

obtain its position very accurately, with the discovery leading to a paradigm changing shift in astronomy. Interesting patterns in the sky, which have been reported from ancient times, can occasionally be reliably dated using computers to track back in time the positions of the objects involved.

In the six chapters which treat the associations, the authors adopt a somewhat more technical tone, freely using nomenclature (like Siddhantic astronomy, which K. D. Abhyankar has said originated with the works of Aryabhata I and Varahamihira around 500 AD) and concepts which most readers would not be familiar with. Various calculations done using ancient formulations, and sometimes their more recent counterparts, are presented to show that the results obtained compare favourably with results which follow from modern techniques. These chapters would be accessible only to those with some knowledge of astronomy, but the results and facts should be of interest to historians and others.

In summary, the book is an interesting, manageably brief and mostly readable account of a class of astronomical phenomena from the ancient perspective. The style and content of the book is unlikely to appeal to young students of astronomy and physics, but the more mature reader with some interest in the history of astronomy and science, as practiced in India of long ago, should surely find it useful. More such books are needed to be written in India, so that we have the opportunity to examine and understand the enormous contribution made by our ancestors, and their place in the development of modern thought and civilization.

AJIT KEMHAVI

*Inter-University Centre for Astronomy  
and Astrophysics,  
Post Box 4,  
Ganeshkhind,  
Pune 411 007, India  
e-mail: akk@iucaa.ernet.in*



**1970s America – An Indian Student's Journey.** Anil K. Rajvanshi. Nimbkar Agricultural Research Institute, P.O. Box 44, Phaltan 415 523, India. 2007. 166 pp. Price: Rs 150/US\$ 15.

A young IIT graduate engineer goes to USA to study for a Ph D; works at the height of energy crisis in 1970s, with the best experts in the world, on energy generation from alternate sources and falls in love with an American born Indian graduate student. The married couple finish their Ph Ds and our hero starts managing a large energy related international project in USA. Soon he gets very attractive offers from the top organizations in USA and India, Bell Labs, Tatas, CSIR, US Government programs, many universities, etc. But the young couple heads to a very small town in Maharashtra, India in the early 1980s. Our adamant hero continues with his wife to struggle for the next 25 years and builds up a research lab practically from scratch, to help farmers to generate energy using modern technologies. Is it a plot of an idealistic Hindi commercial Movie? No! this is real life. This is the autobiographical saga of Professor Anil K. Rajvanshi.

Rajvanshi has an engaging and polite style. The whole book unfolds like a novel. Rajvanshi's simplicity, eagerness to learn and use any new technology, spiritualism and all at the same time mixed with Indian style of a detached observer of his own life makes his sketch quite engrossing. Parts of the book and specially this mixture remind you of classics like *My Experiments with Truth* by Mahatma Gandhi or *Wings of Fire* by Abdul Kalam.

Our national labs, universities, top government and private organizations are

full of people like Anil Rajvanshi. Many of them, after their stay in western countries in the decades of mid-twentieth century following our independence, because of their own convictions, came back to India on meagre salaries and yet spent and enjoyed next decades working quietly in their environment. This is the silent majority of intellectuals, administrators and researchers from India. They will immediately identify with Anil, although Anil is still a little different. He and his wife chose to stay and struggle in a very small town and work in a research lab with almost no facilities.

Rajvanshi is a technologist researcher. He is at his best when he describes how he analysed his engineering problems and experimented in University of Florida at Gainesville. Generally people not familiar with researchers tend to believe that scientists live in their ivory towers and have nothing to do with nature. Reality is opposite. Most good researchers, irrespective of whether they do Mathematics, Physics, or Engineering, get their inspiration and guidance from the nature and sometimes even from spiritual aspects. Anil is no different. Nature provided him clues for his engineering problems.

So when he wanted to create solar collectors that could follow the sun for maximum interception of solar energy, he went to botany professors and tried to learn how sunflowers follow sun and plants manage their energy. When he wanted to use high DC voltage and flip flops to break bonds of water molecules for increasing the evaporation, he went to electrical engineering department and tried to learn how evaporation is increased by high voltages created during lightning. When he wanted to create temperature sensors, he asked how nature sensed temperature and found out that infrared sensors (IRS) of rattlesnakes are fantastic and can sense difference in temperature up to 0.010C to help them in catching their prey. When he wanted to save water, he tried to learn from biochemists how beetle in Namibian desert collected dew on its backside and used that water to survive in the harsh atmosphere of the desert. He then went on setting up three experiments based on these ideas on roofs of three different labs in his university.

Anil had gone to Florida on a scholarship given by the Government of India. Here was a person who was not even getting any official money from the univer-

sity, yet he could set up not only these experiments, he also ran an interdisciplinary seminar on energy research and called some of best researchers from all over the world to lecture. Later the same university also provided him, after his Ph D, opportunity to manage a large international energy education project. This account is indeed a great tribute to the university system in USA. Even today in a very small university in USA, such opportunities are automatically there. Let us hope that our education and research policy makers think about creating similar environment in universities and research labs in India. Just now it practically does not exist, despite tall claims by many of our higher education policy makers.

Spiritualism came naturally to young Anil. For him, doing these experiments and thinking about them was almost like a yogic meditation. Another time in quite Gandhian style he realized that 'maybe the unconscious was telling me that my real purpose of coming to UF was to get a Ph D and not run an Indian club. So I decided to reduce my activities in the association'. On some other occasion he sounds very much like Kalam, 'I have always believed that one should try to take the good things from a person; the negative attributes are his or her own baggage'.

The contradictions of our socialistic (or feudalistic in the name of socialism?) style of ruling in our country during 1970s are quite visible when he prepares to go abroad. On one hand because of his father's politician friends, from independence movement days, he could get direct access to almost topmost bureaucrats, editors and politicians and even top American consulate officers. On the other, perhaps because of coming from a small town and middle class, he did not know that there are travel agents in India and thought that Air India was among the best airlines in the world. He was still fortunate to get at least foreign exchange of US\$ 250. Most of us who travelled in those days abroad had to manage our trips in just US\$ 8! If the recent announcement of government about all government employees being forced to travel by Air India is any indication, it looks like the era of our top government policy makers treating every one else as their subject, like a king, is still not over. They still do not hesitate in putting every one else to hardship to hide their mismanagement. Coming back from USA

with all luxuries and attention of the best minds, science/technologist couple Rajvanshi had to live in slums for several months and had to travel by bicycle three miles to their labs. They could not afford even a scooter.

The book leaves you with admirable confidence in our country, which is full of dedicated people like Rajvanshi and his wife. Indeed I myself see every day in my own institute, almost 200 scientists enjoying their work, working even late nights in their labs or homes without any overtime. In his Epilogue, Anil tries to assess 'all this sacrifice – was it worth taking the trouble?'. He has his share of success and satisfaction. Several energy related products, patents, many awards, honours and even top international awards like recent 'Energy Globe Award' are to his or his institute's credit. Still Anil sounds a little pessimistic in his Epilogue.

A question which often comes to one's mind, is why even with such dedication visible all over India, we cannot provide even basic facilities of life with some minimal economic dignity to every family. This is available today in most countries with much less resources than ours. Anil had also dreamed to create energy with modern technology, to provide such dignified life to an average person. Reasons for this failure are not far to seek. While people like Anil want to work in the direction of solving our problems, policies created by our top economic, science and technology policy makers for the last 4–5 decades have mainly concentrated in one direction only 'to follow the West and to impress the West'. In this eagerness to impress we forget to see that while we have been talking about socialism for decades, Western countries have achieved socialism long back, by providing this minimal economic dignity to practically every-one. Our politicians also resign some times, like some did after Mumbai blasts. But this culture is not visible among our top economic and science/technology policy makers. Despite a massive failure, some of our policies and their framers and managers have continued for decades and have ruled almost all aspects of our education and research systems.

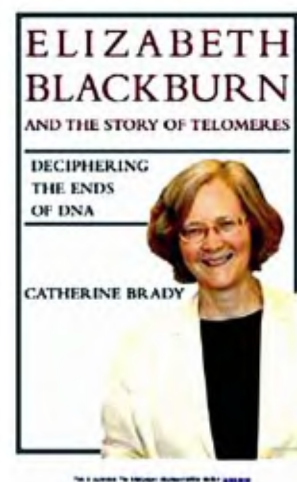
Even in this condition, Anil is not completely pessimistic. He dreams that with his ideas on using agriculture waste in our villages he can get 60% of energy, needed for our country, produced in villages and that can provide some basic

money to average farmers. With such changes, in less than a decade, indeed we can make an average Indian prosper. It does not require big expenditure by the government. All it needs is to change the policies slightly, to create proper investments in this direction. Will our policy makers, science, technology and economy managers wake up? Last such effort, to provide extra money to average farmers, was made by Mahatma Gandhi with his khadi movement, before independence.

Let us hope some of them read Rajvanshi's saga and get inspired to make our education and research sector and average life-style better. Let us also hope that our students, researchers and people from other domains, all over the world, also read this book and see how nature provides clues, or how technology and spiritualism are two sides of the same coin and get inspired to work with more dedication.

NAVIN SINGHI

*School of Mathematics,  
Tata Institute of Fundamental Research,  
Mumbai 400 005, India  
e-mail: singhi@math.tifr.res.in*



**Elizabeth Blackburn and the Story of Telomeres: Deciphering the Ends of DNA.** Catherine Brady. The MIT Press, Cambridge, Massachusetts. 2009. ix + 392 pp. Price: \$15.95/£10.95.

This is a timely biography of Elizabeth Blackburn, the scientist who discovered telomeres and who still continues to work and contribute to this field. The book has something to offer to scientists at all stages starting from undergraduates