scores of men who conduct experiments in such a way that life has not a chance of exhibiting itself. They enter into the subject with a mind predisposed against the theory, and perform the most useless experiments under the most absurd conditions. They did not want to produce animals which lived under like conditions with ourselves, or the animals around us, but creations which would be subject to conditions which are imposed on no living thing. Because animals would not form in solutions known to be destructive to all animal life; because animals could not be evolved with a body which would endure being boiled or roasted; because animals would not come to life in an atmosphere below zero, or could live without water, spontaneous generation was a farce! Many also would mix up mineral substances alone, expecting an animal to result, when the only possible one would be of cast iron, rivetted and jointed with nuts, screws, and washers; they forgot that even such an animal—a locomotive for instance—requires fire, air, and water, to set it in motion. These experiments by incapable or prejudiced chemists, do not, however, affect the main proposition—which, indeed, forces itself on everyone who has seen stale beef, cheese, fruit or vegetables—viz: that under favorable conditions, life will continually spring up spontaneously in matter.

As our time is limited, and it is impossible for us to analyze the subject as we would like, we will confine ourselves to showing what life is, and if we can prove that the life which forms crystals and rocks and moves the compass needle, is the same as that which grows trees and moves our bodies, then we may consider our premises proved, for as all organic beings are composed of so-called inorganic matter, and if the same life pervades both, what should prevent the life force from gathering several inorganic atoms, and growing them into an organic animal? We do not say to grow into an elephant or a hippopotamus in a few days, but into a microscopic animal, having as much semblance of life as an oyster or a sponge. That these animals might, however, develope into creatures as large as elephants, if deposited in favourable situations, and left undisturbed, is not only possible, but probable.

Strange to say, although the origin of life has always been a fascinating one with philosophers, and the laws which regulate the physical and inorganic creation have allured the minds of an equal number of men, yet so far as we are aware, no one has ever attempted the very obvious problem of tracing the connection between the two. They have always been considered as two forces separated by a very wide gulf indeed, but if we only look at it in a common sense light, it is surely more in accordance with the grand workings of nature that there should be only one law of life or motion than that there should be several.

In the first place what is life in the broadest acceptation of the term? We should think any movement or motion of bodies would be called life, for the only death that we can imagine is stillness.

Secondly, is there such a thing as stillness, unchangeability or immovability in matter? None that we know of; even those physicists who deny that inorganic matter has life say that matter is possessed of motion, but what that motion is they do not understand, and they do not even hint at its affinity to organic life.

Seeing then that all nature has motion or life, what in the third place is the lowest form of it? Looking at any object around us, we see that there seems to be an attraction of like to like—for instance in a table or chair the woody fibre has such a strong tenacity, each atom for the other, that they cannot be separated except by force, as by fire or chemical action. Take iron, coal, stone, our bodies, or indeed anything, and this one fact stares us continually in the face, *that matter has an attraction for its like.*

Again, the lowest form of force we know of is magnetism. A piece of iron magnetised will attract other pieces of iron to it. But besides this attraction there is also a repulsion, and thus we have become acquainted with the polarity of iron. If we break a magnet each piece has polarity, and if we break till we can break no longer, each piece will still exhibit polarity, and then we, as Tyndall says, "prolong the intellectual vision to the polar molecules" and see them endowed also with polarity. This reasoning has been objected to by Tyndall's critics as unscientific, because, as one said, "by crossing the boundary of experimental evidence it is no longer in

any sense a scientific conclusion," but we fail to see its unsoundness, and if such deductions are not to be allowed, there is a limit put to all scientific investigation and first causes would never be discovered. If we thought the question worth arguing we could easily show that in all sciences when direct evidence is impossible, analogical evidence is accepted. The world will not, we think, in this instance, submit to be led by an anonymous critic, even although he is a contributor to *Blackwood*.

The next form of force that we know of is in a plant or tree. We before drew the attention of the Institute to the great similarity between the force of a tree and the manner in which the tree grew, to a magnet with filings at either end. We showed how there was no growth comparatively speaking from the trunk, as the centre of the magnet, and how the roots and branches repelled each other and never came into contact; all exactly as we find it in the iron magnet.* Seeing then that there was no theory before the world of the cause of the life of a plant, and seeing that all the exhibition of its force could be explained by magnetism, we thought we were justified in concluding that the life force of a tree was magnetism.

We also spoke of an animal exhibiting somewhat similar peculiarities in its shape and growth, to the iron magnet. A man's legs and arms spread out at either end of his trunk or body, and the life force or action is from the centre (or stomach where the food is dissolved) to the extremities. If we take the lowest form of life—the zoophyte—we find that if we cut it into innumerable pieces each piece will form another complete zoophyte, thus further resembling a magnet. The problem of the vital force of men and animals not being known either, we thought ourselves justified in also saying that the highest as well as the lowest development of life or force was magnetism.

Furthermore, what is true of one magnet ought to be so with another. If then we are correct in saying that the molecules of an iron magnet have polarity, *the molecules of all plants and animals being magnets, should also have polarity.* Again, as

* As in breaking a magnet also, each piece shows itself a complete magnet; so in plants or trees, each cutting shows itself also a complete magnet by growing.

all minerals, rocks, etc., have a certain structural power which may be traced to magnetism, we make the broad assertion that all the atoms *of matter in the earth have polarity*. But it will be said this is only an assumption and nothing more, and as it cannot be proved, we may only take it for what it is worth. Yet strange as it may seem, nothing is easier of proof, and we do it in the following manner:

We have said that in breaking a magnet each piece is found to be a separate magnet having polarity, but if we reverse the experiment, and incorporate a number of magnets into one, each magnet merges its individual polarity into the magnetism of the whole, and no matter what may be the size of the magnet, or the number of magnets incorporated with it, there can never be more than the two poles in it. This leads us, in passing, to say that if an argument holds good in one extreme, it ought to hold good in the other. Thus with regard to Tyndall's prolonging the intellectual vision to the polarity of the magnetic molecules, if such a deduction is not scientific because "it crosses the boundary of experimental evidence," then neither is it scientific to say, that if a million magnets were welded into one great magnet a mile long by half a mile broad, it would have only two poles, because such an experiment is beyond the experimental boundary; yet no one would ever dream of doubting it. Strange also as it may seem, we have a real magnet much larger than the imaginary one we have pictured, composed too of innumerable smaller magnets; but this anticipates the concluding proof to our magnetic or rather *ato-magnetic* theory of life, (for we include the atomic attraction of like to like in it, because the two forces are inseparable). We have said that the atoms of all iron are magnets; we have also said that the atoms of all plants and animals are magnets; we have even hazarded the assertion that the atoms of all matter in earth, air and sea, are magnets, and herein lies our proof of it. If all the atoms in the earth are magnets, then the earth itself ought to be one vast ponderous magnet, with only two magnetic poles. And is it so? The only answer is, Yes!

In conclusion, is not this as it should be, for where is the neces-

sity for a multiplicity of forces when one is sufficient for the purpose. We enter a machine shop, and amid the buzz of wheels and bands we see an engine in a corner running not only the small wheels, but turning the large fly-wheel as well; or we look on our harbour and see the same power moving not only the pleasure steam-yacht but the ponderous iron-clad as well. If then such is the manner in which man accomplishes his objects, if it is his endeavor in every force he controls to make it work not only small things but great, how much more should it be nature's mode to work in a similar way, for all man's highest efforts are but to imitate or to copy her, and it is not possible that the original should be less perfect than the copy.

Spontaneous Generation, therefore, or the cause of it, is only one quoin stone in the arch which girdles the universe, without which nature herself would be incomplete, and in a state of chaos.

Art. IV. — Halifax Meteorology 1874. By Frederick Allison, M. A., *Chief Meteorological Agent.*

(*Read May* 10, 1875.)

I have confined myself this evening to brief remarks upon my meteorological observations at this station the past year; as, although statistics are now rapidly accumulating, it is well to defer extended deductions from comparisons of observed facts until a still larger mass of figures and notes be obtained, so as to ensure more accuracy in normals and limits, to work from in the future time.

Summarizing 1874 then, we find a cool moist year, varying in these principal characteristics very slightly from its two immediate predecessors. The actual tabulated results were as follows:— Mean temperature 42°25 — or .61 below the mean temperature of 12 consecutive years from 1863 inclusive. The maximum was 86°, 93°1, being the highest I have ever recorded here—that was in August 1872. The minimum was 15°8—the lowest degree I