3^- state, but individually they correspond to 0^+ states. Thus the evidence previously interpreted as indicating a single 3^- state is now re-interpreted in quite a different way. There is no other state in the required energy region that could plausibly be interpreted as the required 3^- collective state, so the evidence for the collective nature of this nucleus is weakened.

This result is important for the understanding of the structure of cadmium, but it has several wider implications. First, it is a reminder of the importance of precision in physical measurement. Time and again increased precision does not merely sharpen the picture, but reveals wholly unexpected details that oblige one to adopt a completely new interpretation. Second, it is a reminder of the provisional nature of much of the day-to-day details of scientific work, particularly on the frontiers of knowledge. In so many cases scientists build ideas on quite flimsy and scattered evidence; it is right for them to do this provided they realise how subject it is to revision in the light of new information.

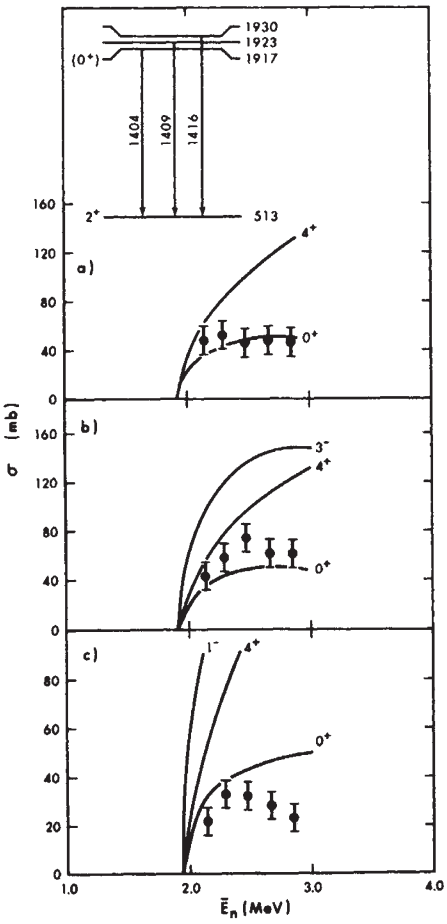

Fig. 2 Excitation functions for the total cross sections for the excitation of the states of 1,917, 1,923 and 1,930 keV by inelastic neutron scattering. The sum of the individual intensities is compatible with 3^-, but individually they cannot be 3^- and are likely to be 0^+.

It is never sufficient to be satisfied with an interpretation that explains the incomplete set of experimental data available. Every consequence of an interpretation needs to be tested as rigorously as possible, and even then one must be prepared for the new unexpected result that calls it all in question again.

Acceptable radiation exposure

from J. R. A. Lakey

THE chairmen of both the International Commission on Radiological Protection (ICRP) and its counterpart on Radiation Units and Measurements (ICRU) were opening speakers at the Society for Radiological Protection International Symposium held at Aviemore, Scotland from June 2 to 6. These two commissions provide the ground rules for all aspects of radiological protection and both place considerable stress on the measurement of radiation and its interpretation.

C. G. Stewart (ICRP) opened the symposium with a statement on the ICRP recommended Investigation Levels and Derived Working Limits and described these as signposts to direct action which could also be used as criteria for discarding unnecessary information. Radiation exposures exceeding these levels demand more careful consideration and higher accuracy of measurement. J. Dunster (National Radiological Protection Board, Harwell) endorsed this thesis and said that errors of a factor 2 are acceptable in some radiation measurements but this does not excuse lack of clarity in thought on the part of the health physicist.

P. J. Campion (National Physical Laboratory, Teddington) described metrology as the cornerstone on which all advances in radiological protection could be built. In addition to the necessity for instrument calibration he stressed the need for a strict hierarchical structure so that the calibration of a particular instrument could be traced back to the national standard. R. Maushart (B. F. Vertriebes, Karlsruhe) appealed for standardisation of the methods of using intruments so that calibration is not an end in itself.

H. L. Wyckoff, the chairman of the ICRU (Washington DC) presented an elegant resumé of the quantity of dose equivalent which has been jointly developed by his commission and the ICRP. This quantity is expressed in the rem unit, derived from the absorbed dose with corrections depending on the nature of the radiation.

R. H. Mole (MRC Radiobiology Unit, Harwell) agreed that a relationship must exist between the absorbed dose of radiation and the degree of probability of an effect on the exposed person. Philosophical problems emerge when risks to population are computed by the summation of risks to individual members. It is particularly difficult to place these computed population risks into perspective and a great deal has yet to be learned about public acceptance of these estimates. On the other hand the concept of risk or detriment to an individual organ of the body is useful for the summation of radiation exposure to the body due to intake of a single radiosotope. J. Vennart (MRC Radiobiology Unit, Harwell) said that this estimate of risk could be derived from the forthcoming ICRP recommended Maximum Permissible Annual Intake which is to replace the less satisfactory Maximum Permissible Body Burden. He said that the commission would also publish Derived Air Concentrations but there was to be no attempt to give limits for drinking water for occupationally exposed persons, who, after all, consume the same water as the public.

The legal attitude to radiation protection varies between countries to the extent that the radiation worker could be restricted in mobility and so the European Economic Community aims to improve this situation through its directives to member countries. These proposals, summarised by P. Recht (EEC), are expected to involve some changes in United Kingdom legislation in spite of the common ICRP basis. A. W. Kenny (Department of the Environment, London) also showed that the EEC would become a new factor in the control of radioactive waste. The UK aproach presented by A. Preston (Fisheries Laboratory, Lowestoft) is to limit radioactive waste disposal by restricting radiation exposure to members of a critical population group. The main difficulty in the application of this procedure is the need to find a completely objective method of selecting the critical group. W. D. Rowe (US Environmental Protection Agency, Washington DC) described an alternative approach which makes use of comprehensive mathematical models which include source terms, environmental transport pathways and human metabolism to predict the dose to members of the public. These models require some form of measurement for their periodic validation but might avoid some of the problems of the critical group method.

Preprints of most of the papers which were presented can be obtained on payment of a small fee from Mr K. B. Shaw, National Radiological Protection Board, Harwell, Didcot, Berkshire OX11 0RQ.