

CURRENT SCIENCE

Volume 85 Number 6

25 September 2003

EDITORIAL

Teachers and Mentors

Teacher's Day is celebrated annually in India on 5 September, to mark the birth anniversary of Sarvepalli Radhakrishnan (1888–1975). S. Radhakrishnan had a remarkable academic career, which took him from a lecturership in the Department of Philosophy at Presidency College, Madras to Professorships at Mysore University and Calcutta University and eventually to Vice-Chancellorships at the Andhra University and Banaras Hindu University. For some time in the 1930s he was the Spalding Professor of Eastern Religions at Oxford University. He went on to become the President of India in 1962, capping a long and distinguished career in education and public service. Radhakrishnan wrote and spoke extensively on higher education; he was the scholar's scholar in the study of philosophy and religion. After his death his birthday has become the occasion to remember our teachers. Curiously, UNESCO also observes Teacher's Day, a month later on 5 October, every year.

Radhakrishnan's life coincided with the remarkable growth of modern science and in his prodigious writings he often alluded to the results of science: *Science reveals to us the inexhaustible richness of the world, its unexpectedness and wonder. Science does not profess to solve all problems. There are regions where its writ does not run. When all is said and done, the world remains a mystery. The ultimate questions are too deep and mysterious for science. We should recognize that we understand and control only a tiny fraction of the universe. (The Present Crisis of Faith, Vision Books, Delhi, 1970, 1983, pp. 171–172).* Radhakrishnan integrated Darwinian thought into his writings: *The story of continuous development through the whole of animate nature suggests the working of an automatic mechanism. No principle outside the natural world is needed to account for it. In a closed world governed by uniform laws, no spiritual principle can interfere . . . We cannot be sure that species move on to higher stages of development in orderly sequence. Ever so many degenerate and some die out altogether. No sooner had some form of existence perfected itself than it proceeds to decay. The progress we have achieved is the result of the terrible method of trial and error. Struggle and suffering, disease and death are such pregnant facts that if there is any ruling power in the universe, it may be fate or chance or careless gods, but in no case a beneficent providence. Man is nothing more than the latest of a long series of living creatures and he did not arrive on this planet faultless and finished but is*

being slowly ground into shape by the shocks of circumstance. (Radhakrishnan, *An Anthology* (ed. A. N. Marlow), George Allen and Unwin Ltd, London, 1952, pp. 87–88). The neutrality of science was readily incorporated into his writings, which focused largely on philosophy and religion. Radhakrishnan is eminently quotable and Marlow's anthology provides some stellar examples: 'We often refuse to admit facts, not because there is evidence against them, but because there is a theory against them' (p. 145). Radhakrishnan, and legions of teachers are now cursorily remembered on Teacher's Day, an occasion which is marked by obligatory functions in many schools, colleges and universities. I found myself a little over a fortnight ago at a seminar in the Biochemistry Department at Osmania University; an occasion where several retired faculty members had returned to their old department to be honoured by a new generation. There was an appealing sentimentality to the proceedings; a feature slowly disappearing from many of our institutions, where teachers are quickly forgotten by students whom they have shaped and sometimes, nurtured.

In institutions of higher education and research teachers are not only those who lecture in classrooms, but include those who initiate and guide students in the intricacies of research, which often leads to a doctoral degree. Here teachers are variously termed as professors (a generic term which accommodates all levels), guides, advisors and supervisors. Each of these terms appears to convey a distinct meaning. *Professors*, seem to have both high academic rank and presumably, correspondingly high scholarly attainment. *Guides* seem to be academics, who shepherd the novice student through difficult areas of research. *Advisor* (a common term in America) appears to signify a member of the faculty, who proffers advice when asked, suggestive of a largely independent role for the student in carving out a research problem in a specific area. *Supervisor*, is a descriptor now commonly used in many institutions, including my own. This is a term which seems to charge the academic faculty with a dominant role in shaping a student's thesis; conjuring up a vision of a shop floor (or even a Roman galley), where legions of workers are orchestrated to perform assigned tasks, by a superior authority. *Teacher* is a term that has strangely fallen into disuse in the academic research community. But there is another term and it is my favourite – *mentor*. The word's origins may be traced to Greek mythology and Homer. Odysseus entrusted his son Tele-

machus' education to his friend Mentor, before setting off for the Trojan War and his long voyage which was to give the English language yet another word – odyssey. Mentor was charged with shaping a future king and today mentor is another description for an all-round teacher, who gently prepares his students to face the challenges of the future.

Semantics apart, the relationships between research students in science and their professors, guides, advisors, supervisors or mentors really shape the attitudes of a beginner in science. The best of supervisors (and I choose this term because it appears most fitting in the modern context of research as a professional and at times, almost corporate activity) lead by example; their knowledge, enthusiasm and commitment to their disciplines often proving infectious, greatly facilitating the process of learning. The worst of supervisors are those for whom a research student is a commodity of academic life, with the supervision of Ph D theses merely being necessary for personal advancement. In many of our institutions, faculty promotions use the number of 'Ph D's produced' as an index of performance of the faculty member, reducing the Ph D to a number to be added to a score sheet. Unsurprisingly, in many institutions the least academically inclined members of the faculty have large groups of Ph D students; a complete denigration of the academic process. Between these two extremes, are the situations, where the process of Ph D research academically benefits both the teacher and the student, in a cooperative and continuous process of learning.

In all our advanced institutes for scientific research, Ph D students have become the most important element in conducting new and original research. Barring the laboratories of the strategic departments, students are really the front line of research activity in academia. As research acquires an increasingly competitive edge, scientists clamouring for success, recognition and fame transmit their fears and insecurities to their students; a situation that leads to far from ideal 'mentoring'. In the frenetic modern world, academic success is measured in terms of grants, impact factors of journals in which papers are published and awards; rarely is scholarship and the ability to transmit knowledge viewed as an important attribute of a supervisor. Indeed, the gulf between the traditional 'good teacher' and the modern supervisor' has been growing.

The demands of the research ambience in most of our better-known institutions place both research supervisors and students under pressure to obtain publishable results quickly; the professional advancement of faculty and students rests substantially on their ability to produce papers. The absence of postdoctoral associates in large numbers distinguishes the Indian research scene from the situation in the West. Ph D students now work in the front line of projects, which have much larger goals, than merely training students for a research career. The temptation to cut corners in the fast track is overwhelming, sometimes misguiding students and producing young scientists, who have a completely distorted perspective of

the practice of science. Another distressing situation which prevails in many universities and some national laboratories is the practice of allowing an almost unlimited number of students to register for Ph D degrees, under a research supervisor. The 'pair of hands' syndrome dominates some disciplines, with the ability to perform physical labour as the sole criterion for entering a research laboratory. In these surroundings it is hard to think of the group head as a 'guide' or 'teacher', with little intellectual discourse between the student and the supervisor. The tendency to view research students as an essential part of the institutional infrastructure, provided to faculty, is growing. There is little or no consideration in many places of the need to promote 'teachers', who provide students with a balanced and healthy view of their chosen disciplines.

In the most successful examples of establishing a scientific tradition by training students, there have been famous instances of scientific dynasties, in which academic success has visited every succeeding generation. But in India, the flowering of schools of science has been limited and the traditions of the great teachers of the recent past have not survived the tide of modernity. A former associate of mine, after reading some of these columns, sent me a marvelous book, *Apprentice to Genius* by Robert Kanigel (The Johns Hopkins University Press, 1986), which traces 'the making of a scientific dynasty'. Kanigel, who is best known for his book on the life and times of Srinivasa Ramanujan, *The Man who Knew Infinity*, follows the growth of the discipline of neuropharmacology, focusing on student-mentor relationships. He spins a riveting tale beginning with the original teacher, Bernard Brodie and moving through three successive generations, Julius Axelrod, Solomon Snyder and Candace Pert. Axelrod, of course, won the Nobel Prize in Medicine in 1970 for his work on chemical neurotransmission, but earlier, together with his teacher Brodie, he did the work that led to the discovery of tylenol. Snyder and Pert were to discover the opiate receptor and to contribute enormously to the understanding of endogenous opioids, work which fetched a Lasker Award for the former. Kanigel's study emphasizes the tensions and rewards of a 'traditional master-apprentice' relationship. Kanigel sums up these relationships succinctly: 'Through it, the student is trained in the ways of the mentor, and comes away with an approach, a style, a taste in the mouth or a feel in the gut for just what makes "good science". Through it, favours are granted, careers advanced, the sway of a particular scientific discipline extended. But through it, too, resentments sometimes spark, lifelong bitterness is kindled.'

Modern science is hardly a solitary pursuit. Collaborations and interpersonal chemistry determine the outcomes of many research projects. Teaching and mentoring have been critically important for the development of science in the past and their role will, undoubtedly, remain undiminished in the future.

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