altered, in successive editions) has had an immense influence in introducing modern statistical methods in biological research. *The Design of Experiments*, though not published until 1935, also flowed directly from his work at Rothamsted.

Although at Rothamsted Fisher was not directly concerned with genetics, he pursued his investigations privately, both on the theoretical side and in practical breeding studies on mice, snails and poultry; from the last he confirmed his theory of the evolution of dominance. *The Genetical Theory of Natural Selection*, published in 1930, contains ideas, particularly on human evolution, much in advance of its time. If these have as yet had little practical impact, it may be in part because Fisher's conviction of the power of genetic selection in moulding organisms to fit their environment led him to belittle the importance of reforms, such as improvements in nutrition, designed to improve the environment, and this enabled progressive thinkers to dismiss his theories on human evolution, which in any event they found distasteful, without serious thought. Nevertheless, the book did much to reconcile Darwinian and Mendelian theory.

Fisher's genetical interests led to his appointment in 1933 to the Galton chair of eugenics in the University of London. Here he became interested in blood groups, and in particular resolved the complexities of the rhesus system. In 1943 he became Arthur Balfour professor of genetics in the University of Cambridge, a post which he held until his retirement in 1957. Here he continued his theoretical studies on population genetics and quantitative inheritance, publishing *The Theory of Inbreeding*, and experimental studies on chromosome mapping in mice, and on polyploidy in *Lythrum*. He remained in Cambridge until his successor was appointed in 1959, and then took up work in Adelaide with the Commonwealth Scientific and Industrial Research Organization Division of Mathematical Statistics. After his formal retirement he became interested in the claim that had been made that cigarette smoking was responsible for lung cancer. Whatever the final verdict on this issue, Fisher's re-examination made apparent the weakness of the deductions from the original evidence, and provided an excellent example of the dangers inherent in the statistical analysis of survey material.

Throughout his life Fisher continued to develop his ideas on the fundamental problems of inductive inference and estimation. He early recognized the fallacies of the Baysian approach, and in 1930 introduced the concept of fiducial probability. Other mathematical statisticians have found great difficulty with this concept; but it will, I think, in due course take its place along with likelihood and exact tests of significance of small samples as one of Fisher's outstanding contributions to the theory of statistics. In 1956 he published *Statistical Methods and Scientific Inference*, in which he summarized his current thought on these problems and for the first time put forward the entirely novel concept of reference sets and recognizable sub-sets for defining probability.

Fisher was elected a Fellow of the Royal Society in 1929, receiving the Royal Medal in 1938, the Darwin Medal in 1948 and the Copley Medal, the highest award of the Society, in 1955. He was president of Gonville and Caius College, Cambridge, during 1956–59. He was knighted in 1952, and received recognition from many foreign universities and academies. In 1961 he was elected a member of the Pontifical Academy of the Vatican, an honour which gave him particular pleasure.

To those who knew him well, Fisher was a man of great charm, a brilliant conversationalist, cultured in the widest sense, and appreciative of historical values. He was also a most stimulating scientific colleague, as the many who have worked with him can testify. He did not believe in direction in scientific research—"I wonder how many of us do the work we're paid for"—and this, and his irascible temperament, made him a poor administrator. He was also, I think, unduly sensitive to much of the unjustified criticism which his work, because of its originality, inevitably attracted. This led him into many scientific controversies, which he pursued with vigour and apparent enjoyment, but often in that indignant frame of mind that leads to a partial view of the problem, and leaves unanswered objections that are obvious to the impartial observer. Indeed, his approach to scientific controversy was often that of an advocate rather than a judge, and this did frequent harm to many of the causes he had most at heart.

He married in 1917 Ruth Eileen, daughter of H. Gratten Guinness, and had two sons (the elder was killed in action as a fighter pilot in 1943) and six daughters.

F. Yates

Mr. G. A. Bacon

Mr. Geoffrey Arthur Bacon, whose untimely death occurred on August 1, 1962, was born at Boxmoor, Hertfordshire, on May 25, 1918. He was educated at Berkhamsted School, and in 1938 joined the laboratory staff of the Royal Free Hospital in Gray's Inn Road, where he worked as personal assistant to Prof. R. A. Webb. The unit in which he worked was moved during the Second World War to the Three Counties Emergency Hospital, near Hitchin, Hertfordshire. In 1944 he joined the staff of Harlow Wood Orthopædic Hospital, Mansfield, where he became technician in charge of the Laboratory Emergency Pathological Service. He entered the Scientific Civil Service in 1947 and was appointed for duty as an experimental officer at the then Microbiological Research Department of the Ministry of Supply at Porton. He was promoted to the post of senior experimental officer in 1955. Throughout his service here he has worked entirely with pathogenic bacteria, initially in investigations of the relationship of nutrition to virulence in *Salmonella typhi* and afterwards, over the past twelve years, on the factors determining virulence in *Pasteurella pestis*. Largely through the devoted work of Mr. Bacon these factors, which initially were completely unknown, have now mostly been identified. This increase in our knowledge of the causative organism should permit a more rational approach to the future prophylactic immunization against plague than has been possible in the past. It is ironical, but by no means unprecedented in bacteriology, that one who had devoted such a substantial part of his working life to this end should have fallen victim to the disease he was helping to prevent in others. His death, however, has made us aware that we do not yet have a complete understanding of virulence and infectivity in this organism and that work on these subjects must continue. There is no doubt that Mr. Bacon was fully cognizant of the risks his work entailed, and these risks he willingly accepted.

Mr. Bacon was held in the highest regard by his colleagues. He may best be described as a gentle man who was always generous, kind and considerate and

prepared to help others whenever possible. His inventive skill applied to the improvement of laboratory techniques and apparatus was invaluable and possibly irreplaceable. A safety pipetting device he designed to eliminate the hazard of aerosol production during pipetting operations has been in use throughout the Microbiological Research Establishment for the past ten years and no doubt has contributed to the excellent safety record of the Establishment.

Mr. Bacon's main interests outside his work were in his family, his new home and large garden and in the theatre. The Salisbury Theatre Club and the Porton Musical and Dramatic Society have lost an ardent supporter, and the social life of the village of Whiteparish and of the Microbiological Research Establishment are the poorer by the death of Geoff. Bacon. Our sympathy is extended to Mrs. Mary Bacon and to his daughters Elizabeth and Susan.

T. W. BURROWS

NEWS and VIEWS

U.S. National Academy of Sciences: Foreign Associates

THE following have been elected foreign associates of the U.S. National Academy of Sciences: Prof. E. Amaldi, professor of experimental physics, University of Rome; Dr. F. Lynen, director of the Max-Planck-Institut für Zellchemie, Munich; Sir William Penney, deputy chairman, U.K. Atomic Energy Authority; Prof. R. N. Robertson, professor of botany, University of Adelaide.

The Second Swinburne Award in Plastics: Dr. J. C. Swallow

DR. JOHN CUTHBERT SWALLOW has been awarded the second Swinburne Medal by the Council of the Plastics Institute for his contribution to the discovery and development of polythene. Dr. Swallow was educated at the Universities of London and Leyden. He joined Brunner Mond as a research chemist in 1924 and was in charge of polythene development work from the discovery to the building of the plant. He became research manager of Alkali Division of Imperial Chemical Industries Ltd. in 1941 and was appointed research director of the Plastics Division in 1942. Dr. Swallow became managing director of the Plastics Division in 1951 and he has been chairman since 1952. Dr. Swallow will deliver the Swinburne Award Address at the Royal Institution, 21 Albemarle Street, London, W.1, on November 12, when he will also be presented with the gold medal and the sum of money which accompanies the award. The award, which has been endowed by Bakelite Ltd., was instituted in 1959 to commemorate Sir James Swinburne, who died at the age of 100 in the previous year. The trust deed specifies the following terms of reference for the award: ". . . to promote the advancement and diffusion of (*a*) the science and technology of plastics and of plastics engineering, and (*b*) science and technology in any field relating to plastics or to plastics engineering . . . by making the award . . . to persons who shall have made an outstanding contribution to such science or technology". The first award was made to Prof. G. Gee in July 1960.

Harry Govier Seeley

MANY interesting papers have appeared in the *Bulletin of the British Museum (Natural History)* and not least is one on "Harry Govier Seeley and the Karroo Reptiles" by Dr. W. E. Swinton (3, No. 1. Pp. 1–39. London: British Museum (Natural History), 1962. 13*s*.) The account of the life and activities of Seeley is an indication of the enormous energy and output of this remarkable man. But Dr. Swinton was especially fortunate in obtaining permission to publish a series of characteristic letters that Seeley wrote when he was in Africa. They constitute a record of great historical and geological interest and throw much light on some of the fundamental fossils in the story of reptilian and mammalian evolution. In addition there are interesting glimpses of life in South Africa in the latter part of the past century. The paper also contains reproductions of some of the anatomical sketches by Seeley. Dr. Swinton was the obvious author for such a historical sketch and it was fortunate that he was able to complete the work before he went to Canada.

The Panchromatograph

A NEW instrument for use in research and chemical analysis, the panchromatograph made by W. G. Pye and Co., Ltd., Cambridge, separates a mixture of liquids or gases into their component parts and gives a measure of the concentration of each. The basis of operation of the panchromatograph is that a sample is fed into a column packed with special material and carried through in the stream of inert gas. Separation is achieved so that the component parts of the sample emerge at intervals and are measured by a variety of detecting and recording systems. The analyser unit is the result of extensive study of modern chromatographic requirements and has been designed to accommodate new advances of technology as they occur. It is applicable to all analytical problems. Columns and detectors are housed in separate ovens, both temperature-controlled to precise limits by electronic proportional counters. The column oven is 42·5 × 28 × 16 cm and is of low thermal inertia construction. A wide variety of columns can be accommodated. The choice of column size and length is governed by the resolving power required by a given sample. For the majority of applications 1·5 metre or 2·7 metre long, 4 mm diameter, glass columns are recommended. Metal columns in lengths ranging from 0·3 to 6 m are also available. The column units may be rapidly exchanged. The detector oven is 23 × 23 × 16 cm and accommodates flame ionization, micro-argon ionization, macro-argon ionization, electron capture, photoionization, cross-section ionization, hot wire gas density and thermal conductivity detectors, together with the experimental triode ionization and electron mobility detectors. An important feature is that any two detectors can be accommodated, allowing simultaneous use.

The panchromatograph has applications in many fields, including medical research, petroleum refining, drug manufacture and food processing. Separate pamphlets, obtainable from W. G. Pye and Co., Ltd., York Street, Cambridge, give details of the various accessories and the numerous applications.