

Interdisciplinary research 'being stifled'

[STOCKHOLM] The traditional disciplinary organization of research bodies is not only failing to encourage interdisciplinary research, but is stifling it, leading scientists and research administrators were told last week at a symposium in Stockholm.

Yet this is happening at a time when a growing need for more holistic approaches to both fundamental scientific questions and complex socioeconomic issues — such as public health, global warming and biodiversity — is making interdisciplinary research more necessary than ever.

Those who attended the meeting, organized by the Wenner-Gren Foundation and the National Science and Engineering Research Council of Canada, included Rita Colwell, director of the US National Science Foundation (NSF) and Sydney Brenner, the former director of the UK Medical Research Council's Laboratory of Molecular Biology in Cambridge. Colwell described interdisciplinary research as "nothing short of vital" and identified it as "one of the major challenges for NSF in the coming years".

Many excellent interdisciplinary research centres and projects have been established over the past few decades. But the main message of the meeting was that these represent an 'avant-garde' minority, while the bulk of mainstream research remains organized along disciplinary lines.

A succession of speakers told the meeting

that the current system tends to discriminate against researchers who dare to move beyond the strict confines of their narrow corner of intellectualism. "The departmental structure is a block," said Colwell. "We need to tear down the walls that separate our funding agencies."

The meeting heard that the need to remove these barriers is urgent, as research needs are undergoing a 'paradigm shift' towards the understanding of complex systems. A major need identified in the post-genome era, for example, is for an effort to reintegrate advances in genetics and molecular biology with those in other areas to get a better picture of how whole organisms work.

A more sophisticated multidisciplinary approach to health and education, integrating neurobiology, developmental biology and epidemiology, was also identified as a major need by several speakers, including Lennart Philipson, from the Karolinska Institute in Stockholm, and Fraser Mustard, head of the Canadian Institute for Advanced Research in Toronto.

Mustard argued that, while most biomedical research uses a disease-based model, major opportunities exist in a broader approach that seeks to explain a growing body of evidence that most of the variation in health and mortality in adulthood is not linked to conventional medical risk factors, but to the environment during early life.

Pioneering interdisciplinary work in this area, by Michael Marmot's group at University College London, has been widely praised. But it is experiencing difficulties in attracting grants, said Mustard. "This research could open up a whole new area of medicine, but it would contradict the dominant disease-based approach."

One problem identified was that interdisciplinary applications for grants are usually assessed by a series of discipline-based peer review committees rather than by interdisciplinary panels, with the result that good projects fall between the cracks. The disciplinary nature of most primary journals means that interdisciplinary researchers find it difficult to have work published in ranked journals.

The meeting produced few remedies to encourage more interdisciplinary research. But there was wide suspicion of the quality and cost-effectiveness of top-down interdisciplinary initiatives by research institutions. "Efforts to create marriages in heaven too often end up with labs sharing the same address, but not a life," said Jeremy McNeil, a biologist at Laval University in Canada.

"Top-down initiatives often lack the motivation of someone trying to address a specific problem and who doesn't care what discipline you use," said Brenner. His experience had convinced him that what was important was to hire the best staff, and ensure "that young people can learn from other specialists".

But McNeil pointed out that larger programmes on global issues, such as biodiversity and global warming, involved extensive cross-agency and university support, and therefore required a top-down approach. Indeed, the meeting identified the major challenge ahead as managing global interdisciplinary research projects on important socioeconomic issues.

Lessons learned from a study of Canadian fisheries management programmes included the imperative need to involve social scientists at every stage, and to avoid compartmentalization of the scientific assessment, political and management phases.

Past fisheries management has been a "total disaster," said Hugh Morris, from the Padre Resources Corp. in Canada, because it failed to take into account the full complexity of the marine ecosystem. "Wider democratization might give you better science," he added, arguing that the inclusion of social scientists in recent programmes has helped to question the assumptions scientists make.

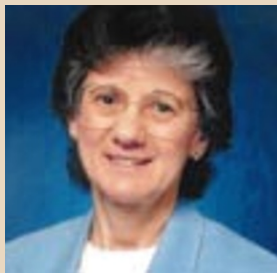
Finding a common language — or "scientific Esperanto" between disciplines, as Colwell put it — to avoid the worsening jargon was identified as a major challenge. "We cannot afford to speak in the tongues of our own disciplines," said Colwell. **Declan Butler**

NSF boss champions need for teamworking

[STOCKHOLM] Interdisciplinary researchers have found a strong ally in Rita Colwell, the new director of the US National Science Foundation. Colwell flew to last week's meeting (see above) from Bangladesh, where, on a grant from the National Institutes of Health, she has been crowning the success of an interdisciplinary programme on cholera that she began 25 years ago.

Colwell told the meeting that she had had major difficulties over 20 years getting funding. But, now that the success of her project was accepted, "I've gone from being a pariah to being a guru."

Colwell observed that cholera epidemics always spread inland from the coast. Her hypothesis, that the bacterium *Vibrio cholerae*



Colwell: from 'pariah to guru'.

might be associated with plankton blooms, was at first scorned. But it is now the basis of a global project involving space scientists, oceanographers, molecular biologists, social scientists, physicians and high-speed computing scientists.

Colwell showed that *Vibrio cholerae* was associated with gravid copepods where it played a role in breaking open the egg sac by secreting

chitinases. She showed that cholera epidemics were correlated with the seasonal incidence of the bacteria in the copepods.

Colwell's group has since used this insight to develop a global predictive system for cholera epidemics using remote sensing techniques. In Bangladesh last week, she was working on prevention. She tested local fabrics as potential filters and found that sari fabric, folded ten times, can remove over 90 per cent of cholera bacteria.

Colwell is now working with social scientists to implement an education programme to introduce the filters. The lesson, she says, "is the need to appreciate the complex reactions that characterize ecosystems; too complex for any one discipline". **D.B.**