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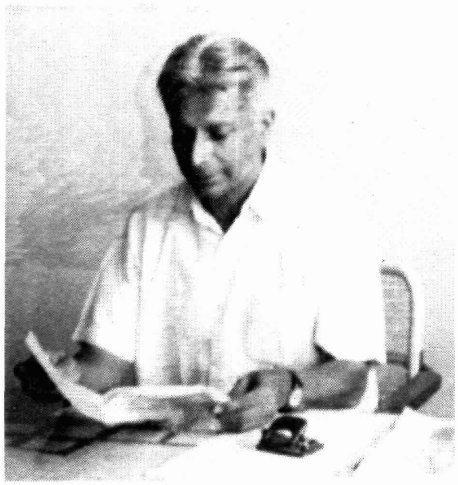

Amalendu Roy (1924 – 2005)

The sad demise of Professor Amalendu Roy on December 23, 2005 marks the end of a long journey of an able navigator who instead of taking the known path, chose to discover new routes in the rough seas and in the process left a blazing trail behind him. The post-independence geophysical research in the first quarter century in India is verily the research of this genius. Like a cricketer delighting the crowd with swashbuckling innings, Professor Roy took geophysical research by storm by publishing in quick succession articles of high standard and with new ideas and concepts in leading international journals, like *Geophysics*, *Geophysical Prospecting*, *Geoexploration* (now renamed as *Applied Geophysics*), thereby inspired his colleagues and young researchers and took to new heights the organizations he served – GSI, IIT, ONGC, and NGRI. It will not be an exaggeration to say that he had a big hand in building these institutes and shaping their future course. Of more than 100 papers he has authored, about 50 of these are being still cited by researchers in India and abroad. The two decades, 1960s and 1970s, were truly the golden era of Indian geophysics. Hidden behind a great scholar, an eminent teacher, an inspiring researcher and an able administrator, stood Roy, an extraordinary man, stern and at times appearing tough, but with a large and kind heart. He was synonymous with discipline, hard work, honesty, integrity and modesty. Such was his reputation that from 1964 till he took up UNESCO Professorship in Nigeria in 1980, his modest office room at NGRI was a veritable pilgrimage for high-profile as well as ordinary earth scientists from all corners of India, his former colleagues at GSI, IIT, Kharagpur and ONGC and the admiring students from all geophysics teaching departments. While visiting India many geophysicists from abroad representing their organizations or university departments made NGRI a destination to meet and exchange views with this erudite scholar.

Amalendu Roy was born in 1924. A student of Professor Satyen Bose, received his Master's degree in Physics in 1946 from Dacca University, now in Bangladesh, a great center of learning in undivided India. Soon after, he joined the Geophysics Division of the Geological Survey of India (GSI) and was sent to the Colorado School of Mines where he obtained his MS in Exploration Geophysics in 1952. Soon after his return from USA he moved to IIT, Kharagpur in 1954, where he obtained his Ph.D. Here at Kharagpur he excelled in teaching and initiated innovative research in geophysics that brought him both name and fame. "The search for answers to the intelligent questions raised by the students at Khargapur", Roy admitted candidly at NGRI later, " formed the life-long research topics for me. Some I have solved, and for some I am still on the look out for suitable answers". He loved IIT life so much that whenever any former colleague, young student or any body else for that matter from Kharagpur visited him at NGRI, he used to get nostalgic, rewind his memories and go back to those youthful days. Roy had a major role in establishing the department of geology and geophysics at Kharagpur, in imparting education at an advanced level, conducting and guiding research of very high quality.

In reciprocation, Professors Ashoke Mukherjee, K. Naha, S.V.L.N. Rao, Sisir Sen, T.K. Bhattacharya, H.P. Patra, S. H. Rao, K.K. Roy and others always wished to have a glimpse of Roy, feel his warmth and take his blessings. He

spoke with a voice that was measured, moist with love and resonated with affection Chain smokers Ashoke Mukherjee, S V L N Rao and S H Rao, when offered cigarettes (Roy smoked only once at 9 30 in the morning and once again at 3 30 pm in the afternoon after a cup of tea), would jump up on their feet and with folded hands admit, "Sir, agreed we do smoke, but never in your presence!" Such was the respect he enjoyed from his erstwhile colleagues!

After spending seven fruitful summers at IIT Kharagpur and publishing numerous research papers of high quality, which are being referred even till today, including the famous 'Ambiguity in geophysical interpretation' and moulding students who in later years gained fame at home and abroad, Roy joined Oil and Natural Gas Commission at Dehradun His personality brought him again to the center stage Commission Chairman, Dr B S Negi, IPE's (Institute of Petroleum Explorations) director Dr Hari Narain (who later moved to Hyderabad as NGRI director in 1963), well known petroleum geophysicists, S N Sengupta and A N Dutta along with Roy formed the core group for India's hydrocarbon exploration It is here that Roy was intimately associated with oil exploration techniques, which stood good for him to obtain startling results in well-logging methods As an institute builder, once again he made a lay-out for research and data interpretation at IPE (renamed later as KDMIPE), the research wing of ONGC

Declining the directorship at IPE, Roy joined NGRI at the invitation of Dr Hari Narain and headed the Mineral and Groundwater group Besides building up the institute at its nascent stage, he spent sixteen very inspiring years at NGRI in conducting and guiding research that, besides putting him as one of the most leading geophysicists in the world, put the institute and our country in the world map of geophysics Ambiguity in geophysical interpretation, continuation of potential and electromagnetic fields, depth of investigation of electric and electromagnetic fields and new results in well-logging techniques are some of the research areas where he opened new avenues and created new frontlines He gave equal importance to theory, model studies and field investigations His work on ambiguity in geophysical interpretation has become a benchmark paper It is he who had demonstrated that the electromagnetic field can be continued up and down, for the first time in the geophysical literature His deep insight of the geomagnetic field lead him to reduce the aeromagnetic data of Nigeria, situated at low latitudes, to the Equator instead of reducing to the pole

His very presence in NGRI created a thrilling environment not only for those who were in his group, but for every other scientist, it was something like 'field at a distance' due to a magnet "Every one like me although not directly associated with Roy," recalls Dr S V S Sarma, former head of magnetotelluric group at NGRI, " was equally inspired to work hard and to do good research " The institute library geared up to procure good books, reports, geophysical maps and good journals (NGRI library till today is considered by many as one of the best of its kind in earth sciences), The maps and drawing section tightened its belt to get all toposheets, atlases and aerial photos required for the scientists Under Roy's watchful eyes, eager-to-learn technical officers like P Krishnaswamy, P J Vijayanandam and M Jayarama Rao produced line drawings, geological maps and geophysical contour maps of such high standard (pre-computer era) that even researchers and officers not belonging to the institute travelled miles to get their figures drawn to meet the international standards Much before the ISO movement in India, NGRI had achieved its own standards, much of its credit goes to Roy Even the drivers felt it a privilege to take him to GSI, Osmania University or Defence Laboratory (where most of Roy's computations were carried out, Lt Col A Balasubramian and Dr K S Rao were eager to give all possible co-operation to him) During my deputation to IIT, Bombay (1978 - 83), Dr K S Rao, then a faculty there, fondly remembered Roy The Hari Narain – Roy combination at the initial stage of NGRI was enthralling While Hari Narain brought in a wider and magnificent perspective to the institute, Roy laid a broad pyramidal foundation for research to reach higher and higher, which continues till to-day

Roy was an intense man and his relationship with colleagues, too, was intense His hard work and research robbed him off socialization and for these, at times he was often misunderstood He held Dr Hari Narain, Professor T C Bagchi, Professor V K Gaur, late L N Kailasam, late P M Mathew, late Professor Jagdeo Singh, late Professor B Sundara Rama Rao and many other eminent earth scientists in high esteem While senior colleagues at NGRI like late Dr S Balakrishna, late Dr M N Quereshy, Professor R K Verma, Dr P V Sankar Narayana, Professor D Guptasarma looked up to him as a friend, to younger generation scientists like late Dr P A Paul, late Dr N Krishna Brahmam, Professor B B Bhattacharya, late Dr A Appa Rao and to freshers like us he was a guide and a teacher From mid-sixties to mid-seventies NGRI was a well-knit institute and there was scientific romance in its youthful environment

He was very sensitive and was deeply affected by the turn of events, such as the passing away of his younger colleagues In a letter dated December 31, 1989 he wrote to me (this correspondent), " Your silence should have told

me something, but I was not listening So many of them have jumped the queue- Rajni (Dr Rajnikant Verma), Rakesh (Dr Rakesh Kumar) and now Sheel (Dr Sheel Chand Jain) It is not just fair What does one say or do at such moments? With 66 years behind me, I feel stupid " In another letter of July 12, 2003, Roy lamented, " Dr Appa Rao's and Dr Kaila's passing away is shocking I wonder what happened to them, they were still young "

At this point may I (this correspondent) take some liberty (and may be forgiven by the readers) to add a couple of personal remembrances in order to project Roy from a different perspective Roy was more than the head of exploration group for me He initiated my research career at NGRI His association was so motivating that he led me to take up challenge after challenge, and taught me not to be a mere follower, but to be one to create followers True to his prophetic words, together we could develop new concepts that were accepted the world over in different fields of geophysics- groundwater and mineral exploration, electrical and electromagnetic methods and potential fields

Roy stood dignified and tall He was quick to acknowledge talent and generous in praise He wrote with great style, and spoke so elegantly by choosing appropriate words and modulating his voice with pauses and measured meters that one can mentally place a coma, a semi-colon, a colon or an exclamation in his crispy sentences He remained honest to the core as a scientist and as a human being He never took any undue authorship of research papers Authorship grabbing is a national as well as international issue that has marred scientific temper to a great extent Roy, on the other hand, was clearly above this unfortunate malady In my first meeting he declared, "My job requirement is to guide and conduct research I am paid by the government to guide, therefore, no claim for authorship, I shall author a paper only when I conduct my own research In a joint-work I shall be a second author, only if my contribution exceeds more than 50% " Such clear and noble thoughts have immensely inspired me In one instance of a field-related case study, he cabled to the editor of *Geophysical Prospecting* to delete his name from the corrected galley!

In scientific communications he remained tough and never reconciled to any changes that he thought unjust In a manuscript to *Geophysics* in 1969, the reviewer tried to correct his English Pointing out the numerous mistakes the reviewer has committed in trying to correct the manuscript, Roy pleaded with the editor that the reviewer's job was to look into the correctness- technical and scientific, of the paper and not merely grammar The editor accepted the manuscript in its original form After several rounds of conflicting comments of five reviewers the editor of *Geophysical Prospecting* asked Roy whether he would like his paper to be published, to which he wrote a two-word reply, "Please publish" The paper on New Results in Well logging appeared in its original form in 1975 A A Fitch, for a series of books on geophysics that he edited, solicited a paper by Roy on well-logging Roy did oblige him, but when suggested to bring in some modifications in the manuscript that were not to his liking, he wrote to Fitch, "Please publish or return the manuscript" Fitch published it without any changes The high noon of his research came when a series of papers on the current pattern and potential distribution in the ground provided new insight into the interpretation of well-logging data that forced the well log giant Schlumberger Company to withdraw their most popular 'Well Log Document No 8' from circulation No mean achievement, in deed!

Roy had many overseas admirers Professor D S Parasnis, well known for his excellent books on applied geophysics, was so enamoured by Roy's personality and work that he named his son Amalendu Parasnis When I was introduced in October 1969 as a research fellow from India to Professor P Meiser, Head of International Geohydrological Programme at Federal Institute of Geoscientific Research at Hannover, Professor Meiser enquired if I knew Professor Amalendu Roy Amazed by his clear pronunciation of Amalendu, I replied that I worked with him "You are fortunate", he smiled Surprise to come He got up, opened his cupboard, took out a silver-bound document and said,

"Reprint of Roy's paper A treasure It has provided me bread and butter all these years " Meiser's words created a rare turbulence of thrill in me Standing to deliver a keynote address on electromagnetic migration to an international gathering in Moscow, Professor Michael Zhnadov said, "All that I am going to say today is, in essence, based on the theory and concept of the continuation of electromagnetic fields by the Indian geophysicist, Professor Amalendu Roy " (The wordings are not exact, the theme is) The lone Indian in the audience to have the hair-raising excitement by this pronouncement was Professor R G S Sastry of Roorkee University (now renamed IIT, Roorkee)

He undertook several overseas assignments He was a visiting Professor at University of Bahia, Brazil (1973 – 74) and UNESCO Professor at University of Ibadan, Nigeria (1979 – 83) Later he moved to University of Ile-Ife, Nigeria and retired in 1984 He gave up geophysics altogether and followed a path of spiritualism, first at Ramakrisna Mission, Hyderabad and then at Maitri Ashram in Varanasi Here, he took pleasure in teaching arithmetic and physics to the

students in the Ashram school He joined his family in Hyderabad to look after his ailing wife After her demise he moved to Calcutta and from there to USA to live with his daughter However, once again he came back to Maitri Ashram in Varanasi where his end came in the early hours of December 23, 2005

On hearing the passing away of Roy, Dr Vijay P D mri, Director, NGRI held a special condolence meeting and described him to be "rarest among the rare personal ties, who chose altogether a different path to lead his life after superannuation Apart from being a great teacher of geophysics in India, he left an indelible mark with his high quality research " A large number of scientists that included Professor D Guptasarma, Dr H K Gupta, Dr D C Mishra, Dr D Atchuta Rao, Dr R Umamaheswara Rao, among others and Dr P D Venkateswaralu of GSI paid glorious tribute vividly remembering the high standard set by him first as deputy director and then as acting director o the institute

When the correspondent contacted Professor K K Roy, formerly with IIT, Kharagpur and now an emeritus scientist at Jadavpur University, his immediate reaction was, 'We deeply mourn the sad demise of Professor Amalendu Roy, one of the great teachers of geophysics in India His contribution to geophysics through his research will be remembered by us for many more years to come " Professor Kabir Roychoudhury, now at Utrecht University, The Netherlands, expressed his deep sorrow, "Yes, very sad, in deed A range of emotions and memories swept through me and my wife, Anita A giant among the geophysicists, a wonderful teacher, a stern task master a rasogolla-distributing deputy director during the holi celebrations and finally, a mellowed elder (almost like a brother) Sure, he had weaknesses, somehow it made him more human and accessible Hope, NGRI will remember him in a suitable way May his soul rest in peace"

Mrs Ramola Roy predeceased her husband A symbol of affection and love, a genial smile always decorated her face Their two children- Dr Sujoy Roy is a practicing physician in UK and daughter Parama is Professor of English in University of California, Riverside campus, USA It so happened that Parama along with her husband, Bharat, an eminent economist, visited her father at Varanasi, where Roy stayed in Maitri Ashram and spent ten days with him before flying back to USA After returning to Riverside Parama wrote to me, "Baba is physically frail His situation is painful to watch, and I hope he does not have much more suffering days ahead of him " True to his nature, Roy did not let his daughter down, and passed away exactly ten days after True, he was ageing, but not getting old His end was sudden

He was a member of SEG, EAEG, regional editor of Geoexploration (now Applied Geophysics) and fellow of Indian National Science Academy Considering his contributions in building institutes and creating a healthy tradition of geophysical research in India, Indian Geophysical Union and Association of Exploration Geophysicists have conferred on him Decennial (1976) and Millennium Awards (2001), respectively The earth science community, his innumerable admirers far and wide, former colleagues, old and young and family members will miss him immensely We sincerely pray for his soul to rest in peace

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We regret very much to record the demise of Prof S Varadarajan, formerly of Delhi University, on 25 September, 2006 at New Delhi