

G. N. Ramachandran

G.N. Ramachandran	
G.N. Ramachandran (8 October 1922-7 April 2001)	
Born	8 October 1922 Madras, Madras Presidency, British India
Died	7 April 2001 (aged 78) Bangalore, Karnataka, India
Nationality	Indian
Fields	Biophysics
Institutions	Indian Institute of Science Cavendish Laboratory
Alma mater	Madras University University of Cambridge
Doctoral advisor	C V Raman
Known for	Ramachandran plot

Gopalasamudram Narayana Iyer Ramachandran, or **G.N. Ramachandran**, (8 October 1922 – 7 April 2001)^{[1][2][3][4][5]} was a prominent Indian scientist, best known for his work that led to his creation of the Ramachandran plot for understanding peptide structure. He was the first to propose a triple-helical model for the structure of collagen. He also made other major contributions in biology and physics.

Education

Ramachandran was born in the town of Madras, India in the village of Moses De Khan in a Tamil Family. Gopalasamudram, the native place of his family, is a village in the old Tirunelveli District of Madras Presidency. He joined the Indian Institute of Science, Bangalore in 1942 in the Electrical Engineering Department. Quickly realizing his interest in physics, he switched to the Department of Physics to complete his master's and doctoral thesis under the supervision of Nobel laureate Sir C. V. Raman. In 1942, he received a master's degree in physics from Madras University with his thesis submitted from Bangalore (he did not attend any Madras college at that time). He subsequently received his D.Sc. degree in 1947.^[6] Here he mostly studied crystal physics and crystal optics. During his studies he created an X-ray focusing mirror for the X-ray microscope. The resulting field of crystal topography is used extensively in studies involving crystal growth and solid-state reactivity.

Ramachandran then spent two years (1947–1949) at the Cavendish Laboratory in Cambridge, where he earned his Ph.D. for 'studies on X-ray diffuse scattering and its application to determination of elastic constants' under the direction of Professor William Alfred Wooster, popularly known as W.A. Wooster, a leading crystallography expert in the world.

Research

After completing his Ph.D, he returned to the Indian Institute of Science, Bangalore, India in 1949 as an assistant professor of physics. In 1952, he moved to Madras University as professor and head of the Department of Physics where he continued his work on crystal physics. His interest, however, shifted to the structure of biological macromolecules. Using X-ray diffraction Ramachandran along with Gopinath Kartha proposed and published the triple helical structure of collagen in 1954. At Madras University, Professor Ramachandran was the favorite of the

famous vice-chancellor and celebrated doctor and medical scientist, Sir Arcot Lakshmanaswamy Mudaliar. Wanting to tackle problems at a more fundamental level, Ramachandran decided to use this information to examine the various polypeptide conformations then known and also to develop a good 'yardstick' that could be used for examining and assessing any structure in general, but peptides in particular. The result which emerged from these calculations in 1962, - now commonly known as the Ramachandran plot - was published in the *Journal of Molecular Biology* in 1963 and has become an essential tool in the field of protein conformation. When it was first calculated, crystal structures had barely been obtained for any protein. From the mid 1960s onward, Ramachandran studied many topics relating to the conformation of peptides including types of β -turns, conformation of prolyl residues, cis-peptide units, occurrence and need for non-planarity of the peptides, NMR coupling constants, peptides containing L and D residues and many others.

Ramachandran can be credited for bringing together into the one field of molecular biophysics the then disparate fields of X-ray crystallography, peptide synthesis, NMR and other optical studies, and physico-chemical experimentation.

In 1970, he founded the Molecular Biophysics Unit at the Indian Institute of Science which was later known as the **Centre of Advanced Study in Biophysics**. In 1971, he moved to Bangalore owing to the deterioration in standards of the University of Madras after the long-term of Sir Arcot Lakshmanaswamy Mudaliar as the vice-chancellor. The general complaint was that the successor N.D. Sundaravadvelu could not sustain the academic standards of Sir A.L. Mudaliar.

Ramachandran and A.V. Lakshminarayana developed convolution-backprojection algorithms which greatly improved the quality and practicality of results obtainable by x-ray tomography. Compared to previously used methods, their algorithms considerably reduced computer processing time for image reconstruction, as well as providing more numerically accurate images. As a result, commercial manufacturers of x-ray tomographic scanners started building systems capable of reconstructing high resolution images that were almost photographically perfect. In 1971, they published their research in a paper ("Three dimensional reconstructions from radiographs and electron micrographs: Application of convolution instead of Fourier Transforms," *Proc. Nat. Acad. Sci.*, vol. 68, pp. 2236–2240, 1971).

Notable awards that Ramachandran received include the Shanti Swarup Bhatnagar Award for Physics in India (1961) and the Fellowship of the Royal Society of London. In 1999, the International Union of Crystallography honored him with the Ewald Prize for his 'outstanding contributions to crystallography'.

Later years

Ramachandran was devastated by the death of his wife Rajalakshmi in 1998, and a gradual deterioration in health occurred. During the last few years of his life he suffered a stroke and was affected by Parkinson's disease. Ramachandran died in 2001 at age 78, and left behind him a legacy of scientific discoveries. Leading scientists including Professor Linus Pauling and Professor Francis Crick regarded Professor Ramchandran as a Nobel Prize caliber scientist of great reputation.

Further reading

- Sarma, Raghupathy (1999). *Ramachandran: A Biography of Gopalamudram Narayana Ramachandran, the Famous Indian Biophysicist*. Adenine Pr. ISBN 0940030780.

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External links

- G. N. Ramachandran - A Jewel in the Crown of the Indian Science ([http://www.vigyanprasar.gov.in/scientists/GNRRamachandran .htm](http://www.vigyanprasar.gov.in/scientists/GNRRamachandran.htm))

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