

## Ball Lightning

SIR,—I had just finished reading Powell and Finkelstein's article<sup>1</sup> and Altschuler's<sup>2</sup> chapter on Kugelblitz (ball lightning) when I came across the three recent reports<sup>3-5</sup> on the subject in *Nature*. On May 15, 1970, at a point some 80 to 150 km east of St Louis, an aircraft in which I was a passenger was forced to fly into and through a thick dark storm-cloud mass. Extreme turbulence resulted in a rather violent movement of the wings of the aircraft (a Boeing 727). All this time the aircraft was descending, and an electrical display was lighting the surrounding clouds in a diffuse glow. The frequency of electrical discharges (no actual strokes were seen) increased with the increasing turbulence. At (what seemed) the moment of maximum turbulence and electric discharge, while the aircraft was still descending through the storm, a sequence of events took place that I list below. The whole took not more than 5 s, and I must admit that the order, save for numbers 4 and 6, is not necessarily chronological. 1, The turbulence ceased altogether. 2, The surrounding electrical discharges (glows) ceased altogether. 3, The wing stopped buckling altogether. 4, A white glowing sphere (ball lightning?) appeared on the port wing tip. I do not know if it was actually touching

the wing. Its diameter was less than 1 m and more than 10 cm. Its boundary was "fuzzy" and not distinct. 5, There was a soft "pop". 6, The ball lightning (?) vanished.

Regarding the accompanying noise (5) I recorded it at the time. Shortly afterwards my scientific upbringing and I both decided that an outside noise was not likely to be heard within a moving jet aircraft, and that my eye, seeing the ball go, insisted to my ear that it should do so accompanied by a noise. Nonetheless, I record it now, as I recorded it then.

Yours faithfully,

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<sup>1</sup> Powell, J., and Finkelstein, D., *Amer. Sci.*, **58**, 262 (1970).

<sup>2</sup> Altschuler, M. D., in *Scientific Study of Unidentified Flying Objects*, sect. VI, chap. 7, London, E. V., Director, USAF Contr. F44620-67-C-0035 (1969).

<sup>3</sup> Covington, A. E., *Nature*, **226**, 252 (1970).

<sup>4</sup> Lillienfeld, P., *Nature*, **226**, 253 (1970).

<sup>5</sup> Bromley, K. A., *Nature*, **226**, 253 (1970).

## Obituaries

### Professor S. Chapman

SYDNEY CHAPMAN, FRS, who died on June 16, made fundamental contributions to many subjects, especially gas theory, geomagnetism and atmospheric physics.

While still a Cambridge student, at Larmor's suggestion he began to work on the problem of viscosity, heat conduction and diffusion in a gas. This problem, posed by Maxwell and Boltzmann forty years earlier, had been solved only for two special types of molecular interaction; Boltzmann had stated that one must almost despair of a general solution. This was true if one sought an exact solution. An approximate solution, correct to any appropriate degree of accuracy, was, however, possible, and Chapman in 1915-17 provided such a solution, based on an equation of transfer given by Maxwell. Shortly afterwards (1917) Enskog independently gave a solution, based on the theory of integral equations. This, though more elegant in formulation, was essentially equivalent to Chapman's; thus one normally speaks of the Chapman-Enskog theory.

Chapman was especially concerned with applications of the theory to actual gases. The theory predicted two new phenomena, gaseous thermal diffusion and a converse thermo-diffusion effect. Chapman was delighted when Dootson in 1917 detected thermal diffusion and when Waldmann later demonstrated the converse effect; still more when Clusius in 1939, by his separation column, realized a dream of Chapman's, dating from 1919, that thermal diffusion might be used to separate isotopes. In 1922 Chapman was applying his results to plasmas (especially in stars); his work on the upper atmosphere, from 1925 on, relied on a background of kinetic theory. After the publication in 1939 of *The Mathematical Theory of Non-Uniform Gases*, written jointly with Cowling, he concentrated less on kinetic theory problems, though he reverted to them as new ideas struck him. It was fitting that the third edition of the book appeared just a month before his death.

When he left Cambridge, Chapman was appointed senior assistant at the Greenwich Observatory. He left Greenwich after only three or four years to devote himself to other interests; nevertheless, those few years in large measure determined his later research. At Greenwich he began by supervising the reconstruction of the magnetic

observatory. He found that magneticians were far readier to collect than to interpret data, and set himself to analyse geomagnetic variations. A visit from Schuster, a pioneer in the theory of geomagnetic variations caused by tides in the ionosphere, stimulated him to work both on the dynamo theory of the solar and lunar variations, and on tides in the upper atmosphere. Dyson drew his attention to the apparent connexion between solar flares and magnetic storms, so sparking off yet another series of investigations.

Chapman's research followed several lines, each systematically pursued over a number of years; sometimes he was working along several different lines at once. His work on the analysis of geomagnetic variations covered chiefly the years 1914-31; for it he was awarded the Adams Prize for 1927-28, and the work was later expanded into the two-volume epic *Geomagnetism* (1940), written jointly with Bartels. His main work on lunar atmospheric tides was spread over the years 1918-48. Before it, such tides could be securely inferred from barometric records only near the equator. Chapman isolated the tide from Greenwich records, and went on to determine its properties over the globe; to do so he had (especially with Miller) to devise methods of data processing at a time when mechanical aids were limited. This and the work of others was expounded in the recent book, *Atmospheric Tides* (1970), written jointly with Lindzen.

Chapman's work on magnetic storms began in 1919 with a paper, the theoretical part of which he later acknowledged to be invalid. During the next ten years he cautiously surveyed various aspects of the problem, but not until 1931 did he, in company with Ferraro, reach the idea that magnetic storms occur because streams of solar particles compress the geomagnetic field. This idea, predating observations of the magnetospheric cavity by thirty years, explained only the initial phase of a storm; not until after the discovery of the van Allen radiation belts could it be completed. Chapman shared with others in its completion, this time working with Akasofu (1961). He also introduced Akasofu to work on aurorae, which had long fascinated him, and took a lively interest in the solar wind, the continuous flow of which he had, in 1955, narrowly missed predicting.

In his Bakerian lecture (1931) Chapman gave the theory

of an ideal ionospheric layer, since named after him. He has also discussed the formation of ozone, other photochemical atmospheric problems, diffusion in the atmosphere and recently (with Kendall) noctilucent clouds. Fittingly, it was he who introduced the word 'aeronomy' for the science of the upper atmosphere.

He served as president for the Royal Astronomical Society and the International Union of Geodesy and

Geophysics, among other organizations. He was also chosen to act as president of CSAGI, the special committee for organizing the International Geophysical Year, a venture which he strongly supported and which owed much to his efforts. Officially he retired from his Oxford chair in 1953; in practice the effect was to double his activity and extend it over the world. His quiet, friendly, committed and wise counsel will be greatly missed.

## Announcements

### University News

**Professor R. J. Kitz**, chief of anaesthesia at the Massachusetts General Hospital, has been appointed Henry Isaiah Dorr professor of research and teaching in anaesthetics and anaesthesia at **Harvard University**, in succession to **Professor Henry K. Beecher** who will become Henry Isaiah Dorr professor emeritus. **Mr C. Richard Taylor**, of Duke University, has been appointed first director of the **Concord Field Station of Harvard's Museum of Comparative Zoology**.

The following appointments have been made in the **University of London**: **Mr J. N. Britton**, to the Goldsmith's chair of education tenable at the Institute of Education and attached to Goldsmiths' College; **Professor B. R. Rabin**, to the chair of biochemistry, University College; **Dr G. F. M. Russell**, to the chair of psychiatry tenable at the Royal Free Hospital School of Medicine; **Mr G. N. Walton**, to the chair of nuclear technology at the Imperial College of Science and Technology; **Dr D. V. Bugg**, to the chair of nuclear physics, Queen Mary College; **Professor S. J. G. Semple**, to the chair of medicine tenable at the Middlesex Hospital Medical School. The title of professor of entomology has been conferred on **Dr Reginald F. Chapman**, in respect of his post at Birkbeck College, that of professor of rock mechanics has been conferred on **Dr Evert Hoek** in respect of his post at the Imperial College of Science and Technology, and that of professor of chemistry has been conferred on **Dr A. J. B. Robertson**, in respect of his post at King's College. The title of Emeritus professor has been conferred on the following: **Professor E. Boyland** (biochemistry, Institute of Cancer Research); **Professor F. Brailsford** (electrical engineering, University College); **Professor F. C. Champion** (experimental physics, King's College); **Professor F. E. Camps** (forensic medicine, London Hospital Medical College); **Professor G. W. Causey** (anatomy, Institute of Basic Medical Sciences); **Professor S. J. De Navasquez** (pathology, Guy's Hospital Medical School); **Professor S. E. Dicker** (physiology, Chelsea College of Science and Technology); **Professor F. Goldby** (anatomy, St. Mary's Hospital Medical School); **Professor J. Greig** (electrical engineering, King's College); **Professor W. J. Hamilton** (anatomy, Charing Cross Hospital Medical College); **Professor H. R. Hewer** (zoology, Imperial College of Science and Technology); **Professor A. Kekwick** (medicine, Middlesex Hospital Medical School); **Professor N. F. MacLagan** (chemical pathology, Westminster Medical School); **Professor Sir John Randall** (biophysics, King's College); **Professor J. W. Smith** (chemistry, Bedford College); **Professor R. S. Stacey** (pharmacology and chemotherapeutics, St Thomas's Hospital Medical School); **Professor Lord Stamp** (bacteriology, Royal Postgraduate Medical School); **Professor J. S. Wilkie** (history and philosophy of science, University College).

### Appointments

**Dr A. F. Spilhaus** has been appointed executive director of the **American Geophysical Union** in succession to **Dr Waldo E. Smith**, who has retired after 25 years of service with the organization.

**Professor George W. Beadle**, University of Chicago, and **Mr Thomas H. Coulter**, Chicago Association of Commerce and Industry, have been appointed co-chairmen for the 1970 meeting of the **American Association for the Advancement of Science**.

The first three senior appointments to the new **Medicines Inspectorate** have been made: **Mr A. G. Fishburn** is to be principal medicines inspector and **Mr R. Baker** and **Mr W. P. Jones** will be senior medicines inspectors. Mr Fishburn was formerly with the ICI Pharmaceuticals Division, and Mr Baker and Mr Jones with Parke Davis and Cyanamid, respectively.

### Miscellaneous

To mark **Professor H. R. Hewer's** golden jubilee and retirement from the chair of zoology at Imperial College, a dinner will be held at the college on October 1, 1970. A presentation will be made at a sherry party before the dinner. If any of Professor Hewer's friends or students have not received details of the celebration, they should contact Dr D. M. Kermack, Zoology Department, Imperial College, Prince Consort Road, London SW7.

### Sabbatical Itinerants

From the issue of September 5, entries of this kind will appear among the classified advertisements and will be charged for accordingly. Copy should be addressed to T. G. Scott and Son Limited, 1 Clement's Inn, London WC2A 2ED

**Exchange:** Cork (Ireland) architect taking one year postgraduate course at the University of Edinburgh wishes to exchange furnished house in Cork in own grounds of 2 acres, 3 miles from city centre and university, for house in or near Edinburgh from October 1, 1970, to June 30, 1971. Please contact G. F. McCarthy, Oldwood, Rochestown, Co. Cork, Ireland.

**Wanted:** Comfortable 4 bedrooomed home in Oxford area from March 25, 1971, to August or September 1971, for considerate family with 4 children, ages 15-20. 5 bedrooomed home available in Seattle. Please contact Professor B. S. Rabinovitch, Department of Chemistry, University of Washington, Seattle, Washington 98105, USA.