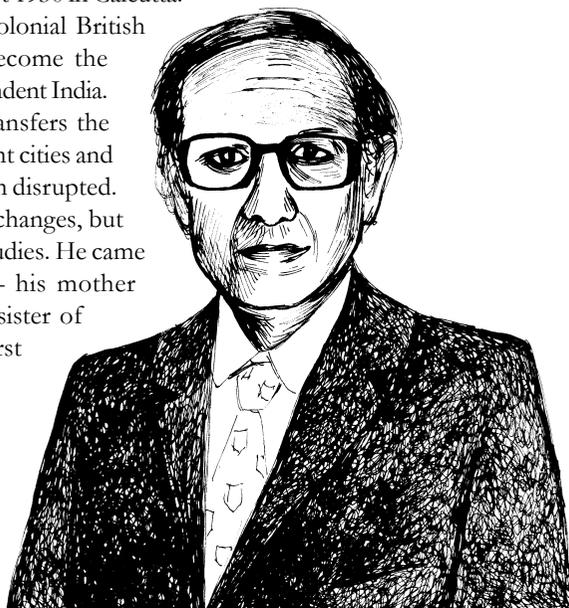


Sivaramakrishna Chandrasekhar

(1930 – 2004)

Today liquid crystals are used for a variety of electronic displays - from mobiles to wide-screen televisions. They have replaced Cathode Ray Tubes and have become the quintessential molecular material for electronic displays. The development and research into liquid crystals has been due in no small measure to the pioneering work of Sivaramakrishna Chandrasekhar, known affectionately as *Chandra*.

Chandra was born on 6 August 1930 in Calcutta. His father worked for the colonial British Government and rose to become the Accountant General in independent India. As a result of his father's transfers the family often moved to different cities and Chandra's schooling was often disrupted. Chandra did not enjoy these changes, but despite this did very well in studies. He came from an illustrious family – his mother Sitalakshmi was the younger sister of Sir C. V. Raman – India's first science Nobel Laureate. His younger brother S. Pancharatnam (of the Pancharatnam phase) died at a young age. His elder brother Prof. S. Ramaseshan was also a

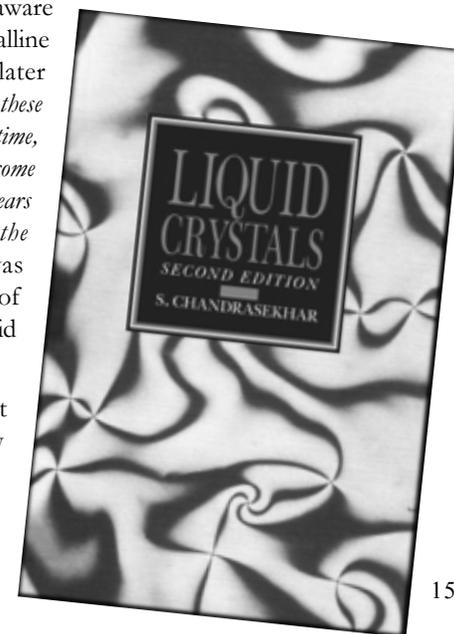


very distinguished scientist. In 1951, Chandra topped the Nagpur University's MSc exam receiving two gold medals and later a PhD.

Later he moved to Bangalore to join the newly opened Raman Research Institute. He was the first research scholar of his famous uncle Sir C. V. Raman, but their relationship was always that of teacher and student and never of uncle and nephew. It is about this time that he met his future wife Ila at the house of his elder brother Prof. Ramaseshan. Despite a small research fellowship Chandra managed to buy a motorcycle and rode with Ila on the pillion, causing quite a stir in the conservative scientific community! Unfortunately, he met with an accident and had a head injury which gave him innumerable headaches for the rest of his life. Because Chandra and Ila spoke different languages and came from different regions there were some problems before marriage. But they were soon sorted out.

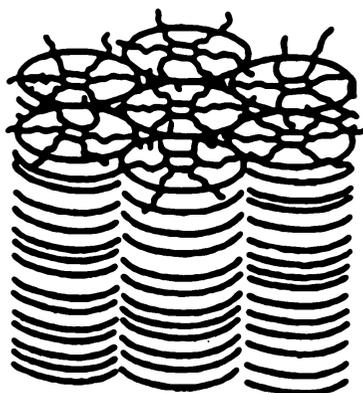
Soon after marriage Chandra won a scholarship and left for the Cavendish Laboratory and obtained a second doctorate degree from the Cambridge University mainly on X-ray scattering from crystals. On returning to India in 1961 he became the first Head of the Department of Physics at the University of Mysore. The department was located in a wild patch belonging to Princess Leelavathi of the Mysore royal family. Even after clearance the land was still frequented by jackals, owls and even leopards. It was here that Chandra got interested in *liquid crystals* – a hitherto neglected field of research. At that time, very few scientists were even aware of the existence of liquid-crystalline materials. Chandra himself later admitted that “*my knowledge of these intermediate phases was, at that time, limited to the brief accounts I had come across as a student more than ten years earlier in books published in the 1930s*”. Nevertheless, he was determined to change his field of research from solid state to liquid crystals.

After a sojourn in Britain, at Cambridge and University College London, Chandra moved in 1971 to the Raman Research Institute in



Bangalore. There he established a liquid-crystals laboratory with some of his former students that soon became an outstanding school. Realizing that cutting-edge research would not be possible without an in-house capacity to produce new materials, an organic chemistry laboratory was also added. Soon new research from the Liquid Crystal Laboratory at RRI made it one of the leading centres of research in the world. The pinnacle in Chandrasekhar's scientific career came in 1977 when he and his co-workers discovered a new type of liquid crystal made of new type of molecules. These molecules had the shape of discs rather than the well studied rods. This discovery made Chandra internationally famous. The paper announcing the discovery of the *discotic* liquid crystal was published in *Pramana*, and is one of the most highly cited papers in the field of liquid crystals.

About 1,500 new *discotic* compounds have since been synthesised in laboratories throughout the world, and nearly 2,000 papers have been published describing their physical and chemical properties. They are being developed for use in a range of technologies including xerography, solar cells, optical storage devices, and hybrid computer chips.



Schematic diagram of the structure of a columnar discotic liquid crystal.

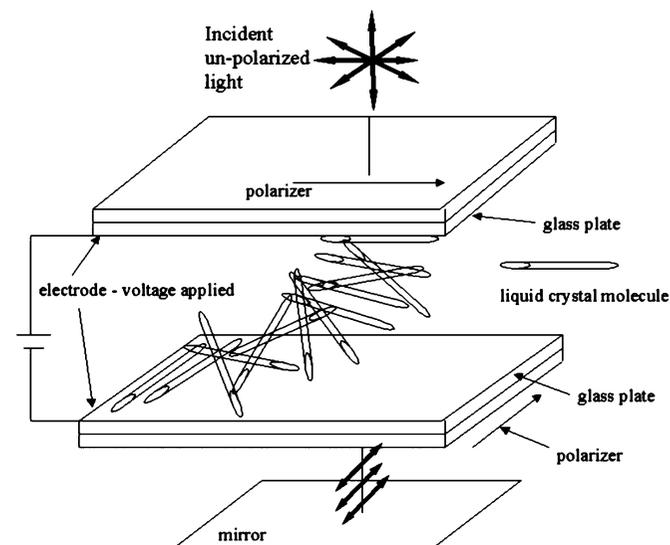
Liquid crystals among other things help in explaining the functions of biological structures, such as living tissues, and knowledge of them is crucial for an understanding of biological membranes. Biologists, pharmacists and medical researchers are therefore among those interested in liquid crystal research. They all owe a debt of gratitude to Chandrasekhar.

In 1977, the Cambridge University Press published Chandrasekhar's book *Liquid Crystals*. This has become a bible for any serious scholar on the subject. This book has already been translated in Japanese and Russian. An enlarged second edition of this acclaimed classic was published in 1992.

Chandrasekhar also organised several international conferences, including the one in 1973 on the occasion of the Silver Jubilee of the founding of the RRI. After retiring from the RRI in 1990, Chandrasekhar started the Centre for Liquid Crystal Research in a building made available by the Bharat Electronics Limited.

Chandrasekhar's scientific achievements brought him many honours. He was elected fellow of all the three academies in India. He was elected as a Fellow of the Royal Society (1983), of the Institute of Physics (London) and of the Third World Academy of Sciences. He was the founder president of the International Liquid Crystal Society during 1990-92, and edited the journal *Molecular Crystals and Liquid Crystals* for over two decades. He received numerous awards – prominent among them being the Bhatnagar Prize (1972), Homi Bhabha (1987) and Meghnad Saha (1992) medals of INSA, the Royal Medal (1994), Niels Bohr Gold Medal of UNESCO (1998) and the Padma Bhushan Award in 1998.

Because of his ill health he was advised to slow down a little. So he relaxed at home and enjoyed all the visitors who called on him. As his health improved he was again full of enthusiasm and was planning trips to various conferences and meetings. Unfortunately, he died of a stroke on March 7, 2004. He was survived by his wife Ila, son Ajit and daughter Indira.



Liquid crystal displays are now used in clocks, computer monitors and TV screens.