

**PERIPHERALITY IN SCIENCE : WHAT SHOULD BE DONE  
TO HELP PERIPHERAL SCIENCE GET ASSIMILATED  
INTO MAINSTREAM SCIENCE**

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**ABSTRACT**

Science on the periphery is characterised by (i) absence of a viable scientific community, (ii) an insularity (resulting from inadequate access to relevant information and inadequate communication within the local scientific community and with the international invisible colleges), (iii) an unduly long phase lag before participants in these peripheral societies can take part in hot/emerging research fronts, (iv) weak institutional infrastructures (such as academies, research laboratories, and more importantly peer review systems), and (v) an excessive dependence on science done elsewhere. However, there are levels of peripherality and within a country there can be vast differences among different fields, for instance. And some researchers may be much better off than their colleagues in the same field. As the problems are so complex and multi-faceted, there can be no simple solution. Attempts to solve one problem or the other in isolation may not lead to an optimal solution. In my view, the key to science development in peripheral countries lies in improving access to information, better dissemination of whatever little is done in these countries, and facilitating the establishment of better peer evaluation procedures within the country and increased participation in international science. Problems and prospects in realising each of these steps are discussed.

*problèmes appelle des solutions multiples: toute tentative pour résoudre un problème de façon isolée peut ne pas conduire à la solution idéale. A mon sens, la clef du développement de la science dans les pays de la périphérie réside dans une amélioration de l'accès à l'information, une meilleure dissémination des travaux locaux, la mise en place dans les pays mêmes de procédures d'évaluation par les pairs de meilleure qualité et une participation accrue à la science internationale.*

## INTRODUCTION

Mike Moravcsik was indeed a tall man. In a world where most scientists are happy to do their "normal" work of teaching, research and publishing papers, Mike decided to devote a considerable amount of his time and energy to promote science development in the Third World. He made a mark as a theoretical physicist, but his long and sustained work in the area of science development did not end with theorizing. He was always looking for practical solutions whose impact would be felt and could be tested quickly in the field. He had a great concern and genuine sympathy for the poorer countries of the world and he strongly believed that the introduction and development of science - as it is practiced in the advanced countries of the West today - in developing countries would not only change their status but it is a good thing per se for the world as a whole. He also believed that often voluntary efforts and individual initiatives could achieve a great deal more than government initiated programmes.

His books "Science Development" (Bloomington, Indiana, 1975) and "On the road to worldwide science" (World Scientific, Singapore, 1989), the large number of conferences he attended and spoke at, and the very large number of friends he made in the Third World are eloquent testimony to his keen interest in

wealth among nations. Just about a dozen countries account for close to four-fifths of the world's published journal literature! The differences are not restricted to the output of scientific research such as papers published, patents taken, processes developed, etc. But also cover a range of input indicators such as money invested in R&D, number and size of laboratories, number of researchers and technicians, availability of equipment and instruments, etc. The recognition received by science done in different countries in terms of awards, medals, and prizes won, the number of times work reported from a country's laboratories are cited in the literature, the number of people invited to speak at international conferences or to be on the editorial boards of journals, etc. Also vary widely.

Science is universal only to the extent that a large part of the cognitive content of science is context free. In the real world we live in, deviations to the "universalism" of science abound and affect both the practice of science and the dissemination of scientific knowledge.

Several hundred years after the emergence of modern Western science and the near-total eclipse of pre-Western scientific traditions and knowledge systems, today we live in a world where only a small minority is involved in both the generation of new scientific knowledge and its exploitation. Vast sections of humanity, living in the Third World, are mere bystanders, often not even able to realize the great consequences - not all of them beneficial and some of them certainly detrimental to their interests - of such developments. Besides the loss of the vast human resources that remain untapped in scientific research, the benefits of research are largely confined to those countries that pursue science. Men like Moravcsik, Marcel Roche, Glen Seaborg and others like us who assemble in conferences such as this one believe that greater participation in science is inherently a good thing: good for science as it will enable science to draw upon talent from a larger pool and from a much more varied cultural milieu; and good for the people themselves as science could be a great liberating force.

I will not go into a discussion of "alternative sciences". For the present, I will

previous section. But size per se need not prove to be an insurmountable obstacle : Israel is a case in point.

working in isolation. Although cognitive factors and an individual's "qualities of the mind" play a very important role, science is essentially a social activity. The creation of new knowledge, which in my opinion is the primary activity in science, does not take place in vacuum. A community of informed individuals and groups inter-acting with and augmenting one another's performance is a must. Such a scientific community either does not exist in most peripheral countries, or if one exists it is not mature. Even in a very large country like India which has a large number of publishing scientists, both sociologists of science and scientists - who unlike sociologists do not carry out scientific studies on

Weak institutional infrastructure - Often a peripheral country mimics the form without much care for the substance. National academies (sometimes more than one), professional societies/associations, etc. are established in much the same manner as in a developing country, but sooner than later these are allowed to deteriorate. The same goes for specialised institutes of higher education in science, engineering, medicine and agriculture. Then there are the ever proliferating number of scientific awards which distorts scientific perspectives altogether.

Here we would consider two institutions, viz. the peer review system is the linchpin of the scientific enterprise. Be it evaluating research proposals for funding or examining a research paper to see if it is worth publishing or choosing Fellows of an academy, one needs a very well working peer review system. In most Third World countries peer review system is not operating as well as it ought to. Let me give only one example from India. The late Professor Sambhu Nath De of Calcutta (1915-1985) made seminal contributions to our knowledge

performance, etc. Most developing country journals are of poor quality and the elite among the local scientists rarely publish their work in these journals. Because these journals publish a very large number of poor quality papers, they will find it difficult to attract good quality papers from both within the country and from abroad.

About three years ago, two professors from Madras - Prof. C N Krishnan of the Madras Institute of Technology and Prof. B Viswanathan of the Indian Institute of Technology - wrote a paper in a not-so-well-circulated journal called the *PPST Bulletin* and pleaded with Indian scientists to be more nationalistic in the matter of journals for publishing their research results. They thought that Indian should build journals of class as the Americans did in the early part of this century. And they found that it was the leaders of Indian science - fellows of the Academies and members of the editorial boards of journals who published most of their work in foreign journals. Although the Krishnan-Viswanathan paper was not the first to draw pointed attention to the quality of Indian journals, it had an unprecedented impact on India's scientific establishment. Prof. C N D. Rao, one

current relevance. In fact, rarely do Third World scientists have opportunities to work in newly emerging research fronts. There is a considerable time lag before research on an area initiated in Western laboratories reaches developing country laboratories. There is another kind of insularity as well, viz. disciplinary insularity. Rarely do we see work done in a Third World laboratory that can be called interdisciplinary. A large part of the citations to peripheral country journals and to articles published by peripheral country scientists in foreign journals will be from scientists from the same country and researchers from the same field.

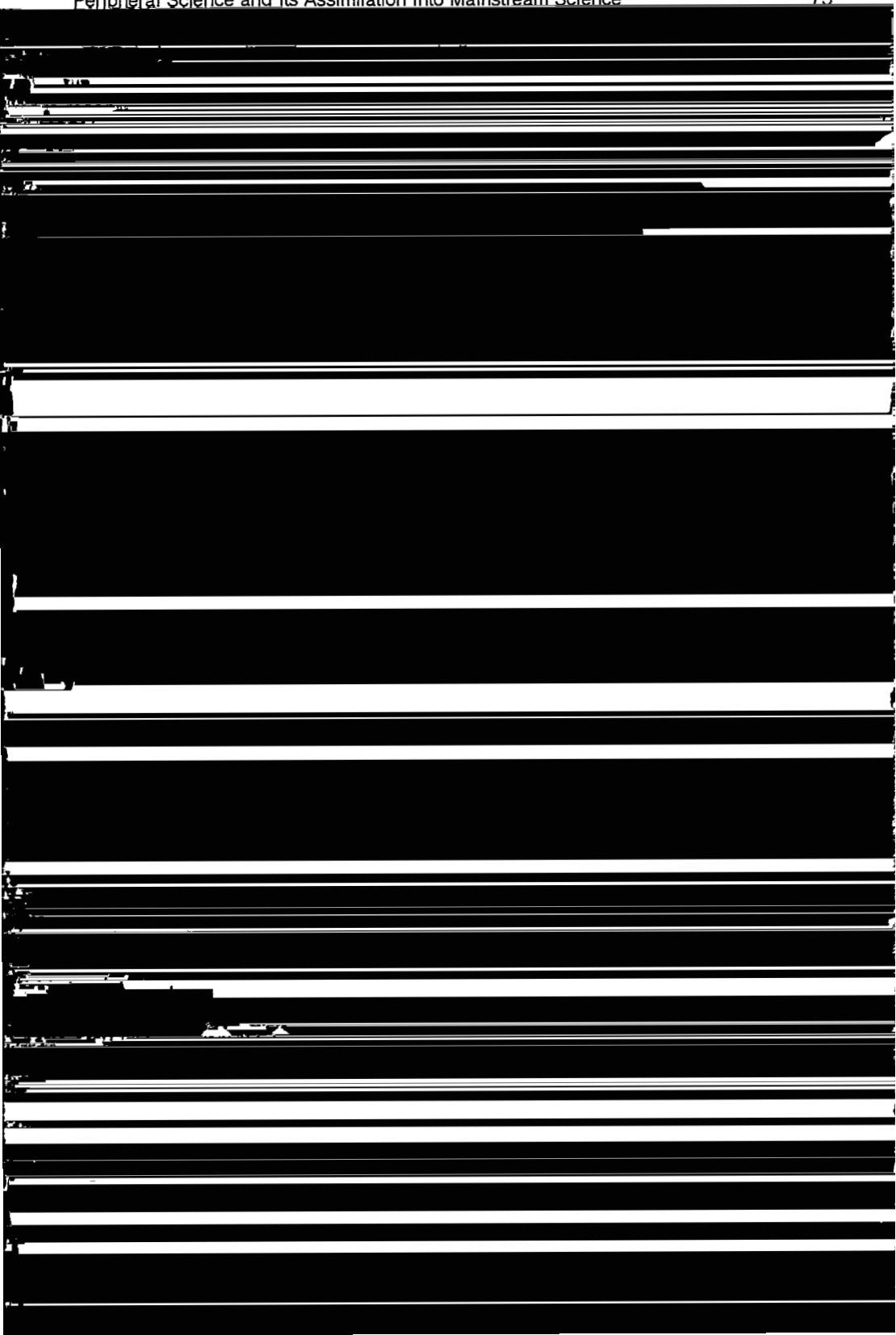
Among the several factors responsible for this state of affairs two appear to be of crucial importance. These concern inadequate access to relevant information and poor communication facilities. After all, the creation of new knowledge, the most essential activity in the enterprise of science as in other areas of scholarship,

governments, etc. There are many already in place. And others could be thought of. Improving the quality of science done on the periphery and making it easily assimilable in mainstream science is a complex task and it would be better to divide the problem into several component tasks. Each of these components can then be tackled by the most appropriate kind of initiative to be decided on the basis of feasibility, costs, etc. For example, raising the level of peer review in a country is essentially to be tackled internally. It is too sensitive an area to brook outsider interference !

However, it will not be wise to tackle one problem or the other in isolation ; that will not lead to an optimal solution. Two related problem, vis. improving access to information and better dissemination of research done in peripheral

~~sciences will not be killing in any scheme of things. Related to these objectives~~





The other problem of disseminating whatever is done in the developing countries is not all that straightforward. Often we hear Third World scientists complain that their own earlier work is not taken note of and subsequent work reported from some laboratory in the West is being cited in the literature. Sociologist Harriet Zuckermann and scientometricist Tibor Braun feel that no deliberate mischief or conspiracy is involved. Such things happen even when the work is published in highly circulated international journals.

Most journals published in Third World countries are poorly circulated and often what is published in them go unnoticed by researchers elsewhere. Unless these journals are covered by all the relevant secondary services there will be no chance of them being noticed by workers elsewhere. It is for this reason Mike Moravcsik assembled about 30 experts in Philadelphia in 1985 and tried his best to persuade ISI, Philadelphia, to cover many more Third World journals in SCI at least on a trial basis for a few years. Somehow, the plan did not work. We realize that philanthropy cannot always work ; in certain things hardheaded financial decisions are to be taken. Getting more Third World journals covered will cost money and we have got to find a source to fund the project. However, we must realise that Third World scientific communities should ultimately have to become self-supporting. One cannot live on blood transfusion for ever. Any initiative which will make developing countries eternally dependent on outside support should, therefore, be eschewed.