

suggested as a target. Now the Department of AYUSH, under the Ministry of Health and Family Welfare, has published the first volume of *The Ayurvedic Pharmacopoeia, Part II (Formulations) (API)* which was released in December, 2007. This covers quality specifications in the form of a monograph for 12 Avaleha (jam-like semi-solid preparations), 11 Churnas (powder formulations), and 12 Grithas (medicated ghee preparations-herbalized clarified butter preparations), 1 Guggulu recipe, 1 Gutika (a pill), 6 Ksara/Lavana (alkaline substances from ash of plants), 6 Taila (medicated oils), 1 Lepa (semi-solid preparation for external use) – 50 recipes in all.

The book has for the first time provided quality specifications for all these recipes, involving description, physico-chemical tests, a mandatory thin layer chromatographic (TLC) test for establishing the chemical profiles, which in some cases have been also made into a quantification of a known chemical marker compound. Each monograph also gives the standard operating procedure (process) for making the recipe apart from the composition of the formulation, its dose and therapeutic use. In the General Notices to *API*, deviations that are permitted from the composition or process, including use of official substitute, deletion of a drug or herb that is banned from commerce have been clearly stated, in addition to allowing a permitted preservative when products are to be stored for long periods of time. The *API* also provides limits for heavy metals, pesticides, microbial contamination and aflatoxins. The pharmacopoeial methods for all the tests prescribed have been provided at the end of the book.

The book provides interesting and historical information on the developments of standards on ayurvedic herbs and ayurvedic formulations in its preface and introduction. Appendix 6 provides definitions and methods regarding ayurveda. Appendix 7 provides useful information on metric equivalents of weights and measures described in classical ayurvedic texts. It also gives general monographic information about each of the dosage forms for which the quality monographs have been included. It should be recognized that the Pharmacopoeia is a book of standards and the additional information really makes the publication useful.

A review of Pharmacopoeia published by other countries like the UK<sup>2</sup>, USA<sup>3</sup>

and Europe<sup>4</sup> reveals that recent editions have introduced monographs on individual plants with medicinal value. These quality monographs in almost all cases have a quantitative test and limit for one or more well-characterized chemical substances (bioactive marker or analytical marker). However it is hard to find quality monographs on finished formulations having more than one medicinal plant and hardly any that are polyherbal in nature. One can find such quality monographs for polyherbal traditional medicinal formulations only in the *Chinese Pharmacopoeia*<sup>5</sup>. It is to be recognized that regulatory standards in any pharmacopoeia are required to lay down minimum acceptable standards for industry-wide acceptance. One may have liked to see more formulations with specific marker compound analysis and quantification of possible bio-actives in all the formulations. Such an approach will serve scientific expositions. This kind of information is still not available for ayurvedic formulations, and even if available, may show the presence of small proportions of chemical markers which would need highly sophisticated measurement techniques, not necessarily adoptable by the large number of medium and small sector ayurvedic industry (more than 6000 pharmacies are reported to produce ayurvedic products in India). Recognizing this, the *API* states that the quality specifications have been kept modest. Viewed in this context and perspective and given the challenges of analytical science and the need for such quality specifications, the publication of this *API* is a step in the right direction, and is commendable.

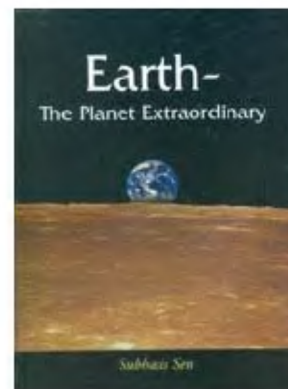
Though this book is primarily of regulatory nature, it also provides a lot of information. It could be made more informative by reproducing the TLC profiles as photodocumented, and also photodocumentation of the microscopic tests prescribed for easy reference by the users. It also provides an opportunity for anyone to get a sample of the ayurvedic products covered in this *API* tested by any of the more than 25 approved public test houses for quality, a long-standing need fulfilled. It is not known whether the industry, the final user of such specifications, was involved in the development of the monographs, as no mention appears in the book, and whether any collaborative testing was undertaken for the products covered in the pharmaco-

poeia. Its strict enforcement by way of insistence that the products be labelled with the term 'API Pt II V-I' after the name of the ayurvedic recipe, indicating the compliance to these standards as required under the law would improve public confidence.

1. Valiathan, M. S., *Curr. Sci.*, 2006, **90**, 5–6.
2. *British Pharmacopoeia*, British Pharmacopoeia Commission, London, 2007.
3. *United States Pharmacopoeia 31, National Formulary 26*, United States Pharmacopoeia Commission, Maryland, USA, 2007.
4. *European Pharmacopoeia*, European Directorate of the Quality of Medicines, 2007, 6th edn.
5. *Pharmacopoeia of Peoples Republic of China*, Pharmacopoeia Commission of the Ministry of Public Health, Govt of China, 1997.

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**Earth – The Planet Extraordinary.**  
Subhasis Sen. Allied Publishers Pvt Ltd,  
I/13-14, Asaf Ali Road, New Delhi 100 002.  
232 pp. Price: Rs 380.

The earth is an extraordinary and unique planet, home to more than a million life forms, including humans. To understand the earth to its full depth of 6400 km, however, no tangible material is available for study. Geoscientists look for phenomena at the earth's surface that provide clues to the properties and behaviour of matter deep inside the earth. The deepest underground mines, e.g. Kolar gold mine, India and Witwatersrand gold mine, South Africa, have reached a

depth of 3 km, while the deepest borehole drilled exclusively for research purpose to a depth of 12 km at Kola Peninsula, Russia has provided direct evidences of the earth's materials and processes to a depth of 12 km. Rapid accumulation of data in the fields of geology, geophysics and geochemistry in recent years has significantly added much to our understanding of the physical and chemical nature of the earth's crust, mantle and core, and the processes that are occurring inside the earth. The earth, as we realize it today, has undergone several stages of evolution. Similarly, different theories and hypotheses have evolved in understanding the earth and its processes. As a result, several theories emerged, some of them were totally discarded, some got modified, while some new theories and concepts came into existence. Yet many aspects of the earth sciences have still remained speculative and unresolved. The book under review presents briefly almost all major theories and hypotheses so far developed pertaining to the earth and its processes. However, the author supports the earth expansion theory, and based on it, he interprets the total earth system including global tectonics, which explains the cause of the earth's expansion, formation of continents, oceans, mid-oceanic ridges and mountain ranges, the nature of mantle, core and fluid geosphere, magnetic features, distribution of temperature, pressure and gravity in the interior of the earth, cause of perennial heat of the earth and various other features of global significance.

The first chapter gives an interesting account of sequential development of the science of geology since 275 BC. The second chapter discusses the shape of the earth, while the third chapter deals with the composition of the earth and distribution of gravity, pressure, density and temperature in the earth's interior. However, a good account of the physical nature and composition of the crust, mantle and core should have been given. In the fourth chapter a brief account about how the concept of isostasy as well as the concept of geosynclines blossomed has been given. The convection hypotheses of different authors have been described in the fifth chapter. The earth's contraction hypotheses of Beaumont, Kober, Suess, Green and others have been briefly described in chapter six. In chapter seven, Harmann's concept of oscilla-

tion theory, Bucher's pulsation hypothesis and undation concept of van Bemmelen have been given. Different types of meteorites are described, along with a brief account of the date of fall, time, weight, specific gravity and composition of some selected meteorites found in India are given in chapter eight. In chapter nine, characteristics of earthquake waves (seismic waves) and their applications in determining composition and structure of the earth's interior are discussed. A short but informative account of seismic discontinuities, crust, mantle and core has been given. Chapter ten deals with the magnetic phenomena of the earth, causes of magnetism, rock magnetism, palaeomagnetism, magnetic character of the sea-floor and concepts of sea-floor spreading.

The concepts on global tectonics other than continental drift and plate tectonics, like sliding continents, sheet evolution of continents, thermal expansion and generation of compressive force, models of tectonospheric earth, splitting continents, rotating plates and self-organizing evolution of dissipating structures are discussed in chapter 11. These concepts, in general, are not described in recent books, and some readers may find it interesting to go through these aspects. An account of continental drift, describing the historical development of the concept since 1545 is given in chapter 12. Now it is well known that the continental drift theory became almost invalid during the mid-sixties after the emergence of the plate tectonic theory. It is surprising to note that the author has recorded more than 40 references from 1962 to 1996, supporting the continental drift theory, while he himself supports the drift theory.

Chapter 13 refers to preliminary aspects of the well-known concept of 'plate tectonics'. Plate tectonics has emerged as one of the significant breakthroughs in the study of the earth system. It is also a well-known fact that the convection current in the upper mantle is the shear driving force for the lithospheric plate movements and plate tectonics. More emphasis should have been given to this particular chapter, with relevant maps and figures. In chapter 14, entitled 'The bone of contention', the author mentions that he differs with the concept of plate tectonics in respect of various points. He is of the opinion that the mantle is a rigid body and hence convection currents cannot be expected in the rigid mantle. Fur-

ther, he assumes that the dimension of the primordial globe in which the continents occurred in a conjoint manner, must have been different and characterized by a greater curvature of the surface, i.e. in a smaller globe. There are several other points in this chapter contradicting plate tectonics that are interesting to read, but are not scientifically conceived and lack supporting and convincing evidences.

The author gives more emphasis to chapter 15 that deals with the earth's expansion theory, and it seems he is a strong believer in this theory. Various theories of earth's expansion have been discussed in this chapter. The author himself has given his own concept of expansion based on his views on geotectonics. The theme of chapter 16, 'Unified global tectonics', forms a key subject, which is essentially based on the expansion of the earth, in contrast to that of plate tectonics and many other hypotheses presently existing. Based on expansion theory, he has discussed segregation of continents, evolution of ocean basins, earth's magnetism and gravitation, earth's mantle, core and perennial source of the earth's interior heat. Based on various structures, textures and low-temperature minerals in both metallic and rock meteorites, the author suggests that a low-temperature zone may exist in the deep interiors of the earth. In chapter 17, global features like evolution of the oceans, symmetrical disposition of ridges and continents, evolution of Pacific region, faults, trenches, ridges and mountain belts, including origin of the Himalayas have been justified with the help of earth's expansion theory and rotation of the earth around its axis. A brief account of tectonics in Precambrian terrains with special reference to the Indian subcontinent is given in chapter 18. In chapter 19, the evolution of global environment including extinction of dinosaurs and extensive volcanism have been discussed based on the expansion-oriented tectonics. In chapter 20, the author concludes that this book can be the beginning of a new chapter in the realm of earth sciences and planetary geology recommending the earth expansion theory, while the concept of unified global tectonics discussed in the book for understanding the earth can be rationally extended to unlock the mysteries of other planets of the solar system. Further, he opines that the most important agenda for the earth scientists right now is to make a

thorough retrospective analysis of various hypotheses and theories with an open mind.

The book does not have adequate illustrations and figures, while the limited number of figures given are not of good quality. There are a large number of excellent books available on various aspects of the earth and its processes. The only individual aspect of the present book is that it seeks to provide an explanation to global tectonics and the global features largely based on the concept of the earth expansion theory. However, till date evidences for an expanding earth are either ambiguous or are based on tenuous and ad-hoc assumptions. Also, it has not yet been possible to find a satisfactory mechanism for planetary expansion.

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#### Annual Review of Plant Biology, 2007.

Merchant, Briggs and Chandler (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. vol. 58. 501 pp. Price not mentioned.

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It is a pleasure to read an issue of the *Annual Review* in any subject area, and the 2007 edition of the *Annual Review of Plant Biology (ARPB)* is no exception. *Annual Reviews* have been the staple diet on which most of us have grown up as research scholars. The credit goes to their authors, editors and publishers, who have ensured that the volumes continue to be not just relevant but also critically important for researchers today, despite the advent of the minireview culture and the growth of monthly review journals over the years. For anyone seeking a single-point entry for comprehensive and balanced reviews of the literature and an excellent source of back references with complete citation details, there are very few alternatives to the *Annual Reviews* even today. This is particularly important for young researchers who need to know what is known and what it not, as well as how to proceed further, from a broader perspective, before they can better appreciate the latest insights, slants, trends and opinions, which have their own value.

The *ARPB 2007* presents an excellent collection of 20 definitive and timely review articles encompassing most of the dominant themes in plant biology today. In addition, there is the frontispiece, a feature unique to the *Annual Reviews* that provides fascinating insights into the triumphs, trials and tribulations of doing science and developing technology, straight from the scientists at the centre-stage of all the action. In this issue, Diter von Wettstein's frontispiece is an account of his group's genetic engineering of barley for improved (animal) feed and metabolic engineering of proanthocyanidin-free barley for haze-free beer. Besides the interesting narrative of research in his laboratory and elsewhere spanning over nearly three decades, his perspective highlights the inter-connectivity between what we often artificially segregate as basic science, applied science and technology development.

Reviewing the 20 articles comprising this 500-page volume is a daunting task. An attempt is made below to capture some of the highlights from related groups of articles in the following section from our own perspective based on plant signal transduction and gene regulation.

Light is critical for plants, not only as a source of energy for photosynthesis but also as a signal for numerous physiological and developmental processes. The review by John Christie on phototropins highlights the role of these blue light receptors (with light-activated ser-thr kinase activity) in phototropism, stomatal opening, chloroplast movement and other light-dependent processes that serve to optimize the photosynthetic efficiency of plants. One of the most critical developmental processes regulated by light is stomatal opening, which includes blue and red light-mediated events. While Bergmann and Sack discuss the relationships between the environmental signals, stomatal development genes and control mechanisms of shoot gas exchange, Shimazaki *et al.* review the myriad mechanisms in stomatal development, including the synergistic interactions between blue light (phototropins) and red light signalling processes and guard-cell chloroplasts. The article also throws light on the properties of the plasma membrane H<sup>+</sup>-ATPase in guard cells and the possible role of type-1 protein phosphatase in mediating light signalling.

Continuing on the theme of signalling, the review by Schachtman and Shin offers

a comprehensive and unparalleled insight into the events that lead to plant responses to nutrient-deficient conditions. From the commonalities and differences in response to phosphorus, nitrogen, potassium and sulphur deficiencies to nutrient sensing and signalling, the authors cover a vast and yet relatively uncharted domain of research, putting the downstream responses of nutrient deprivation in perspective. With the rising nutrient input costs in agriculture and the adverse environmental impacts of poor nutrient use efficiencies in crop plants, an integrative approach to the development of nutrient-efficient varieties is the need of the hour. The article by Osmond *et al.* offers an in-depth perspective on the recent advances regarding the role of various nutrients and phytohormones in root branching, which are important in plant growth and development. Spanning genetic methods involving *Arabidopsis* to alternative high throughput approaches like microarray and proteomic analyses of root branching, it raises some pertinent queries about the nature and regulation of pathway(s) controlling initiation and maintenance of root meristems across root types.

The search for the role of plant hormones in plant development and productivity has also drawn the attention of researchers towards the mechanisms of hormone signalling. Gibberellin (GA) is a well-known phytohormone that affects a range of plant responses and occurs as soluble and membrane-bound forms. Ueguchi-Tanaka *et al.* have traced the history of attempts to identify receptor candidates for GA and their role in GA-signalling. Discussing the key steps of GA-signalling pathways and the role of DELLA proteins, the review throws light on the biochemical and physiological characteristics of the GID1 GA receptor. With several lines of evidence suggesting the presence of a plasma membrane-bound GA receptor, identification and isolation of such a receptor is the next objective. Interestingly, these authors, who were among those who originally characterized some GA-insensitive rice dwarfs as G-alpha mutants and strongly suggested G-protein pathways in GA-signalling less than a decade ago, now cite their unpublished data to advise that the 'involvement of trimeric G-proteins in GA signaling should be reviewed with care'. Our own comparison of microarray-derived G-alpha responsive and GA-responsive