spectral methods, the use of Chebyshev polynomials in vertical direction is presented. The chapter also introduces parallel processing paradigm and briefly covers OpenMP and MPI approaches. The last chapter of this section begins with implementation of 'absorbing' top and bottom boundary conditions, focuses on treatment of side boundaries as permeable periodic boundaries, and then covers in detail the polar annulus and 3D Cartesian and spherical geometries. The chapter mentions two ways of treating absorbing boundary conditions; by gradually increasing the viscous and thermal diffusivities with distance away from the region of interest, or through Rayleigh damping. The equations and solution strategies for annulus and full 3D spherical shell geometries are discussed in great detail.

Part 3 covers advanced topics of magnetic field, density stratification and effect of rotation. This section deals with more advanced topics such as MHD simulations, anelastic models and rotation. The chapter introduces magneto-convection and then reviews the MHD equations. The magnetic induction equation is derived from the Maxwell's equations and then a problem of magneto-convection in a box in the presence of a vertical background magnetic field is discussed. Similar to the hydrodynamic convection, critical Rayleigh number for magnetic case and equation for internal gravity waves are derived. The analysis is extended to magneto-convection in the presence of a horizontal as well as arbitrary background fields. Further, the nonlinear MHD simulations are discussed.

The Boussinesq approximation is not valid for the convective interiors of planets and stars having large density variations. The chapter on density stratification introduces anelastic and pseudo-compressible approximations and presents equations for 2D Cartesian box and 2D cylindrical annulus geometries for anelastic approximation. Numerical treatment of these equations, linear stability analysis and nonlinear simulations are then discussed. The last chapter introduces the effect of rotation on convection and MHD dynamos. The Eulerian time derivative of velocity for rotating frame is presented and the concept of geostrophic flow is introduced. Two more important non-dimensional numbers, the Ekman number and the Rossby number are defined here. The chapter ends with full 3D rotating spherical shell geodynamo simulations and lists a number of significant problems related to planetary and stellar dynamos that should be addressed in the future.

The book contains five appendices describing codes for tridiagonal matrix solver, Legendre functions and Gauss quadrature and storing movie files, and simple directives for parallel programming environment. In addition, movie files for simulations discussed in the book are available online at http://es.ucsc.edu/~glatz/book. The website lists one erratum in eq. (10.8): 'The signs on the two terms on the right need to be reversed.'

In summary, the book is a valuable asset for undergraduate and graduate students as well as early career researchers in this field and would be extremely useful for classroom teaching.

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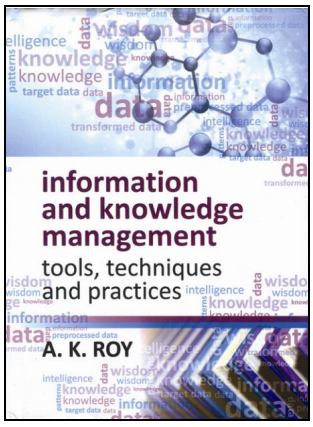

Information and Knowledge Management: Tools, Techniques and Practices. Ajit K. Roy (ed.). New India Publishing Agency, 101, Vikas Surya Plaza, CU Block, LSC Market, Pitam Pura, New Delhi 110 034. 2013. xiv + 665 pp. Price: Rs 2450.

'The basic economic source is no longer capital, nor natural resources nor labor. It is and will be knowledge.' This quote by Peter Druker aptly sets the context to understand the relevance of the topic discussed in this book. The first section of the book uncovers the fundamentals of knowledge management in three chapters by Alivelu *et al.*, Subudhi and Roy respectively. While Alivelu *et al.* uncode the DIKW (data, information, knowledge and wisdom) pyramid and introduce us to the tenets of data mining, Subudhi takes us on a through knowledge management and the changing need of IT applications and leaves us with an alert that the technology is abundant from wired-cables to cloud computing and we all should be prepared to adapt to it.

Acknowledging the insights shared by Rabi, Roy unearths the trends of knowledge management practice. A description of Nonaka and Takeuchi processes converting the tacit and explicit knowledge brings out the nuances of mastering the knowledge bases. The urgency to bridge the knowledge gap is aptly brought out by Roy as he states: 'The efficiency of a firm depends on how fast it bridges the gap between what it knows and what it needs to know.'

An introduction to the new roles identified in knowledge management research such as knowledge engineer, knowledge editor, knowledge brokers, knowledge shepherds, knowledge gatekeepers, knowledge navigators, knowledge asset managers and chief knowledge officers inspires us with the opportunities that lie ahead of organizations to build robust knowledge management departments. Read this chapter to understand what it takes to identify talent in knowledge management and develop it for organizational results.

An insight into the National Knowledge Commission's (NKC) vision and the emphasis on knowledge management in the Eleventh Five Year Plan (2007–2012) highlights the extensive roadmap for our future. The recommendation of Sam Pitroda (Chairman, NKC), and the action taken as follow-up on the NKC recommendations exhibit that we as a nation are moving in the right direction to make knowledge management one of our core strengths for growth and development. The plan to set up a National Knowledge Network (NKN) to interconnect all knowledge institutions in the country with gigabit capabilities for sharing resources and research, stands out as a big milestone to be achieved.

Also, a discussion on innovation in knowledge management practices in

public service organizations such as Defence Research and Development Organization (DRDO), Food and Agricultural Organization (FAO) and international bodies such as the World Health Organization (WHO), World Bank and UNDP (UN's global development network, advocating for change and connecting countries to knowledge, experience and resources to help people build a better life) is quite educative on the progression made in managing knowledge.

The latest tools and techniques for knowledge management are discussed in the second section. Balakrishnan and Soam have discussed cloud computing technologies and their application in bioinformatics. They have described the successful deployment of the commonly used comparative genomics tools. Rai explores the application of fuzzy logic in knowledge management. One of the famous applications of fuzzy logic in the Sendai Subway System in Sendai, Japan is discussed, wherein it is stated that the control of the Nanboku line, developed by Hitachi, used a fuzzy controller to run the train all day long. This made the line one of the smoothest running subway systems in the world and increased efficiency as well as stopping time. Read chapter 5 for a more in-depth understanding of this experiment.

Nagarjuna *et al.* present a study on knowledge management using semantic web. Here they share their innovation on semantic web technology using ontologies that enable machine-understandable semantics, eradicating the limitation of the web content only accessible to humans.

'Rough computing-based information retrieval in knowledge discovery databases' by Acharjya discusses the research done to organize huge amount of data in formal systems, which in turn provides outputs in more relevant, useful and structured manner.

An introduction to machine learning techniques and their application in bioinformatics by Mishra *et al.* engages the readers into an interesting research on how machine learning helps to automatically learn to recognize complex patterns and make intelligent decisions based on data. The reading gets even interesting while we flow into the next chapter on 'Tools and techniques for geospatial data knowledge discovery' by Jayanthi *et al.* They staunchly advocate in this chapter that the consistent reliable means to share geospatial data from one source among all users could result in significant saving of effort and energy. Spatial technology such as remote sensing, mapping and monitoring of existing natural resources and forecasting the future scenarios is discussed in depth. A description of the GIS technology – *Google Earth* that gives location-specific details of the globe is quite interesting. However, the authors of this chapter conclude with a caveat that India's topographical maps need to be reviewed and computerized and emphasize that making these data available is a national priority today.

The chapter by Omer *et al.* on 'Predictive toxicology using a machine learning approach' highlights the application of machine learning approaches in toxicity predictions. This chapter explains that the prediction of chemical toxicity is a significant challenge in both the environmental and drug development arenas.

Tilling and eco tilling are advocated to be highly effective as reverse genetic tools for functional genomics studies on plants and animals by Singh and Barma. They further elaborate that this aspiration of geneticists to unravel and elucidate the function-coded DNA may eventually lead to the development of public tilling and eco tilling services in numerous plant and animal species, which in turn will facilitate streamlining the process of functional genomics for all researchers.

In a chapter 'Advances in fusion techniques of thermal infrared and optical images for human face recognition', Bhowmik *et al.* have provided a detailed study on fusion methodology and its applicability on making biometric recognition simpler and robust.

Serving as an eye-opener to all learning and development professionals and academicians, a chapter on 'Usage of gadgets in Indian education sector and way forward to more effective education delivery' is interestingly discussed by Subhabaha Pal. The chapter convincingly puts forth that the way ahead for the education sector is about an exploration and infusion of technology to enrich the quality of education course delivery with an aim to reduce the gap of effectiveness between campus and distance education. Pal introduces us to gadgets such as smart phones, PC tablet and e-book readers that will help enhance the standards of education and proposes that if the cost aspect incurred to bring these gadgets to the learners is minimized, it will give a huge boost to the Indian education sector.

Section three of the book presents research work by several authors on databases, data mining, knowledge discovery in biotechnology and bioinfomation. For example, Madhuri, and Alivelu *et al.* educate the readers on the different genres of databases, data warehousing, data mining and knowledge enhancing platforms. Selvaraj and Singh prompt the proactive approach of prevention is better than cure, in the chapter on computer aided vaccine design. An account of the history of vaccine development, methods of making vaccines, new approaches to vaccine development and application of reverse vaccinology in vaccine design is provided. The authors conclude this chapter with the concern that many infectious diseases are still waiting for an efficacious vaccine. They share that for these diseases the traditional approaches to vaccine discovery have so far failed and therefore they propose identification of new strategies as a priority. In this context, the authors convincingly predict that *in silico* approaches are expected to play a key role in vaccine research, offering revolutionary tools for the identification of surface-associated proteins and virulence factors.

Section four of the book is dedicated to research work by several authors on data mining and knowledge discovery in agriculture and allied fields. Dey, Hasan and Sanjeev Kumar discuss their proposed strategies for knowledge management in agricultural domain. They unearth the essence of disseminating and transferring agricultural knowledge available and accessible to all key stakeholders. A valid concern is discussed, wherein large sections of the farming community, particularly the rural folk, do not have access to the huge knowledge base acquired by agricultural universities, extension centres and businesses. Given this situation, the authors strongly advocate that knowledge management is one of the tools to resolve this challenge of the agricultural community. Key ICT (information and communication technologies) considered for knowledge management in agriculture like data base and data warehouse, data mining, OLAP and analytical techniques, expert system, use of geographic information system (GIS)/global positioning system (GPS), internet/intranet, simulation and

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 poulty, 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 multidisciplinary 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.

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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