

## THE INDIAN ACADEMY OF SCIENCES—XXXVIII ANNUAL MEETING

THE Thirty-eighth Annual Meeting of the Indian Academy of Sciences was held on the 18th, 19th and 20th December 1972 at the Bhabha Atomic Research Centre, Trombay, Bombay. The Scientific programme for the meeting consisted of four symposia under the titles: (1) Nuclear Physics, (2) Perspectives in Modern Genetics, (3) Mechanisms of Biological Transport, and (4) Corrosion.

The inaugural function took place on the evening of the 18th December in the auditorium at the Central Complex, BARC, before a large gathering of Fellows, Delegates and Invited Guests. Dr. R. Ramanna, Director, Physics Group, BARC, welcomed the gathering. After the introduction of the Fellows and the Special Invitees present, the President Professor T. S. Sadasivan delivered the Presidential Address on "Water Permeability and Ionic Imbalance under Pathogenesis".

On the second day, the 19th December, the forenoon session was devoted to the first symposium which was on "Nuclear Physics", Dr. R. Ramanna taking the Chair. The first paper of the symposium was presented by Dr. S. S. Kapoor (Nuclear Physics Division, BARC) on "Current Interest in Nuclear Fission and Superheavy Nuclei" (Summary follows). The second paper was on "Studies with Few Nucleon-Systems" by Dr. A. N. Mitra of the Department of Physics and Astrophysics, University of Delhi (Summary follows). The third paper was on "Nuclear Physics: Its Interaction with other Disciplines" presented by Dr. S. K. Bhattacharjee of the Tata Institute of Fundamental Research, Bombay (Summary follows). The last paper of the symposium was on "Research with Variable Energy Cyclotron (VEC)", presented by Dr. A. S. Divatia (Head, Van-de-Graff Laboratory, BARC) (Summary follows).

The subject of the symposium for the afternoon session of the second day was "Perspectives in Modern Genetics" in which six papers were presented and discussed. The Session was chaired by Dr. O. Siddiqi of the Molecular Biology Unit, TIFR, Bombay. The first paper of the symposium was presented by Dr. N. K. Notani of the Biology and Agriculture Division, BARC, who spoke on "Genetics of Recombination of DNA Molecules in *Haemophilus influenzae*" (Summary follows). "Transcription of Bacteriophage T<sub>1</sub> Genome *in vitro* and *in vivo*" was the subject of the paper presented by Dr. R. Jayaraman. Symposium Chairman Dr. O. Siddiqi presented his paper on "Genetic Control of Neurophysiological Functions". Dr. M. R. Das of the Molecular Biology Unit,

TIFR, spoke on "Viral Carcinogenesis" (Summary follows). The fifth paper of the symposium was on "Genetic Control of Immune Response" presented by Dr. G. P. Phondke of the Bio-Medical Group, BARC (Summary follows). The last paper of the symposium was on "Genetic Approaches to the Improvement of Livestock" by Dr. P. G. Nair, Principal, National Dairy Research Institute, Karnal, Haryana (Summary follows).

On the third day, the 20th December, the forenoon session was devoted to the symposium on "Mechanisms of Biological Transport" at which there were seven papers. Professor T. S. Sadasivan was the Chairman of the symposium. The papers presented and discussed were: (1) "Translocation of Radio-nuclides in Plants" by Dr. K. B. Mistry (Biology and Agriculture Division, BARC), (2) "Intestinal Absorption of Nutrients" by Dr. U. K. Vikil (Biochemistry and Food Technology Division, BARC) (Summary follows), (3) "Carriers in Vitamin Transport" by Dr. P. Fatterpaker (Biochemistry and Food Technology Division, BARC) (Summary follows), (4) Effect of Irradiation on Electron Transport and Coupled Phosphorylation" by Dr. A. S. Aiyer (Biochemistry and Food Technology Division, BARC), (Summary follows), (5) "Factors Involved in Intracellular Transport of RNAs" by Dr. D. S. Pradhan (Biochemistry and Food Technology Division, BARC) (Summary follows), (6) "Cytoplasmic Control of Protein Transport" by Dr. L. M. Narurkar (Summary follows), (7) "Plant Uptake of Nutrient by Foliage" by Dr. N. P. Datta, Project Director, Nuclear Research in Agriculture, IARI, New Delhi (taken as read).

The afternoon session on the third day was devoted to the last symposium which was on "Corrosion", over which Dr. S. Ramaseshan of the National Aeronautical Laboratory, Bangalore, acted as Chairman, and in which the following nine papers were presented and discussed: (1) Recent Developments in the Cathodic and Anodic Protection of Metals against Corrosion by Dr. K. S. G. Doss, Emeritus Scientist of C.S.I.R., I.I.T., Madras (Summary follows), (2) "Electrochemical Evaluation of Corrosion Rate" by Dr. S. K. Rangarajan and Dr. S. R. Rajagopalan of the Materials Science Division, NAL, Bangalore. (3) "Corrosion in Batteries" by Dr. A. K. N. Reddy of the Indian Institute of Science, Bangalore. (4) "Problems of Corrosion in Reinforced Concrete Structures" by Dr. K. S. Rajagopalan of the Central Electrochemical Research Institute, Karaikudi, Tamil Nadu (Summary follows). (5) "Protection Against

Marine Corrosion" by Dr. C. P. De, Director, Naval Chemical and Metallurgical Laboratory, Bombay (paper presented by Dr. J. C. Chaudhry).

(6) "Water Chemistry in Nuclear Power Reactors" by Dr. Jagdish Shankar of Chemistry Division, BARC. (presented by Dr. Mathur) (Summary follows). (7) "Some Aspects of Corrosion in Nuclear Power Industry" by Dr. J. Balachandra of Metallurgy Division, BARC (Summary follows). (8) "Stress and Environmental Interactions in the Behaviour of Zirconium Base Cladding Alloys" by Dr. K. Elayaperumal,

BARC, (9) "Some Aspects of Studies in High Temperature Oxidation of Metals with Special Reference to Zirconium and its Alloys" by Dr. H. S. Gadiyar, BARC.

Besides the Presidential Address on the first day, there were two evening Public Lectures on the second and the third days of the Session. Dr. G. S. Mutalik, spoke on "Human Heredity and Health" and Prof. E. C. G. Sudarshan, Centre for Particle Theory, University of Texas at Austin, USA, spoke on "Transformation and Invariance—The Perspective of Modern Physics".

## ABSTRACTS OF PAPERS PRESENTED AT THE XXXVIII ANNUAL MEETING OF THE INDIAN ACADEMY OF SCIENCES

### I. Symposium on "Nuclear Physics"

#### Current Interest in Nuclear Fission and Superheavy Nuclei

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Our understanding of the nuclear fission process has undergone a renaissance during the past seven years mainly as a result of the development of a macroscopic-microscopic two part approach<sup>1</sup> to calculate the total energy of a nucleus as a function of its neutron number, proton number and deformation. The smoothly varying part of the total energy is calculated by a macroscopic approach such as that of the liquid drop model (LDM), while the local fluctuations of less than about 10 MeV, which result from the shell structure of nuclei, are calculated by the Strutinsky method by studying the fluctuations in the distribution of shell model levels relative to a smooth distribution. These studies have resulted in the following two important findings: (1) the fission barriers of heavy nuclei like those in actinide region are double-humped and (2) an island of superheavy nuclei in the vicinity of 114 protons and 184 neutrons is expected to be relatively stable against spontaneous fission, alpha decay, and beta decay. Several recent observations such as the existence of spontaneously fissioning isomers have provided sufficient experimental evidence for the existence of the double-humped fission barrier.

Theoretical studies of the thermodynamics of excited nuclei taking into account the nuclear shell structure have been carried out by us<sup>2</sup> at Trombay. An important finding of these investigations is that nuclear shell effects disappear quickly with excitation energy and the observable properties of fissioning nuclei at moderate excitation energies are

governed by the single-humped LDM barrier. From our formulation we have also shown<sup>3</sup> that the shell correction to the LDM energy of a nucleus can be obtained from a study of the asymptotic thermodynamic behaviour of nuclei without recourse to the Strutinsky smearing procedure. As expected this method of calculating the shell correction energies also results in the now familiar double-humped barrier of actinide nuclei and a sizeable fission barrier for doubly closed shell super-heavy nuclei. Theoretical investigations of the fragment mass and charge division in fission based on a stochastic model taking into account the effect of the fragment shell structures have also been carried out in Trombay<sup>4</sup> which bring out most of the striking features of these distributions.

The possibility of the existence of an island of relatively stable superheavy nuclei around 114 protons and 184 neutrons due to the stabilising effects of closed nuclear shells has now resulted in a world-wide interest in the subject and several laboratories have started attempts to search for these nuclei in nature and to produce these by nuclear reactions. Among the several types of experiments carried out so far to search for these elements in nature, one type of experiments involve neutron counting of tons of ores of different types to detect any events resulting in the emission of about 8–10 neutrons expected from the spontaneous fission of these nuclei. The attempts to search for these elements in nature have so far not provided any conclusive evidence for their existence, but this may also imply that their half lives are much shorter than  $10^8$  years. The heavy ion accelerators at Dubna, Berkeley, Orsay and other centres are now actively being used for different types of heavy-ion reactions in an attempt to produce these