Mapping the Landscape – National Biomedical Research Outputs 1988–95. G. Dawson, B. Lucoq, R. Cotrell and G. Lewison. The Wellcome Trust Policy Report No. 9, June 1998 [Policy Research Department, The Wellcome Trust, London, UK]. 112 pp. Price £ 11.00. ISBN: 1869835 95 6.

Scientometrics has moved out of addressing questions related to managing library collections and growth and structure of knowledge, and is currently grappling with issues of science policy. This shift has necessitated the creation of new databases.

For a long time scientometricists had depended to a great extent on the citation index databases compiled, edited and published under the supervision of Gene Garfield of the Institute for Scientific Information, Philadelphia. Once in a while researchers did use other databases such as *Chemical Abstracts* and *INSPEC Physics Abstracts*. But studies based on bibliographic databases cannot answer certain questions; for example, questions involving funding R&D.

In the past five years, the PRISM group led by Joe Anderson and Grant Lewison at the Wellcome Trust in London, UK, has meticulously collected data and constructed a Research Output Database (ROD), implemented using Oracle software, and a TechTrac database of patents citing papers in the ROD. The ROD provides data on some 215,000 UK papers in the serial literature during 1988–95. Now the PRISM team has used these statistics to address questions relating to research performance with a view to facilitating evidence-based decisions on funding. Lewison and colleagues present in this report the contribution made by different funding sectors to biomedical research and to research in 20 selected fields in the UK, and the general nature and impact of research being funded. They have also provided some international comparisons. The report is well written. Both the text running to more than 50 pages and the more than 70 tables provide a wealth of data about the status of biomedical research in the UK.

Here are some findings: The numbers of biomedical papers have increased by one-third between 1988 and 1995; London, Cambridge, Oxford and Edinburgh produce the most number of papers; Belfast and Leicester are the areas where the output is increasing rapidly; UK is relatively strong in tropical medicine and arthritis research and its shares of papers in cardiology, genetics, nursing and ophthalmology have increased significantly in the eight years; both national and international collaboration have increased, with increase in the average number of authors, addresses and funding sources acknowledged on each paper; UK collaboration with Portugal and Spain is increasing; the government and private non-profit agencies are involved in funding roughly equal number of papers, around 33%; the share of basic research, currently at 30%, is increasing. The present report, say the authors, is analogous to an aerial photograph. As the ROD is developed and refined, subsequent reports will move closer to the ground revealing finer details and covering more subfields.

In my opinion, we in India need to carry out studies of this kind as well as encourage studies in the areas of patent bibliometrics and the economics of R&D. Indeed, India should have a full-fledged Observatory for Science and Technology, similar to the one in France headed by Remi Barré. Will the managers of Indian science act soon? Several years ago, at the request of P. J. Lavakare, then with the DST, I looked at the impact of DST-funded projects in seven different fields and found that the citation impact of papers resulting from the projects funded by DST was roughly in inverse proportion to the amount funded. That should be evidence enough for implementing evidence-based decisions on funding!

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The Gymnosperms. Chhaya Biswas and B. M. Johri. Narosa Publishing House, New Delhi. 1997. 494 pp. Price: Rs 680.00.

The gymnosperms include a number of decadent groups of seed plants which were better represented in ancient times. However, out of the numerous groups of plants included in the group, only three genera: *Ephedra, Gnetum* and *Welwitschia* lack a reliable ancient fossil record. All other orders are either entirely extinct or were more diverse and better represented earlier. Writers of books on gymnosperms should therefore be well versed in fossil as well as living plants. If not, books on this subject tend to be weak in one of these two aspects. In this connection it is also important to point out that palaeobotanists tend to have a distinct advantage over authors lacking specialized knowledge of fossils since a palaeobotanist interprets his objects on the basis of his detailed knowledge of living plants. Accordingly the accounts of fossil and living gymnosperms in Seward's *Fossil Plants*, though out of date, remain unsurpassed. Another book, dealing with gymnosperms is *Das Pflanzenfamilien*, vol. 13 edited by Engler and Prantl but it has two sets of authors dealing with living and fossil gymnosperms. Gaussen's *Les Gymnospermes* in French is yet another book in the group. Other books dealing with both living and fossil gymnosperms in English are *Morphology of Gymnosperms* by J. M. Coulter and C. J. Chamberlain, 1917; *Gymnosperms, Structure and Evolution* by C. J. Chamberlain, 1934 and *Morphology of Gymnosperms* by K. R. Sporne, 1965. The first among these is equally good in both living and fossil gymnosperms but the second contains mistakes in the accounts of some fossils, while the third book presents only a bird's eye view of the group although its accounts of all the groups of gymnosperms are better balanced. However, all these books are largely out of date and therefore the present book on *The Gymnosperms* by Chhaya Biswas and B. M. Johri would appear to be a timely addition although another book covering the same topic has been published in 1996.

The strong points of this book are its coverage of living gymnosperms and even here the accounts of embryology and life history tend to be more detailed. The chapter on *in vitro* experimental studies also covers the topic in fair detail. The inclusion of Progymnospermopsida which are not gymnosperms in a book on gymnosperms should have been justified by a suitable title for the chapter.

However, there are some obvious errors even in the accounts of living gymnosperms. The distribution of *Cycas* should

mention its occurrence up to East Africa (it is depicted so in the map but the account of its distribution fails to mention East Africa). The number of species of Cycas is not 20 but about 4 to 5 times that number. The account of Araucariaceae should mention three genera *Agathis*, *Araucaria* and the third monotypic genus discovered and named *Wollemia nobilis* in 1995. On page 11 the authors could have mentioned that *Agathis* and *Araucaria* are also among gymnosperms whose pollen do not reach the micropyles of the ovules. The account of archegonia on p. 16 does not mention the unusually large number of archegonial initials in *Microcycas* which may be more than 200 and lie scattered all around the surface of the female gametophyte and into the median cleft. The homoxylous character of typical gymnospermous woods is not mentioned. The use of terms like 'stalk cell' and 'antheridial cell' is not according to modern usage. The names Coniferophyta and Coniferales are not according to the ICBN 1994 and the group should be called Pinophyta and Pinales.

The accounts of fossil gymnosperms are inadequate and often inaccurate. The structure of *Lagenostoma* needs to be explained by transections at different levels besides a longisection. About the definition of the terms haplocheilic and synoetocheilic, as coined by Florin (1931), it has to be emphasized that the ontogeny of the stomata in Bennettitales is unknown and the syndetocheilic stomata of this group have to be defined on the basis of the location of the two subsidiaries as pointed out by Pant, 1965. The microsporophyll of *Cycadeoidea* (p. 41) is now interpreted by Delevoryas (1965, 1968) as not opening out. The three kinds of habit in Cycadeoideales, herbaceous in *Wielandiella* and *Williamsoniella*, columnar in *Williamsonia* and *Cycadeoidea* and geophilous in *Cycadeoidea* should have been mentioned.

The authors fail to mention that the fossil Cycadales were far more diverse than the living ones and their account of fossils is rather poor. The authors' statements about coralloid roots despite the mention of Staff and Ahern (1993) and Halliday and Pate (1976) run contrary to facts and to their statement that little work has been done on this aspect (p. 458). On p. 53 the authors mention that 'According to Johri (1992) "a type of siphonogamy has been initiated in cycads and they should no longer be regarded as non-siphonogamous".' The cycads, however, are truly zooidiogamous because their pollen tube is not a channel which conveys the motile ciliated gametes. The pollen tubes produced by their male gametophytes are haustorial organs as stated much earlier by Pant 1973 and even others before him. Forms like cycads and *Ginkgo* should indeed be regarded as bridging the gap between zooidiogamous pteridophytes and more advanced siphonogamous seed plants.

The chapter on Glossopteridales depicts *Ottokaria* with its fertile face towards the subtending leaf. Actually Pant and Nautiyal (1984) and others have shown that the sterile face of *Ottokaria* faces the leaf. The stomata of *Nipaniophyllum* are haplocheilic and not syndetocheilic sensu Florin. The term 'bars of Sanio' is now obsolete since it includes two kinds of structures 'crassulae' and 'trabeculae' and the authors should specify them.

Since the book is published in India, its account of the Cordaitales could have included an account of leaves of *Noeggerathiopsis*. Transections of *Cordaianthus* are important for depicting the arrangement of parts in the individual axillary 'flowers' in the catkins. These are important for understanding the relationships of cordaites and conifers as suggested by Florin.

In the chapter on Coniferales (Pinales), the names *Pinus insularis* and *P. wallichiana* are now called *P. kesiya* and *P. griffithii* respectively. I must also mention that ICBN now prescribes that species named after persons whose names end in a consonant should end in 'ii' e.g. *merkusi* should be *merkusii* and *armandi* should be *armandii*. However species named after persons whose names end in 'er' or a vowel should end in a single 'i', e.g. *hookeri* and *beddomei* after Hooker and Beddome. In the account of Podocarpaceae it was important to mention that *Podocarpus wallichianus* is the only species of Pinales which occurs wild south of Himalaya in Peninsular India. A brief mention of *Phyllocladus*, the phylloclade bearing genus was also necessary.

In the account of Ginkgoales, fossil ginkgophytes are conspicuous by their poor coverage. The authors do not mention Florin's important work on Ginkgophytes of Franz Joseph Land (1936).

Again in a book published in India by Indian authors it was perhaps important to mention that though living Araucariaceae are absent in India, their fossils occur in the Jurassic and Cretaceous beds. On p. 265 *Palissya* is misspelt as *Palissaya*.

I am unable to understand how a strange statement 'The anatomy of stem and root have not been studied' has crept into the account of *Cephalotaxus* (p. 268) since it is well known that the secondary wood of *Cephalotaxus* shows tertiary spirals like those of *Taxus*. Further, Chamberlain (1934) has mentioned that *Cephalotaxus* has resin canals in the pith and cortex.

The Ephedrales, Gnetales and Welwitschiales lack a reliable fossil record and the accounts of the living members of these groups are fairly well written although the leaf of *Welwitschia* should be described as isobilateral and not isolateral.

The importance of many gymnosperms to man lies in their soft wood and they can often be distinguished on the basis of wood characters. Accordingly, the authors could have either dealt with wood chapterwise or included a chapter on the xylotomy of living and fossil gymnosperms. This would have not only added much-needed information on wood characters but also utility to the contents of the book.

Despite the above criticisms, the book should provide fairly useful information to students of gymnosperms, particularly on the embryology, life histories and tissue culture of diverse living gymnosperms.

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Plant diseases that result in crop loss have been economically important the world over. With the advancement in