

big data from both academia and industry. Several academic institutions in the country offer courses both at undergraduate and graduate level on data mining. Also, there is a sustained interest from industry on data science; specifically there is a growing demand for data scientists. In this context, the book under review is a welcome addition to the existing collection of good books on data mining.

I could successfully use a part of the first edition of the book to teach a graduate-level course on data mining. Specifically material covered on association rule mining, clustering and decision trees was state-of-the-art. Further, it was the only book on the topic which had provided exercises at the end of various chapters. Most of the important contributions were covered in the discussion and an excellent set of references were provided at the end of each chapter. In the second edition, a chapter on rough sets was added, which is useful in soft computing.

In the current edition, the discussion on data warehousing is significantly enriched and a collection of some of the state-of-the-art references on this topic is provided. A popular soft computing tool in the form of genetic algorithms is examined in more detail. This edition can be used as a textbook for an undergraduate course on data mining and warehousing. However, the references provided at the end of chapters 4 to 11 correspond to publications that appeared before 2001. In order to make the book more useful to the current-day needs, the author may consider adding material on bagging, boosting, random forests, naïve Bayes classifier, topic models and map-reduce implementations in the future editions.

M. NARASIMHA MURTY

*Department of Computer Science and Automation,
Indian Institute of Science,
Bangalore 560 012, India
e-mail: mnm@csa.iisc.ernet.in*

Annual Review of Microbiology, 2013. Susan Gottesman, Caroline S. Harwood and Olaf Schneewind (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 67. xi + 653 pp. Price: US\$ 92.

From my graduate student days, I remember, the *Annual Reviews* was one of the most sought-after reading material on a given topic. Over the years, with the explosion in publishing, a number of other review journals have surfaced, but the *Annual Reviews* have retained their celebrated status. The *Annual Review of Microbiology (ARM)*, started in 1947, generally covers significant developments on a number of subjects in microbiology. The 30 reviews in this book deal with a whole range of diverse topics reflecting the long history of the subject and the revived (read revolution) interest to explore and understand microbial systems. Typically set in *Annual Review* mould, the reviews range from personal reflections on lac operon-based reporter systems, quorum sensing (QS), transcriptional regulation, biofilms, asymmetric bacterial growth, genomics, gut microbiome, microbial interactions, resistance and response regulation mechanisms. Reviews on archaeal, viral and microbial eukaryotes are included in good measure to complete a comprehensive volume.

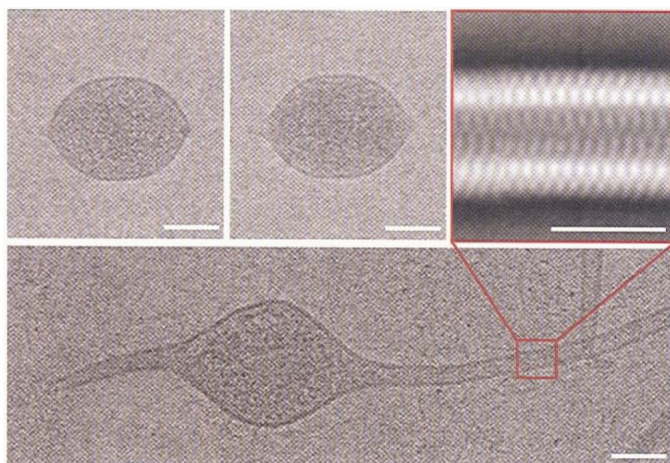
Personal reminiscence from an established investigator dwelling on lifetime achievement has been a characteristic opening review in this series. I have found such autobiographical scientific revelations inspirational and the review entitled 'Fifty years fused to lac' by Jonathan Beckwith is the top of the chart story. He describes the genetic fusions, wherein lac operon of *Escherichia coli* is fused to other genes and the use of such fusions to study various problems in biology. For those engaged in microbial genetics research and the students of biology, this is a must-read article.

Transcription and its regulation has been a subject of a large number of reviews. The article by Decker and Hinton attempts to compare the transcription initiation process between bacteria, archaea and eukaryotes. Strategies used for promoter recognition as well as to alter core promoter specificity across the three branches of the phylogenetic tree are compared and parallels are drawn. Given the extensive literature in this field,

the authors' task was challenging and hence some of the mechanistic details are inadequately described. In contrast, the review on 3'-cap-independent translation enhancers (CITES) of plant viruses provides a comprehensive account of this emerging subject. The variant CITES and their mechanism of action are described. The emergence of recombinant form which may facilitate avoiding resistance and increase viral host range is presented. In the two articles dealing with QS and biofilms, two contrasting overviews are presented. The first one reviews the vast body of literature on acyl-homoserine lactose-mediated signalling, which has been the paradigm for QS and the development of QS-inhibitory drugs. In contrast to the wealth of information on biofilm in eubacteria, very little is known on archaeal biofilm formation, although they are ubiquitously present in every possible habitat. The second review basically summarizes the current state of limited knowledge on archaeal biofilms formation – an emerging topic.

A scholarly review is presented on consequences and advantages of asymmetric bacterial growth by Brun and colleagues. While asymmetric growth and division has been well studied in *Bacillus sporulation* or *Caulobacter* cell cycle, the review also dwells on other kinds of asymmetry, utility and importance, and evolutionary aspects.

The following five articles deal with microbial interactions either as complex communities or specific interacting partner organisms or viruses. From the surge in literature in the last several years, it is apparent that metagenomic approaches have revolutionized the study of microbiology. Large-scale gut microbial genome sequencing efforts and culture-independent analysis of gut microbiome have generated a massive amount of data, with many startling findings. These studies have opened up new avenues to understand the mechanism of host-microbe interaction. Thus, the review on experimental approaches for defining the functional roles of microbes in the human gut deals with newer strategies to understand and utilize the vast body of information to explore the application potential. In a fascinating review on a biological tug of war between host neutrophils and human pathogen *Staphylococcus aureus*, the authors describe the elaborate steps involved in neutrophil recruitment, chemotaxis, their priming and activation to



Cryoelectron micrographs of the virions of *Acidianus* two-tailed virus, undeveloped and two-tailed.

defend the host cell from the invading pathogen. *S. aureus*, on the other hand, has evolved exquisite strategies to resist killing and the review sums up well the 'co-evolutionary arms race' between the host and the pathogen. A few other reviews in the volume deal with bacterial interaction and communication with its various partners. One of them, in particular, focuses on complex bacteria–fungi interactions as well as tripartite interaction involving plants and the potential to exploit the secondary metabolites involved in the process to develop new therapeutic entities.

In the chapter dealing with cnidarian–microbe interactions, Thomas Bosch has elaborated how in a relatively new model system *Hydra*, the components of the innate immune system and transcription factors of stem cells maintain homeostasis between these coelenterates and the resident microbial consortium. He suggests that the host factors play an important role not only in protecting the animal host from overt pathogens, but also in regulating the composition of the colonizing microbiota. In a similar vein, the article by Kondorosi *et al.* deals with the role of several plant factors in cellular differentiation of well-studied root symbiont, *Rhizobium*. The role of *Rhizobium* in acquiring permanent resident status in the root nodules to fix nitrogen has been dealt with extensively and has been a textbook material. The present review highlights the highly diverged variations in morphology and physiology of these endosymbionts in different hosts despite their common function. A must-read article for those involved in studies of plant–microbe interactions.

Among the reviews on virology in the volume, one addresses a more general question while the others are more specific. The review by Wasik and Turner provides compelling views on why viruses are more successful in evolving compared to their hosts. Given their greater abundance in nature, diversity, environmental tolerance and innumerable mechanisms of host control for their survival, it is not surprising that viruses are biologically more successful. With all the advantages they have, the authors argue that viruses are likely to be more ancient than cellular life and are poised for more success in future. The second article is an overview on viruses of archaea, the diversity, the nature of their genomes, evolution of host–virus interactions and comparison of their key features with viruses from other domains of life. The last article reviews elegant strategies evolved and employed by Herpes simplex virus for interacting with human host, attaining latency and ensuring its reactivation.

A few other reviews have dealt with stress response such as mechanism of acid resistance in *E. coli*, stress response mechanisms in bacteria against reactive chlorine species, hypoxic stress response-mediated gene expression in yeast and other fungi. Other chapters in the volume describe diverse aspects like microbial role in phosphorus cycling, how archaea play a crucial role in biogeochemical cycles, some of the electrophysiology studies on bacterial pores, high-resolution structure and functional aspects of export and efflux pumps from *E. coli* and *Pseudomonas aeruginosa*, structure and function of wall teichoic

acids in Gram-positive bacteria, etc. Two well-written reviews on protozoan parasites provide a balanced look for the book. An excellent coverage on how *Plasmodium* parasites invade erythrocytes and completely remodel these terminally differentiated cells, take control of protein traffic in the various subcellular locations to ensure their survival and success is authored by Boddey and Cowmann. *Plasmodium* and *Toxoplasma* are major apicomplexan parasites as they harbour an organelle termed apicoplast, essential for their survival. The apicoplast has evolved from a very ancient fusion of cyanobacteria with a red alga followed by secondary symbiosis with another primitive unicellular eukaryote. Thus, apicomplexans are a complex group of organisms originated by symbiosis and parasitism between different organisms. Dooren and Striepen explore the various molecular and cellular mechanisms that resulted in the formation of stable endosymbiont and its evolution as an apicoplast. The review highlights the emerging information on this unique organelle evolution, biogenesis, structure and function.

In summary, the 30 chapters which make up this volume are authored by a group of renowned scientists. These chapters include historical perspectives, detailed analysis of a process or a phenomenon, description of molecular mechanisms, information and discussion on emerging areas, and also summarize the vast body of literature on established topics of study. Thus, this deeply informative volume provides insights into cell biology, virology, molecular and organismal interactions. Most of the reviews have highlighted a few key references typically seen in some of the more recent review journal which I think is useful for further reading. In addition to a succinct abstract, the reviews contain a concluding paragraph, summary points on salient features and also list future issues on the topic. I find the volume an excellent reference book for researchers, teachers and students of microbiology.

V. NAGARAJA

Department of Microbiology and
Cell Biology,
Indian Institute of Science,
Bangalore 560 012, India
e-mail: vraj@mcbl.iisc.ernet.in