

modelling and multimedia tools have been discussed in this chapter.

Saha and Nath discuss the success story of knowledge transfer through fish-based technology adoption under the National Agricultural Innovation Project (NAIP) in Dhalai District, Tripura. They share the innovative and integrated approach of fish farming by associating different components of paddy and livestock, including poultry, piggery and duckery that were found more meaningful to utilize the available farm space of a farmer, so as to boost the farm income and subsequently fish production of the state, as witnessed from the production and income of the farmers after the successful invention. This study emphasizes the essence of reaching to the roots of our country and contributing for a better living of the common man.

Section five of the book discusses indigenous knowledge (IK), its protection and IPR issues. Rakshit, Pal and Karmakar provide a definition of IK systems, perception, relevance of documenting the IK (which is predominantly uncodifiable tacit knowledge) and the threats to it. Characteristics of IK include localness, oral transmission, origin in practical experience, emphasis on the empirical rather than theoretical, repetitiveness, changeability, being widely shared, fragmentary distribution, orientation to practical performance and holism characteristics of explicit knowledge.

Hence there is a need to protect and channelize IK. Insights into the repository of indigenous practices among communities in different parts of the world provide enormous knowledge to the readers. To cite a few examples of best in class IK practices – Syria proclaims to have shared the water-harvesting technique in dry areas leading to invention of contour ridges, small basins, circular bunds and Na'urah, which lead to best practices in supporting new plantations and regeneration of soil. Ghana proclaims to have shared the best practice in climate change adaptation which led to actively reviving rainwater harvesting. India's contribution has been in the area of seed treatment, which helped use cow dung as a seed-treating chemical. Further, the authors complement the chapter by sharing a pool of the different software tools and platforms of IK which include traditional knowledge digital libraries (TKDL), honey bee databases, AKT5, Latin America Network Information Centre (LANIC), TEK-PAD and PRO-CITE. The authors conclude with a caution to the growing need to preserve IK, as it is a crucial factor for sustainable development.

Saha *et al.* emphasize the need for incorporating IPR for balance, transparency and mutual benefit, so that the IP system serves the broader public interest as well as provides sufficient private incentives for beneficial development and

transfer of technology, fair commercial practices and creative endeavour. The authors have also shared two case studies on neem and basmati rice, wherein organized groups of farmers from India have fought against the patents filed by international communities and claiming the rights on the inventions on using neem seeds to protect crops and basmati rice to be a product raised originally in India. These case studies emphasize the need to have systems to track knowledge discovery and sharing, in turn also giving due credit to the true inventors and avoid the pain of inventing the wheel time and again.

A big positive to this book is the multi-disciplinary approach of integrating information technology with other sciences to enhance knowledge management. The research papers by different authors who have passionately shared innovative practices on knowledge management in their areas of specialization – biotechnology and bioinformatics contribute to making this book a rich reference material on knowledge management. Hence the repetition of some concepts across chapters can be looked at as a refresher to the reading audience.

K. B. AKHILESH

*Department of Management Studies,
Indian Institute of Science,
Bangalore 560 012, India
e-mail: kba@mgmt.iisc.ernet.in*

PERSONAL NEWS

P. L. Narasimha Rao (1913–2013)

P. L. N. Rao, a distinguished biochemist and microbiologist and former faculty member in the Department of Biochemistry, Indian Institute of Science (IISc), Bangalore, passed away in Mysore on 21 December 2013 after a brief illness.

Rao joined IISc in 1935 as a research assistant in the Department of Organic Chemistry (IISc) and then moved to the Department of Biochemistry in 1948; he was an Assistant Professor at the time of his superannuation in 1973. Rao moved to Mysore in 1990.

Following his intermediate in science from the Presidency College, Chennai, Rao received Ph D degree in Organic chemistry in the area of isoquinoline



alkaloids under the guidance of S. N. Chakravarti. His thesis was adjudged the best by Bombay University. During summer vacations he worked as a research scholar at IISc. When he became a research assistant in the Department of Organic Chemistry, he worked on terpenes – the total synthesis of pinonic acid, verbenone and allied compounds. His outstanding performance as a student and researcher earned him several honours and awards such as Lady Tata Scholarship, Prof. Sudborough Medal, Sir M.O. Forster Medal and Sir Ratanji Ranchotji Desai Gold Medal. He was a Fulbright scholar at the Universities of Wisconsin and Rutgers. Rao has published

more than 100 research papers in national and international journals. He was a member of several prestigious committees.

The initial grounding in the fundamentals in organic chemistry stood him in good stead when Rao moved to the Department of Biochemistry at IISc. For an individual trained as a chemist, it was not easy to turn into a biochemist, but V. Subramaniam (who later became the first Director of the Central Food Technological Research Institute, Mysore) desired that he join the Department of Biochemistry and thus he took up challenging problems in chemical biology. Late K. V. Giri who was then the Head, Department of Biochemistry welcomed his joining the department considering his expertise in organic chemistry as a great asset to students working in the department and Rao became the director of the newly set up Antibiotics Laboratory.

Rao's research interest was in the area of antibiotics from indigenous plant sources. The researches on morellin and guttiferin from *Garcinia* species by Rao and co-workers are of particular significance as morellin exhibited antibiotic properties against many Gram-positive organisms and was therefore of considerable interest at the time. There were at least seven students who worked on *Garcinia morella* and wrote their doctoral/Associateship theses on guttiferins, morellins and gamboge, included. The structure of morellin proved to be a difficult problem and could not be determined by conventional degradative methods, though Rao tried very hard. However, on the basis of the available data, he was the first to propose a tetra-hydroxanthone structure for morellin. It was later elucidated using X-ray crystallography by Kartha and associates in 1963. Rao also devoted considerable energies during the early 1950s and 60s on studying guttiferin and gamboge from *Garcinia* species, and the antibiotic substance pterygospermin from *Moringa pterygosperma*, its active principle being benzyl isothiocyanate. He was an invited speaker at an international symposium on isothiocyanates in Czechoslovakia in 1965. He initiated work on the synthesis

of antiviral compounds and their biological activity; and on potassium benzyl-amino-thiomethane-sulphonate and some of its derivatives. He also worked on the derivatives of sulphonamides and organo-seleno compounds. On his return from USA after visiting Rutgers (Selman Waksman's laboratory) and the University of Wisconsin, Rao initiated work on screening actinomycetes, mainly *Streptomyces* spp. from soil samples for potential antibiotics.

Rao is remembered by his many students, colleagues and contemporary associates as a skilled chemist par excellence and as a perseverant researcher. He had a firm grip on and a vast knowledge in all aspects of chemistry that drew other researchers and students alike from different departments and areas of research to sound him out on their own particular problems and hold discussions. I was one among his students who found out that Rao always stressed that quality was more important than quantity in research output. As one of his former students S. C. L. Verma remembers, 'independence of thought in work was his ideal and he would never cross his students' line of thinking in research'. He was a very approachable person and students could go to him any time for consultation and advice. At least fifteen students have worked with him for their doctoral theses. He kept a personal collection of fine chemicals such as terpenes, morellin, guttiferin, the pigment gamboge and certain purines and derivatives and other substances which had been isolated and purified by him along with some of his students. In later years, Rao gifted away his personal stock of some of these compounds to those working in similar and related areas.

Mentoring in scientific studies is what most of his students and associates would recall with great respect and fondness. P. R. Krishnaswamy remembers 'how he learnt to, "solve a puzzle, and got a good chemical education in nuances of nucleic acid chemistry and metabolic events in purine and pyrimidine biosynthesis and identification of degradation products of purines"'. My own work on guttiferin and morellin taught me to

apply a variety of analytical methods in organic chemistry which gave me great confidence and enthusiasm to branch out into biological problems in later years working on amino acids, proteins and such. Currently, there is a great interest in guttiferin and *Garcinia* products for various applications. Today, our early experiments, laboriously conducted without sophisticated instrumentation or ready access to fine chemicals, may look modest by comparison, but at that time it gave us a sense of being contemporary. We learnt to synthesize any chemical we desperately required for our work and therefore were able to do this through most part of our research careers and even until after it was not so difficult to import biochemical intermediates.

Rao was born on 12 June 1913 in Cuddapah District, Andhra Pradesh to Polur Virabhadra Rao and Pitchamma. Rao celebrated his 100th birthday on 12 June 2012 in Mysore when some of his former students and erstwhile colleagues from IISc and other organizations, many of whom have themselves retired, came specially to Mysore to pay their respects and honour. In the later years after his retirement, Rao became interested in many subjects and took to writing articles on several contemporary issues like Indian history, religion, philosophy, astrological and astronomical phenomena and to casting horoscopes based on his own calculations as a hobby. He also wrote poems in English. Over the last year he had become frail but continued to be interested in hearing discussions on current events, news and subjects of his particular interest. Rao is survived by his elder daughter and grandchildren and great grandchildren.

D. RAJAGOPAL RAO^{1,*}
K. V. NAGESHWAR RAO²

¹*Division of Food Sciences,
CSIR-Central Food Technological
Research Institute,
Mysore 570 005, India*

²*University of Chicago,
Chicago, USA*

*e-mail: gopaldr@yahoo.com