creased. The size of the annular opening will of course increase with the increase of caliber, and in a 12-inch gun will be much greater, and allow a far larger escape of gas per unit of surface, than in a 1-inch gun. How far this fact is contributory to the more rapid erosion we do not undertake to say; but that it is a very material factor, we think can hardly be disputed.

THE SEVENTH INTERNATIONAL ZOOLOGICAL CONGRESS—BOSTON MEETING, AUGUST 19 TO 23, 1907.

BY WILLIAM H. HALE, PH.D.

The Seventh International Zoological Congress, which met at the Harvard Medical College, Boston, August 19 to 23, was the first meeting of this congress ever held in America. It was attended by over 500 members, of whom about one-quarter were from abroad, representing all parts of the world—the British Empire, including Australia and Tasmania, as well as England, Scotland, Ireland, and Canada; France, Germany, Belgium, Holland, Austria-Hungary, Switzerland, Russia, Italy, Norway, Brazil, Japan, and China. The programme included over 300 papers read before the several sections.

Prof. Alexander Agassiz presided, and opened the congress at the first general session with a presidential address on American Pioneers in Deep Sea Exploration, presenting a record beginning in 1846. During the greater part of this time Prof. Agassiz has been in charge of exploration or of work connected with it, beginning with the cruise of the "Blake." [His address will be found in full in the current SCIENTIFIC AMERICAN SUPPLEMENT.—ED.] Prof. R. Hertwig followed with an address on "Neuere Probleme der Zellforschung."

At another general session Sir John Murray, of Edinburgh, who commanded the "Challenger" on its three years' cruise, beginning in 1876, stated his conclusions as to the conditions of marine life. After expressing his preference for the term "oceanography" rather than "thalassography," proposed by Prof. Agassiz, he paid his attention to Prof. Petersson, director of the North Sea Biological Station, from several of whose conclusions he dissents. He maintains that ocean currents are mainly the effect of the sun and of winds, hence they are superficial. The ocean depths, from the poles to the equator, are of nearly uniform temperature, being not much above the freezing point of water. Hence life in them is of more uniform type than at lesser depths. Near the poles the surface temperature does not vary more than about 10 deg. F. during the year, remaining always near the freezing point. Near the equator the surface temperature is also limited to about 10 deg., but averages about 70 deg. At intermediate regions is a much wider range of temperature. Warm and cold currents meet; conditions alternately favor and interfere with the life of animals, causing at times great destruction of life because of the change to a temperature either too hot or too cold. The destruction of life at localities where warm and cold currents meet, provides a bountiful food supply, and at these localities come into play all the reason for change in form that obtains anywhere. At these points, therefore, is developed the greatest variety of living forms. The ocean surface generally is covered with algæ and other marine creatures or plants, which subsist on things about them; and on these the deep-sea animals depend for food. These surface forms are so closely related to temperatures, that he could determine the surface temperature by his microscope before the captain of the vessel could get it by his thermometer.

Prof. Jacques Loeb presented his latest conclusions as to artificial generation in a paper entitled "The Chemical Character of the Process of Fertilization." He maintains that as all life phenomena are ultimately chemical, we can only hope to produce life by a series of definite chemical reactions. In the process of fertilization, the spermatozoon produces two kinds of effects upon the egg; it causes it to develop, and it transmits the parental qualities. His address dealt only with the former. The most obvious chemical reaction produced by the spermatozoon on the egg is an enormous synthesis or gathering of nuclear material from the material of the cell. After the entrance of the spermatozoon, the one nucleus of the egg is successively divided into two, four, eight, etc. Each nucleus is of the same size as the original one. Evidently, therefore, the chemical effect is the synthesis of nuclear matter. The nucleus consists of a salt, composed of a base of some protein substance and nucleic acid, the skeleton of which acid seems to be phosphorus. The origin of this phosphorus is obviously the egg itself, since the process goes on just as well when the egg is immersed in sea water deprived of its phosphorus as in phosphatic water.

Free oxygen is essential to the fertilized egg, because the spermatozoon causes or accelerates in the egg still other processes than oxidation. Hydrolyses are some of these processes, and in the absence of oxygen these hydrolyses set up reactions which are incompatible with the life of the egg.

Why the spermatozoon should cause development of the egg is not yet known. Its head is practically egg nucleus, and its tail is a fatty plasm. The fertilizing material, however, must be nearly the same with different eggs, otherwise it could not be understood why animals widely separated, like the crinoids and the mollusks, should be able to fertilize the eggs of the starfish.

Dr. Loeb's first method of obtaining larvæ from unfertilized eggs was by treating them with sea water whose osmotic pressure had been raised about 50 per cent. This method, however, was not successful at all places, which led to the belief that not all the processes were caused in the egg by hypertonic sea water. For example, the membrane normal to eggs naturally fertilized did not occur in the others. But by adding a small but definite amount of a monobasic fatty acid to the eggs developed by hypertonic sea water, they developed into larvæ, in part of which the formation of the membrane occurred in a perfectly normal way. This new method of double treatment has been so successful that "we are now in possession of a method which allows us to imitate more completely the effects of the spermatozoon than the previous purely osmotic method." Marine worms, starfishes, a mollusk, the giant quaker-cap of the Pacific Coast, have been thus fertilized. By adding various chemicals to the solution, Dr. Loeb reached the conclusion that the membrane formation of the egg is connected with the process of solution of a fatty layer underneath the surface film of the egg. He concludes that "the essential feature of the process of fertilization consists first in a liquefaction or hydrolysis, or both, of fatty compounds; and second, in starting the processes of oxidation in the right direction."

Dr. R. F. Scharff, of Dublin, made the opening address before the newly-formed section of zoogeography: "On the Evolution of Continents as Illustrated by the Geographical Distribution of Animals." Some of Dr. Scharff's conclusions are that the Mississippi Valley and the east coast are characterized by the possession of many curious and certainly extremely ancient forms of animal life, which are quite unknown west of the Rockies, but are related to species in Europe and eastern Asia. North America must have been connected with Europe; also with Asia, probably by a land bridge near Bering Strait; but was not connected with South America, as there was no Isthmus of Panama. The West Indian islands were connected. South America was divided east and west by the ocean. The Antilles, Venezuela, and Central America were connected with North America, and formed a bay to the west. There was a land bridge between South America and Africa and Australia. The Melanesian Islands were once part of Australia, with connections to New Guinea and portions of the archipelago. Asia was once joined to Australia by the way of Sumatra and Borneo. Lake Tanganyika was once a bay of the ocean, etc.

An improved system of classification was one of the most important problems considered by the congress. Dr. Theodore Gill read a paper on that subject, which showed that systems now in use are in many respects faulty; and he urged the classification of fishes and birds in uniformity with the methods already applied in classifying mammals.

Many entomologists were in attendance, and some important papers were presented on Economic Entomology. Dr. L. O. Howard, the government entomologist, gave an account of the work with parasites against injurious insects, particularly the gypsy moth and the brown-tail moth in New England, which is now in progress on a much larger scale than was ever before attempted. These insects were accidentally introduced in the northeasterly portion of the United States, but the percentage of parasitism from native parasites was very small, whereas the normal percentage of parasitism in their native homes was enormous. Hence they increased rapidly, till three years ago importation of parasites was begun on an enormous scale, hundreds of thousands of insects containing parasites having been brought each year from their native homes in Europe. Every effort is being made to prevent the escape in this country of the native hyper-parasites—or the parasites on parasites.

Dr. J. B. Smith, State entomologist of New Jersey, read a paper on "Ridding a State of Mosquitoes," as applied in New Jersey. Dr. Smith announces five general deductions: first, that there are an unexpectedly large number of species; second, that their life histories are very varied, and generalized statements about these are unreliable; third, only a few species are really pestiferous; fourth, that some breed only in special places, others everywhere; fifth, that some have limited distribution, others are found everywhere.

In New Jersey nearly ninety per cent of the offensive species breed in salt marshes, and many places formerly considered dangerous as breeding places are relatively safe. A survey has been made and plans adopted to drain these marshes. Work has already been done near populous centers with notable results. No oil or other killing agency is employed.

The meeting was followed by a series of receptions to the members in New York, Philadelphia, and Washington extending over a period of about ten days.

SCIENCE NOTES.

In a recently issued report of the principal chemist of the British government laboratory there is an interesting statement about the value of the eggs of the spur dogfish, a fish which has by its depredations caused much loss to the fishermen on the Devon and Cornwall coasts. The chemist states that the average weight of the egg is 3.6 ounces, the rough skin or "shell" representing 5.4 per cent. Half the egg consists of water, and the other half of protein and fatty matter in about equal proportions. As the shell of the ordinary hen's egg weighs about 11 per cent of the whole, while the contents have nearly 74 per cent of water, the comparative value of the dogfish egg, used in one way or another, becomes apparent. Dogfish have long been a pest of the fishermen on the southwest coast of England, and a few years ago an attempt was made to place them on the market as food. This effort was attended with little success, there being a prejudice against eating "little sharks." Now the fish are disposed of to those stores—common in England—which supply steaks of fried fish delivered to customers hot from the frying pan. The steaks are carried home to be eaten before they cool.

In a communication made to the Académie des Inscriptions et Belles-letters, the Rev. P. Delattre, who is directing the excavations on the site of Carthage, mentions a recent find which has some interest as bearing upon the history of the early Christian martyrs. According to history, two of the martyrs were St. Perpetuus and St. Felicitas. This is now confirmed by a stone slab which bears their names, along with those of several of their companions who no doubt shared their fate. The slab was found on the site of the ancient basilica. Although broken in a number of fragments, it could be put together so as to read the inscription which is in five lines, each line being preceded by a Latin cross: "Hic sunt martyres Saturus, Saterninus, Ribocatus, Secundulus, Felicit. Perpet. Pas.... Maiulus." This slab was taken from the excavations made in the region known as Mcidfa, and M. Delattre is of the opinion that here was erected the great basilica known as Basilica Major, which was perhaps the oldest in Carthage. According to ancient authors, the martyrs St. Perpetuus and St. Felicitas were buried in the basilica, and it was here that St. Augustine delivered several sermons. But the present inscription is probably not the original one which was placed upon the tombs of the martyrs, as the presence of the Latin cross at the beginning of each line as well as other indications seem to show that it belongs to a later period, possibly a century after the death of the martyrs, which occurred in 203 A. D.

The difficulties that beset some branches of research are well illustrated by the skeleton of an extinct Australian marsupial (*Diprotodon australis*) just set up in South Kensington Museum. It was named about seventy years ago by Sir Richard Owen, who from a few fragments of bone thought the creature a near relation of the kangaroo. From time to time various bones were found which tended to modify this classification, but it was not until fully sixty years after its first naming that, in 1899, remains were found from which the structure of the feet and the general form of the skeleton could be realized. These remains were found by Dr. E. C. Sterling of Adelaide, and, thanks to his efforts, it has now been found possible to set up in the central hall of the Natural History Museum at South Kensington a complete restoration of the skeleton, in which a large number of bones are represented by plaster models, although many of those of the limbs and feet are original specimens. As thus restored, the diprotodon is certainly a strange beast, carrying a huge head, the jaws of which are armed with teeth approximating to the kangaroo type, and having the body very short, the front limbs longer than the hind pair, and the vertebral column much arched, and falling away toward the loins, behind which it terminates in a short tail. As regards bulk, the creature may be compared to an unusually tall and short Sumatran rhinoceros; while in the matter of relationship it appears to come nearest to the wombats.

COMPLETION OF THE SCIENTIFIC AMERICAN TROPHY FOR HEAVIER-THAN-AIR FLYING MACHINES.

As we go to press we have just received word from Messrs. Reed & Barton of the completion of the beautiful silver trophy designed and executed by this firm for us in accordance with the suggestions and ideas which we advanced. An examination of the trophy reveals the fact that it is a masterpiece of the silversmith's art. We have arranged to have it on exhibition at the showrooms of the makers, corner Thirty-second Street and Fifth Avenue, for a few days, and our readers are invited to view it at their convenience. We expect to illustrate and describe the trophy in detail in our next issue. The conditions governing the first competition for the trophy (to be held at the Jamestown Exhibition on September 14) have already been published.