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EDITORIAL

Science and Society: Needham, Bernal and Pauling

Calcutta lost its status as capital of British India ninety years ago, when the seat of imperial power moved to Delhi. In the span of a century from Rabindranath Tagore to Satyajit Ray and Mother Teresa, Calcutta has been home to both the highest levels of human achievement and the lowest depths of human despair. Calcutta (or Kolkata as it is now known) has been the capital of science in India through much of the 20th century; its most glorious moments falling in the last century, when Jagadis Chandra Bose, C. V. Raman, Meghnad Saha and Satyendranath Bose raised Indian science to a height, which has since remained unmatched. Even earlier, P. C. Ray's pathbreaking research in chemistry was a sign that Calcutta might prove hospitable to a fledgeling science. Two of India's most far-sighted institution builders, Mahendra Lal Sircar and Asutosh Mukherjee called the city their own. Many other remarkable men and women of science have emerged in the years since; sadly, in the last three decades the lustre of Kolkata's science institutions has dimmed, even as they struggle against the tide of declining intellectual standards, diminishing resources and a deteriorating academic infrastructure. However, through good times and bad, Kolkata has provided a home to some of the most important intellectual and political movements of our times. Ramachandra Guha, a sociologist and writer who for a while called the city his home, passes a perceptive judgement: 'In so far as thought and debate can flourish only in conditions of political freedom, it is Calcutta rather than Peking, Hanoi or Havana, which is the intellectual centre of world Marxism' (*An Anthropologist Amongst the Marxists*, Permanent Black, 2001, p. 10).

I was therefore only mildly surprised to receive an invitation to a national seminar on 'Science, Scientists and Society' to be held in Kolkata. The occasion was to mark the birth centenaries of three remarkable Western scientists, all of whom entered the world in the period 1900–1901; John Desmond Bernal, Joseph Needham and Linus Pauling. These men were at the peak of their intellectual powers at a time when the West was undergoing a remarkable period of political ferment, in the years following the rise of Adolf Hitler in Germany. Rarely has

there been an ideology as opposed to rational enquiry as Nazism; unsurprisingly, many of the most talented Western scientists of the times drifted leftward, beckoned by the seductive ideology of Marx, little realizing that the Soviet Union under Stalin would be as repressive and intolerant of rational thought as Germany under the Nazis. Bernal and Needham were products of a unique intellectual environment in Cambridge in the 1920s. In an appreciation of Needham, Mansel Davies says: 'The Needham peak of enlightenment did not rise from a plain. Fujiyama is unusual in rising almost alone from the greatest of plains, the sea. Mount Shashtra, the Matterhorn and K2 are far more typical in being surrounded by other notable peaks. Joseph Needham is very much a Cambridge man. During his formative twenties and thirties there were contemporary with him at Cambridge (to mention only those in science) J. J. Thomson, Rutherford, Eddington, Keynes, Adrian and Sherrington. To say that these were in the Nobel class is an understatement. The Nobel class in Cambridge over those years comprised some ten others, from Blackett and Bragg to C. T. R. Wilson. But Needham himself would almost certainly mention in this context, his mentor, Gowland Hopkins, and his colleague and friend the physicist J. D. Bernal.' In thinking about the Kolkata seminar that was intended to honour these remarkable men of 20th century science, I realized that I knew a little about Pauling and Bernal, men who contributed greatly to fields I have studied; but of Needham I was ignorant, except for his legendary fame as a scholar of 'science and civilization in China'.

In searching for a quick overview of Needham's life and times I turned to the marvellous compilation of *A Selection from the Writings of Joseph Needham* put together by Mansel Davies (The Book Guild Limited, 1990). Here one can get a glimpse of Needham's far-ranging mind, without having to contend with the formidable size and scholarship of his work on science in China. In the years between 1920 and 1942 Needham was a biochemist of the highest order, before he began an almost half a century association with China. Needham's writings on science, philosophy and religion began even during his days in The Cambridge Biochemical Laboratory,

but these were in his own words, 'by-products, the results of evening reading or time for extraneous study snatched while waiting for the completion of a distillation or an incubation'. Needham's luminous scholarship shines through an essay based on an annual lecture given in 1963 in the chapel of Gonville and Caius College, Cambridge of which he was Master. Needham reminds the college's students that, 'it is good to remember, therefore, that our own pious founders were not the only men, and that Christendom was not the only culture, to set on foot great and noble institutions of learning where successive generations of students assembled to get the benefit of education and research. When the men of Alexander the Great came to Taxila in India in the fourth century B.C. they found a university there the like of which had not then been seen in Greece . . . and was still existing when the Chinese pilgrim Fa-Hsien went there about A.D. 400. Later the torch of learning moved to Buddhist Nalanda in Bihar, as we know from the account of that other great pilgrim Hsüang-Chuang in the seventh century. In China the foundation of the Imperial University goes back to 165 B.C. and by the beginning of the Christian era it had no less than 3,000 students'. In turning to the arts and sciences of Arabic culture, Needham reminds his listeners of a provocative Islamic saying, 'the ink of science is more precious than the blood of martyrs'. Needham goes on to ask: 'How are we to look upon all these achievements of people who were neither British nor European, neither Christian, nor 'white'? Surely, it can only be with appreciation, indeed with admiration. Truly 'God is no respecter of persons'. Today, at a time when international political tensions are intermingled with racial factors, it is more than ever essential that we approach people of other cultures with the conviction that they have at least as much to give us as we have to give to them.'

Desmond Bernal had an unmatched record as a mentor. Dorothy Hodgkin, Max Perutz and Maurice Wilkins, all of whom were associated with him, went on to win Nobel prizes. The application of X-ray diffraction to the study of protein crystals began in Bernal's laboratory. But while the most remarkable advances in structural biology, including the determination of the structure of DNA, were made in England during the three decades from the 1930s to the 1960s, Bernal himself appeared more as a motivator; a man generous with his ideas, whose concerns and interests transcended a narrow commitment to laboratory science. Bernal was an unabashed Marxist in the years before World War II. In the aftermath of Hiroshima and Nagasaki he turned his immense energies and penetrating intellect to the promotion of peace and nuclear disarmament. Bernal was also a major contributor to the issue of assessing a role for science in the civil economy. Indeed,

Bernal was at the forefront of discussions in Britain in establishing 'science policy and technology policy as an important issue of public debate and government intervention'. In an assessment of Bernal, C. P. Snow notes: 'People have asked, just how will he rank in scientific history in the narrow sense. I think the answer is that in natural gifts he stands very high; he is the most learned scientist of his time . . . But he has suffered from a certain lack of the obsessiveness which most scientists possess and which makes them want to carry out a piece of creative work to the end.'

We turn finally to Linus Pauling. Far removed from the intellectual ambience of England and Europe, Pauling epitomized the emergence of the New World. His contact with the centres of quantum physics in Europe during a brief period, 1926–27, was catalytic. He was to subsequently transform chemistry in a manner that was unanticipated by Dirac when he made his famous comment that 'quantum mechanics explains much of physics and all of chemistry'. Pauling could also legitimately claim that molecular biology was born in his laboratory in Pasadena and even before the century had reached its half-way mark, he had established the connection between molecular structure and disease. The Nobel Prize for chemistry was his in 1954 and possibly his greatest honour came posthumously, when members of the American Chemical Society voted him as the most influential chemist of the 20th century. But, the seminar in Calcutta really pays tribute not to Pauling's science but his unyielding commitment to the cause of peace. His pacifism must be seen in the context of the times. Pauling used his immense scientific stature to espouse the unpopular cause of banning nuclear weapons, immediately after the war, and spoke loudly and clearly even at the height of the anti-Communist movement in the United States, led by Senator Joseph McCarthy. Indeed, Pauling's 1962 Nobel Peace Prize was dubbed 'an extraordinary insult to America' by *Life* magazine.

In considering the contributions of Needham, Bernal and Pauling to the causes of peace, understanding and application of science to human betterment, we touch upon a subject that is as important today as it was in their times. The weapons of war and destruction are even more powerful and more widely dispersed today, than a couple of decades ago. Historical conflicts, religious intolerance and economic exploitation have been nurtured over the years. The world remains a dangerous and difficult place. But, there is hope that out of the ferment of the new century will emerge the successors of Needham, Bernal and Pauling.

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