

NEWS AND VIEWS

Poor Outlook for Forecasts

A WARNING that weather forecasting may have been seriously oversold was the principal theme of the presidential address of Dr. G. D. Robinson to the Royal Meteorological Society last week. Dr. Robinson was particularly anxious that plans for the collection of meteorological data on a world-wide scale, valuable in themselves, had been justified by promises of great economic benefits from improvements in weather forecasting and even from weather control. According to Dr. Robinson, it may be hard to keep these promises.

The essence of the question is the extent to which the weather is predictable. According to Dr. Robinson, the Global Atmospheric Research Project was planned by committees of the World Meteorological Office and the International Council of Scientific Unions on the assumption that if the initial state of the atmosphere is known with sufficient accuracy, large scale motions are predictable "as a determinate physical system for a period of approximately two weeks". The proposals of the World Meteorological Organization for what is known as World Weather Watch have been similarly justified. Dr. Robinson was concerned to test this claim, and particularly the truth of the assumption that there is no fundamental limitation of the predictability of the atmosphere, but only practical limitations arising from the limitations of computing machinery and methods of measurements. For one thing, he argued that even if numerical weather forecasting were based on a rigorous set of hydrodynamical equations for the motion of atmospheric particles, predictions would only be valid for intervals of time shorter than those during which particles (in the sense of the theory of fluids) lost their identity. This consideration is by itself enough to limit the times for which advance forecasts can be valid. But in reality, numerical forecasters use empirical analogues of the full Navier-Stokes equations, and Dr. Robinson emphasized that an empirical equation like this can only be tested empirically. Nevertheless, dimensional arguments make it possible for him to calculate limits for the validity of predictions for the motion of meteorological phenomena. He concluded that the times over which predictability is possible "are a factor of three to five less than" the estimates given in the report upon which the Global Atmospheric Research Project is based. For phenomena characterized by a scale of 5,000 km, predictability is likely to be limited to 5 days. Events with a scale of 5 km will probably be predictable for only 2 hours in advance.

Although Dr. Robinson emphasized that his scepticism—like the validity of long-range prediction—would have eventually to be determined by experiment, he was also concerned that "political and financial support" for international projects such as World Weather Watch has sprung from the "promise of enormous economic benefit". He was afraid that "some policy makers in some countries may have come to believe" that "accurate weather forecasts of extended range" will inevitably follow implementation of World

Weather Watch. He pointed out that potential users of forecasts often looked for a much greater degree of precision than necessary to give meteorologists a sense of having made a successful prediction. "We must be careful not to mislead the potential customer."

Reluctant Physicists

ON the optimistic but questionable belief that the gulf between industry and the universities can be bridged by understanding it, a conference was organized last week in Manchester. The moving spirits were the Appointments Board of the University of Manchester and Professor B. H. Flowers, Langworthy Professor of Physics and soon to be chairman of the Science Research Council. Present were forty industrial research physicists, academic staff from the department of physics at the university, the Institute of Science and Technology, and the University of Salford, and students reading for doctorates at all three institutions. Dr. H. M. Finniston of International Research and Development, Ltd., opened fire by declaring that science and technology are not the chief problems of British industry—selling, labour relations and the problems of finance are more serious.

But how can industrial research compete with academic work in sheer fun? Dr. Finniston described how what began as an interest in the direct generation of electricity at IRD has led to the development of a new generation of electric motors based on superconducting magnets, cryogenic surgical instruments and the laser ophthalmoscope. Perhaps the most intriguing glimpse of industrial research was given by Mr. S. L. Bragg, Chief Research Engineer of Rolls Royce, Ltd. He explained that 10 per cent of all unscheduled shut-downs of jet engines are caused by the involuntary ingestion of birds. The origin of damage to the first set of turbine blades is often concealed by the extensive secondary damage, called a "salad", further down the engine. At Rolls Royce they have developed a "pseudo-bird" made of gelatine gel and with the same density and strength as real birds, together with a gun which can be used for firing this soft projectile successfully at the blades. Films of the impacts with turbine blades turning at high speed have shown that different types of vibration are possible, and have suggested ways of reducing damage. Simply putting a guard across the front of the engine or strengthening the turbine blades is useless, because both methods involve unacceptable losses in power.

So far, it seems that those leaving the universities have been indifferent to all this fun and games. Professor J. C. Willmott, Director of the Physical Laboratories at the university, has made a survey of twenty-six British universities and has found that although only 12.8 per cent of physicists with doctorates find their first job in industry, the proportion finding their second job in industry was even lower—10.8 per cent. Universities showed little change between first and second employment, claiming 41.8 and 41.2 per cent, but government service showed a slight drop, from 11.2 to 10.8 per cent, and the number emigrating a slight increase, from 29.3 to 31.9 per cent. This showed, Professor Willmott said, that top physicists "run away from industry as fast as possible". Predictably, academics and industrialists, with their different ways