

CURRENT SCIENCE

Volume 101 Number 3

10 August 2011

EDITORIAL

Speaking of Science: Lecturers and Teachers

Rummaging through stacks of long forgotten papers, consigned to the dark dampness of storerooms, is not a task that is attractive to most people. For the collector, interested in archival material, there is something irresistible in searching and reading documents which may have little to do with the tasks at hand. A sense of history, and the importance of preserving past records have rarely been subjects of concern in our scientific institutions and universities. Few institutions in India maintain a well supported archive which can provide scholars, interested in the evolution and growth of our laboratories and institutes, the material necessary for constructing factually correct histories. A few years ago this journal approached its 75th year of existence, a 'platinum jubilee' which needed to be marked; an organizational milestone that could not pass unnoticed. It was then that I realized that no real documentary records of the struggles to start this journal in 1932 were available. Little seemed to be known about the first editor, C. R. Narayana Rao, and the small band of enthusiasts who promoted the journal in its early years. The hunt for unearthing long forgotten information was undertaken with boundless enthusiasm by a young associate of mine, Riki Krishnan, allowing us to piece together a moderately accurate account of this journal's origins (*Current Science*, 2007, **92**, 129). Shortly thereafter, I realized that my own institution, the Indian Institute of Science, was approaching a centenary; a realization that catalysed another round of searching and collecting by my indefatigable colleagues. Collectors are a strange breed; they are often excited by material that the normally busy professional would find completely irrelevant. There is, however, an infectious enthusiasm that collectors display that is hard to resist. I was, therefore, quite enthused when a colleague burst into my room to display his latest find. He had indeed unearthed some remarkable documents, which detail an unknown chapter in the history of Bangalore's institutions. But, what attracted my attention was a copy of an article in *Science* (1966, **154**, 1613) entitled 'The Art of Talking About Science' by Lawrence Bragg. Curiously, this article was reprinted in this journal over twenty years ago when S. Ramaseshan was trying hard to revive the flagging fortunes of the journal (*Current Science*, 1990, **59**, 1341). The reprint, I now held, was a photostat copy, reproduced under the banner of the 'Information Papers' of the Indian Institute of Science. Bragg's article was the first of a series of 'excerpts of educational interest reproduced from current journals'. Relatively few scientists

remain in our midst, who learnt and practised their craft at a time when photocopiers (the ubiquitous 'Xerox machine') did not exist and the personal computer and laser printer were not even specks on a distant horizon. Information was transferred slowly in those days, and more importantly, judiciously and selectively. Choosing articles for laborious dissemination would have been a labour of love. I could not but help marvelling at the choice of the first article for reproduction.

W. L. (Lawrence) Bragg (1890–1971) invented 'X-ray analysis for finding the arrangement of atoms in crystals and his determinations of the atomic structures of the rocks that make up the bulk of the Earth's crust revolutionized the foundations of chemistry, mineralogy and metallurgy'. These are the words used by Max Perutz in an essay reflecting on Bragg's contributions to X-ray crystallography. Bragg succeeded Rutherford as the Cavendish Professor of Experimental Physics and it was under his benign stewardship that the revolution in molecular biology began, with the elucidation of the structures of DNA and proteins. Bragg was an exceptional writer and lecturer. Perutz is unstinting in his praise: 'When reviewing scientific work I sometimes paraphrase people's papers, but when I tried to paraphrase Bragg's I always found that he had said it much better. Bragg's superb powers of combining simplicity with rigour, his enthusiasm, liveliness and charm, and his beautiful demonstrations conspired to make him one of the best lecturers on science that ever lived' (Perutz, M. F., *International Union of Crystallography*, 2 February 1990; *I Wish I'd Made You Angry Earlier*, Oxford University Press, 1998). Speaking and writing are an integral part of the life of an academic scientist. Classes need to be conducted, lectures delivered and research papers written. Listening is also a key activity, since seminars are often the most painless way of acquiring new information. Sadly, many accomplished scientists are poor speakers and indifferent writers making communication of their results an ordeal. Bragg begins his essay on 'Talking about science' by asking questions that must often occur to many of us. 'How should we present our branch of science to fellow scientists who work in quite another field? How can we present science to those who have little or no scientific background, as is often the case with men of high ability who are important in affairs of state? How can we make the nonscientist understand why its study means so much to us, a passion they sometimes find difficult to understand?' Bragg argues that 'the gap between C. P. Snow's

two cultures is not so much due to a lack of understanding as to a lack of a desire to understand'. He adds: 'There are Philistines as regards science as well as regards the arts.'

Lecturers who try to promote interest in science by speaking to diverse audiences often face a daunting task. Bragg, who for years lectured to general audiences at the Royal Institution, notes that the 'primary object is to create a state of mind or point of view, not to convey information'. How often have audiences wilted under the deluge of detail that earnest speakers have thrown at them? Bragg measures the success of a talk 'by the extent to which an average member of the audience remembers it next day'. In his view, 'the value of a lecture is not to be measured by how much one manages to cram into an hour, how much information has been referred to, or how completely it covers the ground. It is to be measured by how much a listener can tell his wife about it at breakfast next morning, or, if she is not interested, a friend in the morning train'. There are many lecturers who read from prepared texts; a practice more common amongst social scientists. But, in these days of Power Point, there are many who read from slides. If the lecturer stumbles and mumbles the audience suffers silently. Bragg is harsh on the 'readers'. He writes: 'I feel that to collect an audience and then read one's material is like inviting a friend to go for a walk and asking him not to mind if you go alongside him in your car'. Bragg notes that there are exceptions, Eddington among them, who read their lectures to great effect. How do these talented 'readers' succeed? Bragg suggests that these 'are the people who so refine and weigh every word and sentence that their beautiful prose almost become poetry – it is like a poet reading verse'.

Bragg makes a very clear distinction between the written and spoken word. His concern is for situations where speakers confront a general audience. Indeed, most academic seminars are delivered to audiences of scientists many of whom may be unfamiliar with the details of the subject being discussed. The written account has as 'its main function' the need to 'be a storehouse of information'. In Bragg's words: '...one need not cross all the "t's" and dot all the "i's" in a lecture.' In fact, 'the talk would be spoiled by an attempt to do so'. In reading the essay, I was drawn to Bragg's apparent discomfiture when written accounts were requested after a talk had been delivered. This is an uncomfortable situation often faced by those who hazard to speak on many public occasions. He notes that 'to prepare a talk, and to write an account of it, are two separate tasks and the latter may be much the heavier'. Bragg then moves on to a situation that many speakers face: 'The most embarrassing thing is to be told that a tape recording will be made, and asked if one would please correct it. It is embarrassing to see a verbatim report with all the remarks recorded literally and it is generally far less trouble to write it from the beginning than to patch the record.' A point that many organizers would do well to note is the need to be kind to lecturers.

Here he writes on behalf of those speakers who spend considerable time, effort and nervous energy in preparing and delivering lectures: 'A lecture is a *tour de force* and a good and conscientious lecturer is both nervous beforehand and prostrate afterwards'. He advocates a practice in vogue at the Royal Institution where the lecturer is 'immured in a small private room termed "The Lecturer's Room" for at least half an hour before the lecture starts'. Bragg narrates a famous anecdote which recounts the origins of this practice. Apparently 'a lecturer (actually Wheatstone of Bridge fame) ran away from nervousness just before the lecture started, and so a guard has been placed over the room ever since'.

In the old papers I received was another gem, reproduced in 1968; an essay on the 'Making of a Scientist', based on an address delivered by Hans Krebs, widely known to biochemistry students as the discoverer of a key metabolic reaction cycle (*Nature*, 1967, **215**, 1441–1445). The Krebs cycle occupies a central position in the charts, depicting intermediary metabolism, which adorn the walls of laboratories in the area of biological sciences. Krebs, schooled in the strict discipline of his Prussian origins and the rigorous system of German biochemistry in the pre-War years, writes more formally than Bragg. He asks a question which must have come to many of us over the years: 'How can distinction or excellence be attained in science?' He emphasizes the importance of outstanding teachers and advances a view: 'Scientists are not so much born as made by those who teach them research'. Krebs traces his own academic roots constructing a genealogy, that parallels the history of chemistry: Otto Warburg, Emil Fischer, Adolf von Baeyer, Kekule, Liebig, Gay-Lussac, Berthollet and Lavoisier. He asks: 'What then, is it in particular that can be learned from teachers of special distinction?' He answers: 'We measure everything, including ourselves by comparisons; and in the absence of someone with outstanding ability, there is a risk that we easily come to believe that we are excellent and much better than the next man. Mediocre people may appear big to themselves (and others) if they are surrounded by small circumstances. By the same token, big people feel dwarfed in the company of giants, and this is a most useful feeling. So what the giants of science teach us is to see ourselves modestly and not overrate ourselves.'

Reading the decades old essays of Bragg and Krebs, reproduced undoubtedly to stimulate the small band of scientists in Bangalore in the 1960s, I could not but help feeling a sense of regret. The passage of years has undoubtedly transformed the way in which science is practised and communicated. Motivations for doing and speaking about science seem to have changed. In reflecting on these essays, I realized that reading old documents can be diversionary and disturbing. 'Speaking of science', a term I have borrowed from a popular column in *The Hindu* by D. Balasubramanian, can be challenging for both lecturers and teachers.

P. Balaram