

News and views

NOTE FROM ABROAD

MECHANICAL GODS

Dancer Pearl Primus, in the course of her lecture-demonstration on African dance forms given in May at the American Museum of Natural History, has relayed a message from Africa to the United States. The people of the African bush wish to assure the people of America, reports Miss Primus, that mechanical gods such as they understand atomic bombs to be will not harm people unless people wish to be harmed.

NATIONAL SCIENCE FOUNDATION

COMPROMISE VERSION APPROVED

The Senate-House committee of conference on the question of the Science Foundation bill came to final agreement in late April, and in early May President Truman signed the bill aboard his special train during his "whistle-stop" tour about the country. The crippling amendments relating to security provisions submitted by the House of Representatives were eliminated in the final wording, which in brief has the effect of proposing that existing national security safeguards are adequate and that no radical innovations are needed in the case of the Foundation.

Foundation personnel requiring access to classified information in the atomic energy field will be bound by the Atomic Energy Act of 1946, which requires AEC clearance. Foundation research activities pertaining to other aspects of the national defense will be given security safeguards to be established by the Foundation itself, except where such research is carried on with funds transferred from the Department of Defense—in which case the relevant security requirements will be set by the Secretary of Defense. Provision has been made in the bill for both an affidavit and an oath of loyalty for fellowship holders.

The compromise bill stipulates that a budgetary ceiling of \$500,000 be set for the fiscal year ending June 30, 1951, with a 15 million dollar ceiling for each fiscal year thereafter. This has the possible disadvantage that the Foundation may be tempted to rely more than otherwise upon funds transferred from other agencies, a situation that could conceivably inhibit the Foundation's future independence and vitality. But more serious is the limit thus set on the Foundation's ability to support and encourage science education.

BALANCE NEEDED

MANPOWER PICTURE CHANGING FOR SCIENCE

Far more scientists have been coming off the production line in the last few years than was anticipated by the Steelman Report. In an article on "The Changing Manpower Picture" in the March issue of *The Scientific*

Monthly, Philip N. Powers, advisor on scientific personnel with the Atomic Energy Commission, points out that the problem has now become one of balancing supply with demand rather than filling up the post-war deficiency in technical and scientific personnel.

In the school year 1948-49 more than 130,000 science degrees were conferred which, Powers writes, is over 30,000 more than the Steelman estimate of the deficit incurred during the war. He also remarks that one of the goals put forward by the President's Scientific Research Board was the doubling of the nation's research and development effort by 1957; yet it has just about doubled in one-quarter the decade in which this was to take place.

Powers points out that a surplus of persons in some fields is developing and that a shortage in others continues, that among the trends to be expected is the gradual replacement of less qualified people with more qualified people. He ends with a plea for a systematic gathering of facts about scientists and their jobs for "the best possible insurance against having an unemployed surplus of certain kinds of scientific personnel and a critical scarcity of others".

MAGIC NUMBERS

APS SYMPOSIUM REPORTED

A feature of the New York meeting of the American Physical Society was the symposium on nuclear shell structure held in Columbia University's Horace Mann Auditorium. The symposium, which took place on Saturday afternoon, February 4, was developed to present a summary of theoretical ideas and experimental facts involved in recent theories of nuclear structure. G. Placzek presided.

Nuclear structure is apparently simpler in certain respects than was thought possible a few years ago. The dreary prospect of a continuing accumulation of uncorrelated facts has been replaced by the reasonable hope that a systematic theory paralleling in many respects the periodic system of the elements is possible and not far from realization. In atomic theory the occurrence of closed shells and periodic effects is correlated with the operation of the exclusion principle, the existence of angular momentum quantum numbers, and the relative smallness of the interactions between the electrons. The first two factors are present in nuclear structure, but the absence of a strong central force and the large magnitude of the force between nucleons caused attention to be diverted, until recently, from the possibility of a systematic theory of nuclear structure.

W. D. Harkins, the first of the program's five speakers, reviewed early developments in the discovery of periodicities in the distribution, abundance, and stability of nuclei and of the role of the intermediate nucleus in nuclear transmutations.

Contrasting models based on the independent particle viewpoint and the strong interaction viewpoint were then described by V. F. Weisskopf. The possibility of reconciling these opposing attitudes was discussed in terms of a possible analogy to the electron gas in a metal. Here the

exclusion principle has the effect of partially suppressing the more obvious manifestations of strong interaction between the electrons. Similar effects may occur in nuclear structure although this is not certain. Further studies will be necessary, according to Weisskopf, to establish more reliably whether the evidence on shell structure in nuclei is the effect of a new fundamental property of nucleons or whether it can be understood in terms of the application of old ideas to a complicated many body problem.

Maria Mayer, the third speaker, described the $j-j$ coupling shell model and discussed in detail the excellent correlation with experimental spins and magnetic moments. The basic assumption added to the model of single particle orbits in a potential well is that spin-orbit coupling is very large, producing a large energetic separation of levels with parallel and antiparallel orientations of the intrinsic spin and the orbital angular momentum vectors. The model accounts for many facts of beta decay and nuclear isomerism, but fails to provide possibilities for isomeric transitions in odd nuclei with spin changes greater than two units and no change in parity. Although several suggestions have been made to account for the closed shells, it was remarked that the predictions resulting from different models are surprisingly similar.

L. W. Nordheim described the basic features of his model and of the central elevation model. The guiding principle in Nordheim's level scheme is the production of the magic numbers with a minimal departure from the level order in a rectangular potential well. The central elevation model is based on the effect of the Coulomb repulsion between protons on the variation of particle density within the nucleus. This repulsion causes the density to vary from a minimum value at the center of the nucleus to a maximum near the boundary.

Evidence indicating a close correlation between beta decay selection rules and the shell structure of odd nuclei was then reviewed by Nordheim. Allowed unfavored transitions are accounted for particularly well. Regularities are also apparent in the beta decay of even nuclei.

E. Feenberg contrasted the Schmidt single-particle model of nuclear magnetic moments with the Margenau-Wigner uniform model. The experimental evidence is consistent with a composite interpretation utilizing both models. The existence of well defined islands of isomerism points to a close connection of isomerism with shell structure. Possibilities of accounting for the islands occur in all three level schemes although the schemes differ in regard to the possible parity changes. In particular, level crossings in the central elevation model provide a number of pairs of closely spaced configurations with the same and with opposite parity and with spin changes of 3, 4, and 5 units in both islands of isomerism (twelve odd isomers with no change in parity and spin changes greater than 2 units are known).

The speaker next discussed an example to illustrate the connection between shell structure and the unique first forbidden energy distribution in the beta decay of Cl^{36} , K^{42} , Sr^{80} , Y^{90} , Y^{91} , and Cs^{137} . These transitions illustrate the alternations in parity of the orbits available to the odd particles as N and Z increase. The area of agreement of

the central elevation and $j-j$ coupling schemes includes all these examples.

E. Feenberg

PHOTOGRAPHIC SENSITIVITY

THE LATENT IMAGE OF BRISTOL

The third international conference on "Fundamental Mechanisms of Photographic Sensitivity" was held at the H. H. Wills Physical Laboratory of the University of Bristol from March 28th to April 1st, 1950. The general character of the meeting was determined by the participation of industrial and academic research workers in almost equal numbers. Thus the papers and discussions represented a fruitful mixture of pure and applied science.

The preponderant interest of the meeting centered on the latest developments in the theory of the latent image, and related topics. N. F. Mott opened the conference with a review of the theoretical work that had hitherto been done on the subject. Throughout the subsequent proceedings, J. W. Mitchell, The University, Bristol, correlated the mass of theoretical and technological detail given by the speakers.

Since 1938, when Gurney and Mott advanced their theory of the formation of the latent image in silver halides, much of the experimental work seems to be consistent with the proposed mechanism. Gurney and Mott assumed that absorption of light by the bromide ions produces conductance electrons which are eventually trapped by sensitivity centers at the surface of the crystal. These centers were believed to consist of silver sulfide formed during the manufacturing process. The negatively charged centers subsequently attract mobile interstitial silver ions (Frenkel-type defects), thus forming metallic silver. When large enough, a silver speck is thought to induce development. The theory failed, however, to explain the latent image formed inside the crystal rather than on its surface, the existence of which was demonstrated quantitatively a few years later by W. F. Berg and co-workers in England.

This led Mitchell in 1949 to propose a drastic modification of our conception of the nature of the sensitivity and latent image centers, and of the ionic conductivity in the crystal. On the basis of experimental work with large monocrystals by Stasiw and Teltow in Germany, Mitchell concluded that the sensitivity specks consist of aggregates of F-centers (bromide ion lattice sites occupied by electrons) instead of metallic silver or silver sulfide. According to his modification, the ionic conductivity is due to the motion of the bromide ion vacancies (positive Schottky defects) instead of silver ions. Such a mechanism will permit formation of the internal latent image as well as of the surface latent image.

The questions of the existence of Schottky defects, of the relative mobility of silver and bromide ions, and of their vacancies in silver halides, play important roles in the new theory. They were, therefore, the subjects of extensive discussions. Considerable disagreement exists concerning the interpretations of earlier work by C. Tubandt and A. Langer, and more recent work reported at the