

probably be regarded as an extreme luxury by most microscopists.

Photography in colours, by all the current methods, is well illustrated, many examples being of historic interest. G. Lippmann, A. Lumière, L. Vidal and H. W. Vogel and several English exhibitors contribute to this section.

"Photography as a science" refers apparently to what might be called *pure* photography to distinguish it from *applied*. But the distinction is neither clear nor precise. This section includes apparatus for measuring the densities of photographs, including opacities and blacknesses, by Captain Abney, Hurter and Driffield, and Chapman Jones; besides sensitometers, actinometers, and similar apparatus. Many results of the various treatments of photographic plates are shown, such as the sensitising for various colours, and the getting of an image free from stain, &c., that it may be of definite opacity. E. Sanger Shepherd shows an ingenious form of slit for spectroscopes, that is stated to be specially suitable for photographic use.

The National Photographic Record Association, that has recently become established through the energy of Sir Benjamin Stone, is well represented. Sir Benjamin himself contributes twenty-one photographs relating to the Houses of Parliament, every one of which is of general interest. There are numerous other examples of technical work to which we cannot refer in even the most general terms, except to a case exhibited by the Bolt Court Technical School of the London County Council Technical Educational Board, which illustrates the working of some of the most important photo-mechanical processes arranged for educational purposes.

While there are some exhibits that claim attention because of their novelty, these are the exception; the chief interest centres round the old rather than the new, and the complete presentation of the capabilities of photography in its numerous applications at the present day. But those whose knowledge of photography is of the general kind, and those who have not followed up its developments during the last few years, will find more that is new, of both examples and processes, than they will be able to appreciate in a single visit. Such an exhibition has never before been organised, and it must obviously be impossible to arrange another of similar extent until after the lapse of several years. The exhibition will close on May 14.

MICRO-BIOLOGY AS APPLIED TO HYGIENE.

AT the Congress of Hygiene and Demography recently held at Madrid, many matters of scientific interest and importance were introduced and discussed. Unfortunately the papers were not printed and distributed among the members, and as the majority were read in Spanish, the discussions were curtailed. The Section of Micro-biology as applied to Hygiene attracted the largest share of attention. Among the more important contributions was that of Dr. Behring, who announced that, as the result of experimental work with the toxin and antitoxin of tuberculosis, he had isolated a substance from the tubercle bacillus a hundred times more powerful than Koch's tuberculin, and had obtained, by passing the virus through the horse, an antitoxin which he believed to be an efficient cure for the disease. Experiments on a large scale are to be carried out at the Berlin Veterinary University. Dr. A. Calmette, of the Pasteur Institute of Lille, demonstrated in a highly successful manner the prophylactic effect on snake-bitten patients of serum of the blood of horses subjected to small doses of the venom. For this purpose a rabbit was injected with a large dose of a mixture of venom of the cobra, naja, and bothrops; this proved fatal in twenty minutes. Two rabbits were then injected with the pro-

TECTIVE serum, and in ten minutes each received a dose of the mixture equal in amount to that which killed the first rabbit. These rabbits appeared to suffer no ill-effects. Further experiments gave unquestionable evidence as to the prophylactic property of the serum, which is easily prepared and retains its protective power for an indefinite period. Great interest was evinced in the paper read by M. Nocard, of the Alfort Veterinary School, and delegate of the French Academy of Medicine, describing a method of cultivating the microbe of pleuro-pneumonia of cattle, the demonstration of which had baffled the efforts of bacteriologists for nearly half a century. This destructive disease of cattle is communicable only by cohabitation, and heretofore has not been communicated to animals of other than the bovine species. As long ago as 1850, Willems had established the fact that the virus existed in the liquid exuding from affected lungs, and laid down rules for a protective inoculation which has been regarded to a great extent efficacious. His method was to introduce into the subcutaneous connective tissue of the animal to be protected a drop of the serosity from an affected lung. The necessity for having an absolutely fresh lung from which to obtain the inoculating material renders Willem's method very inconvenient and often impracticable. It is hoped that the discovery of the specific microbe and the power of cultivating it for indefinite periods, independent of animals suffering from the disease, will afford the means of providing an effectual, protective vaccine at all times available when necessity for preventive inoculation may occur. Heretofore, failure to cultivate the virus has followed sowing in all ordinary media in air or *in vacuo*, and no method of staining has been successful in demonstrating the virus. Nocard and Roux have, however, applied with success the plan adopted by Metchnikoff on the toxin and antitoxin of cholera. Very thin-walled capsules of collodion, rendered sterile by heat, are filled with sterile bouillon, sown with a very small quantity of virulent matter from a fresh pleuropneumonia lung and hermetically sealed. The capsules are then inserted into the peritoneal cavity of a rabbit. The collodion wall proves an absolute barrier to the egress of the microbe and to the ingress of the cells of the animal, which ordinarily have a destructive effect on each other. The wall, however, is permeable to liquids and dissolved matters. Products of the microbe pass out, and sometimes prove fatal to the animal; while it is usually found that products of the animal body, favouring the growth of the microbe, pass inside the capsule, so that after a longer or shorter period, according to the nature of the microbe and the animal, a rich culture is found inside the capsule. The microbe of pleuropneumonia thus cultivated is exceedingly minute. When examined under a very high power (2000 diameters magnification) the culture shows innumerable refractile, motile specks, so fine that, even after staining, their form cannot be exactly determined. Experiments with cows indicate that subcutaneous inoculation of small quantities of these cultures afford protection from the disease. Another interesting fact in connection with these experiments, is the discovery that if collodion capsules filled with sterile bouillon be inserted into the peritoneal cavity of the rabbit or the cow, and remain there for fifteen to twenty days, they are found to contain a medium suitable for cultivation of the microbe *in vitro*. Beyond the definite results in relation to the special disease under consideration, facts elicited concerning the method of providing favourable culture media would appear to have a broad significance.

Among the most novel suggestions for the application of bacteriological science were those of Dr. E. Vallin, of the French Academy of Medicine, who drew attention to the existence of saltpetre on the walls of dwelling-houses, and its ill-effects on the health of the dwellers therein. Dr. Vallin states that the salt is produced by nitrifying

bacilli, and indicates that the prevention and cure are to be effected by removal of conditions favourable to their life and development. Mortar should be mixed with germicides, as coal-tar, sulphate of copper, &c., and where disease of the walls exist, the cure should be effected by inoculation of the walls with anti-nitrifying bacilli.

NOTES.

THE Council of the Institution of Civil Engineers have made the following awards for papers read and discussed before the Institution during the past session:—Watt medals and premiums to Prof. H. L. Callendar, F.R.S., and Mr. J. T. Nicolson; a Telford medal and premium to Mr. A. H. Preece; George Stephenson medals and premiums to Messrs. Whately Elliot and W. O. E. Meade-King; a Crampton prize to Mr. E. W. Anderson; Telford premiums to Messrs. L. B. Atkinson, Henry Fowler, and W. L. Strange. The presentation of these awards, together with those for papers which have not been subject to discussion and will be announced later, will take place at the inaugural meeting of the next session.

THE Reception Committee of the Fourth International Congress of Zoology have issued a circular containing particulars with regard to lodgings and other accommodation at Cambridge during the meeting in August next, and giving information as to the railway fares from various parts of the Continent, and other arrangements for the Congress. The circular is accompanied by a reply-form, to be filled up and returned to the Secretaries by any member of the Congress who wishes rooms to be taken for him. These circulars have been sent to all who have already informed the Reception Committee that they hope to be present at the meeting, and will be sent to other zoologists on application to the Secretaries of the Reception Committee, The Museums, Cambridge.

THE Select Committee appointed to inquire into and report upon the administration and cost of the Museums of the Science and Art Department have agreed to the following preliminary report:—Since the issue of the report of the Museums of the Science and Art Department Committee in July 1897, your Committee have continued the inquiry, but reserve for a further report the publication of additional evidence with their final review and recommendations. They feel, however, bound to report without delay certain conclusions at which they have arrived, on consideration of the evidence, as regards the South Kensington Museum and the Geological Museum in Jermyn Street. They are unanimously of opinion that with a view to present efficient management, to economy of administration, to future development of the collections, and to their full use for the purpose of exhibition and of instruction, it is necessary—(1) That the whole area on the east side of Exhibition Road (except that occupied by the Royal College of Science, which cannot be sacrificed except at great cost) be exclusively devoted to the Art Museum and the Art Library, with provision for the conduct of the business connected with Loans of Art Objects, and the Art Schools. They are satisfied that the whole of this space is required for the Art Schools, the due exhibition of the Art Collections, and the administration connected with such a museum. (2) That provision for the whole of the Science Collection, the Science Library, for Loans of Scientific Objects, and for the Science Schools be made on the west side of the Exhibition Road. They are convinced that this concentration of Art on one side of the road and of Science on the other is essential to good administration, to satisfactory results from the money expended, and efficiency both in the museum and in the schools. This arrangement would allow space for the future development both of the Art and of the Science branches.

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They also unanimously recommend that the Geological Museum in Jermyn Street be no longer occupied for the same purposes as now; and that the collections there exhibited be removed to the west side of Exhibition Road, and made part of the Science collections.

THE address of the British Institute of Preventive Medicine is now Grosvenor Road, London, S.W., instead of Great Russell Street, London, W.C.

THE death is announced of M. Demontzey, Correspondant of the Section of Rural Economy of the Paris Academy of Sciences.

WE regret to notice the announcement of the death of Dr. Samuel Gordon, president of the Royal Academy of Medicine in Ireland, and successor to the late Dr. Haughton as president of the Royal Zoological Society, Dublin.

AT the Royal Institution on Thursday, May 12, Lord Rayleigh will deliver the first of a course of three lectures on "Heat," and on Saturday, May 21, Mr. J. Arthur Thomson will begin a course of two lectures on "The Biology of Spring." The Friday evening discourse to-morrow is by Mr. E. A. Minchin, whose subject is "Living Crystals."

THE death is announced of Dr. Karl Ludwig Fridolin von Sandberger, who until recently was Professor of Mineralogy and Geology in the University of Würzburg, and Director of the Mineralogisches Institut. Although known for his many important contributions to mineralogical science, to the study of ore deposits and to the microscopic structure of eruptive rocks, he was likewise distinguished for his researches on the fossil Mollusca of various formations in the Rhenish provinces and other parts of Germany. His published works date back to 1847. During the years 1850-56 he issued, in conjunction with his brother Dr. Guido Sandberger, "Die Versteinerungen des rheinischen Schichten-systems in Nassau"—a work remarkable for the beauty of its illustrations and the fidelity of its descriptions, and one which was honoured by the award of the Wollaston Fund, which was given to the authors by the Council of the Geological Society in 1855. In 1863 Dr. Fridolin Sandberger published "Die Conchylien des Mainzer Tertiärbeckens"; in 1870-75 he issued, in two volumes, "Die Land- und Süßwasser-Conchylien der Vorwelt"; and in 1882-5, "Untersuchungen über Erzgänge," an authoritative work on the subject of mineral veins. In the course of his long labours he turned his attention to the Mollusca of many different formations, from those of Devonian age to those of Pliocene and Pleistocene deposits. In later years his work became more concentrated on mineralogical science. In 1875 he was elected a Foreign Member of the Geological Society of London. He was born in 1826, and died at Würzburg on April 11.

MR. W. J. LEWIS ABBOTT sends us the following particulars concerning the career of Mr. Henry Lewis, who died on April 10, at the age of sixty-four:—Though apprenticed to a boot-maker, throughout his early life Lewis spent much of his time in the pursuit of natural history subjects, and thirty years ago was led to the subject of flint implements, and forthwith became one of the most ardent collectors. For many years weekly visits were made to pits in the Thames Valley, in each of which he set workmen hunting. He also successfully worked the Botany Bay section, securing much more material than Skertchley, consisting of worked flakes as well as finished implements. His next work was upon the plateau, where he secured valuable spoil. For the last ten years he visited the glacial and pre-glacial deposits in search of worked flints and implements glacially striated and otherwise, and accumulated a mass of material at present undescribed. His late Celtic discoveries at