

distinct format of this article with a long list of references and material for further reading seems to have met the editor's approval.

The 'Climate in the tropics' should perhaps have followed immediately after the 'Air around us'. The authors have adopted a style that definitely addresses the youngsters and have brought out how much the satellites have aided in understanding the climate and the weather, specifically in the Indian context. The awesome combination of space technology and computer technology that is the lifeline of such fields, is evident in the article.

'Changing face of the earth', due largely to the human dominance of this planet is elucidated in a rather too brief an article, reminding one that the space does cover the earth too. Curiosity is aroused by many interesting remarks like 'more water goes through the vegetation into the atmosphere than flows through all the rivers in the world', but the scientific descriptions that would satiate the curiosity are missing.

Astronomy has always been an exciting science and the present-day space science and technology have drawn inspiration from this branch. In the past four decades the space missions, in return, have had great influence on astronomical observations – confirming or revising the beliefs on the evolution of the cosmic bodies and making exciting new discoveries. The sections on 'The solar system' and 'low and high energy astronomy' take the reader far from the hitherto geocentric science to the frighteningly expansive and active deep space. The difficulty of condensing a large amount of exciting information into a few pages of popular reading is perceptible. Yet the articles are refreshing, especially the one on 'Low energy astronomy' whose language, style and clarity will meet the appreciation of young readers.

Though the effects of space environment, in particular of reduced gravity, have been of interest since long, it has gained immense importance in the last fifty years due to the necessity of proper functioning of equipment and living beings in space missions. But man is also attempting to exploit the now-available space environment for furthering the conventional science and technology, such as material processing. The article on 'Material science in microgravity' delineates some advantages and issues, but

strays away from the central theme of space science. In 'Living in space', one finds a lucid description of how microgravity among all environmental effects, would have a severe influence on the earth-based biological systems trying to conquer space. There is also a good case made for manned missions. The author, in the inimitable Russian style of writing popular science, answers many questions that many of us have in our minds, but hesitate to ask.

Going a little further, in 'Astrobiology – A new dimension is life science', the author shares his personal experiences and excitements with the reader. The article is rather too extensive to be appreciated by non-biologists, but throws light on many unexpected and surprising findings in astrobiology. The author is very candid in admitting failures and limitations of the studies so far, but offers good arguments for continued activities in this field in future.

A book of this nature cannot possibly avoid the ever-fascinating question of 'Life in other worlds' or the search for extraterrestrial intelligence. Although it strikes a different note from other pieces in relating to commonly perceived space science and technology, the article makes a good reading with some interesting but less-known references, such as Miller's experiment and Drake's equation.

In the end, the editor, returns to summarize the contents of the book and provides a glimpse of the future activities and strategies in space science. As he puts it, the promises are greater, the tasks harder and the demands on technology more than ever before.

Bringing out a compendium of this type is indeed a difficult task. Each author writes in a different style, format and level. The book does justice to its proclaimed readership of school and college students, but falters at places by dwelling too long on simple concepts and leaving a few important ones unexplained. There are indications that some of the articles are at least a few years old, which makes a difference in this rapidly-advancing field. Some articles seem to be specific to the Indian scenario, while others address a wider readership. In general, more figures and pictures could have been used to illustrate the concepts effectively and reduce the text to some extent. At the same time, some of the plates could have been replaced by good line diagrams (examples of which are com-

ponents of sounding rocket and orbital parameters) and some others could have been deleted without any loss to the descriptions. There is also repetition of ideas, simply because each author appears to have worked on his script in isolation.

Space science, as a theme, permeates into many basic disciplines and is not easily amenable to confine within the covers of a single book. It is likely that each topic presented here can be found elsewhere; but is equally unlikely that all these topics are found together at one place. From this point of view, this book is an outcome of a commendable effort. Not many readers might like to read all articles, as many of them appear too distant from their basic interests. But the reviewer wishes to recommend reading of all the articles to any serious pursuer of space science, especially the young unbiased ones who can discover for themselves many astonishing and fascinating facets of space science.

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**Green Pharmacy.** James A Duke. Scientific Publishers, P.O. Box 91, 5a New Pali Road, Jodhpur 342 001. 2002. 508 pp. Price: Rs 850.

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Herbs or medicinal plants have attracted serious attention of scientists only in the last two centuries. But primitive man who lived close to 'earth' – the planet, depended on plants for both food and medicine. Mankind had realized very early the value of herbs as a 'gift from the divine' to heal both bodily and mental ailments.

While being dazzled by the wonders performed in scientified laboratories – particularly now (in the 21st century) with such tremendous advances in genetics, molecular and cell biology, we tend to forget that plants were synthesizing and storing potent and useful products

long before man became aware of them. Plants not only afforded the firm fibres which were twisted into ropes by man, but the lucrative business of elastomers and plastics also owe their origin to plants. Vital food products – carbohydrates, protein and fat, as also micronutrients (like vitamins, trace elements, etc.) and fibre are derived from the plant world. Most importantly, plants first synthesized highly potent drugs for which man found use in treating diseases like malaria (e.g. quinine from cinchona).

Morphine from opium poppy; aspirin/salicylates from willow/wintergreen; digoxin from digitalis or foxglove; vinca alkaloids from periwinkle plant; penicillin from penicillium (fungus); reserpine from rauwolfia; taxol from taxus plant; guggulsterones from gum guggul; artemisinin from qinghaosu (Chinese plant) are some of the famous examples of potent drugs valued in therapeutics. Plants have, in fact, taught scientists how to imitate the chemical synthesis of many useful products in the laboratory.

It is not surprising therefore that despite the strong hold of the conventional or Western (allopathic) system of medicine in the developed world as also most of the developing world, herbal medicine or green pharmacy has not only come to stay, but is growing slowly and steadily in its range and outreach. In the US and Europe (particularly Germany), herbs and herbalists are in great demand, and there are special regulatory bodies like Commission E in Germany, to advice on plant-based drugs.

In India (and a few other South East Asian countries), herbs are used not only as household remedies but are also prescribed by the practitioners of various indigenous or traditional systems of medicine (officially recognized and licensed by the Government of India) such as Ayurveda, Siddha, Unani and Naturopathy. There are also other registered medical practitioners (RMPs) who prescribe herbs. There are many pharmaceutical companies who specialize only in manufacturing herbal products.

Through intensive studies, phytochemists now know the type of active principles (chemical entities) one can expect to find in medicinal plants, which include alkaloids, glycosides, saponins, sterones, tannins, enzymes, bitters, starches, etc. Some of the alkaloids, glycosides and saponins are also powerful poisons. Modern research on herbs in the developed

countries aims to find new (more potent or safer) remedies for ailments which are considered refractory (i.e. not satisfactorily responding to the conventional, allopathic system of medicine). The herbal products which successfully pass through the various 'drug development' stages, as prescribed by the Drug Regulatory Agencies of the country (which may take 8 to 10 years at least) are then licensed to be manufactured and marketed. Others which may require more studies, but are in great demand by the public find a place in 'Health Food' counters!

Standardization and quality control of drugs derived from the plant source have been a subject of intense debate and study in India in recent years, and almost all leading Indian organizations concerned, such as ICMR, CSIR, ICAR, DST, DBT, as also the ISM (Indian Systems of Medicine) Councils have been engaged in this exercise in some form or the other.

There still exists considerable skepticism among doctors (physicians and surgeons) as also scientists regarding the efficacy of herbal medicine due to various reasons, some of which are cited below:

(i) Many of the claims made by the herbalists and by various complimentary or alternative systems of medicine in different parts of the world have not been always substantiated by scientific investigations.

(ii) Many herbalists do not always believe in rational analysis of the drugs (in terms of pharmacognostic, phytochemical, pharmacological and clinical studies). This is particularly true of food items which are also used as drugs.

(iii) Evidence-based study (through randomized clinical trials) takes enormous time, efforts and funds, particularly in the case of plant-based drugs. Research on plant-based drugs calls for co-ordinated and integrated multidisciplinary studies over a long period, which can discourage scientists as well as the industry.

(iv) Most studies on herbal drugs are often not carried out according to national/international scientific norms and the results are not documented or published in standard journals.

(v) Pharmaceutical industry is not always keen to sponsor/undertake research on herbal drugs, due to deficiencies and difficulties in patenting, standardization and quality control of natural products, particularly when compound herbal or herbo-mineral formulations are involved.

(vi) Many plants/herbs can have potent pharmacological/therapeutic efficacy, but may not yield single/straightforward active principles. In fact, this reviewer believes that well-planned, randomized clinical trials on patients can be successfully carried out to obtain authentic results, without insisting on or waiting for isolation of active principles of plant drugs, specifically if the drug/device is prepared carefully as practised by the clinicians. A classic example is the now well-known multi-centred clinical trials on kshaarasootra (ayurvedic medicated thread) in anal fistula (centrally co-ordinated by the ICMR).

In fact, there are instances where the crude extract may have promising biological activity, which may get diluted when chemical fractionation is done. Further, while natural chemical active principles show potent medicinal properties, their synthetic analogue may have no biological activity (for example, curcumin from *Curcuma longa* or turmeric).

Despite these problems and pitfalls, however, there are success stories (enumerated earlier) which encourage sustained global attention on 'green pharmacy', by scientists as well as health-care providers.

In the past three decades, subsequent to the recognition of the role of the 'traditional systems of medicine' by the World Health Organization, there has been growing interest in promoting herbal remedies for primary health care, and a number of articles, monographs and books on plant drugs have been periodically published. In India, important publications have been brought out by the CSIR (*Wealth of India; Indigenous Drugs of India* by R. N. Chopra); ICMR (*Medicinal Plants of India*), Individual laboratories of CSIR (CDRI, Lucknow; RRL, Jammu). Individual experts like K. M. Nadakarni, Vaidya Bhagwan Dash and H. K. Bhakru, have also published useful booklets on common herbs with healing properties.

The book under review by James A. Duke reflects the painstaking work done by the author in collecting information on hundreds of useful herbs and presenting it in an orderly and interesting manner. Duke brings his extraordinary insights and enormous experience (of over six decades) into this effort, offering information and advice on herbal remedies which could be used by the common man, for a variety of ailments ranging from aging, arthritis, asthma through

headache, heart disease, high blood pressure, high cholesterol to menopause, multiple sclerosis, warts, wrinkles and yeast infections. Each condition is alphabetically arranged and apart from description of the herbal remedies, Duke provides his own special recipes in each chapter. The text is interspersed with highly fascinating anecdotes based on his own experience as well as his discussion/dialogue with other experts. Illustrations of plants done efficiently by Peggy Duke are an added attraction. Part One gives a useful, step-by-step guide to the newcomer, helping to build one's own green pharmacy through simple and clear instructions.

Authentic scientific database built by Duke provides useful information cited in the text, which enriches its value. However, I am surprised that the book is totally bereft of references or bibliography of published results. While many anecdotes included in the book and opinions of individual authorities may not call for support by references to published literature, this cannot apply to the scientific data included, such as results of research published from different parts of the world (e.g. p. 28, study on garlic for aging; Japanese as also Indian studies on gotukola; p. 35, studies on the effect of reishi in Chinese workers on altitude sickness; p. 92, Indian study on the effect of jasmine flower on lactation, etc.).

Despite this shortcoming, however, the book offers a delightful journey through ethnobotany and herbal recipes, enriched with loads of scientific information on the causes and physiological/pathological mechanisms of various health problems and a choice of herbal remedies, the methods of preparation offered in a most lucid manner.

The author's postscript on a 'Lifetime of loving plants' is absolutely delightful and reads almost like poetry. James Duke brings so much of his own personality and philosophy to this treasure house of knowledge and wisdom on herbal remedies. Duke also cautions the reader repeatedly that, as he is not a medical doctor but a botanist with expertise in herbal remedies, one should seek medical opinion for diagnosis of the disease (in all cases), and in certain cases even before starting the treatment (because of possible interactions with conventional drugs). The contraindications for several herbs (such as pregnancy, hepatic dysfunction, allergies) are clearly mentioned.

I would recommend this book to all those interested in herbal remedies, including the common man, health care providers, scientists, students and experts in herbal remedies. The book has something new and original for all these groups.

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**Sustaining our Food Security.** R. S. Paroda. Konark Publishers Pvt Ltd, A-149, Main Vikas Marg, Delhi 110 092. 2003. 775 pp. Price: Rs 1200.

This book contains the various lectures delivered by R. S. Paroda, during the period 1991–2001, particularly when he was Director General of the Indian Council of Agricultural Research. The book covers a wide spectrum of important topics relating to sustainable food security. Paroda has dealt with both technology and public policy. He has covered crop and animal husbandry, as well as fisheries and forestry. He has placed emphasis not only on crop productivity, but also on sustainability and profitability. He has suggested a way out of the fatigue of the green revolution currently being faced in several parts of the country, particularly in the northwest region which has been a major bread-basket of India. Paroda is an ardent advocate of a rainbow revolution comprising 'Green (crops), White (milk), Yellow (oil seeds

and pulses) and Blue (fish) revolutions'. This calls for a farming systems approach. It also requires capacity-building and human resource development at all levels. Paroda has therefore pleaded for a substantial increase in investment in agricultural research. Such investment also comes under the category of non-trade distorting support to agriculture under the WTO regulations.

I would like to highlight a few areas in the fields of conservation, commercialization and consumption among the topics covered in the book. The need for an action–reaction analysis with reference to all development activities has been stressed by many experts. B. F. Skinner, for example, once stated, 'Every new source from which man has increased his power on earth has been used to diminish the prospects of his successors. All his progress is being made at the expense of damage to the environment which he cannot repair and cannot foresee'.

With regard to conservation-based agriculture, Paroda has dealt with in detail strategies for the conservation, sustainable use and equitable sharing of benefits in relation to agrobiodiversity. Among the other areas he has referred to are integrated pest management (IPM) and integrated nutrient supply.

Scope exists for developing optimum blends of the following sources of nutrients for irrigated and rainfed rice-farming systems: *In situ* conservation of biomass in rice fields and control of grazing with the help of botanical pesticides like neem cake; Azolla application; straw incorporation; cultivation and incorporation of green manures and application of mineral fertilizers coupled with flood water management.

There is need for greater interaction among scientists working on the following components of IPM strategy: Genetic; biological; cultural; chemical; botanical pesticides and socio-economic.

Varietal development and recommendations should be for a cropping system and not just for one crop. The varieties recommended should be tailored to the pest problems of each growing season. Also, concepts like insect thresholds need careful field application, otherwise there could be problems of vector-borne diseases.

Basic studies such as the ecology of weeds and weed problems related to moisture availability as well as more detailed work on disease epidemiology are urgently needed. IPM should not mean putting