

Great Minds: Reflections of 111 Top Scientists by Balazs Hargittai, Magdolna Hargittai and Istvan Hargittai, Oxford University Press, New York 10016, 2014



Science has influenced the modern day life and has never been more important to every aspect of social system than it is today. In today's world more and more tough decisions have to depend on advances in modern science as all these advances are integral part of human existence. But on the other hand, it is becoming increasingly difficult for non-specialists to grasp those scientific advances which have been carried out at specialized centres. In modern specialist era even the best scientists are non-specialist outside their own area of inquiry. The political

decision-making involves broad public participation through representations in every democratic system and therefore it is essential that the general public gain knowledge about the progress being made in science. Public should also know about the individuals, *i.e.*, men and women, who are responsible and have contributed significantly to this progress.

The book under review is an attempt to introduce individual scientists, who have considerably contributed in the various fields of science and have made a mark to achieve the new heights. The book contains excerpts of in-depth recorded conversation with eminent scientists about their lives, work, views and aspirations related to science and even beyond. The conversations have been recorded by the authors at various places, as per the convenience of the scientist and complete conversations have appeared in various magazines and journals, in the past.

A total number of 111 scientists (restricted to Physics, Chemistry and Biomedical Scientists) have been covered in the book and these scientists are from sixteen countries (even more if the native countries of individuals are counted). Out of the total scientists reported, thirteen (about 10 percent) are women and 68 of the total scientists covered, are Nobel Laureates.

The book is divided into three broad sections; section one covers 37 Physicists, section two covers 36 Chemists and section three contains interviews of 38 Biomedical Scientists. The first section contains excerpts of interviews of 33 male and 4 female physicists, out of which 18 are Nobel Laureates awarded as early as in 1960 (Donald A. Glaser) and as late as in 2004 (David Gross and Frank Wilczek). The section not only provides description about eloquent breakthroughs made by these scientists but also contains their views on contemporary issues.

The First section provides conversation on theoretical physics, particle physics, astronomy and astrophysics, high energy cosmic rays, nuclear physics, quantum physics, low temperature physics, Optics, magnetic resonance, dark matter, solid state physics, etc. Besides, the scientist's views on social and political issues are also included in the interview. Zhores I. Alfvén has compared the Soviet and post-Soviet Russian system

and commented that in post-Soviet Russia, the relative importance of science has diminished. Phillips W Anderson has pointed out that physics will enter into more complex subjects in future, such as geophysics, cosmology and astrophysics and even to biology and assigned future to 'seamless web of science'. Catherine Brechignac reported that men and women are alike as far as doing science is concerned and Mildred Dresselhaus said how she actively raised women's issues at Massachusetts Institute of Technology (MIT). Freeman J Dyson expressed that manipulating embryos through genetic engineering could be dangerous for human beings. Vitaly I Ginzburg suggested that religious instructions should be introduced only as elective subject in schools. Wolfgang K H Panofsky raised concern about the danger of nuclear smuggling and social responsibility of scientists. John C Polkinghorne, a physicist and an Anglican priest, expressed his views that science and religion are complementary to each other. He further added that both (Science and Religion) have different ways of investigating the things that interest them but have commonality in seeking how things are and desire to search for truth. Charles H Townes said that it is always difficult to visualize the beginning (about the universe) and questioned the theory of creation. Further, he goes on to say that even if it is taken that God created everything then the question is 'who created the God'. Steven L Weinberg believed that, while doing science, there is always an element of 'intuition' to rely upon. He also discusses the challenge of communicating science to the public, which (public) belong to different culture and is unwilling to learn science.

The second section contains conversations with well known chemists of the world and includes 7 females and 29 male scientists. They have discussed their lives, how they began their careers in science, their aspirations of doing work, the hurdles, obstacles, problems, etc., that they faced in their lives. Further, scientists have talked about the joy they experience when overcoming the hurdles. The research subjects discussed in this section include structural chemistry, medicinal chemistry, natural products, stereochemistry, theoretical and computational chemistry, inorganic chemistry, physical organic chemistry, NMR spectroscopy, kinetics and reaction mechanisms, early molecular mechanics, grants and research support, the increasing

importance of instruments, the brain drain, and the politics of resonance theory and atmospheric chemistry.

In addition to eminent chemists speaking about scientific discoveries, they also have talked about other concerns. Carl Djerassi, a chemist and science fiction writer reported that it should be the mission of scientists to bridge the gap between science and society and for this purpose he used science fiction as a tool. Gertrude B Elion felt her concern about difficulties for a woman in reconciling research work and family. Kenichi Fukui mentioned that the distance between science and society is becoming shorter because of progress in science and technology and pressure created by human necessities, and emphasized that co-operation of natural, social and human sciences is a prerequisite for development. Isabella L Karle has talked about improvement in science education in the United States to bridge the gap between science and general public and said that the National Academy of Sciences is working towards resolving related issues. Jerome Karle said that getting into a graduate school remained the biggest challenge in his life and he went on to get civil service jobs in New York State Health Department. Nobel Laureate Yuan Tseh Lee has raised the issues of menace of corruption in Taiwan, specially the situation after Second World War and Japanese oppression during colonisation. Stephen Mason, a historian of science described the relationship between natural scientists and the authority (political, social and religious). He added that Post-Galileo developments led to the formation of scientific societies in England and France which served as models for eighteenth century science academies in North America, Russia, Germany and other parts of Europe. He further said that 'the relationship between science and authority became more a question of political conformity rather than religious dissent'. Mason holds the opinion that episodes of scientists expropriated and exiled, are a set back to scientific development. John A Pople expressed that after passing out the examination, even a person from middle class family can get admission at Cambridge and Oxford, which are considered to be elite insitutions. Nobel Laureate Ahmed H Zewail talked about the cultural difference in Egypt and United States. He experienced cultural shock in many situations.

A number of conversations invoke humour and lighter moments. For example, Elena G. Gal'pern, co-author of the 1973 Russian article predicting the stable truncated icosahedral structure of C_{60} , told Hargittai, 'I have two kittens and a dog and when I try to talk to them about fullerenes, they stare at me with great bewilderment'. Also, on page 263 we see a cartoon from the *Journal and Courier*, Lafayette, Indiana on October 20, 1979 after the announcement of the 1979 Nobel Prize. Herbert C. Brown is depicted sitting and reading a newspaper, while his wife asks, 'Excuse me, Herbert, but would I be out of line in asking a Nobel Prize winner to take the garbage out?' In a letter to the editor of October 25, 1979 Brown writes, 'I read your cartoon with a sinking feeling. Sarah has always brought the garbage out and cartoons such as you published can only create difficulties in an idyllic arrangement. You should understand that in our long, very happy marriage I have assumed total responsibility for the chemistry, and Sarah has assumed responsibility for everything else. Please, don't sow doubts in a wonderful cooperative arrangement.' On the following page we see a cartoon by Brown's post-doctoral Hsiupu Daniel Lee titled 'Sic transit gloria,' in which the positions of the couple are reversed; Brown is taking out the garbage, while his wife is sitting reading the newspaper.

The third section covers 38 biomedical scientists (includes 30 Nobel Laureates) and contains conversations with 2 female and 36 male scientists. It presents a cross-section of biomedical science, a field that has been dominant in science for the past half century. The conversations cover important research areas and discoveries, as well as the roads to these discoveries, including aspects of the scientists' work that never saw publication. They also bring out the humanness of the famous scientists — the reader learns about their backgrounds, aspirations, failings, and triumphs.

In biomedical sciences conversations are more related to genetics, virology, biochemistry, molecular biology, etc., and more specifically on programmed cell death, nervous system, tumour virus, infectious diseases, Magnetic resonance imaging, Electron microscopy, immunity, growth factors, etc., In addition, conversations were also recorded on issues other than natural

sciences and these scientists provided their frank opinion on these issues. For example, Francois Jacob talked about the rigid relationship between professors and students in Europe compared to United States and warned that this relationship (in Europe) is not favourable for scientific discoveries. Paul C Lauterbur mentioned that it is easier to publish a mediocre paper in journals rather than on path breaking research because of lack of peers to judge it. Nobel Laureate Rita Levi-Montalcini told the story that she was more of an artist than a scientist and she was fascinated by the beauty of the nervous system which led her to become a scientist. Werner Arber said that "some people are afraid of the development of science. They fear that application of science will ultimately lead to the destruction of life on Earth". He further added that he is not anthropocentric and life (all sorts) is important on the planet rather than specifically human life. Jens Chr. Skou talked about uncertainties of availability of funds in science which hampers the new thinking. John E Sulston expressed his views about the difference in objective of research done at private drug companies and the university research. Nobel Laureate James D Watson (who proposed double helix structure of DNA) when asked about intelligence and genetics, said that it is difficult to define intelligence while we don't really know how the brain works and one is intelligent in what is interesting for him/her.

The variety of topics covered in the book, in addition to the conversation on the seminal works carried out by the individual scientist, are a pleasure to read. The description about the life and work of scientists in the book can be a good source of inspiration to the younger generation for taking up science as a career.

SURJIT SINGH
SCM Division, CSIR-NISCAIR
E-mail: ssdabas@yahoo.com