Ayyagari Sambasiva Rao

Ayyagari Sambasiva Rao, popularly known as A. S. Rao, was born on 20 September 1914 in a small village of Andhra Pradesh. He died on 31 October 2003. Rao obtained the Master of Science degree in Physics from Banaras Hindu University, where he subsequently carried out research work as a faculty member for six years. In 1946, Rao was selected for the prestigious Tata Scholarship to successfully pursue his Master's degree in Electrical Engineering from Stanford University in the US.

On his return from the US, Rao was invited by H. J. Bhabha to help him in conducting certain experiments on cosmic rays at the Tata Institute of Fundamental Research (TIFR), Mumbai, as similar experiments conducted at some advanced laboratories elsewhere in the world, were not conclusive. The very first experiment taken up by Rao was successful. Bhabha personally went to Mumbai, congratulated Rao and offered him the job of a Reader in TIFR. 'Thus began my long and rewarding association with one of the greatest Indian scientists and one of the ablest administrators of scientific enterprise in the world,' Rao was reminiscing emotionally.

Rao was associated with India's atomic energy programme since its early stages. In 1953, he joined the Atomic Energy Establishment, Trombay [now Bhabha Atomic Research Centre (BARC)] and was entrusted with the task of designing and building up the control and monitoring systems for India's and Asia's first nuclear reactor, *Apsara* which was commissioned in 1955. *Apsara* became critical on 4 August 1956, within 12 months from the start of the project. It was one of the successes that independent India achieved in science and technology to the surprise of many Western nations.

The success in the field of reactor electronics further continued with the installation of the control and safety system for the second 40 MW heavy water-based reactor, *Cirus* and with design, fabrication, installation and commissioning of the entire electronics system for a third research reactor, *Zerlina* and the radiation monitoring system for the plutonium plant at BARC. The entire reactor control electronics and radiological health and safety aspects of the atomic energy programme bear the imprint of Rao's leadership. As part of the programme for radiation protection in the country, Rao organized a nation-wide network of monitoring stations and laboratories for determining the levels of environmental radioactive contamination resulting both from nuclear explosions and other radiation activities. The Health Physics Division, the Electronics Division, the Reactor Control Division and the Directorate of Radiation Protection at BARC, each of these employing hundreds of scientists and technicians, owe their inception and speedy growth to the vision and guidance of Rao.

During his tenure as Director, Electronics Group, BARC, Rao initiated and carried through design, development and engineering programmes on a broad spectrum of electronic materials, professional-grade electronic components, including semiconductors, industrial, nuclear, medical and test electronic instruments, analogue and digital computers and servo systems. He established a production facility to carry out pilot production of some of the components and systems for which there was a rapidly growing general demand in the country. He was successful in bringing the required leadership and motivation to nearly 1600 scientists, engineers and technicians of the group to work as a team and to generate new technological developments in advanced areas of electronics on the basis of self-reliance, at a time when the industry in the country looked to foreign collaboration for making such simple items as radio receivers. It was under Rao's leadership that the foundation for indigenous electronics development covering innumerable application areas was firmly laid during the early sixties.

The requirement of electronic components, modules, equipment and systems increased manyfold in variety and volume, and the need to create a facility for the manufacture of these items was felt seriously. The Chinese aggression of the early 60s led the Government to realize the importance of electronics for defence and nuclear programmes, and a national committee on electronics was formed in 1963, with Bhabha as its chairman and Vikram Sarabhai, Bhagavantham and A. S. Rao as members. The Committee prepared a comprehensive report, popularly known as the Bhabha Committee report. The object of the report was clearly on achieving self-reliance in electronics so as to put India on par with the developed countries, modernize the Indian industry through new technology and open up vast employment opportunities for Indian scientists and engineers. The Bhabha Committee report became India's first blueprint for the development of the electronics industry and it bears Rao's imprint of practical experience. The publication of the report accelerated the move to establish the Electronics Corporation of India Ltd (ECIL). With Sarabhai as Chairman and Rao as Managing Director, ECIL was incorporated as a fully Government-owned company on 11 April 1967.

Today, if ECIL occupies a respectable position in the country in the field of electronics, it is because of the untiring work of Rao, who from the time he conceived the idea while in BARC, gave it shape in 1967 and nurtured it until the day of his retirement. ECIL was primarily set up to produce a variety of electronic components and systems, which were developed at BARC. This was the course of action recommended by the Bhabha Committee at a time when hardly any professional electronics was being produced in this country with indigenous know-how. The production of electronics was confined to assembly with the assistance of foreign collaborators. Therefore, the decision to create ECIL called for a tremendous amount of courage and self-confidence, and demanded considerable hard work. Many people in the government and public were skeptical about the idea and not many were hopeful that the endeavour would succeed. It was in such a hostile environment that Rao set out

with a small but devoted band of colleagues to disprove that Indian technology would not be able to deliver the goods in the field of professional electronics. The hard and dedicated teamwork that the group had put in saw ECIL grow from year to year and product by product, into a host of technologies that more than vindicated Rao's faith in indigenous technology. Rao, the founding father of ECIL served as its Managing Director from its inception in 1967 up to 31 May 1978. Even though Rao retired from the services of ECIL more than 25 years ago, he had been the primary source of inspiration to all the successive Chief Executives of ECIL. He firmly believed that the electronics industry alone had the potential to address the employment problem of the country. The spirit of self- reliance gave ECIL the courage, conviction and confidence to combat technology denials that the country has been facing from time to time.

Rao represented India at many international conferences in scientific development, including UN conferences on peaceful uses of atomic energy. He was the Chairman of the Board of Directors of Central Electronics Ltd and on the board of Bharat Electronics and KELTRON. He was on the editorial and advisory boards of several journals, including many international journals of high repute. As a mark of recognition of his outstanding contribution to the nation in the field of science and technology, a number of prestigious awards were conferred on Rao, the most important being the Padma Bhushan in 1972 preceded by Shanti Swaroop Bhatnagar Award in 1965 and Honorary Degree of Doctor of Science from Andhra University in 1969. Rao was elected to the Fellowship of the Indian Academy of Sciences, Bangalore in 1974.

Rao evolved a methodology which was in sharp contrast with the way other technological organizations were built. It was his conviction that electronics technology, with its pervasive influence on several spheres of national activity, can be built, sustained and endured only with a strong indigenous base of know-how and expertise. He had faith in the ability and motivation of Indian scientists and engineers. In giving a concrete shape to his conviction and methodology, he opted for the 'growing science method' – one shall not first build an institute and then seek out a suitable man, but shall first pick an outstanding man and then build an institute around him. It was Rao's conviction that industry must adopt a policy of deliberate promotion of innovation in order to obtain breakthroughs at a good pace.

The major impact of Rao's contribution is constituted by the enormous prestige and confidence now vested in indigenous technology, as evidenced by the general national awareness that indigenous, self-reliant effort is the single largest resource for technological development, and the nation has been shown the job potential of technological innovation. It may be noted that Rao's contributions have covered import substitution on a large scale of items, which normally come through imports or imported technology. It has been demonstrated by Rao that the market for any industrial product vital to growth is latent and can be readily tapped. His contributions have revealed that large complex instrumentation systems can be indigenously and profitably developed, given boldness of decision, confidence and clear perception of approach. ECIL has spurned many more industrial undertakings not only in electronics but in other technologies as well. He created a brand equity for public enterprise in India.

B. BHASKERRAO

Electronics Corporation of India Ltd, Hyderabad 500 076, India

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