

variation*, and the prior probability of its possible values has to be distributed uniformly within the range permitted by the total variation to express this. We can then compare the total probabilities, given the observations, that the whole of the variation is random and that part of it is systematic in this sense. It is found that if the new term as found by a least squares solution is more than a certain amount, the observations increase the probability that part of the variation is systematic; if it is less than this amount, they decrease it and support the proposition that the whole of the variation is random. The critical value is usually two to three times the standard error as usually estimated, and therefore is in good agreement with the rule that has been found to work well in practice.

The method can be stated as saying that, if we have no previous knowledge beyond the fact that the new parameter is worth considering, we take the prior probability that it is zero as $\frac{1}{2}$, and we accept it as genuine if the posterior probability is less than $\frac{1}{2}$ (though not with much confidence unless it is considerably less). This is what I have called a 'simplicity postulate' (², p. 250). Some objection has been made to it by alleged naive realists, who would apparently accept every

estimate uncritically as an exact determination. I can only say that every competent statistician does reject new parameters below about the limit that I find, and that nobody who has ever accepted two estimates as consistent because they agreed within the standard error of their difference is a naive realist. Anybody who rejects the simplicity postulate must apparently believe that the Nautical Almanac Office, in predicting the positions of the planets, would get better agreement with future observation by fitting polynomials exactly to the whole of the observations and then extrapolating, than it gets by the actual method of finding the minimum number of parameters by least squares and calculating according to the law of gravitation. But if anybody really believes that, he would add to the clarity of discussion by saying so explicitly. If, on the other hand, current procedure is admitted as valid, it is thereby admitted that probability must be introduced at some stage before we can get practical results. But if it has to come in sooner or later anyhow, we may as well have it at the start; and then it is found to solve most of the problems that have led to controversy, since the apparent postulates turn out to be either superfluous or legitimate inferences from experience.

* It is because it often accounts for nearly all of it that a physicist can think that there is evidence for strict causality. In such a subject as agriculture no such confusion is possible. Fisher's term "the analysis of variance", though used by him only in relation to a particular technique, goes straight to the root of the general problem.

¹ Karl Pearson, "The Grammar of Science".

² Jeffreys, "Scientific Inference", 1937.

³ Jeffreys, *Proc. Roy. Soc., A*, **160**, 330-335 (1937).

[To be continued.]

Obituary Notices

Mr. W. H. B. Cameron

THE untimely death of Mr. W. H. B. Cameron on February 16, at the early age of thirty-six years, came as a great shock to all who knew him.

A native of Ulster, Mr. Cameron entered Queen's University, Belfast, as Sullivan scholar from the Royal Belfast Academical Institution, and graduated in 1923 with honours in physics and mathematical physics. During the next three years he was successively Musgrave demonstrator in physics and Musgrave research student at that University, and undertook research work in spectroscopy under the direction of Dr. R. C. Johnson. His work on spectra associated with oxygen and nitrogen, for which he was awarded the M.Sc. degree, was followed by work on the nitrogen afterglow, and on the production of various spectra in the presence of neon and argon. During this work he discovered the bands of carbon monoxide now generally known as the Cameron bands, and also some new bands of silicon oxide.

Mr. Cameron joined the staff of the Physics Department at the University of Sheffield in 1926, and continued there his spectroscopic researches, working

first on the band spectrum of sulphur, and later carrying out the construction of a novel grating spectrograph. Later work was done in collaboration with his colleague, Dr. A. Elliott, on intensity measurements of the first positive band spectrum of nitrogen excited by various methods. This was followed by a joint analysis of the visible emission bands of chlorine, recently published, in which it was shown that the bands are emitted by singly ionized chlorine molecules. Further work on the continuous spectra excited in chlorine by active nitrogen was in progress when he was stricken by his fatal illness.

Mr. Cameron's activities, however, were by no means confined to his scientific work. He had been leader of the University Rover Crew from its inception, as well as resident tutor at Crewe Hall and supervisor of University lodgings since 1936. During his time in Sheffield he was actively associated with St. Andrew's Presbyterian Church. He was secretary and past president of the Sheffield Physical Society, and an associate of the Institute of Physics.

In all phases of his varied activities, Mr. Cameron's work was characterized by unflagging patience and

carefulness. This was particularly evident in his dealings with students, who held him in high affection and for whom no amount of work was a trouble to him. Besides being an excellent and sympathetic teacher and a delightful colleague, he had many sterling qualities; his modest manner, quiet humour, and kindly smile endeared him to all with whom he associated. It can truly be said of him that he spent himself gladly in the service of others. R. W. L.

Sir Arthur Downes

SIR ARTHUR DOWNES, who died on March 11, at his home on Mount Carmel, Haifa, Palestine, at the age of eighty-six years, had a long career in the public health service. He was educated at Shrewsbury School, University College, London, and the University of Aberdeen, where he graduated M.B., C.M. with honours in 1873. He became M.D. in 1875, and took the diploma of public health, Cambridge, in 1877.

After serving as deputy medical officer for Shropshire, and medical officer of health for the Essex Combined Areas, 1879-99, Downes was made inspector in the old Local Government Board, rising to become its senior medical inspector. He represented that body on many occasions, and served on the Royal Commission on the Poor Laws, and on a number of departmental committees.

Sir Arthur Downes will be best remembered for the pioneer work he did on the effect of light in inducing certain chemical changes, upon protoplasm and micro-organisms, and upon the activity of enzymes, publishing several communications on these subjects between 1877 and 1886, alone or in association with T. P. Blunt, in the *Chemical News*, *Proceedings of the Royal Society* and *NATURE*. Downes and Blunt showed that oxalic acid is completely oxidized and hydrogen peroxide is partially destroyed by insolation. In their "Researches on the Effect of Light upon Bacteria and other Organisms" in 1877, they found that light is inimical to the development of bacteria and micro-fungi, and under favourable conditions may wholly prevent development, the fitness of the culture liquid for growth being unimpaired, and they stated that this effect appeared to be associated with the actinic rays.

They carried this investigation a stage further in 1878 in their work "On the Influence of Light on Protoplasm". They tested the action of light upon Bacteria and *Torulæ* grown in test-tubes screened with different coloured glasses, the light-transmission of which was determined spectroscopically, and found that the action depends chiefly upon the blue and violet rays. Downes published another paper in 1886 on "The Action of Sunlight on Micro-Organisms", and in a letter in *NATURE* of the same year (34, 546) stated that the enzymes invertase, malt diastase, pancreatic diastase and trypsin, are all destroyed by insolation for a month.

Not inappropriately, Downes became a vice-president of the Sunlight League; he was knighted in 1910, and held the Order of the Crown of Belgium.

R. T. HEWLETT.

Sir Raymond Crawford

WE regret to announce the death on March 9 at the age of seventy-two years of Sir Raymond Crawford, registrar of the Royal College of Physicians of London, consulting physician to King's College Hospital and fellow of King's College, London.

Raymond Henry Payne Crawford was born on November 9, 1865, at East Grinstead, where he afterwards became consulting physician to the dispensary. He was the son of the Rev. Walter Payne Crawford, and was educated at Winchester and New College, Oxford. He qualified M.B. in 1894 and M.D. in 1896 with a thesis on Graves's disease, on which he afterwards contributed an article to Quain's "Dictionary of Medicine" (1900). In addition to his position on the staff of King's College Hospital, to which he was appointed assistant physician in 1898, dean in 1900 and full physician in 1905, his two chief spheres of activity were Epsom College, where he was chairman of the Council for thirteen years, and the Royal College of Physicians, where he was successively Fitzpatrick lecturer (1911-12), examiner (1912-16), censor (1918), Harveian orator (1919) and registrar from 1925 until the time of his death.

Apart from his joint editorship with Dr. (now Sir Farquhar) Buzzard of the fourth edition of Burney Yeo's "Manual of Treatment" (1909), Crawford contributed little to the literature of modern medicine, but he took a scholarly interest in the history of his art, being secretary of the section of medical history in the International Congress of Medicine held in London in 1913 and afterwards president of the Section of the History of Medicine of the Royal Society of Medicine, in the formation of which he took an active part. In 1909 he published a work entitled "The Last Days of Charles II", and in 1911 and 1912 chose as the subjects of his Fitzpatrick lectures "The King's Evil" and "Echoes of Pestilence in Literature and Art" respectively. Crawford was not only a fine scholar and an urbane and kindly physician, but also an excellent organizer and man of business whose loss it will be difficult to replace.

J. D. R.

WE regret to announce the following deaths:

Mr. Frederick J. Gould, author of many papers on moral education and world unity, who devoted his life to the promotion of social progress, on April 6, aged eighty-two years.

Prof. F. Mesnil, of the Pasteur Institute of Paris, member of the Section of Anatomy and Zoology of the Paris Academy of Sciences, aged seventy years.

Prof. Otto Naegeli, professor of internal medicine and director of the Medical Clinic in Zurich, known for his work on diseases of the blood, aged sixty-seven years.

Prof. D. W. Hering, emeritus professor of physics in New York University, on March 24, aged eighty-eight years.

Mr. F. A. Molitor, consulting engineer of New York, known for his work in railroad engineering, on March 12, aged sixty-nine years.