

is increased at the expense of the solid particles will result in an increase in the osmotic pressure and a decrease in viscosity, and the opposite conditions would result in the reverse of these effects.

The quantitative investigation of the physical properties of gelatin seems to have passed through three phases: in the first phase it was treated mainly as a colloid, in the second mainly as an amphoteric electrolyte, and now, in the third phase, as illustrated by Loeb's latest ideas, it is being realised that both its amphoteric and colloidal properties must be taken into account, since both play a part in its industrial applications. For example, its action as a protective colloid is of great importance in the preparation of photographic emulsions; but in the operations of developing and fixing its behaviour as an amphoteric substance must be considered, as may readily be realised when one remembers that the usual developers are alkaline, and that acid fixing baths are often used; the swelling of the gelatin film will vary in the baths, and in the change from the developer to the fixing

bath the gelatin must, at some time, pass through the isoelectric point.

The structure of gels has been a bone of contention for a long time. Nägeli assumed that gels were two-phased and that the solid phase was crystalline, but Scherrer has not found any indication of crystalline structure in gelatin when examined by the X-ray method. Bütschli and van Bemmelen have advocated a cell-like structure, forming a net-work, and Hardy concluded that the solid phase consists of a solid solution of water in gelatin and the liquid phase a solution of gelatin in water; Wo. Ostwald has put forward the idea of a two-phase liquid-liquid system. Procter postulates the existence of a solid solution of the exterior liquid in the colloid in which both constituents are within the range of the molecular attractions of the mass, and Loeb has extended this idea. At the present time the conception of a fibrillar structure, as advocated by McBain and his co-workers for soaps, is gaining ground and is especially supported by Bogue in America and Moeller in Germany.

Current Topics and Events.

PROF. F. G. COKER was recently presented in London with the Howard N. Potts gold medal of the Franklin Institute of Philadelphia, awarded to him in recognition of his recent work on photo polarimetry. His method of determining stress in models of pieces and shapes made of homogeneous nitro-cellulose material was brought to the attention of the Institute's committee on science and the arts in February 1921, and it was found that the General Electric Company of Schenectady, New York, had in use Prof. Coker's apparatus. A committee was appointed to investigate the apparatus and method, and it reported that Prof. Coker's work was in the highest degree worthy of recognition by the Institute on account of the ingenuity and experimental skill shown "in applying the principles of photo elastimetry to the study of the magnitude and distribution of strains in models of pieces and shapes under stress." The medal, with the accompanying certificate and report upon which the award was made, was presented to Prof. Coker at a dinner at the Savoy Hotel by Dr. R. B. Owens, secretary of the Franklin Institute.

SOME very remarkable achievements in gliding, or soaring flight, are described by the Berlin correspondent of the *Times* in the issue of August 21. The flights were made by two of the competitors in a test competition on the Wasserkuppe, near Fulda, for the grand prize for motorless sail-planes offered by the German Aeronautical Industrialists Union. On August 18 one of the competitors, Herr Martens, remained in the air forty-three minutes, cruised over the starting-place, and then flew due west, at an altitude of about 320 feet, a distance of ten kilometres, landing comfortably in a meadow near Weyhers. On the following day Herr Hentzen remained in the air about one hour forty-five minutes at an altitude varying between three hundred and

six hundred feet, then cruised to the starting-line and across country, landing also in Weyhers, near the spot where Herr Martens had landed the day before. His total time in the air was two hours and ten seconds. The wind was west-north-west, a moderate breeze with occasional gusts. It died away as he set off for the cross-country flight. The machine flown by Herr Martens was a monoplane, designed by the Science Section of the Hanover Technical High School, in conjunction with the Hanover Flying School. The *Times* correspondent gives the following details of its structure: span, 39.4 ft.; wind surface, 172.2 sq. ft.; surface pressure, 2.4 lb. to the sq. ft. The pilot sits directly under the plane. The controls are worked by both the hands and feet. Lilienthal's glider, the correspondent recalls, had a span of 23 ft. and a wind surface of 151 sq. ft.

WE learn from *Science* that from the list of applicants for the Bishop Museum fellowships Yale University has selected the following fellows for the year 1922-1923: Dr. H. W. Fowler, ichthyologist, Philadelphia Academy of Science; Dr. N. E. A. Hinds, instructor in geology, Harvard University; and Dr. Carl Skottsberg, director of the Botanical Garden, Göteborg, Sweden. Dr. Fowler will devote his attention to a study of the fish of Hawaiian waters; Dr. Hinds will continue his investigations of the geology of the island of Kauai; and Dr. Skottsberg proposes to make a study of the flora of Hawaii with particular reference to comparison with the plant life of Juan Fernandez and other islands of the south-east Pacific. The four Bishop Museum fellowships yielding one thousand dollars each were established in 1920 by a co-operative agreement between Yale University and the Bernice P. Bishop Museum of Honolulu. They are designed primarily for aid in research on problems in ethnology and natural history which involve field studies in the Pacific region.

ON September 18 to 24 will be held at Leipzig the Centennial Festival of the Gesellschaft Deutscher Naturforscher und Ärzte (Association of German Men of Science and Physicians). The meetings will be preceded by a series of lectures and demonstrations in scientific microscopy to be given at Leipzig University. At the festival an exhibition will be held and a number of papers read by leading German men of science. Among the latter are the following: "The Theory of Relativity in Physics," Dr. Einstein; "The Theory of Relativity in Philosophy," Dr. Schlick; "Restorative Surgery," Drs. Bier and Lexer; "A Century of Atavistic Research," Dr. Johannsen (Copenhagen); "External Phenomena and Atavism," Dr. Meisenheimer (Leipzig); and "The Theory of Human Atavism"; "Progress and Retrogression in the Course of the World's History"; "Germany's Climate"; "The Highlands of Tibet and their Inhabitants," by Dr. Sven Hedin. Following the festival will be a series of continuation courses in medicine to be given at Leipzig, while during the period of the meetings special theatrical performances and concerts are to be arranged. Any one interested in medicine or natural science may take part in the meetings for a fee of 100 marks (or a correspondingly higher fee in the case of foreign countries). Those who wish for further particulars should apply to the Association at Leipzig.

THE autumn meeting of the Institute of Metals will be held at Swansea on September 19-22. On the evening of the opening day the first annual lecture on subjects of practical interest to those engaged in the non-ferrous metals industry will be given by Dr. R. S. Hutton, on "The Science of Human Effort (Motion Study and Vocational Training)." There will be a number of social functions and visits to works, and the following are among the communications to be submitted: Sixth report to the Corrosion Research Committee on the Nature of Corrosive Action and the Function of Colloids in Corrosion, Dr. Guy D. Bengough and J. M. Stuart; report to the Aluminium Corrosion Research Sub-committee on Experiments on the Oxide Method of Determining Aluminium, J. E. Clennell; "Grain-size and Diffusion," Prof. J. H. Andrew and R. Higgins; "The Structure of Eutectics," F. L. Brady; "The Antimony-bismuth System," M. Cook; "The Effect of Superheated Steam on Non-ferrous Metals used in Locomotives," Sir Henry Fowler; "The Constitution and Age-hardening of Alloys of Aluminium with Copper, Magnesium, and Silicon in the Solid State," Marie L. V. Gayler; "Intermetallic Actions: the System Thallium-arsenic," Q. A. Mansuri; "The Effects of Overheating and Melting on Aluminium," Dr. W. Rosenhain and J. D. Grogan; and "The Copper-rich, Aluminium-copper Alloys," D. Stockdale.

THE programme arranged for the Engineering Section of the British Association at the Hull meeting is somewhat of a departure from those of recent years. Two mornings are to be devoted entirely to papers and discussions on single definite subjects, and every

effort has been made to arrange the programme in such a way that ample time will be available for discussion. The subject for Thursday, September 7, is "The Strength of Railway Bridges"—a vital topic at the present moment, when bridges are being subjected to loads very much in excess of those for which they were originally designed. Papers on the subject will be read by the engineers of some of the leading railway companies. On Friday, September 8, a descriptive paper will be read on "The Equipment of a Modern Portland Cement Works." The manufacture of cement is one of the leading local industries, and a visit will be paid to the new works of the Humber Portland Cement Co., which have been recently equipped on the most up-to-date lines. A paper of interest to the cement industry will be that on the effect of fire on reinforced concrete buildings. On Friday morning also the president, Prof. Hudson Beare, will give his presidential address on "Some Australian Railway Problems." Monday morning, September 11, will be devoted entirely to a discussion on "Economic Steam Production, with special reference to Marine Practice," and papers on the subject will be read by representatives of the Fuel Research Board, the Admiralty, and Messrs. Babcock and Wilcox. On Tuesday morning a paper on a closely allied and highly controversial subject, viz. "The Propelling Machinery of the Cargo Carrier of the Future," will be read by one of the leading engineers of Messrs. Beardmore and Co., who have done a great amount of work in developing the oil engine for this purpose. On Wednesday morning a paper on the resolution of compound stresses will be read and also one on electrical ignition apparatus for internal combustion engines, and a demonstration of the Collins micro-indicator for high-speed engines will be given. A number of afternoon visits to works and objects of engineering interest has also been arranged.

THE meetings of Section M (Agriculture) of the British Association at Hull are to be held under the presidency of The Rt. Hon. Lord Bledisloe, whose presidential address is to be on the subject of "The Proper Position of the Landowner in Relation to the Agricultural Industry." Following the practice introduced by Mr. Orwin last year, Lord Bledisloe will circulate his address and invite a discussion on his views. This will take place on September 11. In the programme of the section are three joint meetings and discussions with other sections. The first of these on the opening day—Thursday, September 7—is to be held at 11.30 A.M., and will be opened by Sir William Beveridge on the subject of "Weather Cycles in Relation to Agriculture and Industrial Fluctuations." This meeting is in association with Sections A and F (Mathematics and Physics, and Economics). Contributions have also been promised by Mr. Udny Yule and Mr. R. A. Fisher. On the following day a meeting will be held at 11.30 A.M. jointly with the Physiology Section to discuss the subject of Vitamins. This discussion will be opened by Prof. Drummond, and Messrs.

Golding, Orr, and Prof. T. B. Wood have promised to take part. The other joint discussion is also with the Economics Section, and should prove of wide interest, as the subject is "The Possibility of Increasing the Food Supply of the Nation." Sir John Russell, Sir T. H. Middleton, Mr. C. S. Orwin, and Prof. Somerville have promised to speak from the agricultural side. Sir A. Daniel Hall is reading a paper on "Land Reclamation on the East Coast," and an excursion to see natural and artificial warpland should be interesting in this connexion. Prof. T. B. Wood is contributing a paper embodying some of the results which have been obtained in the work at the Animal Nutrition Institute at Cambridge. Among other interesting papers are several dealing directly or indirectly with the use of lime in the improvement of soil conditions, and with the evaporation of water from soil. Horticulture and the nutrition of fruit trees will be dealt with by Mr. H. V. Taylor and Prof. B. T. P. Barker, and farm costs in Yorkshire by Dr. A. G. Ruston. In addition to the excursions already mentioned another has been arranged to enable members to see something of the farming of the Yorkshire Wolds, and it is also hoped to visit some of the oil-cake factories in Hull.

THE Toronto correspondent of the *Times* announces that the Quebec Government has decided to set aside about 22,000*l.* for the purpose of establishing a Radium Institute, under the control of the University of Montreal, for the experimental treatment of cancer.

ACCORDING to the Spanish journal *Iberica*, two underground railways are now in course of construction in Barcelona, viz. the Ramblas-Gracia, of a total length of 3400 metres, and the Puerto branch, 1800 metres in length. The two lines, which will be double-track systems, are of 1.435 metres gauge. The construction of the system will be a matter of some difficulty, as most of it will be underground tunnel-driving, although a certain part, serving traffic in the busiest part of the city, will be in the open. Little difficulty is experienced as regards water, because most of the ground through which the tunnels will be driven consists of a thick stratum of quaternary clay, superimposed in places by strata of hard limestone marl. The method of construction adopted is the Belgian system. The diameter of the tunnels on the straight will be 7 metres, and in curves, etc., 9.95 metres.

A CORRESPONDENT informs us that the admirable drawings referred to in a review of Messrs. Heron-Allen and Earland's report on Antarctic Foraminifera in *NATURE* of August 19, p. 241, were by Miss M. H. Brooks and not Mr. M. H. Brooks as therein stated.

THE Cambridge University Press promises for the autumn "The Air and its Ways," by Sir Napier Shaw. The volume will contain the Rede Lecture for 1921, and other contributions to meteorology, for schools and colleges.

Our Astronomical Column.

COMETS.—A photograph of Skjellerup's Comet, 1922*b*, was obtained on July 31 at Greenwich: it confirms the short period, which appears to be very close to 5 years, thus making it definitely the second shortest cometary period. That of Encke's Comet is $3\frac{1}{4}$ years, that of Tempel's Second Comet is $5\frac{1}{6}$ years. The identity with Grigg's Comet, 1902 II, is rendered almost certain, since both the period and the other elements accord closely. The perihelion distance has increased considerably, but only by an amount comparable with that which has occurred in the case of the Comet Pons-Winnecke.

The *Journal des Observateurs* of August 15 contains a series of observations of Reid's Comet, 1922*a*, made at Santiago da Chili by Rosauro Castro. There are twenty-two days of observation, from February 6 to March 31. The places of the comparison stars are taken from the Perth Astrographic Catalogue. The comet was observed for $2\frac{1}{2}$ months, so that there is ample material for deducing the orbit. As the later observations deviate considerably from Mr. Wood's ephemeris, there is some reason to suspect appreciable departure from a parabola.

M. Kamensky has made in *Astr. Nachr.* 5168 a very elaborate investigation of the perturbations of Wolf's Periodic Comet from 1884 to 1919, due to Venus, Earth, Mars, Jupiter, and Saturn. The comet was observed at five apparitions (1884, 1891, 1898, 1911, 1918), and the normal places are all closely satisfied by the final elements, the largest residual being 8".6. The perturbations during the above period have been small, the range of the mean daily motion being from 518".4 in 1898 to 523".8 in 1884, or 1 per cent. There is, however, a near approach to Jupiter in 1922, which is likely to produce notable

changes in the orbit, making it quite doubtful whether it will ever be seen again. M. Kamensky promises to investigate them. It is to be hoped that others will emulate him in similar researches on other periodic comets. Those of d'Arrest, Pons-Winnecke, and Tuttle are all in need of such work.

THE PROBLEM OF THREE BODIES.—It has long been recognised that the analytical solution of the general problem of three finite masses, moving under their mutual attraction, cannot be obtained in a form that is of practical utility. Something can, however, be learnt of the circumstances of motion, by studying particular cases by the method of mechanical quadratures. Researches of this kind are being pursued at Copenhagen Observatory under the direction of Prof. E. Strömngren. Some of the results were published in the Jubilee Number of *Astronomische Nachrichten*, and are now reprinted as a brochure. There are two cases of special interest where the masses are as 1, 2, 1, the largest being in the centre. The first is an approximation to an "orbit of ejection," and involves periodic near approaches. The outer masses describe curves resembling *limaçons* (without loops or cusps), while the central one describes a curve resembling the inverse of an ellipse with respect to the centre. The other case is an approximation to the case of the arrangement of the three masses at constant distances along a rotating straight line. When the conditions for the straight line are slightly departed from, each body describes a small loop; that of the central body is practically an ellipse with its major axis perpendicular to the rotating line. In each case the motion is periodic, and the curves repeat themselves indefinitely.