In the U.S.S.R. most attention has been given to the movements of anticyclones as the more enduring features of the synoptic patterns, and Dr. Stagg thinks it is no coincidence that long-range forecasting has been established in the great continental areas. Over the British Isles we are next door to one of the world's worst cockpits of weather disturbances, and even a slight error in predicting the mean tracks of depressions can make a forecast completely wrong for the whole country. Dr. Stagg stressed the need for physical understanding of the processes, and referred to research going on in the Meteorological Office; but he also reminded the audience of a remark made by Sir Gilbert Walker, speaking to the British Association twenty-one years ago: "Though the prestige of a meteorological service may be raised for a year or two by the issue of longer range forecasts, the harm done to the science will inevitably outweigh the good if the prophecies are found unreliable".

Prof. Rossby introduced the subject of 'numerical weather forecasting' by referring again to the broad spectrum of frequencies in atmospheric disturbances which was the theme of Dr. Sutcliffe's paper. 'Weather', in the sense of clouds and rainfall, is produced mainly by the smaller-scale disturbances which have relatively large vertical components of motion. The largest scale motions, with dimensions of some 5,000 km., are necessarily quasi-horizontal, and it is these motions which have now been shown to be amenable to direct calculation with useful accuracy. The calculations will not produce a detailed weather forecast; but they may still prove to be of much assistance to the forecaster by keeping him on the correct broad lines over periods of one or two days.

The conception of forecasting by calculation on the basis of the physical equations originated in Britain with the late L. F. Richardson some thirty years ago, but the ideas were at that time quite premature as there was no practicable way of carrying out the heavy computations. It was not until 1947 that the subject was taken up seriously at the Institute of Advanced Studies in Princeton, and since then there has been rapid progress on a research basis not only in the United States but also in Britain, where the work of Sawyer and Bushby is outstanding. In Sweden, with its present limited facilities for electronic computing, Prof. Rossby has confined attention to the simplest model of large-scale atmospheric behaviour, but he expects to be in a position to introduce more elaborate and realistic calculations in the near future. The basic idea was put very simply by Prof. Rossby. It has been shown that the vorticity (about the vertical axis) of the mean motion of the atmosphere is nearly a conservative property. It can therefore be advected with the mean motion. But by integration, with known boundary conditions, the motion itself can be calculated from the vorticity field so that, using a step-by-step method, it is possible to begin with the present known motion, determine the new field of vorticity for, say, one hour ahead by advection, compute the new field of motion by integration and so continue indefinitely until such time as accumulated errors render the calculations worthless. Mathematical refinements have improved on this simple scheme, but the principle remains the same.

Prof. Rossby remarked that "a weather forecast is a rather perishable commodity which must be marketed quickly". Only electronic methods can reduce the time of calculation to anything reasonable, as even in his present simple model there are 10^7 operations to carry out to produce a 24-hr. prediction. But it now seems that the time spent in calculation will not be the most serious item. Much more time will be spent in making, transmitting and collecting the observations from the large area involved (some six hours) and in plotting and analysing the charts (some three hours). Attention will have to be given to these factors, and already objective analysis and diagrammatic recording are being studied.

To show once more that the computations can deal only with the broad synoptic situation and not with the details of weather, Prof. Rossby provided a diagram showing the distortion which may take place in a layer of fluid over a period of a day or two. Beginning as a chequered square of some 500 km. side, the 'fluid element' altered shape by hydrodynamical 'deformation' as though it were a handkerchief flourished in the magician's hand, with all pattern becoming confused in the folds. To analyse such motion in the practical case would require the number of observations to be increased by one or two orders of magnitude.

It was regrettable that time did not permit of general discussion after the papers, but perhaps the mistake had been in making the subject so broad. Weather forecasting is concerned to some extent with almost the whole science of meteorology, and any one of the four papers could have provided the basis for a profitable morning's symposium.

OBITUARIES

Dr. E. S. Russell, O.B.E.

In the death of E. S. Russell, on August 24, zoology lost one of its foremost thinkers. Many knew Russell as a friendly and quiet companion, who even as president of the Linnean Society of London always seemed to be as it were 'off duty'; but the formidable character underneath was revealed, for example, in the concluding passage of "Form and Function" (Murray, 1916):

"Dogmatic materialism and dogmatic theories of evolution have in the past tended to blind us to the complexity and mysteriousness of vital phenomena. We need to look at living things with new eyes and a truer sympathy. We shall then see them as active, living, passionate beings like ourselves, and we shall seek in our morphology to interpret as far as may be their form in terms of their activity.

"This is what Aristotle tried to do, and a succession of master-minds after him. We shall do well to get all the help from them we can."

Those were remarkably confident words from a man not thirty years of age. By now, thirty-eight years later, we have experienced part of the fulfilment of his demand, in the insight gained into the nature of animals by von Koehler and Bierens de Haan, by Lorenz, von Fritsch and Tinbergen; and the corresponding morphology is clearly on its way, indeed begun, by Baerends and others.

All Russell's books are exciting, alike for their scholarly marshalling of facts and for their heterodoxy. Lamarck and Samuel Butler receive honour only a little less than that accorded to his chosen

guides: Aristotle, Cuvier, von Baer and Johannes Mueller.

From 1921 to 1945 Russell was director of fishery investigations in the Ministry of Agriculture and Fisheries. As a fishery naturalist he had shown a talent for handling statistical material, conjuring biological and ecological discoveries from the records of quantities and sizes of fish on the fish-markets. Later, he decided to clarify the problem of the relation between the yield of a fishery and the vital processes that produce it: growth and reproduction, less mortality. Starting from first principles, he published, in 1931, "Some Theoretical Considerations . . .", and, as it transpired, ushered in a period of new understanding of this problem.

In the Conseil Permanent International pour l'Exploration de la Mer, Russell was an active officer; and it was there that during 1930–35 he persuaded the European governments to embark on regulation of mesh of nets and size limits for fish in the over-fished regions.

This was clearly a man of great and many-sided ability: a critic who shaped irreversibly the course of zoology and of fishery research; a sensible and humane administrator; fond of animals, naturalists and fishermen—he would always help any of them. He led a staff of scientists wisely, teaching us reliance on personality rather than in arrangements, and handing on his own sceptical appreciation that things are rarely what they seem. Would that there were more like him.

MICHAEL GRAHAM

Dr. Jean White-Haney

THE death occurred in the United States on October 21, 1953, of Dr. Jean White-Haney, daughter of the late Mr. E. J. White, one-time assistant government astronomer in Melbourne. She was born in 1877, and after attending the Presbyterian Ladies College entered the University of Melbourne in 1901 to study biology, and graduated as B.Sc. in 1904 and M.Sc. in 1906. She was awarded a McBain Research Scholarship in the same year, and began research in the Botany Department under Prof. A. J. Ewart, at the same time taking University tutorials and teaching science at several schools, including her former one. She was also a University examiner at the public examinations. In 1908 she began full-time research under a grant from the Victorian Government. Between 1907 and 1911 thirteen papers bearing her name were published, eight papers on joint studies with Prof. Ewart and others on the flora of Australia, and also an appendix to his paper on longevity of seeds. In 1909 she was awarded a doctorate of science, being the second woman in Australia to receive this degree, for a thesis entitled "The Ferments and Latent Life of Resting Seed" which was published in the *Proceedings of the Royal Society of London*. Two papers on bitter pit in apples aroused great interest and controversy among horticulturists and staffs of State agricultural departments; the tentative view put forward by herself and Prof. Ewart, that bitter pit could be caused by arsenical spraying, was warmly debated. She was unable to complete the investigation, which was taken over by others under a joint arrangement between Federal and State Governments.

In 1912 she was appointed officer in charge of the Queensland Prickly Pear Board's research station in Dulacca, to initiate work towards eradication of this pest. In this she established the value of arsenical injections and sprays in killing the Dulacca prickly pear (*Opuntia inermis*) and of the wild cochineal insect in killing *Opuntia monacantha*, which was spreading in North Queensland and was afterwards eradicated by the insects. This work was recorded in four reports.

In 1916 she discontinued scientific work, having married Mr. Victor Haney in 1914. She continued to live in Queensland, and was member, and for a time secretary, of the Lyceum Club in Brisbane. In 1928, after further school teaching in Melbourne, she joined the staff of the Council for Scientific and Industrial Research as biological assistant and field officer. While in this position she wrote a history of Australian scientific work on the prickly pear. In 1929 she began a field investigation of the Noogoora burr (*Xanthium pungens*), which was a trouble in sheep pastures in New South Wales, and completed the basic taxonomic studies and survey of its distribution. In 1930 she joined her husband in the United States, and thereafter retired from active scientific work. Apart from one visit to Australia in 1936, she remained in that country until her death.

Dr. White-Haney is remembered by friends and former pupils for her genial personality and the enthusiasm she showed for anything she undertook, and which she succeeded in communicating to others. Several of those whose interest in biology she aroused at school, or at the university, have since made it their life's study. Even after her retirement she maintained an interest in science, and she regretted that the circumstances of her life prevented further active work, and also that she had to leave to others the completion of those investigations that she started.

R. C. TRAILL

Prof. L. J. Stadler

THE death occurred on May 11 of Lewis J. Stadler. Born at St. Louis on July 6, 1896, he received his B.S. degree at the University of Florida in 1917, and his doctorate from the University of Missouri in 1922. After working at Harvard as a National Research Fellow in biology, he became professor of field crops at the University of Missouri. At various times he occupied the position of visiting professor at the California Institute of Technology and that of senior geneticist and later principal geneticist to the Bureau of Plant Industry of the U.S. Department of Agriculture (1930–37).

Prof. Stadler was a member of the Botanical Society of America, the Genetics Society of America (of which he was president in 1938), the American Philosophical Society and the National Academy of Sciences.

His researches were principally in the field of induced mutations in plants, and his important contribution, "The Experimental Alteration of Heredity", published as Chapter 1 in "Science in Progress", Series II, contains the gist of his findings. His work has been of great significance for plant breeding, since the induction of mutations by the use of X-rays, ultra-violet light and other agents is now a valuable technique, which has been the means of effecting valuable improvements in agricultural plants. The *American Scientist* rightly says of him: "A great scientist with a friendly spirit has departed. He will long be remembered for his devotion to scientific research and especially its application to human needs".

S. C. HARLAND