ART. X. — 1. PROF. AGASSIZ *on the Origin of Species.* American Journal of Science and Arts for July, 1860.

2. PROF. PARSONS *on the Origin of Species.* American Journal of Science and Arts for July, 1860.

THE scientific world and a large surrounding district, including many who, without being investigators themselves, take a deep interest in the results of investigation into the laws of nature, have been thoroughly aroused and excited by the publication of Mr. Darwin's speculations. Many are dazzled by the ingenuity which he displays, and do not at once see that facts are wanting for a sufficient basis of so broad a theory; and not only so, but that facts inconsistent with his theory are carefully kept out of sight, and are left to be brought forward by others, who discern the difference between the actual laws of nature and those processes which Mr. Darwin has so ingeniously proposed to substitute for them, and for the creative action of a Supreme Being. The constant demands of Mr. Darwin upon our belief, his constant assump-

tion that what may have been has been, and his frequent errors in statements of fact, are distinctly pointed out in the brief extract from the coming volume of Agassiz, which has appeared in Silliman's Journal; and we congratulate ourselves that the views we have heretofore expressed have been so much confirmed by this high authority.

Mr. Parsons's article is designed to point out the difference between the statements and arguments of the new theory of the origin of species, and the arguments of those who would derive all things from chance or accident, and to show that Mr. Darwin's theories are reconcilable with a belief in an Almighty Creator. We willingly accept the conclusion without deeming it necessary to arrive at it by this precise path. We think Mr. Darwin's treatise has little or no bearing upon that question; as a creator is necessarily presupposed in every theory of creation, except the utterly untenable one of chance, which is no theory at all.

Mr. Darwin became very favorably known, as a scientific investigator, by his work upon the islands of the South Seas, in which he discovered the powers of a diligent, careful inquirer, with as little disposition to speculate or theorize upon newly discovered facts as could be expected of the most prudent investigator into the operations of nature. This wise caution gave immediate authority to the results of his more recent studies, and procured for his new work, "On the Origin of Species," the most favorable reception among scientific men. The language of the work, too, is so unassuming, so full of the modest tone of an inquirer, as to make the book quite a model, in this respect, for all scientific investigators. The *style* of the work, we say, is thus diffident; but in the substance of the language, in the ideas expressed, we think there is as much confidence of tone, and as much security as to the accuracy and weight of the thought, as in the terms used by any of the more obviously confident inquirers. We perpetually come upon such phrases as these: "I do not pretend that the facts given in this chapter *strengthen in any degree* my theory; but none of the cases of difficulty, to the best of my judgment, annihilate it." "Fi-

nally, it *may not be a logical deduction, but to my imagination* it is far more satisfactory." (The Italics are ours.)

Now, if the facts given in any chapter do not strengthen in any degree his theory, why are they inserted in the book at all? They must be irrelevant. And if a deduction be not a logical one, why is it made or suggested in a professedly philosophical work? We should not urge this criticism, if the phrases quoted, or similar ones, did not abound in a book in which it is claimed that everything is proved which is necessary for establishing the probability of the theory. It appears to us that there are many facts mentioned which not only do not strengthen the theory of Mr. Darwin, but are, in truth, inconsistent with it; while he has most adroitly kept out of sight other facts, familiar and innumerable, which are not only inconsistent with it, but absolutely and entirely opposed to it, and subversive of it, so far as we know at present. For instance, in a state of nature, how much can we discover of hybridism? It is frequently a result of human contrivance and arrangement, and can be practised only to a limited extent between animals or plants that are by nature somewhat allied. Species often differ so extremely in formation and habits, that no idea of intermixture between them can be entertained; and there exist no gradations by the intervention of which such intermixture can be even conjectured to be brought about. Between a geranium and an oak, a mole and an elephant, we cannot conceive of a series of gradual changes by which they could be traced back to a common ancestor, even through an endless series of years. They are different, — utterly, irreconcilably different, — and no amount of time or arrangement of circumstances can be imagined by which the two could be produced from one original stock. Hybridism is possible only between related stocks, and the new varieties produced by it die out, if left without human care to perpetuate them. Hybrids are not natural productions, but artificial ones, and require the constant exercise of intellect, not only to produce them, but to continue their existence.

"Naturam expelles furcâ, tamen usque recurret."

The idea of deriving one race of animals or of plants from

another, in an infinite series, seems to us utterly inconsistent with all that is known of either. Because numerous and great varieties of pigeons can be produced from one original stock, does it follow that hawks and pigeons were of one blood originally? Because a bear can swim, and pursue insects in the water, does it follow that he might become a whale, or "something very like a whale," or, as Mr. Darwin phrases it, "as monstrous as a whale"?* In order to bring these speculations within the compass of possible belief, Mr. Darwin has recourse to the by no means novel expedient of the extension of creation and generation through an endless term of past ages; and small variations at a time, he thinks, may have been propagated by the superior vigor of some of the early specimens of a particular species. Perhaps they may, and perhaps they may not. The negation is just as probable as the assertion, in a world where we see daily so many proofs of those words of wisdom, "The race is not always to the swift, nor the battle to the strong." It cannot be considered an axiom in natural history, that the stronger animal of a race survives the weaker in the struggle for existence. Yet this is taken for granted in Mr. Darwin's work, and must be, in order to sustain his theory at all. As far as our observation extends, there are always specimens of the stronger and weaker individuals of every species coexisting, and always specimens of weaker and stronger hostile races coexisting. There are races too which are forever enemies, yet never gain a decided or overwhelming victory on one side or the other.

Geologists have laid down with great minuteness the order of the appearance, by deposit or eruption, of the rocks and earths of which the superficies of the globe consists; and we do not call in question the accuracy of the results to which they have attained. It does not seem to us necessary to infer that the changes which have taken place upon the surface occurred at a given time all over the globe at once. The imagination is active in drawing pictures of general convulsions, when it may just as easily be conceived that great changes were partial, and

* This suggestion, by the way, would reverse the commonly adopted order of creation, and supposes the superior organization to have been first created, and then to have degenerated into one of a lower order.

that an alteration of level was gradual and various, as it is at the present moment. In one part of the earth the sandstone may have subsided, at the same time that, in another locality, the chalk was elevated; just as, at present, some of the atolls of the South Sea are supposed by Mr. Darwin to be subsiding, while it is believed that the shores of the Baltic are rising. This process may go on for a while, and then be reversed; the insect formation of coral may be discovered, in future ages, in the marble quarries of southern lands, and the Baltic may again be a sea of deep waters. Convulsions do not appear to be necessary for these changes, but simply a few of those ages upon which Mr. Darwin draws as upon an inexhaustible fund of eternities. The varieties of surface and deposit tend to the same conclusion. Nowhere do we find an unbroken series of deposits, from the lowest to the highest, from the first to the last. It would seem that deluges have, for the most part, been partial, and earthquakes local, and that they have produced changes which, however grand and striking, have not been universal. Animals have existed of which no living specimen can be found; and we see, at this day, the process of extermination going on, as in the case of the beaver, or accomplished within a brief period, as is shown by the loss of the dodo. We have not witnessed any universal convulsion, yet we see vast changes brought about. We infer, therefore, that other equal changes may have been produced in past ages, with which we are not familiar, in the same quiet manner. The extermination of animals we have known and witnessed ourselves. The creation of them we have not witnessed. We consequently know, and can know, nothing of the manner in which it is accomplished.

Modification of the animal creation is all that has been effected by man, — as in the case of the pigeons, on which Mr. Darwin lays so much stress; that is limited, of course, by the nature of the animal, and the progeny of pigeons, however curiously various, are still pigeons, and not eagles. Nor can we, by any effort of the imagination or the understanding, conceive of the one being converted into the other, or into anything else than pigeons and eagles, however great might be the differences of the organization of each as transmitted from

parent to offspring. Pigeons are Mr. Darwin's *cheval de bataille*, and till he has made it evident not only that great changes in appearance, but great changes in organization, are effected, so that pigeons cease to be pigeons, and become crows or humming-birds, or something as different from their progenitors as humming-birds or crows, we do not see that he has taken the first step toward demonstrating his theory. Pigeons are pigeons still, though there may be hundreds of very different varieties of them. Bears will continue to be bears, whether they swim after insects or not; and men will continue to be what they always have been, notwithstanding the theories and conjectures of all the philosophers from Monboddo to Darwin. At least, these are our present opinions, which we shall be ready to renounce upon the first *proof* that man has degenerated into the monkey, or that the monkey has risen to be man, — that a bear has been converted into a whale, or a whale into a bear.

It may be true that these, or equally wonderful transformations, have taken place; but the mere conjecture that they have occurred is not exactly the natural history or philosophy that we desire. We want not the possible, but the actual history of the formation and descent of animals and races of animals. It is not enough that we can suppose gradual changes by which one animal might be converted into another. We must witness the process, we must see one animal changed into another, or see the history of such transformation carefully proved, before we can believe any such thing, or can assent to any hypothesis by which all varieties of animals are represented as produced from one original animal, or a few primary patterns. But this kind of evidence is admitted to be impossible. The changes of nature are so slow and minute as to escape detection by any one generation, or even by all generations, as far as mankind have yet existed. If so, of what proof are these changes susceptible? If they cannot be proved, why should they be suggested? Does it in any degree facilitate our conception of creation, and of the infinite variety of living forms, to trace them all back to one or a few original types existing an inconceivable number of ages ago? We must confess to as great readiness to believe, and to as great facility in comprehending, the creation of many types as of

one, and to their being brought into existence at once as successively. The growth of all animals from one or a few original prototypes is in itself as great a marvel as a multitudinous creation at the same time. We venture to think that not the slightest proof, nor anything that really amounts to a tendency to prove that the process of creation has been such as is contended for, has been produced as yet by Mr. Darwin. Is it sufficient to show that a few varieties and hybrids of plants and animals have existed, to render it probable that all plants and animals are in fact hybrids of two or three original species? Is it philosophical to rely on a theory which requires an infinite length of time to produce a single one of the prodigious changes of structure which are the subject of investigation? Even granting the infinite length of time, how can it be shown that it is otherwise probable that one race of animals has been derived from another? Who can overcome the obvious, the inherent incredibility of such a theory? Does it not seem probable that the great diversities of form and character among animals and plants, amounting to absolute immiscibility, were designed to show, and is it not clear that they do show, that they were not derived from any common ancestor?

Between the most ferocious animals of the same species, there is no such hostility as between them and other beasts. Lions do not contend with lions, but with animals of other blood. Can it be supposed, is it philosophical to suppose, that the lion and the lamb are of one common ancestry? If so, their lying down together, instead of being an intimation of miracle, would only be acknowledging their relationship, and giving up, at last, a family quarrel. If all the animals of the world were derived from a common ancestry, would such an infinite diversity be a natural result? We see the constant care which is necessary to preserve the distinguishing traits of a particular breed of pigeons, or of cattle. Pouters and short-horns cannot be left to the chance consequences of natural selection. They would soon lose their characteristics. They have been produced within a short period, and a shorter period would suffice to mix them up again with the general blood of pigeons and cattle. But all animals of a particular race have remained substantially the same ever since any historical ref-

erences to them were written and transmitted. The lions of the Roman amphitheatre, the elephants of the army of Pyrrhus, the flocks and the herds of Lot and Abraham, and the horses of the army of Pharaoh that perished in the Red Sea, were doubtless the same animals as are known to-day as lions, elephants, cattle, and horses. It is obvious that for any modification of races, on the theory of Mr. Darwin, we must go back beyond historical times, into the world of conjecture and theory; and when there, we are tempted to ask the old, but not worn-out question, "Cui bono?" One theory may be as sound and rational as another; and we may conjecture all animals to have been drawn from one stock, or to have been derived from different originals, as we find most consonant with reason and judgment. One man's conjecture is just as probable as another's; Mr. Darwin's frequent phrase, "It may be," is a good introduction to an infinite diversity of schemes of creation.

> "Of God above, or man below,
> What can we reason, but from what we know?"

The argument from our ignorance, namely, that we do not know the contrary of what is asserted, is hardly sufficient, at the present day, to maintain a startling theory; and we confess to some surprise that any ingenuity, however great, could so turn men's eyes from broad facts, to dwell upon fanciful theories, as Mr. Darwin has succeeded in doing.

The diversity of form and character in plants and animals is very great at the present day; and at the same time the resemblance of individuals of the same species, and in many cases of allied species, is so great as to be instantly recognized by the student of nature. If all are derived from a common ancestor, how has the diversity been produced? The ancestors of each existing species, so far as we know, had at least a general resemblance to their descendants. Flocks and herds, bears and lions, were the same creatures, with the same differences, five thousand years ago as to-day. We have reason to infer that other animals were also the same then as now; and we are led to inquire how far back the similarity, which is the evidence of consanguinity, begins to appear. As far as we can

trace the history of man and animals, we find no symptom of any change in races; nor do we perceive that the difficulty of understanding the work of creation is in the least diminished by reducing the number of original and distinct formations, from which all others have been derived, to one pattern or a half-dozen patterns of animals. The difficulty of creating, or rather of imagining the creation, of one, is as great as that of imagining the creation of many. The same power and wisdom which could create a race or an individual, could create many such; and a creator is as necessary for one as for many, unless we suppose the unphilosophical absurdity of self-creation.

There is one animal about whose origin Mr. Darwin has said little or nothing; leaving his readers to infer for themselves how far his theory extends, and whether man is one of the many races derived from a remote ancestry of beastly structure or not. We should like to know precisely how he would span the gap between man and the other animals. Does he mean to merge the human race also, with the bears and the whales, in a primeval archetype? Or does he suppose a separate creation, a peculiar origin for this peculiar race? He has given us scarcely a hint upon this point, the most interesting, of course, to us; and we must wait for the further development of his theory in the complete work of which we have now only a sketch and outline, for any extended view of this part of the subject. In the mean time we will venture the confession that the speculations of Mr. Darwin and others upon the origin of species do not materially change our old-fashioned belief. We do not, as yet, see the slightest approach toward proof that animals, numerous and various as we see them, are all descended from one or half a dozen archetypes. There are certain broad distinctions between animals, as well as certain resemblances, and the resemblances must be shown to a much greater extent than they have yet been proved, before anything like identity of origin can be rendered even probable. It does not follow that, because we cannot discern the differences between the germs of different animals in the ova of very various species, there are no differences. It is certain that differences exist, and that the ova of one animal cannot be made to develop into an animal of another species.

Moreover, the differences remain to be accounted for, if we adopt the theory of a common origin. A fin is not a leg, nor a wing, however much the three may resemble one another; and the *conatus* of the animal to change one into another, according as it finds itself in the air or the water, is not generally considered an explanation of their origin. There are, also, differences for which the slender resource of instinctive effort is not even offered as an explanation. There are many animals, for instance, with the bones on the outside of their bodies, instead of having them protected by the more elastic material of flesh. Some have a part of their bones exterior and a part interior. Some have the breathing apparatus carefully protected by thicker or thinner masses of bone, gristle, and flesh; others have these delicate organs on the exterior of their frames. Some have air-bladders adapted to one element, some to another, and some to both. There are flying fish, and diving birds. The eggs of all these creatures are so much alike in their intimate structure, that we cannot discern the differences in their earliest development; but that there is some essential and original difference is proved by the fact that they cannot be interchanged. No egg of a duck ever produced a chicken; and we think it requires a peculiar, as well as a philosophical, constitution of mind, to suppose that, while this apparently slight change in the order of nature cannot be produced by successive efforts during long periods, still others of an infinitely greater amount may have been produced by "natural selection," in the course of time. We know not how long ago the experiment of hatching ducks' eggs under hens may have been tried; but we do know that there seems to be no tendency, in a considerable number of years, and of experiments, to diminish the instinctive aversion of the hen to the water, or the instinctive love of it in the ducklings. It is of no consequence how much the germ of the one may resemble the germ of the other in the egg. Essential differences are, at some time, developed; and to all appearance — aye, and to all sound philosophy — must have existed in the first births of the two animals as strongly as in those born yesterday. Generation after generation, so far as human knowledge goes back, has developed no change, no gradation of instinct

or of form, in so many animals as to justify a theory that would derive all from one primeval form, or from a very few original patterns. The diversities are apparently insuperable, and, as far as our knowledge extends, always have been so. That the fact may have been otherwise in antecedent ages is a gratuitous assumption, which, of course, admits of no proof, but which, we think, requires proof of the most distinct and positive kind to render it at all admissible.

Finally, of what possible use or value, except as an exercise of mind, can it be to speculate upon the origin of species, in the absence of a sufficient number of acknowledged facts to render a theory tenable? In many cases, the smaller the array of facts upon which a theory is founded, the greater the ingenuity and skill of the founder; and in this sense we cannot but congratulate the author of the great theory we have been considering. We think, however, his task is but just begun. We look, hereafter, for a more complete development of the idea, in which we shall expect to see some account of the form and character of the two or three original animals from which the present varieties of living beings have descended, and a genealogy of the families of animals as far back as to the original Adam of each. We can hardly expect Mr. Darwin to live long enough to complete this course of study himself; but it will be ample and noble employment for many successive generations of his pupils and admirers. In the mean time the humbler faculties and efforts of less original men must go on in the old method of inquiry into what is, and, as far as possible, into what has been; leaving to the higher orders of genius the exalting speculations as to what may have been in the eternity that is past, as well as what may be in the eternity that is to come.