

FOREWORD

The epoch-making discovery of nuclear fission by Otto Hahn and Fritz Strassmann in December 1938 is certainly among the most important scientific discoveries of the twentieth century. This discovery has been responsible for changing the world, by showing a way to exploit the enormous potential of the nuclear energy. Although fifty years have elapsed since its discovery, nuclear fission continues to be the only way available to tap nuclear energy for the generation of electricity. Many believe that this single discovery has also been largely responsible for the rapid pace of scientific progress in general in the last few decades as a result of large scale national funding for the nuclear and allied sciences which followed subsequently. While the technological revolution brought about as a result of this discovery is a common knowledge, it is not so well known that the basic research on the nuclear fission process during these fifty years has also provided valuable information on several aspects of nuclear behaviour which could not have been obtained easily by other means.

To commemorate fifty years of the discovery of fission, it is appropriate that *Pramāṇa – J. Phys.* is bringing out a special issue of invited review articles covering different aspects of basic research of the physics of fission.

The first article on the historical aspects of the discovery of fission is followed by an overview of the fission process to provide an introduction to the physics of the fission phenomenon. The next two articles review the very important subject of shell effects on the fission barrier resulting in the double-humped fission barrier for the actinide fissioning nuclei and the consequence of this nature of the fission barrier on the fission probability and fission cross-sections. The fifth article reviews research work on a rare mode of fission involving emission of a light-charged particle along with the two fission fragments. In the subsequent article, recent radiochemical studies of the fission process have been reviewed. The seventh article on mass-asymmetry relaxation in fission and fission-like binary reactions discusses the challenging problem of the origin of mass-asymmetry in fission on the basis of nucleon-exchange mechanisms which establishes a common bridge between the conventional low energy fission, and fission-like reactions in heavy-ion induced reactions. The last four articles deal with different aspects of fission and fission-like reactions in heavy-ion induced reactions. The first of these reviews the calculations of fission barriers for rotating nuclei and their comparison with heavy-ion induced fusion-fission results. The next is a review of the models of the fragment angular distributions including the case of heavy-ion induced fission where one produces intermediate nuclei with high fissility and spin. The tenth article is on pre-scission particle and γ -ray emission in heavy-ion induced fission which is another area of active current research in heavy-ion induced reactions, as these investigations promise new information on nuclear dynamics of the fissioning system. The last article on the categorical space of fission concludes among other results that fission and evaporation are the two, particularly obvious

extremes of a single statistical decay process, the connection being provided in a very natural way by the mass asymmetry coordinate.

We are aware that research work on the physics of the fission process has been so extensive and intensive that the present volume of the review articles may not have covered some aspects which may be considered important. Despite such possible shortcomings, we hope that this special volume of *Pramāṇa – J. Phys.* will become a valuable source of review articles on the current status of the physics of the fission process and will therefore serve as an important source for further research in this still very active field.

I would like to take this opportunity to thank the various authors who spontaneously agreed to my request and contributed excellent review articles on various topics.

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Guest Editor