energy to radiation. This process, described theoretically by the theories of Oppenheimer and Coulson, Bhabha and Heitler seems to be confirmed by Wilson chamber photographs of Street and Stevenson showing the 'build up' of the shower. A second process results from the conversion of the energy of a heavy particle into positive and negative electrons through the intermediary of proton-neutron transitions. Experimental results on cosmic rays were discussed by Prof. B. Rossi.

Dr. F. W. Aston gave an account of his recent measurement on the masses of nuclei by the method of close doublets, and Prof. M. L. E. Oliphant and Dr. J. D. Cockcroft described other recent work of the Cavendish and Mond Laboratories, Cambridge, including a description of the new High-Voltage Laboratory and its equipment and the recently reported peculiar properties of liquid helium.

In all, about twenty physical papers were communicated to the Congress.

Obituary Notices

Mr. W. S. Gosset: "Student"

WILLIAM SEALY GOSSET, who died after a short illness on October 16, was best known to statisticians throughout the world by his pseudonym "Student", under which his scientific contributions were published. He was born on June 13, 1876, and became in turn a scholar at Winchester and at New College, Oxford, where he worked at mathematics and chemistry. In 1899 he joined the firm of Arthur Guinness, Son and Company, and a few weeks before his death had been appointed head brewer; his handling of statistics was only one of many duties.

Gosset's work brought him at an early stage against the problem of interpreting routine tests in chemical analysis, and at the suggestion of one of his chiefs he turned his mind to the question of what help the theory of probability could bring to the practice of brewing. He first met Karl Pearson in the summer of 1905, and a year later went to London to spend some months in the Biometric Laboratory at University College. Throughout his life he was to gain much from the continuation of this contact between 'student' and 'professor', but from the very beginning he launched out on research lines of his own which were to prove of very great importance to the development both of the theory and practice of mathematical statistics.

Under Galton, Weldon and Pearson, the Biometric School had been mainly concerned with the handling of comparatively large samples from biological populations, but Gosset in his daily work was forced to attempt to draw conclusions, leading to executive action, from the analysis of relatively small numbers of observations. Thus he might need to answer such a question as, "What is the accuracy of this arithmetic mean based on 8 observations (the population standard deviation being unknown)?" Thirty years ago a statistician was forced to reply somewhat as follows: "Following the method appropriate for large samples the odds are 19 to 1 that your unknown population mean lies between (say) 22·1 and 24·6, but as the sample is so small this statement is entirely unreliable." Gosset's work has, however, made possible a far more useful answer, namely, "If you have taken reasonable precautions to see that your sample is randomly selected, the odds are 19 to 1 that the limits 21·8 to 24·9 include the unknown population mean." At the expense of somewhat broadening limits which before had little meaning, definite information has replaced a counsel of despair. This process of making full allowance within the statistical test itself for uncertainty regarding the standard deviation due to small numbers, by use of what in fact are ratios instead of absolute measures, has sometimes been termed 'studentizing'; the conception involved has been the basis of a rapid theoretical advance without which many of the problems of agriculture and industry could scarcely have been brought within the range of statistical inquiry.

But Gosset's contribution was only in part a theoretical one; he recognized the risks involved in basing action on the application of statistical calculus to few observations, yet all his work as a practical statistician in industry went to show that, with due precaution, these risks could be taken with economic advantage. Thus all that he wrote, whether on the reliability of the mean and standard deviation, on methods of measuring correlation, on the problem of counting cells with a hæmocytometer or on the checking of routine analysis, helped to give confidence to those who were trying to apply similar methods in the face of scepticism or even opposition.

Besides dealing with questions which concerned the chemist and biologist, Gosset's work led him into the field of agricultural experimentation. His paper of 1923 "On Testing Varieties of Cereals" was one of the most important early contributions to an era which has been notable for the introduction of precise statistical methods into agricultural research. His influence spread very widely in later years, not only through the medium of his written papers, but also through a correspondence which linked him to experimenters all the world over. He was always ready with advice and friendly criticism, and many must have gained from his suggestive mind the initial ideas which have borne fruit in their later research.

Much could be written, if space allowed, of the charm of Gosset's personality, with its modesty, unconventionality and tolerance. It is to be hoped that it will be possible to do fuller justice elsewhere to a man who has occupied a very special place in the hearts of so many friends in Great Britain and abroad.

E. S. P.