on the basis of earlier experiments of Bichat and Blondlot, an electrometric condenser method for the comparative determination of the gas-liquid P.D.'s. The results which he obtained show that substances (such as the aliphatic alcohols and acids) which concentrate at the surface produce a very great change in the surface P.D., whilst highly dissociated univalent inorganic salts, such as potassium chloride, do not. The results obtained by Kenrick have been much extended by an investigation carried out with the same type of apparatus by Prof. T. Thorwaldson in my laboratory. The general result of these experiments can be described in the following terms:

Consider the system:

Aqueous solution of KCl (conc. = c) A	Air	Aqueous solution of KCl (conc. = c) B
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The positive potential of A will be equal to that of B. If we now add to the solution B a small quantity of a substance S (generally a non-electrolyte or weak electrolyte) which has a strong tendency to concentrate at the air-B interface, it is found that the positive potential of A rises markedly above that of B, the value of the quantity, positive potential of A minus that of B, varying with the concentration of S in the way that is characteristic of adsorption phenomena. What is the interpretation of this phenomenon?

Quincke has shown that a bubble of air in water placed in an electrical potential gradient travels towards the anode—*i.e.* the bubble behaves as if it were negatively charged. From this it would follow that the P.D. at the air-water interface is such that the *negative* half lies towards the air side. As an electrolyte such as potassium chloride is negatively adsorbed at an air-liquid surface, it is probable that a P.D. of the character indicated by Quincke's experiment exists at the A-air interface. If we accept this conclusion, it follows that the effect of S is markedly to *reduce* this P.D. (or to reverse it). Now the P.D. at the air-water interface is probably due to the existence of a double layer containing hydroxyl ions on the outside and hydrogen ions on the inside, or to oriented water molecules regarded as electrical bi-poles. If S is a non-

electrolyte (or a substance which possesses little self-ionisation), we can understand why its concentration at the surface could result in the reduction of this P.D.

Within the last few years H. A. McTaggart has made a number of experiments on the electric cataphoresis of gas bubbles in aqueous solutions and other liquids. He finds that aliphatic acids and alcohols in aqueous solution reduce the surface P.D., and that this effect runs parallel with their influence on the surface tension of water. He also finds that acids reduce the P.D. These results may be regarded as a corroboration of those obtained by Kenrick. McTaggart has found that the nitrates of tri- and tetravalent cations have a powerful effect in not only reducing but even reversing the P.D. (*i.e.* the bubble becomes positively charged). His experiments also show that polyvalent negative ions, such as the ferrocyanide ion, act in the opposite direction to the polyvalent cations—*i.e.* they increase the negative charge on the bubble or diminish a previously existing positive one.

The subjects which I have been discussing have an interesting bearing on the formation and stability of foams and froths. If air be violently churned up with water, only comparatively large bubbles are produced, and these quickly rise to the surface and burst. If now a very small quantity of a substance which concentrates at the air-water interface be added, an almost milk-white "air emulsion" of small bubbles is produced, which rise to the surface and produce a relatively durable froth. It is clear that the diminution in interfacial tension facilitates the subdivision or dispersal of the air. The existence of the surface layer will also confer a certain amount of stability on the resultant froth, since it will give rise to forces which resist the thinning of a bubble wall. Any sudden increase in the surface will produce a momentary diminution in the concentration or "thickness" of the surface layer, and hence a rise in surface tension, which will persist until the normal thickness or concentration is readjusted by diffusion of molecules from the inside volume—a process which in very dilute solution will occupy a perceptible time.

(To be continued.)

Obituary.

DR. ALEXANDER GLEICHEN.

THE sudden and unexpected death of Dr. Alexander Gleichen on October 21 is reported from Berlin. Born at Niederschönweide on September 23, 1862, Dr. Gleichen commenced his higher education at the Neu-Ruppiner Academy, and later studied mathematics and natural philosophy at the University of Berlin. After passing his final examination at the University of Kiel, he became an assistant and then a head teacher at the Kaiser-Wilhelm Academy. At the same time he acted as "Privatdozent" at the Technical High School of Charlottenburg, where he lectured upon geometrical optics, a subject with which his name will always be associated. He also lectured upon mathematics at the Helene Lange College for Women.

Dr. Gleichen's academic career terminated in 1904, when he was called to the German Patent Office, with

which he was connected until the end of 1918. While thus occupied, he was able to produce the *Archiv für Optik*, and later to act as editor of the scientific and technical sections of the optical and mechanical central journal. From 1919 until his death Dr. Gleichen was engaged in the scientific work of the C. P. Goerz optical establishment, where the opportunity was afforded him of applying his special knowledge of ophthalmic theory to the satisfaction of the ever-increasing demands of the spectacle industry.

Beyond Germany, Dr. Gleichen is best known as a writer of optical text-books of particular value to the student whose object it may be later to apply his knowledge to the practice of the art. This combination of theory and practice is most marked in his "Schule der Optik," published in 1914, and in his "Theorie der modernen optischen Instrumente" of 1911. The latter

book was, in 1918, translated into English under the auspices of the Committee of the Privy Council for Scientific and Industrial Research. The "Schule der Optik" has been translated into Spanish. As a theoretical treatise, his first work, published in 1902 and later translated into French, the "Lehrbuch der geometrischen Optik," is generally regarded as his most valuable legacy to the literature of optics.

The long list of Dr. Gleichen's books and contributions to scientific journals and societies is indicative of a life the leisure hours of which were exclusively applied to the study and expression of the science to which he was devoted; and yet it was characteristic of Dr. Gleichen that he was never too absorbed in his own affairs to appreciate the needs of others and was ever ready to leave his desk to assist a fellow-worker.

JAMES WEIR FRENCH.

MR. G. D. MAYNARD.

THE untimely death of George Darell Maynard at the age of forty-seven has removed another of the small company of medical biometricians which lost Dr. Goring in the pandemic of influenza and Dr. R. J. Ewart this year. Maynard did not enter the field of statistics until he had had wide clinical experience, and at the time of his death he was in active medical practice.

The first notable contribution by Maynard to medical statistics was a paper on anti-typhoid inoculation published in the sixth volume of *Biometrika*, and he contributed four other memoirs to that journal, the last of which was published this year. He was the author of three of the memoirs issued by the South African Institute for Medical Research. The first of these, "An Enquiry into the Etiology, Manifestations, and Prevention of Pneumonia amongst Natives on the Rand recruited from Tropical Areas" (November 1913), is perhaps his most important contribution. Apart from the critical appraisal of the value of inoculation, the section of the memoir which examines the evidence in favour of the view that pneumonia is an infectious disease is a strikingly original piece of work.

Maynard was the first writer to propose statistical criteria of infectiousness, and his treatment of "runs" of cases is very suggestive, while his use of time intervals shows that he had grasped a notion which has since been developed by various mathematical statisticians. The joint memoir (with Dr. G. A. Turner) on "Bantu Natives" (1914) is a careful piece of biometry, and the same may be said of his biometric study of the typanosomes of sleeping sickness (1915). Maynard's work on the correlation of the death-rates from cancer and diabetes (*Biom.* vii. 276) was one of the first applications to the problem of cancer of the calculus of correlations and contains a great deal which is valuable and suggestive. As, except during a brief period, his research work was the product of a scanty leisure, and he never enjoyed access to a first-rate collection of statistical literature, the range and accuracy of his contributions are remarkable. His loss, at the zenith of his powers, is a serious blow to science. M. G.

MR. T. F. CHEESEMAM.

BOTANY in New Zealand has sustained a heavy loss by the death of Mr. Thomas Frederic Cheeseman,

Curator of the Auckland Museum. Thomas Kirk had been entrusted with the writing of the "Students' Flora" of New Zealand, but it was cut short by his death in 1897. The half-finished volume being brought out by the Government in 1899, was followed in 1900 by a commission to Mr. Cheeseman to draw up a complete flora of the Dominion, at the same time he was set free from his duties of Curator. He had begun his researches in 1870, embracing the whole region from the Kermadec Islands to Otago. The result appeared in 1906, entitled "Manual of the New Zealand Flora," and is regarded by those who have used it, as one of the best local floras in existence. This volume being completed, its author turned his attention to a series of plates in illustration, selected by Mr. Cheeseman, but drawn and lithographed in England under the care of Mr. W. Botting Hemsley, F.R.S., which were worked and sent to New Zealand, where the text was printed, and the book published at Wellington in two quarto volumes.

At the last anniversary meeting of the Linnean Society, the award was made to Mr. T. F. Cheeseman of the gold medal, its highest award, which was received for him by the High Commissioner. It was a matter of the highest gratification when received, but a few months later, news came that his death had occurred in October last, unexpectedly, though he was known to be far from strong. He had read the proof of his revised "Manual" as far as the end of Monocotyledons.

For years Mr. Cheeseman had worked alone, without a botanical companion, his knowledge being entirely due to reading and observation. He was gifted with extraordinary patience, sound judgment, and calm common sense; gentle and lovable, he had a quiet sense of humour, betrayed by the twinkle in his eye. Mr. Cheeseman, who was born in Hull in 1846, had been a fellow of the Linnean Society since 1873.

B. D. J.

WE regret to announce the following deaths:

Canon T. G. Bonney, F.R.S., emeritus professor of geology in University College, London, on December 10, aged ninety.

Lieut.-Col. H. H. Godwin-Austen, F.R.S., on December 2, aged eighty-nine.

Dr. L. Grunmach, a member of the Physikalisch-Technischen Reichsanstalt, Berlin, and Privatdozent in physics at the Berlin Technical College, on October 23, aged seventy-two.

Prof. J. Harkness, Peter Redpath professor of pure mathematics in McGill University, Montreal, aged fifty-nine.

Col. C. Swinhoe, distinguished by his work in entomology, on December 2, aged eighty-six.

Prof. C. C. O. R. Tigerstedt, professor of physiology in the University of Helsingfors, Finland, author of works on the physiology of the blood circulation, on December 2, aged seventy.

Sir Frederick Treves, Bart., formerly Hunterian professor of anatomy and Wilson professor of pathology at the Royal College of Surgeons, Serjeant Surgeon to King Edward VII. and to the present King, on December 7, aged seventy.

Prof. D. T. Wilson, since 1903 a member of the department of astronomy of the Case School of Applied Science, Cleveland, Ohio, who was known for his work on the perturbations of the minor planets, on October 12, aged sixty-one.