ments devised to ascertain how far this factor might be *per se* lethal to bacteria in insterstellar space. A growth of *Bacillus pyocyaneus* raised from a thin film of a culture (made in peptone water) spread on glass and kept dried *in vacuo* for four months. The vacuum was produced by Sir James Dewar's method (a bulb of powdered charcoal surrounded by liquid air, after exhaustion by pump); after five days the vacuum was maintained by sealing off the tube. Light was excluded throughout. The bacillus when dried in the air (light excluded) dies within three months. The behaviour of this bacillus *in vacuo* is exceptional. Its maintenance of vitality corresponds with that of certain seeds under similar conditions. (2) Microscopic sections of urinary calculi from the human subject.

Hon. N. C. Rothschild.—Model of *Xenopsylla cheopis*, the tropical plague flea. *Mr. F. Enock.*—Photomicrographs of new species of British Mymaridæ. The insects comprised in the subfamily Mymaridæ are ovivorous in their habits, laying *their* eggs in those of various Homoptera and Coleoptera. Hitherto only thirty-five species have been recorded. The photomicrographs are part of the hundred to one hundred and fifty new species (many as yet unnamed) collected or bred during the past thirty-five years. *Sir W. B. Leishman, F.R.S.*—A parasite found in cases of infantile splenic anæmia. In cases of this disease, occurring in Tunis, Italy, Sicily, Malta, Portugal, and elsewhere, a protozoon—*Leishmania infantum*, Nicolle—has been found by C. Aicolle and others. It resembles closely the parasite of kala azar—*Leishmania donovani*, Laveran—and that of Oriental sore.—*Leishmania tropicum*, Wright. The disease is extremely fatal, and appears widespread in the Mediterranean littoral. It has recently been proved to be identical with the fatal disease of children known as "ponos," which occurs in some of the islands of the Grecian Archipelago. The parasites have also been found in dogs, and it is probable that they are transmitted from the dog to the child by the bite of some insect. *The Lord Avebury, F.R.S.*—(1) Moth from Peru (Caligo) imitating an owl. (2) Elytron of beetle (Pachyrhynchus). (3) Butterfly from Borneo (Ornithoptera-Brookeana) mimicking the tips of the leaflets of a pinnate leaf emerging from the deep shade of a tropical forest; the midribs of the leaflets and the serratures of the edges are well represented. *Mr. H. Eltringham.*—Colour drawings illustrating African mimetic butterflies. *Prof. Poulton, F.R.S., Mr. C. A. Wiggins, Mr. W. A. Lamborn, and Mr. E. G. Joseph.*—Recent observations on mimicry, protective resemblance, &c., in African and South American butterflies and moths. *Dr. Deane Butcher.*—Osmotic growths. Osmotic growths are mineral productions simulating the forms of organic life. They are obtained by sowing a mineral seed or nucleus in a concentrated inorganic mother liquor. The nucleus reacts with the liquid to form an insoluble gelatinous precipitate at the surface of contact. This semi-permeable extensible membrane is distended by the osmotic pressure within, and grows by a process of intussusception, branching and putting forth terminal organs as it reaches a solution of lesser concentration. Osmotic growths were first described by Prof. S. Leduc in his work on "The Mechanism of Life." *Dr. G. H. Rodman.*—(1) Stereo-radiographs of monkey and tortoise. (2) A set of transparencies illustrating the development of the X-ray tube.

The Cambridge Scientific Instrument Company.—A new large sliding microtome. This instrument is a very powerful one, and will cut sections of superficial measurements up to 150 by 120 mm. (6 inches by 4¾ inches) through decalcified bone or cartilage. *Dr. W. J. Dakin.*—Sections showing stages in the sporogony of a new coccidian parasitic in the whelk. *The Marine Biological Association of the United Kingdom.*—(1) The culture of marine diatoms as food for developing larvæ. Some of the difficulties in the way of rearing marine larvæ in the laboratory have been overcome by keeping them in sterile sea-water and feeding them with cultures, as pure as possible, of suitable diatoms. (2) A collection of living marine animals from the neighbourhood of Plymouth. *Dr. W. S. Bruce.*—Deep-sea invertebrates: new or rare species taken by the polar ship *Scotia* in Antarctic seas during the Scottish National Antarctic Expedition (1902–4). *Mr. C. Tate Regan.*—Sketches illustrating instantaneous colour changes in sea-perches from the Bermudas. The sketches show colour phases observed in the New York Aquarium; these fishes are constantly changing their colour and markings; this is accomplished by the expansion and contraction of chromatophores, or pigment cells.

Mr. A. W. Clayden.—(1) Footprints from the Permian sandstones at Poltimore, Devon. Numerous footprints have been discovered during the last two years in the sandstones mapped in the Survey maps as Lower Sandstones They are of two types. Neither can be exactly matched from any of the known localities at which footprints of Permian age have been found, either in Great Britain, America, or Germany. They bear, however, a general resemblance to those obtained at Corncockle Moor and Penrith, though differing in detail. *Mr. R. W. Hooley.*—Skeleton of *Ornithodesmus latidens*, a pterodactyl from the Wealden shales of Atherfield, Isle of Wight. *Mr. W. Taylor.*—Remains of fossil reptiles from the Triassic sandstone of Lossiemouth, Elgin. *Prof. W. M. F. Petrie, F.R.S.*—Roman portraits, first century A.D. These portraits are painted with coloured wax upon thin panels of cedar. On some a fresh coat of paraffin has been now added for security. They were placed over the faces of the mummies and bandaged down round the edge. They are from the same cemetery, at Hawara, Egypt, as those in the National Gallery, a site now exhausted by the British School of Archæology in Egypt. *Dr. Vaughan Cornish.*—Photographs of surface waves. *Dr. Tom G. Longstaff.*—Mountain photographs.

THE IRON AND STEEL INSTITUTE.

THE annual general meeting of the Iron and Steel Institute opened on May 11 under the presidency of his Grace the Duke of Devonshire. The meetings were held at the Institution of Civil Engineers. The Bessemer gold medal for 1911 was presented to Prof. Henri Le Chatelier, of Paris, who attended for this purpose. The Carnegie gold medal was awarded to Mr. Felix Robin, who has conducted researches on the wear of steels and their resistance to crushing. Carnegie research scholarships have been awarded to Messrs. W. M. Guertler, of Berlin, G. Hailstone, of Birmingham, R. M. Keeney, of Colorado, U.S.A., and G. Dietrich Röhl, of Freiberg, Saxony. Messrs. J. Newton Friend, of Darlington, and T. Swindon, of Sheffield, have had additional grants made to them to enable their researches to be extended and completed.

Sixteen papers in all were presented for discussion; the principal points dealt with in a few of these are given below.

Dr. J. E. Stead contributed some notes on the welding up of blow-holes and cavities in steel ingots. The evidence advanced shows that, if the blow-holes in steel ingots are subcutaneous, *i.e.* under the skin and having no opening to the atmosphere, and the heating of the metal is sufficiently high, say 1000° C. and above, the cavities will weld up completely on being rolled or forged, provided they contain no foreign matter. It is doubtful whether pipe cavities can be so readily welded. The upper ends of the pipes in ingots are open to the gases of the heating furnace, and the cavities become coated with oxide scale, which prevents the metallic surfaces from coming into contact. If the pipe is deep and is bridged over at intervals with diaphragms of solid steel, it is not improbable that welding below these bridges might be effected, provided that the imprisoned gases become forced back into the steel and do not form layers of highly compressed gas between the steel surfaces, and so prevent these surfaces from coming into direct contact. Prof. Howe has suggested that forged steel blooms should be heated for a long time to above the welding point, so as to complete the reabsorption of the gas. This is based on two assumptions: first, that the gases of the cavities are capable of being forced by pressure into the hot steel and of becoming occluded there; secondly, that what gas is not so forced into the metal will diffuse into it during prolonged heating at a high temperature. Prof. Howe's suggestion calls for experimental evidence as regards the quantity of mixed gases or of any gas which can be forced by pressure into solid steel, and also as regards how much of it will come out again on removal of the pressure, and it is understood that a research has been undertaken with the view of settling these important points.

Messrs. E. F. Law, W. H. Merret, and W. P. Digby have studied welds, and in their paper present the results of their investigations. Defining a weld as the actual fusion together of similar or allied metals, the authors have carried their investigations into the region of the characteristic microstructure of both good welds and unsuccessful attempts to produce welds, a subject on which there has hitherto been very little work done. No matter what the process may be by which two metals are welded together, there must always be an area, more or less sharply defined, of altered molecular construction. The authors show that each process of welding has its own hall-mark. For example, it is possible to say whether an electric weld has been made by an arc or by a resistance method from the evidence afforded by polishing and etching alone. Without annealing to restore the original structure, acetylene and water-gas welds have each their own marked characteristics. Resistance welds are seemingly less prone (with the exception, perhaps, of acetylene welds) to oxidation, but the extrusion of the metal renders good working, while the metal is still plastic, of supreme importance. Arc welds are most prone to oxidation, and many will hesitate to rely on such a process in those positions where corrosion is likely to occur. When the welded metal is not likely to be subjected to corrosion, the excellent fusion of the metal renders the method commendable. Flame welds should receive adequate working and manipulation while in their heated condition. Water-gas welds may be abnormal through the use of oxidising flames; acetylene welds certainly require annealing to break down the crystalline structure in the vicinity of the weld.

Prof. H. C. H. Carpenter has continued his investigations on the growth of cast irons after repeated heatings. His principal results up to date may be summarised as follows:—phosphorus tends to diminish growth; sulphur is never present in commercial cast irons in sufficient quantity to have more than a small influence on growth, which is, however, in the direction of retardation; manganese always retards the rate of growth, and diminishes the absolute amount in the majority of cases. Dissolved gases have no influence on the growth of an iron containing more than 3 per cent. of silicon; if the silicon does not exceed 1 per cent. they may be responsible for a growth of at least 10 per cent. The simplest and most rapid test for forming an opinion as to the growth that is liable to take place in any particular grey iron is to estimate the silicon, and then read off the approximate growth from the following table:—

Silicon, per cent.	Approx. growth, per cent.	Silicon, per cent.	Approx. growth per cent.
1·00	15·0	2·50	31·0
1·25	18·5	2·75	32·5
1·50	21·5	3·00	34·0
1·75	24·5	3·25	35·5
2·00	27·0	3·50	37·0
2·25	29·0		

If the iron contains 0·3 per cent. of phosphorus and upwards, the growth will be from 2·5 to 4 per cent. lower than the above figures, and if more than 0·5 per cent. of manganese is present, the rate of growth will be diminished and the amount of growth somewhat lessened. An alloy containing 2·66 per cent. of carbon, 0·587 per cent. of silicon, and 1·64 per cent. of manganese, showed no signs of growth after 150 beats, but, on the contrary, a slight contraction, viz. about 0·13 per cent. It is a tough material, and its mechanical properties were improved by this treatment. It begins to freeze at about 1346° C., and appears to be a suitable material for annealing ovens, rolls, fire-bars, and the grids of muffle furnaces. Probably it could be used for ingot moulds in an iron foundry without cracking.

The influence of impurities on the corrosion of iron is dealt with in a paper by Mr. J. W. Cobb. Interpreting the results of the author's experiments on the basis of the electrolytic theory of corrosion, it may be stated that pure iron is definitely electro-positive to most of its impurities. Among such impurities were found phosphide, sulphide, carbide, oxide, and silicate of iron. With carbon (graphite) the effects were particularly marked. All the iron alloys tried (excepting ferro-manganese) were also electro-negative to pure iron. With the sulphide and silicate of manganese little or no current flowed. Manganese and 80 per cent. ferro-manganese were found definitely electro-positive to iron. Every piece of commercial iron showed electrical effects with any other, and the effects between portions of the same piece were always sufficient to induce corrosion when the other conditions were satisfied. The presence of an impurity determines so many corrosion centres for iron, and so its influence depends more on quality and distribution than on quantity; thus a more homogeneous iron, even if chemically less pure, may be more highly resistant to corrosion. Other papers bearing on corrosion were contributed by Mr. P. Longmuir and by Messrs. J. Newton Friend and J. H. Brown.

Mr. W. H. Hatfield gives experimental results of the influence of vanadium upon the physical properties of cast iron. As an instance where vanadium has increased the life of locomotive cylinders, a case is quoted where cylinders made of cast iron not treated with vanadium wore 1/32-inch per 100,000 miles, whereas vanadium cast-iron cylinders showed only microscopic wear after running 200,000 miles. The present experiments show that additions of vanadium have a definite influence upon the physical properties of cast iron, and that this influence is mainly that of assisting the carbon to persist in the combined state. The persisting carbides, physically, do not differ materially from the normal carbides found in the cast iron; owing, however, to the actual presence of much of the vanadium in the carbide, that carbide is rendered more stable.

Messrs. A. McWilliam and E. J. Barnes give records of a lengthy series of experiments on the influence of 0·2 per cent. vanadium on steels of varying carbon content.

A paper on the chemical and mechanical relations of iron, chromium, and carbon is contributed by Profs. J. O. Arnold and A. A. Read. This paper is in continuation of the work of the authors already published, and gives an account of a number of experiments to determine the composition of the carbides separated from a series of annealed steels containing various percentages of chromium, the percentage of carbon being practically the same in each. The mechanical properties of these alloys under static and alternating stress, and their microscopic features, have also been investigated.

Iron-silicon-carbon alloys are dealt with in a paper by Dr. W. Gontermann. Some of the work performed at the Institute of Physical Chemistry at Göttingen has already been published, and the present report contains further particulars. The paper contains many diagrams and photographs of models showing graphically the properties of this series of alloys.

The magnetic properties of some nickel steels, and notes on the structures of meteoric iron, form the subject of a paper by Messrs. E. Colver-Glauert and S. Hilpert, of Berlin. A 5 per cent. nickel steel is hardest (magnetically) when quenched in the neighbourhood of 900° C. Quenching from higher temperatures results in a softer material. The changes which occur during thermal treatment of a 25 per cent. nickel-iron alloy are of a far more complicated nature than has been thought previously. At high temperatures there probably exists a product which may be preserved by rapid quenching, and is then strongly magnetic, and persists to the temperature of liquid air. This product does not exist in the region between about 600° C. and 900° C. There is very little connection between the magnetic properties and metallographical structure. There is no sharp magnetic change point for this alloy below zero, but the permeability gradually increases as the temperature decreases from about −50° C. to −180° C. The magnetic properties of a 33 per cent. nickel-iron alloy are only very slightly affected by thermal treatment. The microstructures of commercial nickel steels are practically the same as those of meteoric iron.

Messrs. A. McWilliam and E. T. Barnes complete their series of papers on steel with another on the properties of heat-treated 3 per cent. nickel steel.

Messrs. F. A. Daubinè and E. V. Roy, of Aubone, France, give an account of a process for the desiccation of air by calcium chloride. The authors have investigated the appliances necessary for drying large volumes of air, and an appliance has been installed at the Differdauge Steelworks, Luxemburg, where it is now in normal working. In this process, the volume of air to be dried is made to traverse a mass of calcium chloride by means of a fan. Water is circulated through pipes bedded in the calcium chloride for the purpose of carrying away the heat generated by the absorption of water by the chloride. The hydration of the calcium chloride is arrested when the outside pellicle of the broken pieces commences to liquate, and a regeneration operation is employed for the purpose of rendering the calcium chloride capable of being employed for desiccating fresh volumes of air.

THE INTERNATIONAL PHILOSOPHICAL CONGRESS AT BOLOGNA.

THE fourth International Congress, which met at Bologna under the presidency of Prof. Enriques, was formally opened on April 6 by the Duke of the Abruzzi. It has been by far the best attended of the series, the total number of members being more than five hundred, and has been most hospitably entertained by the committee and the various municipalities. The general tone of the debates was much more cordial than usual, and the congress was fortunate even in its conclusion, for the next day a general strike was declared in the town and province.

It is difficult to say what exactly we should expect from such gatherings. It is clear that they can never produce any definite result; but the contact of personalities does sometimes bring into clearer light the existence of general tendencies of thought which otherwise might not have been so definitely perceived. This congress did bring to light the existence of such a tendency, and this was the quite evident decline in the importance of "system" in metaphysics. Philosophy does seem to be steering away from its traditional form. It is beginning to form a more fluent and a less rigid and systematic conception of truth. The working out of this tendency is connected with and was most clearly shown in the discussions of what really formed the main problem of the congress, the one it has spent the most time over—that of the relations between philosophy and science. This problem practically resolves itself into the question as to whether philosophy has any right to an independent existence, and it is perhaps one of the surest signs of the renaissance and vitality of the subject that it can discuss such a question with enthusiasm. This key-note of the congress was struck by Prof. Boutroux in his opening speech. Charming though this was in manner, it was not remarkable for profundity of thought, and offered no more original solution than that science, quite legitimately for its purposes, considered the world impersonally, and that it was the business of philosophy to reintroduce for a complete synthesis the element which science left out.

The same subject formed the theme the following day of a paper by that picturesque personality, Fra Gemelli, monk, biologist, and editor of the *Revista Nee-Scolastica*, which drew a reply from Prof. Hans Driesch, in which he explained the scientific use of his conception of entelechy, as distinct from Aristotle's more metaphysical use. The same subject continued to be discussed each day, until the debate finally culminated in the lecture, that was awaited with the greatest curiosity, that which was given by Prof. Henri Bergson, who is perhaps the most discussed and the most interesting philosopher in Europe at the present time. The main point he tried to establish in his *conférence* was that there were two different, and indeed inverse, ways of acquiring a knowledge of reality, the one that of scientific analysis, and another which he described as a kind of intuition, which should be the method of philosophy. Unfortunately, however, this is not the conception that philosophy has formed of itself. It has always attempted to use the same method as the science of its day; it has always attempted to do for the world in general what particular sciences have done for particular fields. It has conceived itself as the complete science, and therein lies the reason of its failure.

This is true historically; Greek philosophy is nothing but the extension into a different field of the method which prevailed in the science of the times, that of geometry. We get a similar phenomenon in modern philosophy. For the static geometrical concepts of the Greek, substitute the conception of scientific law, extend this to the general problem of reality as the Greeks did geometry, and you get the predominant types of modern philosophy. Always you get philosophy pursuing the same method as that of science, that of intellectual analysis, and having the same ideal, that of a complete science of existence. Now, said Bergson, philosophy, so long as it persists in following this method, is doomed to disappear, for it being obviously not wanted in the field of any particular and successful science, it must pursue its activities in the fields where science has not yet penetrated, *i.e.* in the field of the unknown; and this is not a very secure position for it, for as soon as science begins to penetrate the same field, and there is a contradiction between its conclusions and the conclusions of philosophy, it is philosophy that must give way, not science.

The only future of philosophy, then, lies in a recognition of the fact that it must pursue a different method entirely to that of science. It must give up the attempt to give a complete intellectual representation of the cosmos. There remains the allied question of the place of system in philosophy. Looking at the extraordinary complicated constructions of the great systematic philosophers, they certainly seem to have been animated by the conviction that they were creating a science of the real. But, said Bergson, that is only superficial appearance. If you study, say, Spinoza long enough, you will find that the whole elaborate system was merely the language by which he expressed one perfectly simple intuition, a thing which would be stated in one sentence if you yourself had been in a similar state and could at once recognise it. Here comes, then, the absurdity of explaining a philosopher by his sources—you only by that method catalogue the material by which he expressed himself. The important and central thing in a philosopher is a kind of intuition akin to that of the artist, and differing fundamentally from the kind of activity you get in science.

To get to the detailed work of the congress, particularly the work done in the various sections of logic, theory of science, esthetic, ethic, general philosophy, and psychology, one can only say that it was very abundant and very unequal, considerable so far as the magnitude of the subjects raised was concerned, and very little so far as actual results obtained go. This sterility was in great part due to the defective organisation of the congress and to the persistent keeping to the tradition of a free choice of subjects and free individual communication, with the result that there is never time to really discuss in a serious way the subjects raised. For this reason the most interesting work of the congress was done at the general meetings in the afternoon, and we refer here to the lectures which attracted the greatest attention.

The mathematician Henri Poincaré examined the question which has been raised by Boutroux and certain other philosophers as to whether the laws of nature may change. In a world which evolves continually are the laws, *i.e.* the rules under which this evolution takes place, alone exempt from all variation. Such a conception could never be adopted by the man of science without denying even the possibility of science, but the philosopher has the right to pose the question. Imagine a world in which there was no difference of temperature. Certain laws would be discovered by the inhabitants, such as, for example, that water boils at a certain fixed pressure. Suppose, now, that in course of time this uniform temperature changed, all the laws would now change; water would boil at a different temperature, and so on. Now, however perfect might be the conductivity for heat of this planet, it would doubtless not be absolute, so that one day a physicist of genius might with his delicate instruments detect these imperceptible differences. A theory might then be erected that these differences of temperature had an effect on physical phenomena, and, finally, some bold speculator might affirm that the mean temperature of the world had varied in the past, and with it all physical laws. May there not be some physical entity as yet as entirely unknown to us as was temperature to the inhabitants of this