

At Vienna has appeared, as a kind of first-fruits of the Mexican connexion, "Mexico: Historische Skizzen, vom einern K.K. Offizier."

A FIFTH VOLUME of Welcker's "Alte Denkmäler," which originally was not to appear till after the author's death, has nevertheless been published, at the instance of Professor Jahn, who took the preparation for the press off the veteran archaeologist's hands.

The first portion of an important work on the aquatic botany of Europe has been published by Mr. Ed. Kummer, of Leipzig: "Flora Europæa Algarum Aquæ Dulcis et Submarinæ;" by Dr. L. Rabenhorst. The work, which is extensively illustrated with woodcuts, will be completed before Christmas by the publication of the second portion.

In Schimmert, near Aix-la-Chapelle, remains of a Roman camp have been discovered. Arms, needles, bones, a beautiful ruby-ring, and various other objects have already been brought to light; and the excavations, which are being carried on vigorously, bid fair to prove more fruitful still.

A CURIOUS festival was celebrated the other day at Winterthur. It was in the year 1263 that the good citizens of that place, seizing the opportunity of the illness of the old Governor of the stronghold Wynthurn, Hartmann von Kyburg by name, took the castle and destroyed it. But their brilliant charge cost them dear. His nephew, Rudolf von Hapsburg, hurried to the spot, and forced them into speedy submission, making them pay enormous ransoms. Soon afterwards, however, he gladdened their hearts by giving them a "charter of liberty." They were promised that no one should henceforth be judged except by their courts of public justice, and that the taxes should never exceed the sum of 100 florins. This letter was granted to them on the 22nd of June, 1264; and the good people of Winterthur celebrated their jubilee, or "tusig Rittertag," as they call it, with an immense deal of joy, flowers, shooting, eating, drinking, and dancing. In fact, a similar popular festival, they say, has never been seen in Switzerland before. The whole city, from the largest edifice to the smallest cottage, was literally covered with flowers; and all the female part of the town was busy with garlands and other domestic decorations for a full fortnight before. The number of strangers was very great.

OF new German dramas we mention "Hexen-Hans," by H. Hersch, author of "Anne Liese;" "Lustiges Volk, oder Berlin im Sommer," by Weirrauch; and "Die Männer von Heute," by the pseudonymous Julius Rosen.

"OESTERREICH'S Btheiligung am Welthandel" is the title of a memoir just published which sets forth the unfavourable state of Austria with respect to her maritime trade, and is creating a great sensation in high quarters. Immediate steps towards the remedy of some of the worst evils pointed out in the pamphlet are anticipated in Vienna. The proceeds of the sale of the pamphlet will be handed over to the seamen wounded off Heligoland.

The memory of the daughter of Maria Theresa is still so much cherished by the Bohemians that a bookseller of Prague is issuing in cheap numbers for the colporteur trade "Marie Antoinette: ihr Leben und Wirken, geschildert in ihren eigenen Briefen," the letters being those now in course of publication from the originals by Count Paul Vogt von Hunolstein, who edits the work.

B. AUERBACH'S "Volkskalender für 1865" will make its appearance this month. Its contents will be richer than ever:—two stories by the editor himself, besides contributions by Gerstäcker, Hartmann, Ziegler, B. Sigismund, Prof. Holzendorff, Wackernagel, and other eminent writers.

THE "General Direction of the Royal Museums" in Berlin has acquired a most valuable engraved gem, consisting of a beautifully executed bust of Antoninus Pius—the first "gem-bust" of the royal collections. Last century, it appears, the gem was brought to Prussia by a man who had travelled in the East, and it remained in his family, who were living on an estate near Berlin. In consequence of the death of its late owners it was put up for sale. The bust seems to have been buried for years, as is evidenced by its discoloration. Only the tip of the nose is slightly mutilated.

ANDREAS FAX, the Nestor of Hungarian literature, died on the 26th of July, seventy-eight years old.

A VOLUME of hitherto unpublished letters of Alfieri has appeared at Florence with the title of "Alfieri Lettere Inediti alla Madre, a Mario Bianchi, e a Teresa Mocenni," under the editorship of MM. J. Bernardi and C. Milanese. Amongst

other recent Italian books we notice Luigi Anelli's "Storia d'Italia dal 1814 al 1863," in 4 vols.; Cesare Cantu's "Storia della Letteratura Latina," a volume of nearly 600 pages; "Storia della Vita e del Pontificato di Pio VII.," in 2 vols. 8vo., by Gaetano Giucci; and a volume of some significance by Luigi Nascimbene, "L'Italia, il suo avvenire e la sua capitale, e soluzione della questione Romana."

The "Pfahlbauten" are not confined to Switzerland or Bavaria, it seems. At Olmütz, in Austria, some of the very oldest structures of this description have been discovered, and the southern end of Lake Garda, in Peschiera, contains such dwellings, abounding in curious bronzes.

A MONUMENT is to perpetuate the visit of the King of Spain to Napoleon III. At Irun, on the Spanish frontier, a pyramid is to be erected, the inscriptions of which are to allude both to the visit and to the inauguration of the Northern Spanish Railway and the great tunnel of the Pyrenees—which would seem to verify Louis XIV.'s "Il n'y a plus des Pyrénées."

THERE has appeared at Plon's, in Paris, the first volume of the Memoirs of Cardinal Gonsalvi, Secretary of State of Pius VII. This volume contains entries on the conclave held at Venice at the election of Pius VII., memoirs on the concordat drawn up between Napoleon I. and the Roman Chair on the 15th July, 1801, and items on the marriage between the Emperor and Marie Louise of Austria. The introduction to the volume is formed by the Cardinal's testament and many letters addressed to him by men like Hardenberg, Gentz, Metternich, Castlereagh, George IV., Nesselrode, Frederic William III. of Prussia, Wilhelm von Humboldt, Niebuhr, Bunsen, Mme. Letitia Bonaparte, and other members of the same family.

"WHEN Homer and Virgil are forgotten," said Heyne to a young aspirant to poetical fame, "your poems will be read, Sir Count." A gentleman of Exeter has sent us a pamphlet entitled "Battalia: a new Game of Skill upon Military Principles, designed to supersede Chess." An aspiration so modest makes it certain that, when Chess is forgotten, folks will find delight in Battalia—but probably not till then.

## CORRESPONDENCE.

(Anonymous Communications cannot be inserted.)

### THE VILLAGE OF CHARING.

To the Editor of THE READER.

Northampton, Aug. 9, 1864.

SIR,—Mr. Abel quotes a paragraph respecting the Eleanor Cross at Charing which assumes that the village derived its name from the words *Chère Reine*. But it bore the same appellation at least thirty years before the death of Queen Eleanor. In the narrative of the quarrel between the merchants of London and Northampton, in the *Liber de Antiquis Legibus*, the following passage occurs:—"Quibus litteris impetratis, ecce! rumores quod predicti prisoneres fuerunt apud Cherringe juxta Westmonasterium, ubi Maior et Ballivi Norehamptone illos adduxerunt." This was in 1260, and Queen Eleanor died in 1291.—I am, &c., G. J. DE WILDE.

## SCIENCE.

### PROFESSOR KÖLLIKER ON DARWIN'S THEORY OF THE ORIGIN OF SPECIES.

[FIRST NOTICE.]

IN the last number of the *Zeitschrift für wissenschaftliche Zoologie* Professor Kölliker has published an address on the Origin of Species delivered by him to the Physico-Medical Society of Würzburg. The object of this essay is stated to be the consideration of the Darwinian hypothesis, and of the objections which have been urged against it; and the author expresses a hope that, although he may be unable to elicit the whole truth from his investigation, it may yet assist in removing some differences of opinion, and lead more or less towards a settlement of the question.

Of the Darwinian theory itself Professor Kölliker gives the following outline:—

Starting from the notions, in the first place, that every organism presents variations arising from either external or internal causes, and, secondly, that every living creature has to struggle for its existence, Darwin enunciates the proposition that, in this struggle for existence, those varieties have the best chance of maintaining their ground which are most useful to the

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organism. This he calls "natural selection." Consequently, as the most beneficial varieties are always maintained, these are also transmitted hereditarily, and cause the production of *stable varieties*. These, however, undergo further variation, and again furnish new stable forms; and thus, in the end, the same process constantly going forward, are produced species, genera, families, &c.—in a word, all animal organisms. Darwin says expressly that we may assume as the starting-point of all animals a few primordial forms, or, perhaps, only a single one, as to the mode of creation of which he says nothing.

As regards his fundamental principles, it is remarked, in the first place, that Darwin is a *Teleologist* in the fullest sense of the word. He says distinctly that every peculiarity in the structure of an animal has been produced for its benefit; and his conception of the entire series of animal forms is solely from this point of view. A second point is that Darwin does not believe in any general laws of nature displaying themselves always in the same manner in perfectly independent creations; and thus he arrives at the conclusion that the unity in the series of forms of all creatures (unity of type), their natural affinities and numerous transitions, can be explained only by his theory of their gradual development from each other—in other words, by their genetic relation. If each species had been created independently, this wonderful harmony would be inconceivable.

After this brief exposition of the most prominent features of Darwin's theory, Professor Kölliker proceeds to the discussion of the chief arguments which have been used in opposition to it. These he takes in the following order:—

1. *No transitions have been observed between the species of the present period; and their known varieties, whether produced spontaneously or by artificial means, never go so far as to justify us in speaking of them as giving origin to new species.*

Undoubtedly there are animals, such as the dog, which vary so greatly that we might be inclined to suppose that they belong to several species and to ascribe to them a common origin in consequence of the numerous transitions existing between them. But, so long as we know so little about the history of this animal, it can be of little value in support of the Darwinian theory; for it is quite conceivable that several species of dogs may have existed originally, and that the numerous forms with which we are familiar have gradually been produced by their intermixture. Nor is it to be forgotten that certain very characteristic breeds of dogs—such as the pug, the bulldog, and the badger dog—evidently present us with *pathological conditions which have become hereditary*.\*

This applies also to pigeons, upon which Darwin has laid so much stress; and, with respect to these, it must be remarked that we possess no investigations upon the important question as to what forms of them are of morbid origin. As a pug dog is not a species, but a canine *cretin*, the short-billed pigeons, for instance, may also be pathological productions.

That great variations are not easily produced is proved by the long duration in an unaltered state of many living species—a duration which must not be measured only by the few thousand years of our historical period, but is incalculably longer; as, according to the unanimous statements of geologists, many species not only of the Diluvial epoch, but of still older formations, agree with those still in existence. To invalidate this fact Darwin might certainly argue that the great duration of certain species does not prove that others may not have undergone a change; nevertheless, it is deserving of consideration.

2. *No transitions of one animal form into another occur among the fossil remains of earlier epochs.*

In refutation of this objection Darwin has justly remarked (1) that the remains which have hitherto been exhumed certainly constitute only a very small portion of those present; and (2) that the remains preserved in the earth's crust only represent the smallest portion of the organisms which lived upon the earth. Thus only those animals have been preserved which were quickly destroyed by sudden catastrophes and protected from disintegration; everything that existed during the long periods of quiet life upon the undisturbed surface of the earth was entirely destroyed.

Moreover, although we cannot find perfect series of transitions, we may certainly meet with remarkable intermediate forms amongst fossil

remains—such as the Zeuglodon, the numerous fossil ungulate Mammalia, the Labyrinthodon, the Pterodactyles, and *Griphosaurus*. On the whole, it appears that, although the want of connected transitional forms between fossil species and genera does not necessarily furnish an argument against Darwin's view, his hypothesis certainly finds no support from palæontological facts.

3. *The struggle for existence assumed by Darwin does not occur in nature as described by him (Pelzeln, Bemerkungen gegen Darwin's Theorie vom Ursprünge der Species, 1861).*

It can, however, hardly be denied that every creature is exposed to multifarious unfavourable influences, and that in consequence of this many individuals are destroyed—some as ova and germs, others at a later period. Could all creatures be developed without hindrance, the earth would soon be over-peopled.

4. *No tendency of the organisms to form useful variations, or natural selection, exists.*

Varieties are produced in consequence of multifarious external influences; and it is not easy to see why all or some of these should be particularly beneficial. But, even if a variety should be advantageous and really maintain itself, we can discover no reason why it should proceed to undergo still further alteration. The whole notion of the imperfection of organisms, and of the necessity of their improvement, is evidently the weakest side of the Darwinian theory: it is a makeshift—Darwin being unable to imagine any other principle to explain metamorphoses which, as I also believe, really took place.

5. Pelzeln has likewise urged that, if the later organisms have originated from pre-existing ones, the whole developmental series, from the simplest to the highest organisms, could not still exist, but in this case the simpler forms must have disappeared.

This objection may be partially admitted; for Darwin evidently assumes an enormous extinction of earlier forms; but, according to his theory, such forms may also maintain themselves. And what is there to prove that vast numbers of early forms have not really become extinct—such as the Ammonites, many Brachiopods (*Spiriferide* and *Productide*), the Trilobites, the Echinoderms, especially the Crinoids, the Nummulites, the old fishes with an imperfect vertebral column, the gigantic Saurians, the numerous Marsupials, Pachyderms, and Edentata, the Ganoid Fishes, many sponges, corals, &c.? And what do we know of the earlier molluscs which have left no remains? And we must remember that the higher organisms—such as Insects, bony Fishes (Teleostin), Chelonian Reptiles, Serpents, Birds, and Mammalia—are evidently of recent origin.

It may consequently be regarded as proved that, at early periods, simpler organisms were in existence; and from this side Darwin's theory certainly rather receives support than the reverse.

6. Huxley, otherwise a warm partisan of the Darwinian hypothesis, raises a strong objection against it—namely, that we are acquainted with no varieties which copulate fruitfully, as is the rule among sharply-separated animal forms.

If Darwin is right, it must be demonstrable that, by careful breeding, forms may be produced which, like the existing sharply-defined animal forms, are not fertile *inter se*; but this is not the case.

7. *Darwin's general teleological conception is erroneous.*

Varieties are produced without reference to notions of design or to any utilitarian principle, in accordance with natural laws; and they may be advantageous, injurious, or indifferent. The assumption that an organism exists only for a particular purpose, and does not merely represent the embodiment of a general law, presupposes a one-sided conception of the whole of existing nature. It is true that every organ and every organism has and fulfils its purpose; but this does not constitute the reason of its existence. Moreover, every organism is sufficiently perfect for the purpose it has to serve; and this cannot furnish a cause for its advance towards perfection.

8. *The Darwinian theory of evolution is not necessary for the comprehension of the normal series of organisms advancing harmoniously from the more simple to the more perfect forms.*

This harmony may be explained by the existence of general laws of nature, even if we adopt the notion that all creatures have been produced independently of each other. Darwin forgets that inorganic nature, in which no connexion of the forms by reproduction is imaginable, nevertheless exhibits the same regular plan, the same harmony that is displayed by organized structures, and that there is a natural system of minerals as well as of plants and animals.

We have hitherto spoken only of the deficiencies of Darwin's theory. It must, however, be admitted that he has been the first to venture on approaching the important question of the creation of organisms on the footing of *observation*, and that, by giving prominence to the genetic element, and by his attempt to represent the first production of organic beings as the result of a series of developmental acts, he has certainly struck into the only path by which this problem is to be solved. Philosophy and Natural History alike reject the notion of a production of organisms as directly perfect creatures—of an immediate action of the Deity at the first formation of each individual being; but this may be done, as Darwin has shown, without in any way impeaching the belief in the power and greatness of God; for, says Darwin, citing the opinion of a theological friend, our conception of the greatness of God will be just as noble and elevated if we think that He created a few forms, or even a single one, possessing the capability of producing the others by development, as if we were to believe that a direct action of the Deity has been necessary at the creation of every creature. Indeed, this conception may be justly placed upon a still wider basis; and, even by the assumption that the creative activity of the Deity simply called into existence a number capable of development, the idea of His greatness will not be essentially altered.

Darwin's work, compared with which all the older attempts at explaining the creation of animals on the ground of developmental history appear poor and weak, is, consequently, deserving of consideration even for its fundamental ideas; but it certainly merits the highest praise on account of the careful investigations upon which it is founded, the earnestness with which it is penetrated throughout, and the many new points of view which it opens up in so important an inquiry; for all these reasons it will always mark an epoch in science.

(To be continued.)

## THE ARCHÆOLOGICAL INSTITUTE AT WARWICK.

PROFESSOR WILLIS'S DISCOURSE ON LICHFIELD CATHEDRAL.

This year especially was Professor Willis's lecture, as Mr. Beresford Hope well described it, the venison course in the archaeological feast; for, putting aside the interest and clearness of the Professor's remarks, never, perhaps, before has any structure lent itself so well to one who delights to discourse on the gradual growth of architecture. The whole structure may be likened to a quarry on which the life-growths of successive formations may be examined *in situ*, the development of *idea* in the one case running parallel with the development of new life-forms in the other. Although much of the present discourse has already been committed to print in the *Archæological Journal*, vol. xviii., a brief account of what was said at Lichfield will, doubtless, be of interest to many of our readers. The edifice itself, which, though small, has always been considered as one of the finest examples of mediæval architecture in the country, stands on the spot where a number of Christian martyrs suffered death under Diocletian, and the fabric was begun by Bishop Clinton, who presided over this church from the year 1128 to 1163. In a region devastated by the Civil Wars it suffered much, and, although surrounded by a wall and foss by Bishop Langton, was, in March 1643, compelled to surrender to the Puritans, who stripped it entirely of its external covering, and of every thing they could convert into money, mutilating the images and carved ornaments, and destroying the monuments, as they did in so many other places which came into their hands. During a protracted siege which it sustained, Lord Brooke, Earl of Warwick, the leader of the Parliamentary forces, was shot in the eye by "dumb Dyott," whose fatal fowling-piece was exhibited by Archdeacon Moore.

It was during an examination of some old foundations laid bare in 1861 that Professor Willis discovered most of the traces of the successive buildings erected on this spot; for the documentary evidence, so valuable generally, is, in the case of Lichfield, remarkably scant and unsatisfactory. These foundations revealed exactly what might have been expected—a gradual increase of the fabric rendered necessary by the renown of its patron saint St. Chad, who was bishop here in 662, and the number of worshippers, and rendered possible by the gifts of the devotees. This is

\* See H. Müller, *Ueber Fittale Ruchitis*: *Würeb. Med. Zeit.-schrift*, I., p. 221.

Suffolk," was then read by Mr. Roberts; but it was too technical and rather too long for a mixed assembly of auditors.

On Thursday the castle of Framlingham was the first object of the excursion. This fine ruin is boldly situated on an elevation of the ground, and presents a strikingly picturesque appearance, especially from the road across the fields towards Dennington, which the visitors took after they had finished their examination of it. Mr. Phipson, who read a paper on the history of Framlingham Castle, made the rather bold statement that a Saxon castle stood here so early as the sixth century. The present castle, of which little more than the shell remains, was built after the middle of the twelfth century, and the character of the masonry is mostly late Norman, with a few alterations of more recent date. At an early period it was the property of the Bigods, and afterwards passed to the family of the Howards, dukes of Norfolk. The churches of Framlingham and Dennington were also visited and examined, and at the latter a paper was read by the rector, the Rev. C. Alston, who gave the visitors a very hospitable entertainment at the rectory. Both are fine churches, and present some features of interest. At the evening meeting in Ipswich Mr. Roberts read a paper on the East-Anglian ecclesiastical round towers; and there was a short paper by Mr. Phipson on a human heart found interred in the church of Holbrook, which he supposed to be that of the founder of the church. A paper "On Suffolk Emigrants to New England" was communicated by Mr. Clarence Hopper, and gave rise to some discussion.

Friday morning was devoted to the fine old mansion of Helmingham, the seat of the Tollemaches, which was built in the reigns of Henry VII. and Henry VIII., and remains in a very perfect condition. It is remarkable for its fine old library, which contains many printed books and manuscripts of great value. Among the latter is the Anglo-Saxon manuscript from which Daines Barrington edited King Alfred's "Orosius," and which was for some time supposed to be lost. The church is a building of nearly the same date as the house. The present incumbent, Mr. Cardew, has recently discovered near the churchyard the remains of an early cemetery—perhaps late Roman or Saxon, or both—a part of which was laid open for the inspection of the visitors. In the afternoon of Friday the Association visited the president, Mr. Tomline, M.P., at his beautiful seat at Orwell Park, where a very magnificent collation was prepared for them; after which they returned to Ipswich to a *conversazione* given by the Mayor; and next morning, after a shorter excursion of no great importance, the Congress was concluded, and the visitors separated. Next year the annual Congress is to take place at Durham, from which place a very pressing invitation had been received. The meeting at Ipswich has been decidedly a successful one—partly owing to the earnestness with which it was received in that town and in all the places visited, and partly to the zealous attention of its President, who displayed the greatest activity during its week of excursions. It will be seen that its work consisted more in excursions and visits to monuments than in the reading of papers; but perhaps it is in this circumstance that its greatest utility consists.

## PROFESSOR KÖLLIKER ON DARWIN'S THEORY OF THE ORIGIN OF SPECIES.

[SECOND NOTICE.]

WE have already shown that the principles which Darwin regards as governing the production of organisms have not been happily chosen; and we may now raise the question whether anything better can be set in their place. No one will approach such a difficult subject except with the utmost caution, and I therefore state beforehand, most decidedly, that we must not expect in this case to arrive at certainties, but only at possibilities and suppositions.

It seems to me that the notion of a creation of organisms *ex bloc* as perfect forms does not deserve discussion; consequently the following possibilities remain:—

I. All organisms have been produced *independently* from different germs, each of which developed itself into a particular typical form. This may be called the *theory of creation by spontaneous generation*.

II. Or only one or a few fundamental forms were produced separately and independently, and from these all the rest have originated by further development. This we may call the *theory of creation by secondary generation*.

This secondary generation may have taken place:—

A. By slow metamorphosis, in accordance with the principle of natural selection laid down by Darwin.

B. By gradual or sudden changes, under the operation of a law of development governing the whole of nature (*theory of heterogeneous reproduction*).

Professor Kölliker then discusses these possibilities *seriatim*.

### THEORY OF SPONTANEOUS GENERATION.

The existence of an organic material susceptible of development being presupposed, we may assume the formation in it of cells and cell-structures, which might become further developed independently of each other, in the manner of eggs and germs, to produce various forms of organization. Such a development can only be imagined as taking place in a fluid medium, and might possibly have induced the formation of the lower marine animals, and afterwards of Fishes and Amphibia. But how can we conceive the development of the land animals—such as Insects, Birds, and Mammalia—in this manner? If the course of development of a mammal, for example, were the same as in sexual reproduction, its development would be impossible, as it would be destitute of a placenta, and of the necessary nutritive matter. It only remains for us to suppose that the mode of development must have been different. Assuming the most favourable conditions, we have two possibilities to choose from:— (1) *that the germ evolved itself at once into the perfect mammal*, or (2) *that the mammal attained its permanent form very gradually by passing through intermediate stages*.

In the first case we have to imagine a colossal primordial germ, around which a shell must be formed; the whole might then stand in shallow water until the development, in accordance with the type of Birds and true Reptiles, of a young animal large enough to take care of itself immediately after breaking through the shell—something in the manner of the young of existing snakes and lizards. This notion was first invented by Oken; but it departs so widely from anything within the range of our experience that it probably never found any adherents, and is hardly likely to do so, unless, indeed, R. Wagner thinks of taking it up, as he has lately expressed the opinion that a germ-stock composed of cells may have been the starting-point of the creation of all organisms. But, as R. Wagner has judiciously avoided explaining how the Mammalia, and higher animals in general, were detached from such a germ-stock, I presume that he will not object to our abstaining from subjecting this imaginary germ-stock to any further critical examination.

In the place of the first-mentioned possibility, Karl Snell of Jena (*Die Schöpfung des Menschen*, 1863) has quite recently proposed the second, at least with reference to man; but it is not easy to ascertain from the work of this *savant* his precise conception of the nature of this gradual evolution. He refers to the larval life of Insects, and seems to imagine that man (and consequently also the other Mammalia) has lived for a long period under certain embryonal forms. But, as none of these forms is of such a nature that it would be capable of independent existence, Snell supposes that a mammalian germ furnished in the first place (1) an ichthyic form, which then (2) passed into a batrachian form, and (3) finally produced a mammal. Snell thinks that man lived and propagated for a long, long period—indeed, through many æons—in the primitive forms; and he has extremely original notions of these early ancestors of the human race. Although resembling animals in their structure, they were nevertheless no animals; and he supposes that they were distinguished especially by their look and expression, which gave them a character "attractive, mysteriously anticipatory, and profound"! Although an opponent of Darwin's theory that man has been produced from animals by natural selection, he nevertheless supposes that both human and animal forms have originated from one and the same main race, and that the boundary between man and animals did not originally exist.

This possibility, like the former one, departs so widely from any basis of fact furnished by the existing modes of development, and at the same time leads to such absurdities, that no one is likely to feel any inclination to adopt it. If the second theory, according to which all creatures have been produced from one or a few primitive forms, can be brought more into accordance with observation, we shall certainly be inclined to give it the preference; and this, in fact, appears to be the case, although not in respect to the Darwinian



theory, which we have already shown to be somewhat unsatisfactory, but to that which I have designated as

#### THE THEORY OF HETEROGENEOUS REPRODUCTION.

The fundamental idea of this hypothesis is that, under the influence of a general law of development, organisms produce other different ones from germs generated by them.

This might be effected—

1. By the fecundated ovum passing into higher forms during its development under particular circumstances, and

2. By the primitive and subsequent organisms producing other organisms from germs or ova without fertilization (Parthenogenesis).

There are facts which show that these suppositions are not *a priori* to be rejected as untenable; and, among these, I give the first place to

1. *Alternation of generations*, in which higher animals pass through forms agreeing with certain simple types, and do not originate from these by direct metamorphosis, but are produced by an act of asexual reproduction, in which the procreant zoid (nurse) does not necessarily perish. It is, however, especially in certain forms of the alternation of generations, taken in connexion with the rest of the history of reproduction in those sections of the animal kingdom in which they occur, that my hypothesis of heterogeneous reproduction finds a strong support—namely, those occurring in the Hydrozoa (Huxley).

Among the Hydrozoa there are three nearly allied, but still different types—namely, the Hydroid Polypes (including the Siphonophora), and the simpler and the higher Medusæ—certain genera and species of which lead an independent life, whilst others are connected by the closest developmental ties. Thus the *Hydra* is a fully-developed independent form, increasing by gemmæ and ova, and possessing no relation to the Medusæ. Another creature resembling *Hydra*, the so-called *Hydra tuba*, is, on the contrary, only a stage (*Scyphistoma*) in the development of certain of the higher Medusæ (*Aurelia*, *Cyanea*, *Chrysaora*, *Cassiopeia*, *Cephea*) which it produces by gemmation. Certain Campanulariæ, Sertulariæ, and Tubulariæ propagate in the ordinary way by ova produced in simple sexual individuals which differ entirely from Medusæ; in others, and also in the Siphonophora, these reproductive individuals more or less resemble Medusæ; in others they detach themselves and live as free sexual animals; and, finally, some such Polypes produce by gemmation, in peculiarly aborted individuals, several creatures of the form of simple Medusæ, which, becoming detached, lead an independent existence and form sexual products from which Polypes are again produced. But, as there are Hydroid Polypes which produce Polypes from ova, so are there also Medusæ (Equoriæ, Aginidæ, Trachynemidæ, and Geryoniidæ) the ova of which produce only Medusæ; and, again, many of the simpler Medusæ, besides polytipiform nurses produced from ova, furnish also Medusæ by direct gemmation. Glancing over the whole series of known facts regarding these animals, we cannot avoid the thought that a creative act has taken place, and probably is still going on, in them such as I have denominated *heterogeneous reproduction*—namely, that Hydroid Polypes are producing simpler and higher Medusæ; for, from these simple Polypes, which propagate directly by eggs, up to the Medusæ, which are likewise formed immediately from eggs, there is an almost continuous series of transitional forms of reproduction.

Next to the Hydrozoa, the Echinodermata deserve to be mentioned as examples of alternation of generations, especially on account of the remarkable forms of the larvæ, which may very readily be compared with simple animal forms once capable of leading an independent life. Nevertheless, the position of these larvæ is very different from that of the polytipoid nurses of the simpler Medusæ, and they rather resemble the Scyphistoma-form of the higher forms; at any rate, it cannot be regarded as impossible that such larvæ capable of sexual reproduction may have once existed, and the more when we consider that propagation by alternation of generations is by no means universal among the Echinodermata, and that there are species (*Ophiopsis squamata*, *Asteracanthion Müllerii*, *Echinastor spec.*), which produce young star-fishes directly from their ova. This fact appears to me to be especially favourable to the notion that we are here witnesses to a creative act still advancing towards completion; because, according to Hensen's recent observations, in other species of *Ophiopsis* and *Asteracanthion* reproduction by larvæ takes place, and thus the conditions resemble those exhibited by the Medusæ.

In the third place we may mention the nurses of the Trematode worms. By the circumstance that some of them at any rate produce similar nurses before they form Cercariae, these seem to indicate that possibly they were once independent forms.

2. We have certainly no facts directly proving that the fertilized ovum of an animal is capable of being developed into a higher form; but the possibility of such a process taking place cannot be doubted, as the embryos of the larger groups of animals are exceedingly similar in appearance. Thus not only are all mammalian embryos most strikingly similar in their early stages; but they also approach very closely to those of Birds and Reptiles. For example, a mammalian embryo need only make a little step in one direction or another to produce a different form, acquiring a larger skull, a greater amount of brain, &c. Above all, however, it must be remarked that, in animals which undergo a metamorphosis, the larvæ of certain inferior animal forms are extremely similar in appearance; and it therefore does not appear improbable that the ovum of a Perennibranchiate Amphibian might produce either a Triton or Salamander, or a tailless form. Moreover, by a retrogression or arrest of development, or by the excessive evolution of particular parts, embryos may acquire forms corresponding with those of other organisms of the same class. A microcephalous prognathous human embryo, for example, exhibits a simian type.

In conclusion, we may call attention to the two following facts, which show that an ovum does not necessarily always develop the same form:—1. It is well-known that in many animals the males and females are very different—so different, indeed, that, if they did not constitute the sexes of the same species, they would often have to be placed in different genera, or even in different families. 2. In the insects which form colonies even three different forms—namely, males, females, and workers (aborted females)—are produced from the eggs; and, amongst the ants, the workers may present very diverse forms.

These remarks will suffice to show that, among the possible theories of creation, that of heterogeneous reproduction agrees most closely with our present knowledge. If we admit this mode of development we may assume either one or several primitive forms, perhaps one for the invertebrate and one for the vertebrate animals; but these are suppositions which I will not further discuss at present. Each primitive form must have possessed the faculty of developing itself in various directions. It would first furnish species; and these would produce genera, which might go on constantly diverging more and more, so as, by degrees, to cause the establishment of families and larger groups.

It will be seen that the hypothesis set up by me is very similar to Darwin's, as I also seek to derive the different forms of animals directly from each other. Nevertheless, my hypothesis of the origin of organisms by heterogeneous reproduction differs essentially from the Darwinian hypothesis by the entire omission of the principle of beneficial varieties and their natural selection; and my fundamental idea is that the production of the entire organized world is founded upon a great plan of evolution, which constantly impels the simpler forms towards more and more complicated developments. How this law acts, what influences guide the development of the eggs and germs and impel them constantly into new forms, it is of course impossible for me to say; but I have at least the great analogy of the alternation of generations in my favour. If a Bipinnaria, a Brachiolaria, or a Pluteus is capable of producing so different a creature as the Echinoderm—if a hydriform polype produces the higher Medusa, and the worm-like Trematode-nurse forms the totally different Cercaria in its interior, it cannot appear to be impossible that the ovum or the ciliated embryo of a sponge, under particular conditions, might become a hydriform polype or the embryonic Medusa an Echinoderm.

Another difference between Darwin's hypothesis and mine is, that I assume many changes *per saltum*, although without laying the main stress upon them, as I am not inclined to assert that the general law of evolution, regarded by me as the foundation of the origin of organisms, and which is manifested solely in reproduction, may not act in such a manner that from one form others may be produced very gradually. I rather regard this point as suitable for further discussion; and, in connexion therewith, I will call attention to the following considerations:—

If we assume that my general law of evolution influences the development of organisms, so that

their transition into new forms is quite slow and gradual, giving origin, at first, only to varieties, and afterwards to species, we, in point of fact, place ourselves upon Darwin's standpoint, and subject ourselves to all the objections which may be urged against his hypothesis from this side, especially, 1st, that no gradual production of one species from another has been demonstrated; 2nd, that no transition from one animal form to another is known in geological periods; and, 3rd, that we are acquainted with no varieties which, like species, produce an infertile progeny. Moreover, it may, perhaps, be said with justice that, on the supposition of a gradual development of species and genera, even those enormous periods of time occupied in the formation of the earth's crust could hardly be sufficient.

If, however, we follow out the notion that the transition from organism to organism has taken place more *per saltum*—so that, for instance, a primitive organism produced creatures related to each other as species, or, perhaps, even presenting still greater differences—we gain the following advantages:—

First, and upon this I lay most stress, we have a support for this theory in certain phenomena of the alteration of generations, of which, at least with reference to its more remarkable forms, we may even say that it becomes intelligible only when we bring it into connexion with a theory of creation of this kind.

2. The deficiency of transitional forms between species and genera does not affect us.

3. The conditions of reproduction are placed in a new light. In the first place, we are no longer troubled by the fact that varieties are always fertile *inter se*; and, in the second place, we can understand why some species are fertile and others not—a fact which can no longer be doubted. If species in creative action furnish species, these will be capable of fertile interbreeding; but, on the other hand, it is conceivable that this power afterwards ceases.

4. Such a mode of creation will certainly involve a long period of time, but not a period exceeding all probability.

Although this theory appears to possess many advantages over its rivals, I do not overlook the fact that there is something doubtful about the assumption that creatures which propagate by ova are able to produce other forms, however nearly allied to them, directly from the egg—that, for example, a marsupial organism might produce a rodent, a carnivore, or a low form of quadrumanous animal, or the latter a higher form of the same group. Nevertheless, there is no impossibility involved in such an assumption, as may be best shown by the example of the Perennibranchiate and Batrachia; and I confess that, as the development of the lower animals so decidedly points to such a mode of origin, I am at present inclined to follow it, without, however, feeling called upon to pronounce a perfectly definite and final opinion at once. I am consequently decidedly against the principle laid down by Darwin for the explanation of the conversion of one organism into another, although I do not consider that the mode of development advocated by him can be represented *a priori* as impossible.

If I am to express my opinion as to the position of man in relation to the animal kingdom, it is shortly this—that I find it impossible to assign him an exclusive place either in a corporeal or intellectual point of view. If the fundamental ideas suppositively established by me be correct, man also must follow them. It is true that, if we compare the cultivated Indo-germanic man with the highest Mammalia, the gap, not only in the intellectual, but even in the corporeal sphere, is so great that we can easily understand the general unwillingness to assert that man and certain mammals, such as the highest apes, stand in a genetic relation to each other. But, if we take the uncivilized prognathous Australian or Bushman, whose body may almost be denominated brutal, whose mental phenomena are of the lowest grade, the gap is by no means so great; and a comparison with such a being is not exactly flattering to ourselves. And who can say that the most anthropomorphic of known living apes—the gorilla, the chimpanzee, and the orang—are actually the most similar Mammalia to our race that ever existed, or that there were not formerly some races of men lower and more brutal than any now known? Consequently, although I should hesitate to say that the gorilla probably produced man, I cannot avoid stating distinctly that, if the law of creation which I have here endeavoured to sketch as possible should prove to be true for animals, it must also apply to man.