responsible for the Coulomb degeneracy. His last review article in 1964 is a brief and very elegant discussion of variational methods in two-electron problems.

The impact of these collected papers is amplified by one particular memoir (*Rev. Mod. Phys.* **35**, 421 1963) that gives us great additional insight both into Hylleraas and into the way physicists work. There he deals with the early history of quantum theory, as seen by him as a young man. It should be compulsory reading for students and young physicists today. He shows a university life quite different from the present day. As a student "we could do what we chose to do, and nobody had a responsibility for the result, except ourselves . . . The top aim of our learning usually was to become useful teachers in our high schools, and none of us, or at least very few, would hit upon the idea of becoming scientists by profession."

On the research side, in Göttingen, he shows the presence of a well tempered competition and a great deal of discussion. A most interesting part deals with his gradual understanding and development of the approximation theory, which led to the calculation of the helium ground-state energy. This is a beautiful documentation on the growth of an idea nursed along by insight, discussions, persistence and luck.

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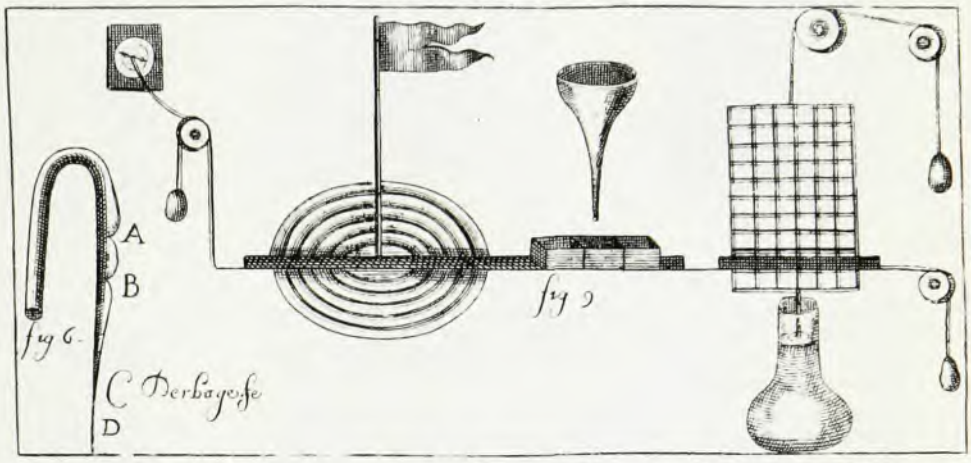
Invention of the Meteorological Instruments

By W. E. Knowles Middleton
362 pp. Johns Hopkins, Baltimore, Maryland, 1969. $12.00



Sir Christopher Wren's weather-measuring device, sketched by Balthasar de Monconys.

An oral examination question attributed to Enrico Fermi is "How much energy is dissipated in a bolt of lightning?" The reaction of most examinees would be stark panic because most physics students learn little or nothing about the physics of their environment.

This is particularly sad because many advances in physics were intimately connected with the development of meteorological instruments. As far as we know the use of meteorological instruments goes back to the fourth century BC where weather-watchers in India tried to measure rainfall. But the real introduction of the instruments began in the flowering period of science during the 17th and 18th centuries.

W. E. Knowles Middleton is retired from the National Research Council of Canada and now lives in Vancouver, B.C., where he is associated with the department of the history of medicine and science at the University of British Columbia. He is a well known authority on the history of meteorology having written *A History of the Thermometer and Its Use in Meteorology* and *The History of the Barometer* and other excellent books. In the present work he treats the barometer, the thermometer, instruments for measuring humidity, duration of sunshine, the rain gauge and atmometer, the windvane and the anemometer, instruments for measurement of the upper winds and the height and motion of clouds, upper-air soundings, and concludes with telemeteorology and the radiosonde.

Middleton has traveled extensively to gather the data for this work. He has shown extreme care in preserving and presenting his historical data, not only in excellent bibliographical notes, but also in the 224 illustrations, many of them photographs of the ancient instruments and papers he discusses in the text.

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X-Ray Diffraction

By B. E. Warren
381 pp. Addison-Wesley, Reading, Mass., 1969. $15.00

Every once in a while a book appears that contains much of the author's creative life. This text by B.E. Warren, well known for his research and teaching, is just such a work. Intended for seniors and graduate students in physics and metallurgy, it provides both an introduction to the basics of x-ray diffraction and to advanced topics primarily in nonstructural problems. It is *the* primer for anyone intending to do research in the latter field. As is obvious, diffraction studies have contributed immensely to solid-state physics, and Warren's text covers several fields that are currently of research interest. Today, x-ray diffraction has even entered the area of Fermi-surface investigations.

About one third of the book covers introductory x-ray diffraction theory and practice; this section existed for many years as mimeographed notes and was referenced by A.H. Compton and S.K. Allison (1935). Then follow four long chapters that are the heart of the book: "Scattering by Non-Crystalline Forms of Matter," "The Effect of Temperature Vibration on X-Ray Diffraction," "X-Ray Studies of Order–Disorder" and "Diffraction by Imperfect Crystals." In each of these areas, Warren and his students have made original and significant contributions. Finally there is a full chap-