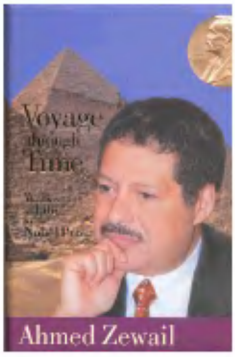

Voyage Through Time: Walks of life to the Nobel Prize. Ahmed Zewail. The American University in Cairo Press, Cairo – New York. 2002. 287 pp. Price: $ 22.95.

This is a unique book, appeared at a troubled time in the history of many developing countries, particularly in the Middle East, a region where the author was born and raised. The book is about his journey from an Egyptian town on the Nile to the position of a distinguished scientist and Professor at Caltech (the California Institute of Technology) in Pasadena, California, USA and ultimately to the Nobel Prize in Chemistry. Zewail is of course well-known to the entire chemistry community (and also to much of the physics and biology communities) for his historical experiments. Many adjectives have been used to describe Zewail's experiments, 'Christopher Columbus of the femtoworld', the 'man with the fastest camera who photographed the life of molecules', 'the person who completed mankind's "race against time"', 'Galileo's telescope turned to molecular motions', to name a few. Zewail received the Nobel Prize (unshared) in Chemistry in the year 1999. As mentioned in the Prologue of the book, he is the first from the entire Islamic World of one billion people to receive an *unshared* Nobel Prize (the earlier, shared one, was received by Abdus Salam from Pakistan in 1979). As he wistfully remarks: 'Nearly all of the prizes in science and medicine have been awarded to the Western world'.

Thoughtful is perhaps the correct word to describe the mood of this highly readable autobiography. All through the book, one feels the author's tremendous love for his country Egypt, for its music, culture and tradition and its rich history. One also remains aware of his concern for the Third World countries – 'the world of the have-nots'. The book is a very lively description of Zewail's life and his work – often inseparable from each other. Some discussions of the scientific aspects of laser chemistry are highly illuminating.

As an autobiography, this is clearly a rather unusual book. That the author is a scientist is apparent from the structure of the book, from the crisp presentation, and indeed, many pages of the book are devoted to his (well-known) scientific works. The first two chapters describe the author's formative years in his hometown Desuq, which was then a small quiet town on the Nile, and subsequently his education at Alexandria University. The first chapter provides a portrait of a budding scientist as a young student. Chapter 3 describes the period of Zewail's Ph D work at UPenn with Robin Hochstrasser, and Chapter 4 depicts his postdoctoral work at Berkeley, as well as his initial period at Caltech. Both these chapters contain vivid descriptions of a student from a Third World country trying to get used to the conditions in USA (and this has been done with a great sense of humour), ultimately becoming a Professor at one of the world's best universities. Actually, Chapter 3 contains incidents that are experienced by nearly all the students from our part of the world as well.

Chapters 5–7 are the most technical parts of the book. Here the book almost ceases to be an autobiography. Instead, the scientifically-minded reader is rewarded with insightful discussions and descriptions of fundamental aspects of laser chemistry. Chapter 5 provides a lucid description of the study of coherence as a dynamical tool to probe motions of isolated molecules. Zewail gives a clear explanation of the concept and utility of coherence in molecular science. Chapter 6 contains the famous experiments dubbed as 'the race against time'. As everywhere else in the book, Zewail places this in the perspective of the history of human civilization, elaborating how measuring time has been an important endeavour of mankind throughout history, giving interesting examples from ancient Egypt and medieval Europe. This historical perspective has certainly given a very attractive dimension to the book, particularly for history-lovers. Also enjoyable is Zewail's vivid explanation of the femtosecond experiments. Here he shows how the idea of ultrafast photography of molecules can be described in terms of the famous Muybridge's fast photographs of a galloping horse. I have to quote a few lines to give the reader a flavour of Zewail's descriptive power – here is how he describes his experiment: 'Everything was now set up: we had the new light probe, we had the molecular beam or reaction cells, and equipment for taking 'snapshots' of the molecular changes. We just needed the 'actors' to get in place. The 'actors' in our little production, of course, were simple substances that would undergo a reaction. But our production was not going to be a two-act story with only a beginning and an end – we wanted to put on the centre stage what goes on *between* the beginning and the end'. It is hard to believe that one is talking of a very difficult experiment that combined femtosecond laser spectroscopy with a molecular beam to catch the molecule in its transition state!

Chapter 7 deals with time and matter – femtouniverse in perspective. The author again starts by placing the subject in a fascinating perspective, beginning with a quotation of physicist Freeman Dyson. In this chapter, Zewail provides a unified view of femtochemistry and its importance in natural science. Chapter 8 is about the celebrations of the Nobel Prize as well as about his new wife and family.

Chapter 9 contains a personal vision of the world of the have-nots – the developing and the under-developed world. In this chapter Zewail makes several observations that are relevant to the Indian society as well. He emphasizes the need for a *healthy scientific structure* as the base on which further improvement of an under-developed society can take place. This is to be complemented by the development of technology. He was positive about the success of the Indian Institute of Science and the Indian Institutes of Technology and termed them as centres of excellence in India. Chapter 10 looks at the future with hope – for Egypt and America. He isolates (not surprisingly) illiteracy as the major obstacle. He also did (pleasantly) some plain talking about the responsibility of the United States in the world today.

For the science-oriented reader, this is a remarkable autobiography. For chemists, particularly for physical chemists, it contains discussions of subjects which are known to them, although the insight

provided here into their nature is rare. Zewail's mastery of presenting things with picture and illustration is evident all through book and is something to emulate. The basic message which Zewail seems to be offering to the reader, especially those from the developing and under-developed countries, is that if one is prepared to work hard and be dedicated, it is still possible to make wonderful discoveries. There seems to be one flaw in the logic though. Many of the experiments would not have been possible in any other place than in an affluent American university, which Zewail himself points out.

The book contains many nice photographs, spreading over the entire life of the much-honoured scientist. These are not only pictures of his parents and his other family members, but also of many famous scientists of our time, like Linus Pauling, Dick Bernstein, George Porter, to name a few.

On the whole, this is an enjoyable autobiography. One is spared from the egoism that often marks the autobiography of successful people. It will be nice if an Indian edition could be published so that the price is within the reach of Indian students for whom I would strongly recommend the book. In fact, the entire science community stands to gain if more such autobiographies are available.

BIMAN BAGCHI

Solid State and Structural Chemistry Unit,
Indian Institute of Science,
Bangalore 560 012, India
e-mail: bbagchi@sscu.iisc.ernet.in

A Basic Course in Crystallography. J. A. K. Tareen and T. R. N. Kutty. 2001. vol. 1. 205 pp. Price: Rs 230.

Fundamentals of Crystal Chemistry. T. R. N. Kutty and J. A. K. Tareen. University Press (India) Limited, 3-5-819 Hyderguda, Hyderabad 500 029. 2001. vol. 2. 84 pp. Price: Rs 105.

These books are essentially lecture courses in crystallography, intended to cater to textbook needs of students in various interdisciplinary areas at the postgraduate levels. Accordingly, a simple and logical development of the basics of the subject, not commonly available in most textbooks of this kind, is presented in the first volume. The external and internal symmetry aspects of crystals are covered well, with lucid enumeration of the 32 point groups and 230 space groups. The symmetry descriptions essentially follow the International Tables of X-ray Crystallography, but strangely their reference is not included in the bibliography. The description of various crystal forms and habits as also the methods of symmetry projections and pole figures are presented well and should be useful to students of mineralogy, metallurgy, etc.

The crystallographic methods and techniques presented, however, are quite antiquated, as the presentation is restricted to the old classical methods and photographic methods only. It would have greatly benefited the students to have a glimpse of the phenomenal advances that have taken place in this field in recent years, since the advent of synchrotron radiation (SR) source. The high brilliance SR storage ring sources now available at several laboratories around the world, coupled with use of sophisticated instruments based on electronic position detectors or image plate systems have revolutionized practically all areas of X-ray crystallography, from powder diffraction to macromolecular crystallography. The presently available sample environments ranging from ambient to extreme conditions of temperature and pressure were not believed possible just a few decades ago. The current advances, apart from eliminating the earlier drudgery associated with crystallographic experiments, have opened up a wide variety of new applications in several areas of biology, chemistry, physics and materials science. Study of macromolecular structures using microcrystal samples, dynamical structure studies at nanosecond timescales, study of solid state reactions and growth of crystals are now carried out with precision and ease. Likewise, recent advances in global optimization methods (using the maximum entropy techniques, etc.) coupled with innovative processing of powder diffraction data are now able to provide high throughput (*ab initio*) crystal structure solutions for medium large (< 100 atoms) organic molecules using powder samples. Further, the use of the Rietveld profile refinement technique on high-resolution powder diffraction patterns can now refine these structures to precisions that were earlier possible only with single crystals. None of these advances are touched upon, even in passing.

Volume 2 is essentially a reproduction of chapter 4 of volume 1, re-emphasizing the basic concepts of inter-atomic forces, chemical bonds and the packing considerations needed to understand solid state chemistry. It includes a few simple examples of commonly encountered structures with good item-wise discussions. Inclusion of the bond valence concepts and some more examples would have been helpful to build a stronger foundation.

There are quite a few typographic errors some of which are misleading. For example, there are some confusing inconsistencies in Figures 2.28, 2.29 and 2.30; the shortest atomic distances are not indicated properly in Table 4.1 (also in Table 1.1 of vol. 2); 'incoherent scattering' is incorrectly defined on page 138; how does 'theta' become 100.6°, if the sine is calculated as 1.184 on page 143?

In conclusion, while seeking 'to present a comprehensive basic course in crystallography to Indian students', the books fail to enthuse them by not attempting to give a glimpse of any of the state-of-the-art advances that have taken place to revolutionize this exciting field of crystallography in recent years.

A. SEQUEIRA

6 Beach Resort,
Plot 1, Sector 10A,
Vashi,
New Mumbai 400 703, India

Sustainable Human Ecology. H. D. Kumar. Affiliated East-West Press Pvt Ltd, 105 Nirmal Tower, 26 Barakhamba Road, New Delhi 110 001. 2001. 307 pp. Price: Rs 195.

The author in his Preface suggests that this book is a modest attempt to collage and summarize on his part, a variety of views of 'enlightened and discerning people', who have written on a variety of issues in this multidisciplinary area.