science. Much needs to be done to improve the analysis of personnel policies and practices; the personnel officer needs fuller understanding of and participation in operational research and management studies to solve his own problems more effectively, and to contribute more positively to planning and decision-making, to administration and management in the enterprise as a whole.

T. H. HAWKINS

PREPARATION AND STANDARDIZATION OF ISOTOPIC TARGETS AND FOILS

STABLE and radioactive isotopic films and foils of precise composition and dimensions are needed as targets for a variety of particle accelerators for nuclear data measurements; accurately defined films of α-active actinides are also needed as fission standards for reactors. Such standard targets are made in a number of laboratories in different countries and there was a clear need for closer co-ordination with the users in order to relate the limits of chemical purity and dimensional tolerance desirable to those practically attainable. To meet this need and also to promote an interchange of ideas and techniques a seminar was held at Harwell, Didcot, during October 20–21, 1965. The hosts were the Electromagnetic Separation Group of the Atomic Energy Research Establishment (A.E.R.E.) and the Special Techniques Section of the Nuclear Physics Division of the Atomic Weapons Research Establishment (A.W.R.E.).

The seminar, of about seventy scientists, was strongly supported by the Central Bureau of Nuclear Measurements of Euratom, Geel, Belgium, and the isotopic Target Preparation Centre of Oak Ridge National Laboratory (O.R.N.L.), Tennessee. Participants from laboratories in eight other countries also contributed to the 30 papers and the discussions.

Isotopic targets, which may be required on backings or self-supported, generally range in thickness from a few $\mu g/cm^2$ to several mg/cm^2. A wide variety of chemical techniques such as vacuum evaporation, electrodeposition and electrospraying, and metallurgical methods are used, but problems arise owing to the small amounts of expensive isotopic material available, the risks of isotopic contamination and the need for high chemical purity and exactly known thicknesses. Chemical conversions and purifications on the sub-gram scale may have to precede the target-making process.

During the first day the meeting considered the problems involved in these methods, means of improving process efficiencies and the effects of impurities. G. H. Debus of the Geel Laboratory emphasized the difficulties involved in obtaining exact and realistic specifications from users, in preparing and transporting samples, and obtaining from users adequate comments on the behaviour of the targets which would help future preparations. Other contributions from the Geel Laboratory discussed non-uniformity of deposits and isotopic fractionation during evaporation. G. T. Arnison of A.W.R.E. analysed the experience gained using electron bombardment techniques instead of resistance heating for vacuum evaporation. The description by W. Parker of the Chalmers University of Technology, Gothenburg, of the novel method of 'molecular plating' from organic solutions, which appears especially useful for making actinide targets, excited much interest. Experience with established methods for making α-active sources was reviewed by Mrs. Glover of A.E.R.E. and J. Champion of the French Atomic Energy Commission.

For many applications unbacked targets are desired, and several laboratories use metallurgical techniques to make isotopic metallic foils of thickness down to below 1 mg/cm^2. The end-product of electromagnetic isotope separation is normally the oxide, and methods of efficiently converting small quantities of the valuable isotopes to the metal were described. A range of foils of the isotopes of the rare earth metals, reactive alkaline earth metals and some of the actinides has been prepared by simultaneous reduction-distillation followed by rolling or evaporation at O.R.N.L. Some of these were shown by E. H. Kobisk, who also considered the merits of ultra-high vacuum techniques as a means of obtaining high purities. The techniques used at the Argonne National Laboratory for rolling films down to thicknesses of a few microns and at Geel for high-frequency levitation melting and evaporation were described. This latter method avoids contamination by crucible material and can be used for metallic samples of 3–100 mg. J. B. Reynolds of A.E.R.E. listed the thin stable isotope metallic foils now made at Harwell by rolling techniques and showed how the deformities and thickness contours in a rolled foil had been measured by attenuation of 5-MeV α-particles. The problems of preparing targets by very small-scale electroplating were discussed by several speakers.

The second half of the meeting was concerned with measurement and standardization. F. A. Howe, A.W.R.E., introduced the topic with a critical survey of the non-destructive methods for determination of film thickness which were applicable to nuclear targets. Methods used at Geel for precise standardization of the chemical and physical properties of targets were reviewed by H. Moret and K. F. Lauer and some specific procedures were described by other speakers. This aspect of thin-film preparation will undoubtedly receive increased attention in the future, and the first seminar on the subject was particularly useful in making the participants aware of the many causes of errors which can exist in the determination of purity, uniformity and thickness of isotopic targets. Both makers and users will undoubtedly be more cautious in the future and will understand each other's problems better. More efforts will be made to introduce monitors to follow the continuous build-up of targets and to control and measure the chemical and physical characteristics of the films and foils.

Copies of the seminar programme and abstracts and, later, the record of the proceedings can be obtained from the following address: Electromagnetic Separation Group, Atomic Energy Research Establishment, Harwell, Didcot, Berkshire.

M. L. SMITH

THE NATIONAL INSTITUTE OF OCEANOGRAPHY

THE National Oceanographic Council met for the last time on October 20, 1965, and decided to petition the Queen to withdraw the Royal Charter granted in 1950. This was the final stage of the change-over of the responsibility for the National Institute of Oceanography from the National Oceanographic Council to the recently formed Natural Environment Research Council. Mr. J. P. W. Mallalieu, Parliamentary Under-Secretary of State for the Royal Navy and chairman of the National Oceanographic Council, while thanking the Council for their work over