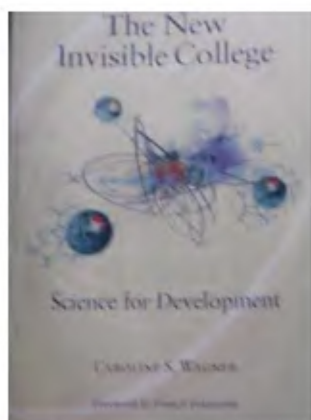


dedication behind the work. I must also congratulate the Indian Institute of Science and those behind the actual production of the book for the high quality of the product. If it is a priced publication, the publishers should evolve a better marketing strategy so that the book receives wider publicity. Just as the copy that I have reviewed has become a valuable addition to Care Earth's library, many would like to possess one.

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The New Invisible College: Science for Development. Caroline S. Wagner. The Brookings Institution, 1775, Massachusetts Avenue NW, Washington DC 20036, 2008. 157 pp. Price not mentioned.

The central thesis/argument the book makes is that 'Science operates at the global level as a Network – an Invisible College'. This, the author visualizes is fundamentally changing the structure of science in the 21st century. The rise of networked science makes knowledge creation more efficient and creates opportunities for developing countries to participate in global scientific activity and tap resources to solve local problems. But the author cautions that in order to take advantage of the networked structure, countries need to design new science policy framework that moves beyond national orientation. In advancing these arguments, the author uses both qualitative and quantitative perspectives.

Francis Fukuyama's foreword provides a perfect setting for this book. He succinctly provides a glimpse of the changing landscape of science and articulates why this book is important. The book has three parts. Part I covers three themes: The emergence of the new invisible college (Chapter 1); The topology of science in the 21st century (Chapter 2); Network character of science (Chapter 3). Part II makes an analytical introspection of the network dynamics. Three themes cover this section. Tectonic shifts: The rise of global networks (Chapter 4); The virtual geography of knowledge (Chapter 5); Scientific capacity and infrastructure (Chapter 6). Part III dwells upon how the emerging configuration requires innovative policy framework and governance. These aspects are covered under the title 'Governing the new invisible college' (Chapter 7). Appendix explains the construction of the index used by the author to assess scientific capacity. For scholars, the Notes section in the end is a rich source of reference material.

To advance the different arguments, the author brings in concepts that span a wide disciplinary matrix; borrowing extensively from network theory and innovation studies. For a lay reader the concepts are introduced in a manner that can be easily assimilated. For example, the author uses the language of network theory to visualize the structure of invisible college (Chapter 3, Networked science). Using this world view, the author argues that invisible college is a complex adaptive open emergent system (p. 35). But to provide readers a deeper insight into the meaning of each of the concepts, she uses the metaphor of a forest. Later when other network concepts are introduced such as scale free network, power law that are common language in network theory but are esoteric concepts for others (p. 39); the author moves beyond the metaphor of forest to explain mathematical underpinning behind these concepts. This innovative style makes the arguments more compelling.

The book also provides glimpse, evolution and functioning of scientific activity across the world through empirical and qualitative investigations. Concepts such as preferential attachments (that defines collaborations), weak links, lock-in, path dependency, cumulative advantage are used to construct the story. As

interactions (among different fields) grow more complex and become institutionalized, a new area/subfield emerges. Even though the activity within the invisible college is largely self-directed, it is not random. It follows identifiable patterns and rules. Social capital (shared ethical values, mutual trust) is instrumental in emergence and fruition of collaborations; it motivates scientists to self-organize into teams and share resources to solve scientific problems.

Wagner advocates some key issues for developing countries to participate in global science. Each nation including advanced countries has to enter the global system as participants so that valuable information (reciprocity) or/and resources (complementarity) can be exchanged. Developing countries need to identify and exploit unique local conditions; require to link to larger world community but not at the expense of local connections. The new emerging structure of science requires new governance of science that can facilitate knowledge creation and problem solving by involving experts from different countries and diverse disciplinary backgrounds. Developed and developing countries should re-design their science policy framework that can accommodate the new structure that views science and technology as an emergent networked system that can facilitate global scientific exchanges rather than being directed only towards strengthening national assets. Science policy should take into account the different levels at which scientific network operate, align incentives to increase opportunities for local participation and democratize decision making about scientific investments and resource allocation.

Although the author's views are compelling, there are other dimensions that cannot be ignored. The book does not take into account the changing contours of knowledge production. Increasingly it is being observed that the locus of knowledge production is becoming enlarged with firms and other actors apart from universities actively participating in this process. This is more so with the advent of science-based technologies. There is reference to new modes of knowledge production, interactions among different actors ('triple helix'), but these are not expounded further.

Science is going through new tensions. A substantial portion of public science is becoming private knowledge. Firms treat

scientific knowledge created by them as 'private goods' – a commodity that can be traded or exchanged like other market goods. In public funded organizations (universities and public research institutes), new institutional structures, for example, technology transfer offices, proprietary protection (through various intellectual property instruments) are also trying to create fences in public knowledge. The non-rival, non-excludable character of knowledge is eroded by these activities. The author's policy framework does not factor in these dynamics.

There is a serious attempt to bridge the gap between qualitative and quantitative perspectives but one still finds the author comfortable with the rationalistic, uncritical view of science. The author does not exploit the rich theoretical literature on dynamics and structure of science emerging from sociological and philosophical traditions. The book is sometimes prescriptive!

Overall the book is a very important scholarly work. The book addresses a large community and is not restrictive to a narrow domain of scholars in STS (Science Technology Society) studies. It helps to bridge the gap between the qualitative and quantitative perspectives. It is a must read book for scholars in collaboration studies and those involved in research policy. The narrative style the author uses to glue the different pieces together makes the arguments appealing and entices the readers to agree to many of the arguments she provides.

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Annual Review of Pathology: Mechanisms of Disease, 2009. Abul K. Abbas, Stephen J. Galli and Peter M. Howley (eds). Annual Reviews, Palo Alto, California, USA. Vol. 4. 582 pp.

The Annual Reviews series of books has been in existence since 1932. Beginning with *Annual Review of Biochemistry*, the series now covers a wide range of sciences, including public health, financial

economics, genetics, political science and pathology. This edition of *Annual Review of Pathology: Mechanisms of Disease*, as with all other editions, begins with an autobiographical essay; this one by Peter Ward, who is a leading researcher in immunology, in the field of complement and cytokines. All – young and not-so young – researchers would do well to read this essay. It traces his most interesting path from a medical student to professor of pathology and beyond and illustrates the excitement of research. You will learn about the good mentors that he had – and also see how even the experts can get it entirely wrong. Baruj Bennaceraf (who later won the Nobel prize in 1980) tells him at one stage in 1962, 'Young man, there are three areas of research to avoid: endotoxin, fever and complement'!

There are 21 chapters on the pathogenetic aspects of disease. As many as 13 of the chapters are on neoplastic pathology, given that cancer (and cardiovascular disease) is among the biggest killer diseases in the USA. The essays of a general type include those on microRNAs and epigenetic changes in cancer. Most, however, are more focused and include topics such as head and neck cancer, urinary bladder cancer, melanocytic neoplasms, neurodegenerative disease and the sudden infant death syndrome.

Head and neck squamous carcinoma is uncommon in the USA but is the most common cancer seen in Indians. Because of this latter fact (and because I personally have always found the subject fascinating), I shall dwell a bit more on this than on other areas. The term head and neck mucosal cancer includes cancers arising from the oral cavity, pharynx, sinonasal tract and the larynx. More than 90% of head and neck mucosal cancers are squamous carcinomas. Despite their common histology and embryology, it is now obvious that head and neck cancers are not as homogenous as believed previously. There have been many advances, both basic, and epidemiologic in the past decade in this field. For instance, the incidence of oropharyngeal carcinoma is increasing despite the decrease in head and neck cancer in the West. Since the use of tobacco and alcohol is implicated in the causation of oral cancer, and there has been no parallel increase in the consumption of alcohol and tobacco, it suggests that some other agent is responsible for the increase in oropharyngeal carci-

noma. HPV (Human Papilloma Virus), which has been well established as a cause of cervical cancer – for which Harald zur Hausen was awarded the Nobel prize for physiology or medicine in 2008 – is now known to be a cause of oropharyngeal cancer as well. HPV type 16 is the causative agent of approximately 70% of oropharyngeal carcinomas. HPV-associated oropharyngeal carcinomas are strongly associated with sexual practices such as oral sex, which lead to repeated viral exposure.

Field cancerization is a well accepted idea in carcinogenesis. According to this theory, put forward by Slaughter in the 1950s, multiple groups of cells independently undergo neoplastic transformation under the influence of carcinogens. However, molecular genetic data now shows that when a primary tumour is compared with a second tumour elsewhere in the same field, both tumours exhibit similar patterns of genetic changes. This suggests that the genetic insult took place in a single cell initially and that at some later stage, cells with these genetic changes migrated to other contiguous areas of the epithelium, accrued other alterations and other growth advantages and finally transformed into aggressive subclones. It appears that during the earliest phase of cancer, some cells express genetic changes without a corresponding morphological change which can be recognized by the histopathologist looking at the tissue biopsy under the microscope. The practical importance of the concept of field cancerization is that it explains why tumours recur locally after they have apparently been excised entirely at surgery.

The authors, both from the Johns Hopkins Medical Institutions, Baltimore, explain how the peculiar anatomy and microanatomy of the tonsils (part of the oropharynx) contribute to the physiology and pathology of the organ. The tonsils have numerous blind cul-de-sac like crypts which increase the surface area of the tonsil by as much as 700%. The tonsils also have an incomplete basal layer of epithelium. Besides, its basement membrane (the layer on which the basal layer stands) is porous and fenestrated. This allows the direct passage of lymphocytes and antigen presenting cells, thus creating the first line of defence. However, the same pores provide easy access to the body when the tonsil is exposed to HPV. The presence of the crypts