Guest Lecture

MAKING SCIENCE WORK IN SRI LANKA

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Although science (the process of testing hypotheses by repeatable experiments and the construction of theory thereon) has been widely taught in Sri Lanka for decades, it is yet to become integrated into our culture and thinking. Although there are many people educated in—and teaching—the sciences, practitioners of science are few, even within the university and research establishments, and national policies driven by science are almost non-existent.

The lack of funds is often cited as the cause of Sri Lanka's poor performance in science. Close examination shows, however, that there is little merit in this argument. There are many branches of science which could be pursued successfully with only modest financial resources. For example, even though Sri Lanka is considered part of a global biodiversity hotspot, the quantum of exploration-driven research on biodiversity borders on the trivial. National diversity in many groups of plants and most groups of animals are yet to be assessed, and the drivers of diversity (the relationships between species and their habitats, and the determinants of their distributions) remain to be addressed even cursorily.

Indeed, a survey of the research that led to Nobel Prizes in the sciences during the past 20 years shows that in at least two cases, the research could easily have been carried out in Sri Lanka, and involved investment well within the means of a middle-class person working in his or her individual capacity. Similarly, mathematical research, which requires almost no investment, has shown little development in Sri Lanka.

In Sri Lanka, the divide between science and the environment is particularly trenchant. Recent debates relating to the environment, e.g., as to the environmental impact of the Eppawela Phosphate initiative, the Upper Kotmale Hydropower Scheme, the Norochcholai Coal Power Plant, and the wisdom of engaging with the US Tropical Forest Conservation Act, have been driven largely by non-scientists. The arguments for and against each of these ideas have been based mainly on emotion and misinformation, and driven by agendas that were essentially political. While this is to be expected, what was surprising was the total disengagement of scientists from the decision-making process.

The divide between scientists and the policy-making machinery is perhaps most noticeable in the case of biodiversity conservation. While there are more than a dozen university departments of botany and zoology turning out upwards of a hundred graduates in these fields annually, many of these graduates once qualified turn to other disciplines or become teachers—rarely practitioners—of biology. The Wildlife and Forest Departments have a combined staff strength in excess of 3,000: yet they employ less than 10 graduate biologists and not even a single biology PhD. While this obviously results in biodiversity-conservation policies and practices that are far removed from science, it also leads to a situation in which there could be a vested interest—even if only subconscious—in keeping scientists (and therefore, science) out of these agencies. Yet, there has been little or no evidence of initiatives by the universities or scientific bodies such as SLAAS or the NASSL

to urge government to employ more biology graduates in agencies for which their skills are appropriate.

While it is difficult objectively to measure a country's or university's scientific performance, the *Science Citation Index* (SCI) offers a rough method of assessing output by the numbers of publications made, the quality ('impact factor') of journals in which they are published, and the frequency with which they are cited. The latter two criteria have drawbacks in that a handful of journals such as *Cell, Nature* and *Science* have impact factors an order of magnitude or more higher than the average for the ~6,100 journals indexed; and because papers sometimes receive many citations not because of the quality of science they contain, but because they involve review, opinion or methodology, or sometimes simply achieve notoriety (e.g., papers that are withdrawn after being found to be fraudulent).

In 2005, authors with addresses in Sri Lanka published 336 SCI-indexed papers. Of these, 103 were from the University of Peradeniya, while Colombo had 58, Kelaniya 23, Ruhuna 14 and Moratuwa 10. It is noteworthy that University of Peradeniya has led the national SCI rankings every year since 1990 with an output of about twice that of its nearest rival, Colombo. While this is cause for satisfaction in the context of Sri Lanka, however, it is not impressive when compared with other countries, even developing countries in which English is not widely spoken. For example, the National Autonomous University of Mexico, which ranked 195 in the global rankings published by Price Waterhouse-Coopers and the *Times Higher Education Supplement*, had 418 SCI publications in 2005 as against Peradeniya University's 103 (the National University of Singapore, ranked 18, by comparison, had 3,602 papers).

A rough breakdown of Peradeniya's tally of 103 in 2005 shows that 40 were from the medical sciences, while 17 related to aquaculture / agriculture / forestry. Engineering scored only 1, while zoology and botany had 3 each. By comparison, Colombo's had 37 medical papers and 5 zoology papers, but sadly, no papers in botany. Interestingly, when compared with the annual average for the period 1990–1999 (43.9 yr^{-1} for Peradeniya, 23.0 yr^{-1} for Colombo), both universities had increased their performance by about 2.5 times as at 2005.

Despite the steadily-growing body of quality science being done in Sri Lanka, and published in the international peer-reviewed literature, the community of *practising* scientists remains small and with relatively little influence. The scientific establishment continues to treat SLAAS abstracts as publications, and few financial or career-development incentives are offered to scientists who publish in the international literature. Ironically, some senior scientists have even expressed the view that such publications should not be encouraged in a developing country, where the need to the hour is 'technology relevant to development' and not 'academic research': I argue, however, that this cannot be separated. Further, the national budgets of countries such as India and China show that some developing countries are committing R&D funding an order of magnitude higher (~1% of GDP) than Sri Lanka is, on a *per capita* basis.

Clearly, the solution to the crisis Sri Lanka faces in the sciences lies in the university system. By rewarding scientists who do work of international standard, we would not only improve the standards in our universities but also cause society to award greater respect to scientific opinion. Most importantly, however, scientists need to be heard in Sri Lanka: unless they engage in and inform public-policy debates, society will neither recognize them nor take them seriously.