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Fifty years of neutron diffraction: the advent of neutron scattering. Edited by G. E. BACON. Pp. 280. Bristol: Adam Hilger, 1987. Price £30.00.

In comparison with other subjects of science, neutron scattering has the following three peculiar features: (1) Since it started as a by-product of the development of atomic bombs during the Second World War, the nuclear policies of nations have always cast shadows upon it. (2) It is an extremely costly method of investigation that can be carried out only at national or international central facilities, mostly aided by sophisticated spectrometers and computers. (3) Its role is very often decisive in solving scientific problems in such various fields as physics, chemistry, biology, metallurgy, polymers and material sciences. This situation has endowed the neutron-scattering community all over the world with a special character. Its members are tied to each other in a spirit of comradeship, but they seem to speak to each other in jargon. If they are heard by outsiders, there is, at least in Japan, a barrier between the neutron scattering community and other scientists. This situation has to be remedied. Today the neutron scattering scientists are faced with several severe difficulties: Neutron scattering scientists often encounter immense problems in securing more powerful neutron sources, particularly nuclear reactors and intensive accelerators. They are challenged by X-ray scientists, who have been assisted in the last decade by the introduction of synchrotron radiation sources. The neutron scattering method has lost the enchanting character that it had in the 1950s and 1960s, when it afforded various possibilities for solving important scientific problems, e.g. the confirmation of antiferromagnetism and magnetic screw structures and the observation of phonons and spin-wave dispersion relations.

In view of these hard facts, it is quite timely to read this book, edited by George Bacon, bearing in mind the Chinese proverb 'search the old to find the future'. This may be illustrated by many experiences of the pioneers of neutron scattering. Here are some examples:

Great breakthroughs of new ideas and findings have occurred almost always not using the most sophisticated machines but with hand-made tiny instruments. To take an example, we find the first demonstration of neutron diffraction by Halban and Preiswerk, and Mitchell and Powers in 1936 using a radium-beryllium source, as George Bacon

overviews. Before the triple-axis spectrometer was built, B. N. Brockhouse recalls that 'at the time this task seemed to us to be virtually impossible for reasons of intensity'. 'The idea of neutron spin echo spectroscopy was born one morning in April 1972 at the corner of Alagat and Attila streets in Budapest . . . while waiting at the traffic lights', as F. Mezei describes. Indeed, the first neutron interference pattern of an interferometer was observed by Helmut Rauch in 1979 at a 250 kW research reactor.

We cannot overemphasize the importance of international collaboration. The book documents many cases of the way the new techniques of neutron diffraction spread from the USA to European countries and then to the rest of the world. Visits of scientists from one country to another were so frequent that close international collaboration proceeded almost always without a formal superstructure. The Institut Laue-Langevin is a good example illustrating this spirit of international collaboration, since it is not restricted to its three member countries, France, Germany and England, but is open to the rest of the world, as Gerry Briggs recalls. Since 1970, a number of Japanese scientists have carried out experiments in the USA. Furthermore, since 1981 a long-term USA-Japan collaborative project has started to promote the same activities. As Sadao Hoshino describes, within this framework of joint work, two advanced spectrometers, a polarized neutron time-of-flight spectrometer at BNL and a wide-angle powder spectrometer at ORNL, are in operation as a result of Japanese funding.

So much has been discussed about the future plans for neutron scattering and related international collaboration in various countries. It is my personal opinion that the future of neutron scattering activities should be free from national nuclear policies. Even today the future plans for research reactors are influenced by such policies. Neutron scattering has grown up from its fatherless childhood and has reached such maturity that it needs no guardian any more. It should be able to determine its future according to scientific criteria independent of current political considerations.

This book will certainly help those who are, in the present hard situation, seeking breakthroughs in neutron scattering towards a bright scientific future.

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