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THE THIRD INTERNATIONAL ZOÖLOGICAL CONGRESS, LEYDEN, SEPT. 16–21, 1895.

THE International Zoölogical Congress was organized at Paris in 1889 and the second meeting was held at Moscow in 1892. Neither of these Congresses was conspicuously successful in attaining a truly international character. The third Congress, however, which met at Leyden, September 16–21 of the present year, was not only brilliantly successful from the scientific point of view, but was also thoroughly international in the best sense of the word, a result which the Committee of Organization took the greatest pains to secure. The whole number of members registered was 232, representing 22 nations and colonies. Of course, these numbers were not equally distributed, Holland having 64 and France 56 of the entire number. Of much more importance than mere numbers in giving this international character was the distinguished position of very many of the delegates, most of the countries being represented by their foremost zoölogists, and the quality of the papers presented was unusually high. The arrangements for the comfort and convenience of the members, for the meetings and excursions, were in all respects excellent, and the Committee of Organization, MM. Hubrecht, Jentink, Hoek and Horst, as well as the local committees, acquitted themselves of their difficult task to the admiration of all the visitors. Upon this subject there was entire unanimity of opinion, and none who had the privilege of attending this Congress are at all likely to forget the delightful and stimulating experience.

On Sunday evening, September 15th, an informal gathering of the members of the Congress was held in the summer building of the 'Amicitia' Club, which, like the other clubs of Leyden, was hospitably thrown open to the delegates. This occasion was principally remarkable for the graceful speech of welcome in three languages, made by Prof. A. A. W. Hubrecht, President of the Netherlands Zoölogical Society, under the auspices of which the Congress was held. This speech, which was warmly applauded, is given in full:

MESDAMES, MESSIEURS ET CHERS COLLÈGUES!

C'est avec une joie bien sincère que je prends la parole ce soir pour vous remercier au nom de la Société Néerlandaise de Zoologie de vous être rendus à la bonne ville de Leyde afin d'y constituer un troisième Congrès International de Zoologie, qui a été précédé par les seuls Congrès de Moscou et de Paris.

Nous avons beaucoup apprécié la décision qu'a prise le Congrès de Moscou, il y a trois ans, de conférer l'honneur de la troisième session à la Hollande.

Aujourd'hui nous nous félécitons de nous voir entourés d'une réunion si nombreuse de savants des divers pays d'Europe, d'Asie et d'Amérique, voire même d'Afrique, qui ont bien voulu répondre à notre appel. Nous tous, nous aurons l'occasion de constater qu'une semaine, comme celle qui nous attend, va porter des fruits utiles à la science en même temps qu'elle va tisser de nouveaux liens d'amitié entre ses adeptes.

Ce soir nous ne sommes pas encore le Congrès International, ce soir nous ne sommes que des molécules libres qui ne demandent qu'à se combiner au plus vîte en un produit d'un ordre plus élevé et d'une utilité incontestable, sous la direction du chimiste si compétent, notre collègue le Dr. Jentink.

Profitons donc de la liberté dont nous iouissons encore ce soir pour ne pas le consacrer à des discussions scientifiques, mais uniquement à nouer et à renouer des liens personnels d'amitié, ce qui sans aucun doute constitue un des avantages les plus précieux de ces réunions internationales.

Es giebt aber *einen* Punkt über welchen man sich in diesen internationalen Zusammenkunften hinweg zu setzen wissen muss, nl. eine all zu grosse Vorliebe und eine zu sorgsame Pflege seiner Muttersprache. Ein jeder von uns wird es sich gefallen lassen müssen, dass er seine Fachgenossen aus aller Herren Ländern, sowohl aus Höflichkeits- wie aus Bequemlichkeitsgründen in ihrer anstatt in seiner eigenen Sprache anzureden haben wird und wir werden uns freuen, wenn ein uns interessirender Vortrag eines ausländischen Collegen uns zu gleicher Zeit die Gelegenheit verschafft unsere Sprachkentnisse zu erweitern. Die Niederländische Zoologische Gesellschaft, welche sich für ihre Einladungen zum Congress von drei modernen Sprachen bedient hat, hofft, dass auch die Mitglieder sich innerhalb des Rahmens dieser drei Sprachen einzuzwingen wissen werden. Soviel ich weiss werden wir Holländer den Herren nicht mit einer einzigen auf Holländisch vorzutragenden Mittheilung das Leben sauer machen.

Dem Thurmbau unserer Wissenschaft wird es zu Gute kommen, wenn wir die Sprachverwirrung—die traditionell am Ende einzutreten verspräche—gleich im Anfang in beherrschbarre Bahnen zu lenken wissen.

And so, to complete the triology of languages which I have recommended to your consideration, I ought to set a good example and to close these few words of welcome to the members of the Congress that is to be, in the language that was spoken by Newton, by Harvey, by Darwin and by Huxley.

This language is undeniably spreading all over the globe with greater rapidity than any other, and has got a very firm hold on

the five continents. Without speculating about its future, we may admire the simplicity of its grammar and the terseness and conciseness of style by which so many of its scientific worthies have distinguished themselves. We are very pleased to see so many of its representatives in our midst and I feel sure that they will largely contribute to the success, both of this and of many future International Zoölogical Congresses.

And now I propose to give you all the most hearty *welcome to Holland!*

Auf Ihr wohl, meine Herren.

Je vous souhaite la bienvenue à vous tous et je bois au succès du prochain troisième Congrès International de Zoologie.

MONDAY, SEPTEMBER 16TH.

The Congress was formally opened by an address from the Minister of the Interior, M. van Houten, honorary President of the Congress, which was responded to by the President, Dr. Jentink, Sir William Flower on behalf of Great Britain, Professor A. Milne Edwards for France, Baron E. de Sélys de Longchamps for Belgium, and Dr. C. W. Stiles for the United States. Professor Weismann was then called upon and delivered a long and formal address, the publication of which will be awaited with great interest. He defended the principle of natural selection and developed certain new ideas complementary to this principle. Darwin and Wallace have proved the existence of selection between individuals, and Roux has shown that there is a struggle between the constituent parts of each organism. This struggle is of the highest importance for the life of the organism and, *à fortiori*, for the existence of the species. It is necessary, in the third place, to call attention to what the speaker has named *germinal selection*. The smallest vital units, the biophors and determinants, of which, according to his ideas, all living organisms are formed, are in more or less favorable reciprocal conditions. It is just this which gives us the key to the fact that useful variations are always presented when selection requires them. The direction in which variations develop is determined by their utility. Here is an automatic mechanism which determines that useful variations shall be protected from their incipient stages, and under the sheltering mantle of individual selection these variations attain complete development. This dominant idea was supported by numerous examples taken from organisms which are advancing, as well as from those which are retrograding. The principle of Panmixia is thus logically completed and it becomes possible to explain why harmonious variations in different parts of the organisms are produced simultaneously.

Professor R. Blanchard reported on behalf of the committee that the prize instituted by the Emperor of Russia had been awarded to Dr. R. T. Scharff, of Dublin.

The following gentlemen were appointed permanent secretaries of Sections: Section I., Professor J. van Rees, Amsterdam; Section II., Dr. C. L. Reuvens, Leyden; Section III., Professor J. F. van Bemmelen, the Hague; Section IV., Professor G. C. J. Vosmaer, Utrecht; Section V., M. H. P. Nierstrasz, Utrecht; Section VI., Professor M. C. Dekhuyzen, Leyden. The presidents of Sections were changed at each meeting. At 2.30 P. M. the Sections held their first meetings and were classified as follows: I. General Zoölogy. Geographical Distribution (including extinct faunas). Theory of Evolution. II. Classification and Distribution of recent and fossil Vertebrates. III. Comparative Anatomy of recent and extinct Vertebrates. Embryology. IV. Classification and Distribution of recent and extinct Invertebrates. V. Entomology. VI. Comparative Anatomy and Embryology of Invertebrates. This arrangement is re-

markable for the full recognition given to paleontology as a branch of zoölogy.

Prof. Sedgwick (Cambridge) read a paper on Cellular Theories, in which he pointed out the morphological inconsistencies and absurdities to which the prevalent theories lead.

Prof. Hensen (Kiel) made a report upon his Plankton studies, of which he considered the most interesting result to be the fact that the method of measuring percentages of various animals collected at different depths by fine, self-closing nets proves to be exact and may be employed as a basis for further investigations.

Prince Roland Bonaparte spoke of the researches in marine zoölogy made on the steamer 'Roland,' which he had placed at the disposal of M. de Lacaze Duthier.

Prof. Lütken (Copenhagen) spoke of the expedition for exploration of the great depths of the subarctic seas.

Prof. Scott (Princeton) made some remarks upon the relation of individual variations to the origin of species.

Prof. de Zograf (Moscow) gave a paper upon the origin of the lacustrine fauna of European Russia. The Russian lakes may be divided into four groups, the first derived from a bay of the White Sea and from a glacier; the second and third are the remains of glaciers. These three regions have the same limits as the three glaciers of the latter glacial periods of Geikie. The fourth group is derived from the Black and Caspian and other ancient seas which once covered southern Russia.

M. Vaillant (Paris) spoke of his researches on the structure of the osseous spine in the carp

Prof. Emery (Bologna) made a communication upon the polymorphism of ants and upon alimentary castration, defending the principle that the sterility of neuters and their different forms are chiefly due to the way in which the larvæ are fed.

The paper of M. Wasmann (Exaeten) dealt principally with the determination and classification of the ants and termites, giving the criteria of division with especial reference to those morphological characters which are of an adaptive nature.

At 4:30 P. M. the members of the Congress were received, by invitation of the Municipal Council of Leyden, in the Town Hall, where the Burgomaster welcomed them in a graceful speech, to which the President, Dr. Jentink, responded. The day was very agreeably ended by a concert at Katwijk given to the Congress.

TUESDAY, SEPTEMBER 17TH.

Prof. O. C. Marsh (New Haven) gave a paper upon the affinities and classification of the Dinosaurian Reptiles, illustrated by diagrams of *Aëtosaurus*, *Hallopus*, *Triceratops*, *Stegosaurus* and others, and of footprints, one of which shows a difference in the number of digits of the fore and hind feet. A new classification of the Dinosauria was proposed.

M. Büttikofer (Leyden) gave an account of the Dutch expedition to the interior of Borneo.

Prof. Lütken spoke of the investigations made in Denmark upon the fossil mammals of the Brazilian caverns.

Dr. C. W. Stiles (Washington) read a paper on the 'Revision of the Leporine Cestodes,' based upon the original types of European species and upon extensive American material. None of the European species have been found in North America.

M. S Goto (Tokio) gave a short report on some ectoparasitic Trematodes from the Atlantic coasts of the United States and communicated also a case of synonymy of an European species. The species treated of are as follows: (1) Tristomum læve, Verrill. Examination of an original specimen shows that this is identical with the species described under the name

of Tristomum ovale by the speaker, so that Tristomum ovale, Goto, is a synonym of Trist. læve, Verrill. (2) Phyllonella hippoglossi (P. J. v. Beneden). This is the species called Epibdella hippoglossi by v. Beneden. The distinction between the two genera is that Epibdella has a pair of well-developed anterior suckers, while Phyllonella has none. The vagina is present and opens into the yolk reservoir, as in other species of Tristomidæ. The 'vésicules séminales' of v. Beneden is the prostate gland and the internal cavity of the penis, while the vesicula seminalis of Cunningham is the vagina. (3) Polystomum Hassalli, n. sp. This species was found by Dr. Hassall, of Washington, in the bladder of Kinosternon pennsylvanicum. Body 1.5 mm. long, egg-shaped, genital hooks 16(3) and of the same size. Ovary sometimes on the right, sometimes on the left side. Intestine bifurcated, not branched. The Polyst. oblongum of Leidy is *not* Polyst. oblongum, Wright. (4) Hexacotyle thunninæ (Par. et Per.). This is the Octocotyle thunninæ of Parona and Perugia. The form of the body, the structure of the suckers as well as that of the vagina, shows that the species ought to be brought under the genus Hexacotyle.

In conclusion the speaker referred to the so-called 'grosse Zellen.' Under this name structures of various natures have been included, viz., (1) ganglion cells, (2) connective tissue cells, (3) gland cells.

Prof. S. J. Hickson (Manchester) in speaking of the classification of the Alcyonaria referred to the difficulty there is in finding sufficiently distinct characters to separate the Alcyonaria Gorgonacea. He considers that the Corrallidæ and Briarcidæ should be included among the Alcyonacea and not among the Gorgonacea.

The author then referred to some difficulties in the determination of species from museum specimens of Alcyonarians.

Prof. R. Blanchard (Paris) made a communication upon the leeches of the Dutch East Indies and of the Indo-Malayan region.

M. Dollfus (Paris) read a paper on the distribution of the isopod family, *Oniscidæ*, in Europe. This group is particularly favorable for such studies, for most of its species exactly follow climatic zones. Most of them belong to the Mediterranean region, *stricto sensu*; some present curious phenomena of penetration toward the north or south, and a single one is ubiquitous. Three species of *Armadillo*, one of *Eluma* and twenty-five of *Armadillidium* were considered.

Baron E. de Sélys de Longchamps (Liége) presented a paper entitled 'Progress in knowledge of the Odonata.'

M. Piepers (the Hague) spoke of supposed cases of mimicry among the insects, and expressed doubts concerning several so-called facts to which a place has been accorded in science before they have been sufficiently studied.

Prof. Perrier (Paris) gave an account of the marine laboratory on the island of Tahiton, of which he is the founder and director. It supplies facilities for researches in pure science, also for those bearing on fisheries and pisciculture. It is furnished with all necessary appliances and covers a space of 4 hectares.

M. Bolsius (Oudenbosch) read a paper upon the nephridea of the leeches, which, he contended, are separate from the ciliated organs. Prof. Kowalevsky (St. Petersburg) then gave a paper on contributions to the anatomy of the Clepsines.

Prof. Julin (Liége) communicated the work of his pupil, R. Legros, on the structure and development of the sexual organs in *Amphioxus* and the Ascidians. In both groups there is close homology in the formation of the sexual products. The cavity of the ovary and testis is homologous

with that in *Amphioxus* (cœlom). The simple epithelium covering the germinal epithelium, together with that covering the sexual ducts, is, as a whole, homologous with the somatopleuric and splanchnopleuric epithelium covering the sexual glands of *Amphioxus*.

In the afternoon no Sectional meetings were held, the time being given to a lecture by Prof. Scott (Princeton) on the Tertiary Lakes of North America and their Mammals, which was illustrated by lantern slides. The lecturer pointed out that paleontology must be founded upon exact stratigraphy, and then gave an account of the American Tertiaries, indicating their European equivalents. Especially dwelt upon were the remarkable continuity of the American Tertiary horizons, their vast geographical extent, and the abundance and excellent preservation of their mammals. Many phylogenetic series may be worked out with great completeness, and from these may be deduced important laws as to the mode of development among mammals and their migration from one region to another.

In the evening a very large and brilliant audience, including the Queen and Queen Regent of Holland, assembled in the Concert Hall for the lecture of Dr. R. Bowdler Sharpe, of the British Museum, upon 'Some Curiosities of Bird Life.' The lecture was illustrated by a remarkable series of lantern slides painted by the Dutch artist Keulemans.

After Dr. Sharpe's lecture a reception to the Congress was given by the members of the students' club 'Minerva,' in their spacious and luxurious club house.

WEDNESDAY, SEPTEMBER 18TH.

The second plenary session of the Congress was opened at 10 A. M. Professor A. Milne Edwards then delivered a lecture upon the resemblances of the fauna of the Mascerene islands and that of certain islands in the south Pacific. The lecturer pointed out the importance of the study of sedentary animals for the solving of distributional problems. The former existence of flightless birds in Madagascar and the neighboring islands has long been known. In 1889 M. Sauzier exhumed a large quantity of bones, which enabled Newton, Sclater and others to confirm the accounts of the traveller Leguat. The researches of Forbes, Newton and Hutton were then considered. These show that the Mascarene islands were formerly part of a great land area, which has been submerged beneath the ocean.

M. E. L. Bouvier (Paris) presented a report upon Dr. Herbert H. Field's plan of bibliographical reform and for the establishment of a central bibliographical bureau for zoölogy. The recommendations of the report are: (1) An International Bureau shall, as soon as possible, give effect to Dr. Field's plan for the reform of zoölogical bibliography. (2) National committees, established in each country, under the auspices of the zoölogical societies, will coöperate to simplify the work of the Bureau and to facilitate the reform. (3) In order to supply the Bureau with the necessary resources, the national committees will obtain subscriptions from individuals and learned societies. (4) An International Commission shall be appointed by the Congress to audit the accounts, assure the permanence and supervise the operations of the Bureau. This commission shall be composed of seven members, each of a different nationality; it shall report to the International Zoölogical Congress, and shall be renewable, in alphabetical order, at each meeting of the Congress.

These recommendations were unanimously adopted and the following commission was then appointed: For England, Prof. S. J. Hickson; for France, Prof. R. Blanchard; for Germany, Prof. J. W.

Spengel; for Holland, Dr. P. P. C. Hoek; for Russia, Prof. W. Schimkewitsch; for Switzerland, Prof. A. Lang; for the United States, Prof. W. B. Scott.

Prof. F. E. Schulze proposed the appointment of a commission of five members to codify the rules of nomenclature of living beings now used or recommended in various countries; the code to be published with the same text in three languages.

The proposition was unanimously adopted and the commission appointed as follows: Prof. R. Blanchard (Paris), Prof. Victor Carus (Leipsic), Dr. F. A. Jentink (Leyden), Dr. P. L. Sclater (London), Dr. C. W. Stiles (Washington).

The following resolutions introduced by Dr. Stiles were unanimously carried:

Whereas, The Third International Zoölogical Congress considers Article 16, 3–1(1) of the Universal Postal Convention of Vienna, forbidding the transmission through the mails of "*animals and insects, living or dead, excepting the cases provided for* [*i. e.*, live bees] *in the Regulations of detail*," as a hindrance to the advancement of science, and

Whereas, Switzerland is at present the seat of the *International Bureau of the Universal Postal Union*, be it therefore by this Third International Crongress held at Leyden, September 16–21, 1895,

Resolved, That this Third International Congress respectfully petition the Swiss Federal Government through its delegate, Prof. Studer, to introduce, at the next International Postal Congress, the following amendment to Article XIX. (Samples), 4, of the '*Regulations of Detail and Order*,' *i. e.*,

5th. Natural History Specimens—such as dried or preserved animals and plants, geological specimens, etc.—not sent for commercial purposes, provided the packages conform to the general conditions prescribed for 'Samples of Merchandise;' and be it further

Resolved, That this Third International Congress call upon all of its delegates and members to bring this amendment to the attention of their respective governments, and to urge the several governments to instruct their delegates to the next International Postal Congress (Washington, D. C., 1897) to support the same; and be it further

Resolved, That the Secretary of this Third International Congress send a copy of these resolutions to every government represented in the Universal Postal Union, but not represented at the Third International Zoölogical Congress.

Wednesday afternoon was occupied by an excursion to the Hook of Holland.

THURSDAY, SEPTEMBER 19TH.

Sectional meetings at 10 A. M. Prof. Apáthy (Klausenburg) presented a paper upon a controlling element and its position with reference to the cells in invertebrates and vertebrates. The speaker distinguished between ganglion cells and nerve cells; the latter (as the muscle cells do for the contractile substance) produce the controlling substance which grows out, reaches and penetrates ganglion cells, sensory cells and muscle cells. This is done by means of the intercellular bridges, derived from the embryo, which always connect together the cells of the body. The old conception of Max Schultze has thus again been brought forward in opposition to the views of Bütschli, Leydig and others. By the gold chloride method, confirmed by methyl blue and other stains, Prof. Apáthy has been able to distinguish both kinds of cells and the finer details of the controlling primitive fibrils, especially within the ganglion cells, and also to establish the connection between the controlling motor and sensory primitive fibrils. An extremely interesting demonstration of these facts was given at the close of the session.

M. C. Janet (Beauvais) read a paper

showing that the problem of species and their variations may be compared to the examination of the positions of equilibrium of a point placed on a resisting surface and submitted to the action of a force which is a function of the coördinates of the point. The discussion of this problem of mechanics, translated into zöological language, leads to the following conclusions: That in a given fauna in a given environment there is but a limited number of possible species, and that the passage of the initial forms to the definitive forms will be made very rapidly. This explains the small probability of finding remains of the transitional forms. The same applies to the transition of one fauna to another under the action of a changed environment.

Prof. Eimer (Tübingen) spoke on definitely directed development (orthogenesis) and the impotence of Darwin's selection in the formation of species; also upon the development of species and affinities of the swallow-tailed butterflies. The speaker's works, which in part have been published for years, especially those on the markings of animals, show that definitely directed development is an unquestionable fact and his continued investigations everywhere confirm this. Variation always takes place in a few quite distinct directions, progressively, or sometimes (Foraminifera) retrogressively, *never* 'oscillatingly.' Utility plays no part, either in the minimal beginnings or in the further development. Transformation is to be referred to the influence of the environment upon a given constitution. Selection can create nothing new, but what is developed *may* become useful and be selected. The separation into species of the chain of organisms thus formed occurs chiefly through arrest at definite stages of development (Genepistasis) as well as by saltatory development (Halmatogenesis) and by hindrance of fertilization (Kyesomechania). Even the origin of apparently mimicking forms is to be explained by definite directions of development (independent similarity of development, Homœogenesis). Only thus, not by selection, is the origin of mimicry made intelligible. The speaker employed, as evidence for his views, figures of the *Papilionidæ*, from which, as he said, the laws of development and of the formation of species may be read as from the letters of a book. The fact of the definitely directed development of non-useful characters completely refutes the lately propounded 'germinal selection.' Speculation may have its place in natural science, but it must not ignore *facts* previously established.

Dr. R. Bowdler Sharpe presented a paper on the geographical distribution of the birds of prey, and M. F. Mocquard (Paris) one upon some new reptiles and amphibians from the upper Congo.

Dr. T. Schmitt made a communication on the principles followed in preparing the new edition of the Scandinavian Fishes.

In the paper of M. Forrest, presented by the Baron d'Hamonville, upon the ostrich, egrets and birds of paradise, the principal points were: (1) Reintroduction of the ostrich into North Africa. (2) To have measures for the protection of the egrets universally adopted. (3) To obtain protection for the birds of paradise.

Prof. W. Leche (Stockholm) gave an outline of his investigations upon the development of the dental system in mammals, emphasizing the general considerations which are to be regarded in this question. He dwelt upon the fact that the serial appearance of the teeth had been only gradually acquired and also that there are no impassable barriers between the different dentitions. He pointed out the occurrence of at least four dentitions in the mammals and made some statements concerning the genesis of these.

Prof. Semon (Jena) spoke on the fœ-

tal membranes and appendages of vertebrates. He referred the formation of the amnion to the need of protection for the germ when the eggs are laid on land. Mechanically regarded, the process may be considered as a sinking, first of the front end, and then of the hinder end, of the embryo into the yolk sac. The development ment of the allantois as a respiratory organ keeps pace with the sinking of the embryo. In the structure and development of their fœtal membranes and appendages the monotremes stand between the Sauropsida and the higher mammals.

Prof. Hubrecht (Utrecht) gave a demonstration of lemurine placentas. He finds the placentation of *Tarsius* to be entirely different from that of *Nycticebus* and other lemurs. While *Nycticebus* has a diffuse placenta, in *Tarsius* the chorion is quite thin and transparent, except at one spot, which forms a discoid placenta, so to speak. This develops at first as a massive cone, which grows into an especially modified part of the uterine wall. The allantois grows into this cone and surrounds the maternal blood vessels.

Prof. Zograf (Moscow) made a communication upon the teeth of the chondrostean ganoids. The sturgeons possess teeth in the young stages which are preserved longer in the eastern species than in the western. A series may be made from the sterlet (*A. ruthenus*), which loses its teeth toward the end of the first year, to *Psephurus gladius*, which retains them throughout life. The American *Polyodon folium* also retains its teeth permanently, but nothing is known in this respect of the other sturgeons of that continent. It is to be hoped that American investigators will soon clear up this point.

Mme. Céline Renooz (Paris), in a paper on the embryonic development of vertebrates, explained her views as to the derivation of aërial animals from plants and the vegetable traces which occur in the first stages of embryonic development.

Prof. van Bemmelen (the Hague) presented a paper on the phylogeny of the Testudinate reptiles. The perforated cranial roof of the fresh-water turtles, as well as that of the lizards and snakes, must be derived from the uninterrupted roof of the marine forms. In the series of turtles the quadrate has developed into a tympanic ring, probably homologous with that of the mammals. The plastron contains elements of different phylogenetic antiquity; the anterior three are the homologues of the episternum and clavicles.

Prof. Kowalevsky spoke of the lymphatic glands of *Scorpio europœus* and certain allied forms. In some of these may be distinguished one class of glands which deals with solid substances and the lymphoid glands which prefer dissolved matters.

Prof. Schimkewitsch made a communication upon the first stages of development in the parasitic copepods. He has observed the segmentation, the formation of the germ layers, the very precocious development of the germinal cells, and the formation of the nervous system in the same way as in *Gammarus* as given by Bergh.

Prof. Gilson (Louvain) described the special muscular organs which he has discovered in the dissepiments of *Owenia*. It seems certain that these organs serve to regulate the pressure of the perivisceral fluid in the different segments and occasionally to isolate certain segments. Epithelial tubes situated in the fifth and sixth dissepiments and opening externally lead to the septal canal, and seem destined to introduce water into the perivisceral cavity for the needs of the hydraulic mechanism which constitutes the body of this tubicolar annelid.

M. Dautzenberg (Paris) gave an account of new molluscs dredged from near the Azores and the coast of Senegal—another

instance of the wide distribution of deep sea forms.

Prof. Perrier (Paris) spoke on the classification of worms. The Nematodes, with *Echinoderes*, *Gordius* and *Acanthœcphalus*, are separated from the worms and, under the name Nematelminthes, united with the Arthropods. The Plathelminthes and Annelids constitute the worms proper. The Rotifers, Bryozoans and Brachiopods form a group (Lophostomata) transitional between the Plathelminthes and Annelids.

Prof. Julin (Liége) read an elaborate paper on 'the epicardium, pericardium, heart and stolon in the larvæ of *Distaplia magnilarva*,' which is not reported in the Bulletin of the Congress.

Prof. Salensky (Odessa) gave an account of the development of the heart in the frog, from which it follows that the vertebrate heart is totally different from that of the Tunicates and that the endocardium is of mesodermal origin.

Prof. Eimer read a paper upon the formation of the tailed species of *Papilio*, in which he further developed his ideas on Orthogenesis referred to in the former paper.

The day was charmingly concluded by a 'dîner intime' in the Kurhaus at Scheveningen.

Friday, September 20th, was devoted to excursions to Helder, Marken and Graveland.

SATURDAY, SEPTEMBER 21ST.

The paper which excited perhaps the greatest interest of all those presented to this Congress was that by Dr. E. Dubois on '*Pithecanthropus erectus*, a transitional, manlike form.' Dr. Dubois described the locality in Java where the remains were found, and mentioned as occurring near them a tooth of *Hyœna*, bones of *Cervus*, etc. No complete skeleton was found. The speaker then described the cranium and femur, of which he had maintained that they belonged to a man-like creature. He had compared the thigh bone with 150 different femora of Malays, Negroes, Europeans and other races, but could establish no similarity. Virchow's view of the greater resemblance of this femur to that of the apes (especially *Hylobates*) is correct. It is remarkable that the zöologists maintain the skull to be human, while the human anatomists refer it to the apes. The speaker discussed the cranial capacity of man and the anthropoid apes, with especial reference to the Neanderthal skull. In his published work Dr. Dubois had not referred to a second tooth found later among the excavated material. The speaker concluded that *Pithecanthropus erectus* should be placed between man and the anthropoid apes, that it represents a peculiar type and renders necessary the formation of a new genus.

Prof. R. Virchow (Berlin) opened the discussion with the statement that he agreed better with Dr. Dubois than would be supposed from newspaper accounts. He displayed some human femora, with exostoses like the Javan specimen. Virchow inclined to the view that the femur was human, but could not deny that the whole appearance of the bone was not man-like; it is most like that of *Hylobates*, but gigantic compared with the recent gibbons. He expressed himself positively against the opinion that the skull is human and explained the importance of the orbital region in such questions. Dubois' discovery is a very important one.

In reply Dr. Dubois pointed out the likeness of this skull to that of Neanderthal.

Prof. Marsh called attention to the great age of the bones. He had often observed similar exostoses on fossil femora. It is extremely desirable to establish the antiquity of the specimens.

Prof. Rosenberg (Utrecht) pointed out certain characteristics of femora; the long axis and its curvature, the linea obliqua,

crista trochanterica, linea aspera, angulus medialis, &c. Of the human femora examined, one showed all four peculiarities of the Javan specimen, so that he doubted whether the latter differed from a human femur. He also doubted the reference of the skull and explained why he did not believe that *Pithecanthropus* had an erect gait. He would like to have these bones compared with those of the New World monkeys.

Prof. Martin (Leyden) stated that the age of these bones could only be late Pliocene or early Pleistocene.

Sir William Flower laid much stress upon the correspondence between the skull of *Pithecanthropus* and that of *Hylobates*.

Dr. Bashford Dean (New York) spoke 'On the Embryology of the North American Ganoids, *Accipenser*, *Lepidosteus* and *Amia*,' and exhibited a number of specimens illustrating their embryonic and larval development. A comparative study of these forms emphasizes the results of the palæontologist as to the phylogeny of the Teleosts, *i. e.*, their descent from a series of transitional Mesozoic Ganoids, as Leptolepids, Caturids; it interprets also the difficulties of the embryology of the Teleost, *e. g.*, the origin of the periblast, the mode of grastulation, of blastulation, the significance of Kupffer's vesicle, of the solid neural axis, and of the specialized origin of the mesoderm. In a series of diagrams of saggital sections of early and late grastulæ there was shown on the screen a more detailed comparison; thus in *Lepidosteus* shark like features were apparent, the conditions of the development of the germ layers of ventral and dorsal lip were closely similar, and by the time of the blastopores closure the appearance of the embryo was hardly to be noted. In *Amia*, on the other hand, the precocious character of the development of the embryo was extremely notable, forming clearly marked transitional conditions to the Teleosts.

At 2 P. M. was held the third and last session of the full Congress, when Mr. John Murray (Edinburgh) delivered a lecture upon 'Deep Sea Explorations.' He showed the respects in which our knowledge of the great ocean depths and of their animal life has so greatly increased in the last 40 years, and that the biological sciences have reaped the chief benefit of such increase. The greatest measured depth in the sea is 8500 metres, the mean depth 4500 metres. About 5 per cent of the deep part is 5500 m. or more. Mr. Murray then gave an account of the investigation of the bottom deposits undertaken by himself and M. Rénaud, of Brussels, which had led to such important results. The question of temperature was then taken up. This varies at the surface from 28° at the equator to 0° at the poles; at the bottom the water has a temperature almost everywhere equal and constant, averaging 3°. It is especially remarkable that in the tropics the number of deep sea species is much greater than in temperate regions, but in the latter the number of individuals of each species is far larger. The speaker then considered some of the characters of deep-sea animals. We have not succeeded in finding animals which can be considered representatives of extinct faunas. The forms are distinct; they are often of considerable size, they carry phosphorescent organs and usually have no striking colors; but on the whole they resemble animals from less profound depths. A very curious point is the resemblance between the deep sea forms of high latitudes, north and south. This was explained by assuming that the bottom had formerly the same fauna everywhere. The temperature was then uniform and a rich flora flourished at the poles, as at the equator. At that time the sun did not give out much more heat than at present, but its radiating surface was far larger, and therefore the distribution of solar heat upon the

earth was quite different from that which obtains at present.

Baron d'Hamonville next made an eloquent plea for protection to the birds of paradise and appealed to the ladies for support in this movement.

Dr. Herbert H. Field (Brooklyn) transmitted to the Congress a proposition of Prof. E. L. Mark, Cambridge, U. S. A., to "consider the desirability and feasibility of constructing a code of abbreviations in animal morphology based upon Latin names and to be recommended for general use by zoölogists and anatomists throughout the world."

The Congress voted unanimously that Sir William Flower should be the president of the fourth Congress, and that this should be held in England, the president-elect to agree with his English colleagues upon the place of meeting.

After speeches from MM. Milne-Edwards, Studer, Sélys-Longchamps and Flower, expressing the high appreciation felt by all the members for the admirably successful labors of the Dutch committees and the remarkable character of the work laid before the Congress, the president declared the sessions of the Third International Zoölogical Congress to be closed.

RELATIONS OF THE WEATHER BUREAU TO THE SCIENCE AND INDUSTRY OF THE COUNTRY.

Mr. President and members of the American Association for the Advancement of Science:

It is a matter of much pleasure to me that I am allowed the privilege of speaking at a joint session of this Association—representing as it does within the confines of its admirable organization the scientific thought of our country. This is the Mecca towards which annually journey all those who wish, each to contribute his mite to the sum of human knowledge; each inspired with an ambition to add even one flickering ray to the great luminous orb which to-day is shedding the benign light of wisdom even unto the uttermost recesses of the earth; subduing the barbarous instincts of man and warming and invigorating into life the better impulses of his nature. Thus is civilization advanced, and thus is humanity elevated to higher and higher planes of existence.

I hope to be a worker in the ranks of this great army, and as the science of meteorology can hardly be said to have passed beyond the embryonic state, I feel that the realms of investigation are boundless, and that the opportunities are correspondingly great.

As the Chief of the greatest meteorological system in the world, and with the power to control, under the direction of the Honorable Secretary of Agriculture, not only its executive functions, but the lines of future scientific investigation, I fully realize the great responsibility that rests upon me, and that, at the bar of public and scientific opinion, I shall, in the years to come, justly be held to a strict accountability for my stewardship.

Before considering the lines of investigation which can consistently be prosecuted by the Weather Bureau, it will be well to note the law which prescribes the duties of the chief.

By an Act Congress approved October 1, 1890, Sec. 3, Statutes at large, Fifty-first Congress, p. 653, it is provided:

"That the Chief of the Weather Bureau, under the direction of the Secretary of Agriculture, on and after July 1, 1891, shall have charge of the forecasting of weather, the issue of storm warnings, the display of weather and flood signals for the benefit of agriculture, commerce and navigation, the gauging and reporting of rivers, the maintenance and operation of sea-coast telegraph lines and the collection and transmission of marine intelligence for the benefit of commerce and navigation, the reporting of temperature and rainfall conditions