

lution of pathogens. Chapter 11 (Function, evolution, and classification of macromolecular transport systems by P. J. Planet, D. H. Figurski and R. DeSalle) rightly contends that secretory mechanisms are extremely pivotal to prokaryotes and probably more so for pathogens. It is from this standpoint that the evolutionary underpinnings of different secretory systems, viz. Type I (ATP-binding cassette transporters), Type II (main terminal branch), Type III (contact-dependent), Type IV (conjugation related) and Type V (autotransporters) have been discussed with combination of functional and phylogenetic analyses. Chapter 12 (The evolution of antibiotic resistance by D. Rowe-Magnus and Didier Mazel) is like studying evolution of pathogens in real-time as the span of evolution of antibiotic resistance is hardly six decades old. The role of mutator phenotype and the integrons in evolution of antibiotic resistance has been dealt in detail. The integrons are gene assembly platforms which can give rise to profound changes in pathogens allowing evolution to occur in quantum leaps much like that mediated by PAIs.

Section III (Evolution of selected pathogenic species and mechanisms) has five chapters wherein specific examples of microbial pathogens are taken and the discussion is more finely tuned. An overview (chapter 13) of this section by James Kaper, himself an eminent *Vibrio* expert, is a pithy account of emergence of TSST-1 carrying *S. aureus*, methicillin-resistant *Staphylococcus aureus* (MRSA), Enterohaemorrhagic *E. coli* O157:H7, high pathogenicity island (HPI) of *Yersinia enterocolitica* and *Mycobacterium tuberculosis*. Chapter 14 (Group A *Streptococcus* and *Staphylococcus aureus*: evolution, re-emergence, and strain diversification by James Musser and colleagues) is an account of genome-scale allelic variations in Group A streptococci (GAS) and *S. aureus* which tries to hammer out some of the long-standing controversial issues of the evolution of TSST-1 and MRSA. Chapter 15 (Evolution of enteric pathogens by R. Lan and P. Reeves) is a detailed account of the evolution of three important human enteric pathogens namely, *Salmonella enterica*, *E. coli* (including *Shigella*) and *Yersinia* spp. This covers a whole gamut of studies on *E. coli* reference (ECOR) strains, lateral transfer of O-antigen genes, pseudogenes and gene mosaics in

these pathogens. Chapter 16 (Mycobacterial evolution: insights from genomics and population genetics by A. Pym and P. H. Small) highlights some of the unique features of *M. tuberculosis* genome and its evolution – lack of PAIs and plasmids, though  $\approx 3\text{--}4\%$  of the genome is composed of mobile genetic elements, its evolution primarily by mutation rather than HGT, and how its genetic homogeneity has proved to be a challenge for studying its evolution. Chapter 17 (The evolution of fungal pathogens by J. N. Steenbergen and A. Casadevall) shows that evolution of pathogenic fungi is an altogether different ball game. There are discussions on the emergence of virulence among commensal and saprophytic human pathogens. Emergence of virulence in *Candida albicans* is intimately associated with changes in host variables. The commensal and pathogenic strains of *C. albicans* are genetically indistinguishable. The saprophyte-turned human pathogenic fungi generally attack phagocytes in the human host. Using *Cryptococcus neoformans* as a model, it was hypothesized that virulence probably arose in the environment during residency in amoebae such as *Acanthamoeba castellanii*. It was also shown that passage of *C. neoformans* through *Dictyostelium discoideum* enhanced virulence. However the molecular mechanisms of this have not been explored as yet. Thus the area of evolution of pathogenic fungi is still in its infancy.

This is an amply readable volume written by well-known experts. A couple of chapters on the evolution of pathogenic protozoa would have been a welcome addition. Nevertheless, the volume would be extremely useful to medical and molecular microbiologists, geneticists, molecular epidemiologists, infectious diseases experts and evolutionary biologists. A detailed index of the important keywords used in the volume has been provided. The language is extremely lucid, indicating that it might be useful even to postgraduate students of microbiology.

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**Microbes and Non-Flowering Plants: Impact and Applications.** Mamatha Rao. Ane Books Pvt Ltd, 4821, Parwana Bhavana, 1st Floor, Ansari Road, Darya Ganj, New Delhi 110 002. 2009. xxv + 565 pp. Price: Rs 1195.

The microbial world is very diverse and has attracted the attention of scientists all along besides being exploited in the fields of food, medicine, industry, biotechnology and genetic engineering. Microbes include bacteria, fungi, mycoplasma, viruses, archaea, protists, etc. Equally diverse is the world of non-flowering plants. However, exploitation of these is limited due to various reasons. Non-flowering plants include liverworts, mosses, ferns, gymnosperms and their relatives. Of late there is a growing interest in the potential of non-flowering plants in the area of biotechnology, particularly in medical biotechnology.

The total information that has been published about microbes and non-flowering plants is too voluminous and is scattered in all forms of publications. Further, there is hardly any compiled information on the economic potential of microbes and non-flowering plants which includes viruses, mycoplasmas, bacteria, algae, fungi, lichens, bryophytes, pteridophytes and gymnosperms. Therefore, the idea of the author to set up a database for the microbes and non-flowering plants is very apt and laudable, and the first step in that direction. Such databases would highlight the vast spectrum of microbes and non-flowering plants present in India and elsewhere and the related information can be used for exploiting the enormous economic potential of these microbes and non-flowering plants.

The author of the book has rightly pointed out that in addition to published information, there is a lot more valuable unrecorded information with people in the remote and tribal areas on the uses of microbes and non-flowering plants. This culture-based information, constituting ethnobotany, ethnomedicine and ethno-pharmacology will be lost forever if not recorded at the earliest. The author also emphasizes that there is an unlimited scope for bioprospecting diverse chemical compounds in microbes and non-flowering plants, and efforts are necessary to know what is already known, in order to save time and effort and to prevent duplication of efforts.

In such an effort, this book under review is timely and much sought after. It is an excellent piece of work synthesizing scientific facts and information on the impact and applications of microbes and non-flowering plants. The style of information presented is most appealing to both students of biology and lay readers. The book is divided into 24 chapters covering conservation and use of bioresources, biomolecules from viruses, mycoplasmas, bacteria, yeasts, fungi, lichens, algae, bryophytes, pteridophytes, gymnosperms, non-flowering plants in biotechnology, antibiotics, vaccines, microbial toxins, endophytes, microbes in industry and biodegradation. The sequences of chapters take the reader from one aspect to another with ease. In that sense, this volume has the appeal of an introductory textbook on the subject.

The first three chapters deal with known information on various subjects associated with microbes and non-flowering plants. Even though these have been described in the past by several authors in their publications, their inclusion in the first part of this book serves the purpose of orienting the beginners to the core issues on the applications of microbes and non-flowering plants in biotechnology. All the next chapters of the book provide the most comprehensive review of scientific literature on microbes and non-flowering plants and their biotechnological applications.

The first chapter deals with biodiversity and emphasizes the need for its conservation and sustainable use, the importance of bio-prospecting of microorganisms, the dual impact of organisms and environment. The author has stressed upon the need for bringing together the massive available information regarding

microbes and non-flowering plants in the form of 'Databases'. In the second chapter, a detailed account of species diversity, genetic diversity, microbial diversity and environmental evolution, hotspots of biodiversity and conservation is presented. The third chapter presents a detailed account on the importance of isolation of biomolecules and bioorganic compounds, their synthesis and bioactivity. A brief introduction to viruses, viral infection of microbes and viral diseases is discussed in the fourth chapter. The antiviral drugs, medicinal uses of viruses, applications of viroids and virusoids are all discussed in detail.

The fifth chapter is about mycoplasmas and diseases and this chapter is very brief. A detailed description of bacteria, the importance of actinomycetes as a source of antibiotics, their role in biological agents to control plant pathogens, important diseases caused by bacteria, uses of bacteria in human medicine, bacterial toxins and therapeutics, applications of bacteria in genetic engineering are all reviewed in chapter six. Chapter 7 elaborates on yeasts covering diseases caused by them, use of yeasts as food, medicine and their biotechnological applications. The eighth chapter is a very detailed account on fungal diseases in both plant and human diseases, including a large number of tables that are self-explanatory and very exhaustive. This chapter also covers the uses of fungi in food and medicine and also in therapeutics with a special account on VAM fungi and their uses.

Chapter 9 briefly highlights the medicinal value of lichens on food and their industrial applications. A detailed account on algae is presented in chapter 10. The chapter covers food and medicinal value of algae, biofuels, bioremediation, industrial applications and diseases caused by algae. Chapter 11 is a small chapter covering medical value of bryophytes and their use as pollution indicators. Pteridophytes as sources of food and in medicine, particularly in ethnomedicine, is dealt with in chapter 12. Food and medicinal values of gymnosperms, their use in ethnomedicine, and gymnosperms as sources of biomolecules are then presented in chapter 13. The chapters on mycoplasma, bryophytes, lichens and gymnosperms are very brief.

Chapter 14 is a synthesis of the latest information on the use of microbes and non-flowering plants in biotechnology,

applications of yeast, fungi, bacteria in biotech industries, genetic transformation of microbes, secondary metabolites, biopharming, biofertilizers, biofilms and biosensors. The chapter also gives a brief account on nanobiotechnology. The author has made a concerted effort to present the information about nanotechnological application of microbes which is an emerging area of biotechnology.

Chapters 15 and 16 are on the uses of antibiotics and vaccines, their sources and use in medicine. The role of endophytes in production of antibiotics, anticancer agents, antidiabetic and immunosuppressive agents is highlighted in chapter 18. Chapter 19 deals with fermented foods and beverages as well as traditional fermented foods from different countries. A detailed account of industrial application of microbes, production of amino acids, vitamins, sugars, lipids, hormones, steroids, solvents, enzymes and their industrial applications, microbes in production of biopolymers, bioplastics, biosurfactants and biofuels and biofertilizers are elaborated in chapter 20. A brief account of the microbial contamination of foods and food poisoning is presented in chapter 21. Similarly, a brief account of microbes is presented in chapter 22. The 23rd chapter is very elaborate and deals with the role of microbes in biodegradation of natural substances, hydrocarbons, explosives, radioactive wastes, pesticides and also the role of microbes in composting. The next chapter is the shortest chapter and it explains the applications of microbial lectins in determination of human blood



Pteridophytes. *Botrychium virginianum* var. *lanuginosum*.

groups and the detection of the onset of cancer.

In general, Mamatha Rao's work provides a broader conceptual framework highlighting the importance of microbes and non-flowering plants in biotechnology, which is an interesting subject in a way that manages to stimulate the readers' interest. The textbook is easy to read and understandable. The information is also up to date and lucid. This book has led to a greater understanding of the key concepts of the topic and has thereby increased interest in the subject and their impact on human welfare.

The pictures and diagrams are excellent and provide wonderful insights towards the title of the book, although the sequence of arrangement of figures could have been better arranged serially. The author has kept in mind that careful and detailed explanations of topics, and comprehensive and recent information coverage are all important criteria of any good scientific text book.

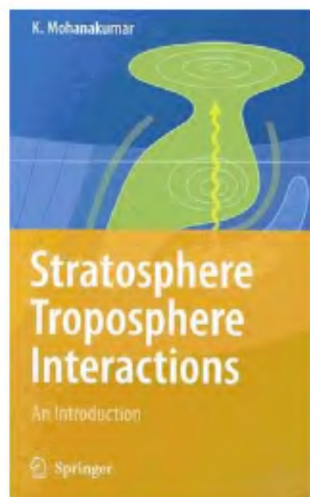
At the end of the book, the glossary of medical terms is very useful to the reader and its utility for researchers and practitioners. The authors have provided references to establish authenticity of the statements made in the text for each aspect. The scientific names of organisms provided as an index in the end of the compilation of text is relevant for the researchers to verify and utilize more information for the practical purposes.

The book is printed and bound well, contains very few typographical and spelling mistakes.

The book is a compiled source of information on microbes and non-flowering plants, and serves as an important reference book for graduate students, scientists and professionals interested in the subject.

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**Stratosphere–Troposphere Interactions: An Introduction.** K. Mohankumar. Springer-Verlag, Tiergartenstr. 17, 69/21 Heidelberg, Germany. 2008. xvii + 416 pp. Price: 69.95 EUR.

Stratosphere–troposphere interactions/exchange process is a subject which has gained immense importance in the field of atmospheric research in the last couple of decades. This stems from the increasing realization of the key role of stratosphere–troposphere exchange in affecting the climate. Dynamical, chemical and radiative coupling between the troposphere and stratosphere must be understood in evaluating the global change. Stratosphere is a region of high static stability, poor in water vapour and rich in ozone which are two important constituents of the greenhouse effect. In contrast, troposphere is a region of low static stability, rich in water vapour and relatively poor in ozone. Vertical transport of air and chemical species through the depth of the troposphere can occur on time-scales as short as a few hours, whereas it takes a year or more in the lower stratosphere for a similar altitude range. The tropopause marks the transition between troposphere and stratosphere. In the tropics it is generally well defined by a sharp minimum in the altitude profile of temperature whereas at higher latitudes the temperature minimum is not sharp and quite often a region of nearly constant temperature separates the troposphere and stratosphere. Even in tropics it is physically more meaningful to consider the region of transition between dominance of convective equilibrium and radiative equilibrium separating troposphere and stratosphere and this region is

called the Tropical Tropospheric Layer. This layer is the gateway for the entry of water vapour into the stratosphere from troposphere and for ozone transport.

While there are textbooks in atmospheric science dealing with atmospheric dynamics and chemistry, there are practically none specifically on stratosphere–troposphere interactions and the relevant physical processes. In view of its growing scientific importance, a textbook on this subject especially intended for undergraduate and graduate students and for those who want to pursue research in this area is a long felt need. The book under review eminently fulfils this need. Mohankumar himself made many important contributions to the area of solar influence on stratosphere and stratosphere–troposphere exchange processes and this is amply reflected in the presentation of the various topics relevant to stratosphere–troposphere interactions in this book. Radiative processes in the lower and middle atmosphere, dynamics of the troposphere and stratosphere, waves in the troposphere and stratosphere and chemical processes are dealt with in the book in minute detail. The subject of antarctic ozone hole, which is of great scientific and also public interest, is presented in detail. The stratospheric influence on tropospheric weather and climate, a topic of current scientific interest is also dealt with.

In a book of this nature dealing with a subject of current scientific research, there are bound to be a few overlaps, repetitions and omissions (at least in the first edition!). Some of the topics described in a chapter are repeated again in a later chapter in a little more detail. For example, the basic topic of vertical structure of pressure and density (hydrostatic equation) described in the first chapter is described again in a later chapter (on dynamics) in some detail. This should have been dealt with in the first chapter itself along with the assumptions involved including the general and realistic case of non-isothermal atmosphere. Description of jet streams, quasi-biennial oscillation and semi-annual oscillation is in the first chapter. It would have been useful if these aspects were dealt with after the chapter on dynamics so that the physical mechanisms of these can be better understood. The topic of atmospheric tides is very important and relevant but is not included in the chapter on dynamics. Convective–radiative equilibrium, thermal balance of