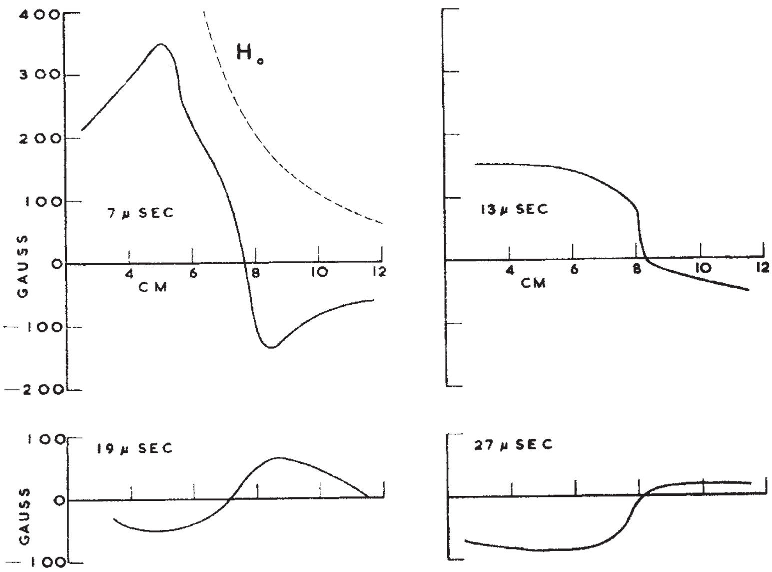

Fig. 3. Profiles of the change in magnetic field along the line from the dipole to the plasma gun at the delay times indicated. The abscissae represent distance from the dipole axis towards the gun. The undisturbed dipole field H_0 is also shown for comparison

sphere' and a westward current was set up at about the same stand-off distance. This current may be analogous to the ring current proposed in the explanation of the main phase of geomagnetic storms.

There was no strong gradient in the field-change within the region B, which thus showed that the net current there associated with the particle motion was small. This indicates, in accordance with meridian plane photographs, that B was a belt of charged particles trapped by the magnetic field. A net current carried by this belt could only be due to an approximately collisionless drift[1] produced by the field gradient, and the drift current is shown by the observed field-change distribution to be negligible compared with the west-flowing current surrounding the plasma. It appears that the dominant effect here was the injection into the initially compressed field of the 'magnetosphere' of diamagnetic plasma which lowered the magnetic flux in this region, thus necessarily maintaining a circulating current around itself and the dipole in a westward direction.

The experiment exhibits several features matching geophysical observations. A typical geomagnetic storm is probably caused by a sudden gust in the solar plasma stream passing the Earth. The initial phase of the storm is observed at the Earth's surface as an increase in the local magnetic field and is adequately explained by magnetosphere models following the ideas of Chapman and Ferraro[2,3]. The main phase of the storm, during which the terrestrial field strength stays below its undisturbed value, has proved more difficult to explain. Our experiments suggest that the decrease in field intensity could be caused by penetration of solar plasma containing little magnetic flux into the magnetosphere. The meridian plane photographs indicate that there is appreciable plasma injection along the magnetic field lines passing through the so-called neutral points over the polar regions, where even a 'closed' model of the magnetosphere is open to the plasma stream.

Bostik *et al.*[4] in a similar experiment have concluded that vortices present in the plasma flow enable plasma to break through the magnetosphere boundary. This has possibly occurred in the experiments described here and might also be important in geophysical phenomena since observations[5] have indicated that in the neighbourhood of the Earth's orbit the solar wind is highly irregular. The scale of the irregularities dominating the flow is probably between 10^2 and 10^4 km (less than one-tenth a typical magnetosphere dimension) so that the magnetosphere is set up by the average wind. If the plasma irregularities are vortices and contain closed magnetic field lines, some of these might link with the Earth's field so that penetration of the interplanetary plasma would be facilitated.

A more detailed analysis of the experimental results is proceeding and it is hoped to determine whether the characteristics of the experimental magnetosphere most resemble those predicted by the Chapman–Ferraro model and its derivatives or those expected on the basis of the theories of Alfvén[6] and Karlson[7].

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[5] Slee, O. B., *Planet Space Sci.* (in the press).
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OBITUARIES

Prof. S. G. Wilson, C.B.E.

The untimely death of Prof. Samuel Geoffry Wilson came as a great shock to the veterinary world and as a still greater one to his friends and colleagues.

Geoff, as he was called by those who knew him, was born in Donaghmore, County Tyrone, Northern Ireland, educated at the Royal School, Dungannon, and then went to Queen's College, Belfast, where he took a B.Sc. degree in agriculture. From there he moved to the Royal (Dick) Veterinary College, Edinburgh, and obtained the degree of M.R.C.V.S.

In 1936 he was awarded a colonial scholarship and went to Nyasaland (now the Malawi Republic) where, among other duties, he studied ticks and tick-borne diseases; for these researches he was awarded a Ph.D. degree in 1946. In fact, he was a recognized authority on ticks in Africa.

At the same time he had a very keen interest in tsetse and trypanosomiasis problems and in 1947 transferred to Uganda as chief veterinary research officer at Entebbe. In 1949 he took up the post of chief field zoologist in the Tsetse and Trypanosomiasis Control Division of the Kenya Veterinary Department. In 1952 he became director of veterinary services in Northern Nigeria. He retired from Government service in 1962.

Later in 1962 he was appointed professor and director of the Institute of Tropical and Protozoal Disease in the Veterinary Faculty of the State University of Utrecht. There he remained until he died in September 1965. He was 55 years old.

Geoff Wilson was full of drive, enthusiasm and energy. He was also bold and quick to see the practical application of new developments—the ideal man to introduce modern and progressive methods.

In Uganda he studied trypanosome infections in cattle, sheep and goats, carried out some early trials with the new trypanocidal drug 'Antrycide' and investigated drug resistance acquired by trypanosomes resulting from underdosing with 'Antrycide'.

In Kenya he started an insecticidal tsetse eradication scheme in the Nyando river basin near Lake Victoria, in collaboration with the Tropical Pesticide Research Institute. This project was to have far-reaching effects on the sleeping sickness problem in that country, for it was the first successful large-scale residual insecticidal project undertaken against *Glossina* in East Africa.

When he went to Nigeria he immediately recognized the urgent necessity of 'Nigerianizing' his department and began at once to do so. Again, with his characteristic foresight and drive, he lost no time in forming a Veterinary Tsetse and Trypanosomiasis Unit, staffing it with the best men he could find, and sent an officer to Kenya to examine the methods in use there. The next step was the Komadugu Ghana scheme, the biggest, boldest, most successful and cheapest residual insecticidal spraying operation ever undertaken against the tsetse flies *Glossina morsitans submorsitans* Newstead and *G. tachinoides* Westwood in the Sudan zone of Northern Nigeria. This work was followed up by even larger schemes and to-day the Northern Nigerian Veterinary Tsetse and Trypanosomiasis Unit ranks among the best and most up-to-date organizations of its kind in Africa. In recognition of his outstanding services he was awarded the C.B.E. by Her Majesty the Queen.

Geoff Wilson was a man of many parts, and two years after his appointment as professor at Utrecht he gave an inaugural address entitled "The Problems of Trypanosomiasis Control in Cattle in Africa", ending up by speaking for 10 minutes in the Dutch language. But he had lost his heart to Northern Nigeria, and through his influence the 'Zaria Project' involving a part of the Veterinary Faculty of the new Ahmadu Bello University, supported by Dutch aid, came into being.

Apart from his numerous scientific interests and achievements, Geoff was an accomplished sportsman. As a boy he played rugby for the Ulster Schools side and later won his boxing blue at Edinburgh—he was Scottish Universities Welterweight Champion for 1933–34.

Besides his wife, Maureen, he leaves behind two sons and a daughter. His eldest son is a veterinarian following in his father's footsteps, for he has recently taken up a post with the East African Trypanosomiasis Research Organization at Tororo in Uganda.

Geoff was Irish to the finger-tips—kind, generous and considerate to his friends and a thorn in the side of his enemies—he will be sorely missed. P. E. GLOVER

Prof. S. K. Allison

SAMUEL KING ALLISON, director of the Enrico Fermi Institute for Nuclear Studies and the Frank P. Hixon distinguished service professor in the Department of Physics at the University of Chicago, died on September 15, 1965, in England.

Prof. Allison was serving as the United States delegate to the Plasma Physics and Controlled Nuclear Fusion Research Conference under the sponsorship of the International Atomic Energy Agency in Culham, near Oxford. He suffered an aortic aneurism on September 6, and underwent surgery at the Radcliffe Infirmary, Oxford. Death was attributed to a pulmonary embolism.

Allison was one of the best known and best loved of American scientists. Born in Chicago in 1900, the son of a Chicago public school principal, he was a product of the community of which the University of Chicago is a part. He was educated in the Chicago public schools, received his B.S. degree from the University of Chicago in 1921 and his Ph.D. degree two years later. Following a period as National Research Fellow at Harvard University (1923–25) and as Fellow at the Carnegie Institution (1925–26), he joined the faculty at the University of California, Berkeley, but returned to the University of Chicago in 1930 after having achieved the rank of associate professor.

Allison's early researches at Berkeley and Chicago were in X-rays. His major work involved the design and construction of a high-resolution double crystal spectrometer, its application to the measurement of the widths and intensities of X-ray lines, and to the experimental confirmation of the C. G. Darwin–P. P. Ewald dynamical theory of X-ray diffraction. The depth of his understanding of the field of X-rays is evident from the book he wrote jointly with A. H. Compton, *X-rays in Theory and Experiment*, a classic text in the field.

His interest turned to nuclear physics during the middle 1930's. He concentrated on the reactions among the light elements that could be examined with accelerators of relatively low energy. The Cockcroft–Walton accelerator which he built himself and operated with his students developed a maximum of 400 kV. He dubbed it *Kevatron* to emphasize its modest capabilities at a time when his associates were constructing machines in the million- and then the billion-volt range. Yet the *Kevatron* kept turning out a continuous stream of interesting research and a continuing succession of able graduate students. Much of the research which he carried out together with his students concerned precise measurements of the energy released in proton-induced reactions. In later years this interest shifted to the reactions induced by heavier ions. He was particularly successful in developing sources of lithium ions. To pursue these reactions more extensively, he needed higher energy machines. The University made available to him its 2-MeV Van de Graaff, acquired originally for biological studies. In the end he obtained a 4-MeV machine with a grant from the National Science Foundation.

A subsidiary interest which grew into a major activity was the investigation of the energy loss of charged particles moving through gases. This developed into an extensive investigation of the mechanism of capture and loss of electrons by the ions, a subject that turned out to give important insights into plasma physics and the quest for ways to harness thermonuclear fusion. For these studies the *Kevatron* continued to play a central part until the end.

Allison's emergence into public life had its origins in the secret wartime enterprise that developed the atomic bomb. He began, in January 1941, to investigate the suitability of beryllium as a moderator of slow neutrons for the chain reaction. The work was done with a grant of 9,000 dollars, obtained from the U.S. Office of Scientific Research and Development. Writing about this later, he commented, "I remember being aghast at the ease with which this seemingly colossal sum was placed at my disposal". This work has remained of fundamental interest and serves now as the basis for certain major lines of nuclear reactor development. Although beryllium, because of its scarcity, did not occupy a prominent place in the initial development of the chain reaction, Allison's early effort served to focus that development at the University of Chicago. His group at Chicago was joined by Fermi's Columbia group and Wigner's Princeton group when, in February 1942, the "Metallurgical Laboratory" was organized under the leadership of A. H. Compton to develop a method for producing plutonium as a possible material for the atomic bomb. It was this Laboratory, at the University of Chicago, that successfully achieved the first nuclear chain reaction in December 1942.

Allison liked to recall his role on the occasion of the first chain reaction experiment. He was the leader of the "suicide squad". It was his brawn, not his brain, he insisted, that qualified him to be entrusted with the ultimate, last-ditch measure. It was his idea to prepare a huge jug of cadmium solution, and he stood ready to pour it over the chain-reacting pile in the event of all other control mechanisms failing to operate.

The work of the Metallurgical Laboratory led directly to the large-scale production of plutonium, out of which