

heavy ion-induced fragment angular distributions with the pelletron accelerator, leading to experimental confirmation of pre-equilibrium fission phenomenon.

**Murthy, C. Siva Ram**, Department of Computer Science and Engineering, Indian Institute of Technology, Madras. He has developed many innovative algorithms for the assignment of tasks in parallel computers to ensure their optimal performance.

**Padma, S.**, School of Chemistry University of Hyderabad, Hyderabad

She has made outstanding contributions to the synthesis of extremely interesting molecules such as 6-prismane and garudane. She possesses deep insight into the mechanism of the chemical transformations involved in the synthesis.

**Rajaram, Nirmala**, Immunology Division, Cancer Research Institute, Tata Memorial Centre, Bombay. She has worked on the cytotoxic mechanism in oral cancer in three different lymphoid compartments.

**Sengupta, Pulak**, Department of Geological Sciences, Jadavpur University, Calcutta

He introduced for the first time in the Eastern Ghats granulites of India a P-T-t route, involving three phases of metamorphic-tectonic evolution on the basis of geothermo-barometric work and correlating it with textural evidence.

**Uma, Kuchibhotla**, Molecular Biophysics Unit, Indian Institute of Science, Bangalore. She has contributed to the area of *de novo* design of protein mimics and developed approaches to the construction of stereochemically rigid peptide helices. Her research has covered the area of peptide design and characterization.

## PERSONAL NEWS

# Nucleus of chemical activity

## *An obituary of Jagdish Shankar*

Jagdish Shankar, a distinguished fellow of the Indian Academy of Sciences and a former head of the chemistry division at the Bhabha Atomic Research Centre, Trombay, expired on 31 January 1992 at the age of 80 years at Bombay. Till the day before his demise Shankar was actively associated with research and development in chemistry and was even attending a symposium on radiation and photochemistry at the centre.

After obtaining the master's degree, his work on determining molecular orientation from X-ray diffraction studies and magnetic anisotropic data won him the PhD degree from Bombay University in 1939. Commencing with the Institute of Science, Bombay, Shankar taught in different institutions for about a decade. During his tenure at Delhi University he proceeded to the US and took an M S in chemical engineering at Columbia University in 1947.

At the invitation of H J Bhabha, who was chairman of the Atomic Energy Commission, Shankar joined the then Atomic Energy Establishment, Trombay (now Bhabha Atomic Research Centre) in 1949 as chief chemist with the

mandate of formulating and executing the chemistry programmes in the nascent nuclear technology. Although his laboratories were located in temporary



sheds, soon the address of 414-A Cadell Road became synonymous with chemistry activities of India's atomic energy programmes for years.

Under the leadership of Shankar well-equipped laboratories for analytical chemistry, spectroscopy and advanced research in the emerging field of recoil chemistry were established. Besides, he initiated and encouraged research in solid state chemistry, X-ray and electron diffraction, thermal analysis and radiation chemistry. As the programmes initiated by him expanded and flourished, divisions of analytical chemistry, spectroscopy, applied chemistry and chemical engineering were established out of the chemistry division. His chemical engineering background came in handy in establishing solvent extraction, ion exchange, distillation and zone refining units for preparing high-purity materials required in the exacting nuclear and electronics industries. Based on the developmental work carried out in the division, a high-purity-materials plant was set up as part of the Nuclear Fuel Complex at Hyderabad to manufacture B, Nb, Ta, Se, Au, etc.

The knowledge accrued over the years of work on the radiolysis of aqueous media during his tenure and afterwards became very useful in ex-

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mining the role of oxygen and hydrogen in nuclear reactors under accident conditions. Under his prudent leadership the risk-prone chemical operation of removing the biofouling of the CIRUS nuclear reactor was successfully carried out in the sixties. He recognized very early the necessity of having stringent control of the chemical parameters of reactor water to minimize corrosion. Such foresight led to the establishment of the water and steam chemistry laboratory at Kalpakkam and the research groups in recoil and radiation chemistry made notable contributions of international standard. He was a champion of instrumentation in chemical research which is reflected in the development and transfer of know-how of the first indigenously designed gas chromatograph to industry.

He attended several international conferences including the first UN Conference on the Peaceful Uses of Atomic Energy held in 1955. He was a member of the editorial boards of

several Indian and international journals. In recognition of his outstanding contributions in chemical sciences he was elected fellow of the Indian National Science Academy (1969) and of the Indian Academy of Sciences (1975). Shankar was keenly involved in the activities of the Indian Chemical Society which he served in various capacities, ultimately as its president. He was elected president of the chemistry section of the Indian Science Congress Association in 1965.

About fifty students have received their doctorate degrees under his erudite guidance. He has more than 100 publications to his credit in reputed journals.

After retirement from BARC in 1972 Shankar actively continued his academic pursuits. He was an emeritus scientist and later adviser in the Department of Atomic Energy. During 1975 his services as Director of the Science Research Council were used by the University Grants Commission to streamline the

selection and funding of research schemes. He was also an advisor to the vice-chancellor of Kashmir University, Srinagar.

His admirers and students organized a national symposium on emerging frontiers in chemistry on his 75th birthday in November 1987 and the Indian National Science Academy brought out a special commemorative volume on this occasion.

Shankar ardently believed in observing discipline in scientific research and in life. He was always courteous and an immaculately dressed person. His death is a blow to the cause of chemistry in this country.

Shankar is survived by his wife and six illustrious sons.

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## BOOK REVIEWS

### Comprehensive radiobiology

**Biological Radiation Effects.** J. Kiefer. Springer Verlag, Berlin, 1990, 444 pp. Price: DM 98.00.

The book contains 24 chapters and two appendices and is a good attempt to give an overall view of the different aspects of radiobiology. The first four chapters are devoted to radiation physics, dealt with in a detailed manner usually not encountered in a book on radiobiology. The book starts with a chapter on the types of radiation, their sources of production, emission spectra of UV and ionizing radiations and the decay process of natural as well as artificially produced radionuclides. It then goes on to explain the processes of interaction of radiation with matter, which covers the next two chapters, the second of which only may interest

biologists as the first will fall into the field of a physicist.

Chapter 4 gives the energy transfer and microdosimetric consideration in energy deposition and distribution in biological targets. The relation between energy transfer and ionization track structure is described in detail, quoting values for different nuclides. This chapter also deals with the dosimetry of incorporated radionuclides and a short section on dosimetry of optical radiation.

The next two chapters are devoted to radiation chemistry; the first part of the fifth chapter dealing with photochemistry will fall more in the realm of a chemist, while the second part on radiation chemistry is of direct concern to a radiobiologist and is highly relevant to the radiation chemistry of DNA dealt with in the next chapter. Considering the importance DNA lesions have attained in radiation biology in recent years, the treatment of effect on DNA is rather brief. Though the topic continues to the next chapter, a major part of

chapter 7 is allotted to modern techniques like application of recombinant-DNA technique in studies of molecular changes.

Chapters 8 to 17 are devoted to cellular radiobiology. Cell survival curves and their relationship to biological complexity and cell population structure are described in chapter 8. Also included in this chapter is a note on dependence of cellular radiosensitivity on nuclear DNA content. Role of LET in influencing the survival curves is analysed in detail and the chapter ends with a brief account of the interaction of different types of radiation, which includes both UV and ionizing radiations.

The next chapter deals with chemical sensitization and protection, where the role of oxygen as a radiosensitizer is given a dominant place and is described in detail, while the topics of normal tissue protection by thiols and hypoxic cell sensitizers get a cursory glance.

Chapter 10 is on radiation effect on cell cycle phases. A brief outline of the