

Amulya K. N. Reddy (1930–2006)

How do you describe Amulya? *'Cricketer, electrochemist, energy analyst, rural energy practitioner, appropriate technology pioneer, spokesman for sustainable development, campaigner against nuclear energy and weapons, respected teacher and more than anything, a person who has tried to live up to Gandhiji's talisman'*. This is what we wrote when we prepared a website of his works in October last year, on the occasion of his 75th birthday. Does it complete the description of Amulya K. N. Reddy (Amulya, as he asked many of us to call him), who passed away on May 7 at Bangalore, at the age of 76? Does it explain how his work and writings inspired many researchers and engineers to take up pro-poor development initiatives? Or how in these times when centralized, high investment driven, supply oriented approaches dominate the development debate, Amulya's writings continue to inspire many of us on possible alternatives?

It does not, and when we started writing this piece about him, we found it near impossible to capture all aspects of his work and personality.

Amulya was born on 21 October 1930 into a well-known family of Bangalore. His first passion was cricket, which he retained for the rest of his life. But a teacher in school awakened an interest in chemistry and friendship with children of the family of the Nobel laureate C. V. Raman opened the world of science to him. After a graduate degree in chemistry, he did his M Sc at Central College, Bangalore – years later he would recall that he was admitted to the M Sc through the 'sports quota' because of his skill as an opening batsman and leg break bowler! It was in college that Amulya, like many of his generation at that epochal time – on the cusp of independence – was exposed to social and political issues through student activism and contact with socialist leaders and party workers. After a brief stint as a lecturer in Central College, Bangalore, he went, in the mid-1950s, to the UK to do his Ph D at the Imperial College, London.

To summarize the 'professional' time line of Amulya's life: On his return from the UK he worked for three years at the Central Electrochemical Research Institute, Karaikudi, Tamil Nadu and for 25 years at the Indian Institute of Science, Bangalore. He joined IISc in the Department of Inorganic and Physical chemistry and was the Chairman of the Department of Management Studies when he retired in 1991. In 1974, he set up the cell for the Application of Science & Technology to Rural Areas (ASTRA) at IISc. In 1975,



he was instrumental in establishing the Karnataka State Council for Science & Technology (KSCST). After leaving IISc in 1991, Amulya, along with his collaborators in three parts of the world, set up the International Energy Initiative (IEI). He was the founder President of IEI and edited its research journal *Energy for Sustainable Development*.

Career shift

His journey from electrochemistry to rural technology to energy to sustainable development is best read from his autobiographical article 'The Making of a Socially Concerned Scientist: Personal Reflections of a Maverick' (*Seminar*, 1993). In 1973, when he was quite well known in the area of electrochemistry, he started asking basic questions on the inequalities in Indian society, the role of technology

and the role of technologists. In his own words: *'I argued that India was a dual society with ... islands of elite affluence amidst vast oceans of poverty of the masses ...', that this poverty was primarily due to inadequate income-generating employment in the rural countryside and that such employment would not come from capital-intensive industrialization. I attacked Indian science and technology for firmly allying itself with the elitist pattern of industrialization and demanded that it should devote itself to the generation of an alternative pattern of capital-saving labour-intensive technologies of relevance to the rural poor.'*

Amulya made his career shift when he was in his early forties, at a time when most scientists are comfortably placed and prefer to stick to their chosen paths. By then Amulya had made his name in electrochemistry and the two-volume book he co-authored with J. O.'M. Bockris had become a standard in the field.

In 1974, Amulya chose to burn his bridges with electrochemistry to set up ASTRA in the IISc and was its founder Convenor. *'After almost two decades in the field of electrochemistry, I felt that, like most of the work in advanced institutions of education, science and technology, my own work was largely irrelevant to India's poor, the majority of whom live in villages. I also felt that I should reorient my efforts towards technologies for rural development. Such a viewpoint found sympathy from many other colleagues at the Indian Institute of Science. This shared vision led in 1974 to the formulating and implementation of the ASTRA programme through which it was hoped that the application of science and technology would be a weapon (or asthra in Sanskrit) in the interests of the poor'*. With this perspective, ASTRA has over the years worked in the areas of bio-energy, biogas, gasification, fuel efficient stoves and driers, water purification, renewable energy, climate change, forestry and alternate and low-cost buildings. Much of the work was done in the villages of Pura and Ungra, about 100 km from Bangalore, and over the next decade and more, ASTRA's work attracted a band of colleagues and students who worked with commitment and excitement on developing technologies to suit the needs of rural India.

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Path-breaking research

The work on community biogas plants was in many ways a trendsetter and brought Amulya and his colleagues national and international renown. An early joint paper on the economic aspects of biogas ('Biogas Plants: Prospects, Problems and Tasks') was published in the *EPW* in 1974. It was such work that brought him into closer contact with the world of social sciences. The biogas paper in *EPW* attracted the attention of K. N. Raj at the Centre for Development Studies, Thiruvananthapuram. An informal association with CDS led to Amulya being on the board of the Centre for about two decades.

No tribute to Amulya can miss mentioning the tremendous encouragement he gave students and young colleagues. While we ourselves were not his students, those who had been recall that he was an excellent teacher, whose lectures would hold audiences spellbound. Amulya always took a keen interest in the work of young researchers and activists. Generations of researchers remember how he would seek them out and find avenues in which they could further explore their interests. An expression of this interest in youth was the large-scale programme he organised under the KSCST for students

of engineering and science courses in the state. He was no less generous in acknowledging the work of his colleagues and others in the field. To give just one example, readers of this journal would recall his high praise for the proposal by T. L. Shankar for a people's plan in power ('In Support of a People's Plan for Power Sector Reform', *EPW*, 2 November 2002).

It was not that Amulya faced no opposition whatsoever in his work. In the early years of his work on appropriate technology and in ASTRA, he was criticized by a number of scientists and Left thinkers for attempting to argue for the adoption of 'inferior' technology. Later, his appointment as a member of the Planning Commission in the late 1980s was widely believed to have been sabotaged even though the then Deputy Chairman, Ramakrishna Hegde, supported his candidature. (Incidentally and perhaps coincidentally, this happened within months of his critique of the economics of nuclear power on the occasion of a public and high-profile debate with the Department of Atomic Energy on the Kaiga Nuclear Power Plant in Bangalore.) It is not difficult to understand why there were powerful groups opposed to Amulya's involvement in policy-making. There were no sacred cows for Amulya

and he was ever willing to think originally and question established shibboleths.

Opposition to nuclear weapons

Nuclear weapons were another major concern of Amulya in the last decade of his life. He visited the concentration camps at Auschwitz and Birkenau in October 1999. On his return, he wrote and spoke on Auschwitz to Hiroshima to Pokhran to Indian science. His critique of nuclear weapons was lucid and strong, as he wrote in 2000, after Pokhran II: '*Nuclear weapons are unique – their impacts are primarily on innocent civilian non-combatants particularly women and children; they are intrinsically indiscriminate; they are largely uncontrollable; they are instruments of mass murder on a scale unparalleled in human history. Nuclear weapons have security, economic and political implications. In the ultimate analysis, however, the issue of nuclear weapons is a moral question. It is a question of right and wrong, good and evil, ethics*'. Amulya was one of the few established names in the world of science and technology who came out strongly against Pokhran-II and the nuclear weapons programme. It was touching to see him participate in the November 1999 people's convention in Delhi against nuclear weapons even as most of his colleagues in the world of science and technology preferred to buy the lie about these weapons of destruction and remain silent. His struggle against illness had by then begun, but this did not prevent him from making the journey to Delhi to take a public position against the nuclear weapons programme.

More recently, in perhaps one of his last papers, he was trenchant in his criticism of the India-US deal on nuclear power – not because it would sell the Department of Atomic Energy down the river, as has been the predominant argument in the Indian media, but because of, as Amulya described it, the 'false assumptions' of nuclear power (*EPW*, 27 August 2005). Moreover, in this article and elsewhere Amulya drew out the connection between nuclear power and nuclear weapons, a link that many do not wish to see.

Energy paradigm

All his life, Amulya was engaged in learning, questioning, and challenging dominant

In the passing away of Professor Amulya K. N. Reddy, the electrochemical fraternity has lost an outstanding scientist and a teacher par excellence. His popular magnum opus, *Modern Electrochemistry* (in two volumes), with J. O. M. Bockris, reflects faithfully his commitment to the subject, his holistic approach to science (and life) and passion for lucid exposition of complex ideas. In his own words about the book: 'the ecstasy consisted of my discovering the electrochemistry for myself, being excited about what I learnt and communicating a fresh account of the learning'.

During his active years of research in India on electrochemistry, he was mostly associated with the Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore. Needless to say, through his endearing personality, how much he influenced the course of electrochemistry and the men who practised it! His penchant for home-building of instruments, commitment to socially relevant projects and a true appreciation of rigorous, analytical approaches marked his choice of projects and team mates.

His seminal research contributions in this field centred around structure and growth of electrodeposits – their preferred orientations and techniques of observations, especially *in situ* optical techniques for the study of anodic films.

The ground realities of doing research in an interdisciplinary area like electrochemistry in the midst of scarce funding of the early seventies, compounded by a highly competitive international scenario and a growing alienation with the then existing philosophy and approach of S&T in the country are some of the factors that weaned Reddy away from the 'traditional' confines of electrochemistry (and science, in general). This also launched him as a valiant player in a much wider and more meaningful (in his view) field of S&T choices in social development, especially in energy. Rest is history.

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perspectives. His work on rural technology and development led him to questioning the existing paradigm on energy. This paradigm, according to him has a consumption oriented, supply driven approach, bypassing the poor and ignoring environmental sustainability. With his characteristic caustic sense of humour, he attributed seven sins to this paradigm (unwise – consumption emphasis; unfair – bypasses the poor; unclear – non transparent; un-frugal – ignores efficiency improvement; unbalanced – has supply emphasis; uneconomic – has exorbitant capital requirements and finally unsustainable – has negative environmental impact) and named it the GROSSCON (Growth Oriented Supply Sided Consumption directed) paradigm. This critique and the seeds of an alternate paradigm were presented in Energy for Sustainable Development – the book Amulya wrote in 1988 with his three colleagues from different parts of the world. Authors were Jose Goldemberg from Brazil, Thomas B Johansson from Sweden, Robert H Williams from USA and Amulya – to borrow another original expression from Amulya – ‘the gang of four’. This alternate paradigm christened DEFENDUS (Development Focused End Use oriented Service directed) has been applied in the Indian context by Amulya’s team to Karnataka and few other states and to Maharashtra by Prayas. Compared to the official Karnataka plan, this approach called for two-thirds the energy requirement, half the generation capacity increase and half the capital cost, without reducing the quality or quantum of energy service.

Continuing this spirit of enquiry, Amulya applied these ideas to areas like public transport. He also paid special attention to the gender aspects of energy by engendering energy towards empowering women. Amulya realised the importance of including developing countries (South) in partnerships to study their problems. IEI was an excellent case of a South–North partnership, which was South initiated, South based and South led, working on issues facing the South.

Did society recognize the contribution of this outspoken pioneer? Amulya’s energy expertise was globally recognized. He lectured widely and advised several foundations, governments and UN agencies. There were mainstream recognitions

like the Om Prakash Bhasin Award for Energy (India, 1988), American Council for an Energy Efficient Economy (1992), the international Volvo Environment Prize for the year 2000 awarded to the ‘gang of four’ and Sir M. Visvesvaraya Award for Senior Scientists (India, 2004). One cannot but suspect that Amulya’s high sense of integrity and fearless criticism of the mainstream prevented more such recognitions and positions coming his way. Not that he seemed to feel bad about it. Bitterness or cynicism was not for Amulya. On the contrary, he was justifiably proud that many young scientists drew inspiration from his work; many grassroot movements studied his work carefully in their search for alternatives; the gang-of-four could challenge the existing energy paradigm, which was leading to unsustainable development and *Energy for Sustainable Development*, the international journal he nurtured has today become a ‘sudevelopment’ platform for debates on technologies for the developing world.

Sensitivity

Amulya was very sensitive to ordinary and poor people, had a keen insight to their lives and had implicit faith in them. Writing about his experiences about the biogas plant in Pura, he highlighted the key role played by people’s participation in planning and operation of the plant. In a short article ‘The blessing of the commons’, he wrote how the Pura villagers triumphed over the ‘Tragedy of the commons’ – a paradigm where each individual chooses to derive the immediate personal benefit rather than save the commons.

All those who came in contact with Amulya would remember the extraordinary support he received from Vimala Reddy, his wife of 55 years. Throughout his career, she was a constant source of strength (‘as constant as the northern star’ as Amulya would say). It would be no exaggeration to say that but for her support, Amulya would not have been able to exercise the choices he made and make the commitment he gave to innumerable assignments and projects. She even fully shared the Pura experience – she was to say later that those visits to

Pura when they stayed in a one-room home, without electricity and without basic furniture were some of the happiest times of her life and their marriage.

It was not as though Amulya was unaware of his unfinished tasks. As a pioneer, he faced the challenge of developing a critical mass, which could carry forward his paradigm of sustainable development. This was no easy task, considering also the changes in the socio-political climate in the last decade. Last October, Amulya participated in a daylong seminar organized at IISc, Bangalore, on the occasion of his 75th birthday. He was quite unwell, but he sat through the seminar and made many insightful and introspective comments. In his introductory talk, he emphasized that all social needs cannot be answered with technological solutions. And since the needs of the poor are not addressed by the scientific establishment, special efforts have to be made to articulate them. With his sense of optimism and unwavering faith in humanity, Amulya had said: ‘*The future is difficult, but the present is unsustainable. Fortunately, ideas are powerful and when they become visionary messages, capturing the hearts and minds of the people, mighty empires crumble and powerful structures collapse*’.

We bid adieu to this pioneer, carrying with us these words of hope.

Note: Amulya wrote extensively. Two recent sources, which have consolidated his major works are the website prepared on the occasion of Amulya’s 75th birthday (www.amulya-reddy.org.in) and a book containing his selected works released on the same occasion (*Energy, Environment and Development – A Technological Perspective: Selected works of Prof. Amulya K. N. Reddy*, edited by B. Sudhakara Reddy and P. Balachandra, Narosa Publishing House, 2005).

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