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"Development of Scanning Probe Microscopes and Their Applications in Technology"

Scanning Probe Microscopes have become essential tools for nanotechnology. We will discuss the development of this field from its infancy. The first part of the talk will focus on the speaker's early experiences driving the AFM technology from the first published experiments toward fully hardened instruments for use in manufacturing and development both within and outside IBM. Several key scanning probe technologies evolved in his group as a result of this highly focused effort aimed at getting the technology into use within IBM. The second part of the talk will describe recent projects that the speaker has initiated and driven. They range from nano probes that can probe and manipulate the genetic expression within living cells to technologies that can mechanically detect the vibrational modes of individual molecules and to the development of an ultra-high speed DNA separation technology which can separate DNA strands at speeds that are 10,000 times faster than current micro fluidic separation technologies. Implications for some these technologies will be discussed.

BIOGRAPHY

H. Kumar Wickramasinghe, Ph.D., is a member of the National Academy of Engineering and respected pioneer in nanotechnology. Prior to joining UC Irvine, Wickramasinghe managed nanoscience and technology research at IBM's Almaden Research Center in San Jose, California.

Prof. Wickramasinghe received a Ph.D. from the University of London in Electrical Engineering in 1974, and a B.Sc. from the same institution in 1970. Following a post-doctoral appointment at Stanford University, he joined the faculty in the Electrical Engineering Department at University College London in 1978.

In 1984, Wickramasinghe moved to the IBM Research at the T. J. Watson Research Center in Yorktown Heights, N.Y. where he was manager of physical measurements and chief scientist, manufacturing research. He led the team that developed atomic force microscopes (AFMs) into fully hardened instruments that are used both within IBM and world-wide. Holding 94 patents, some of his most significant inventions and contributions to the nano field include the development of the vibrating mode atomic force microscope (AFM), the magnetic force microscope, the electrostatic force microscope, the Kelvin probe force microscope, the scanning thermal microscope, and the apertureless near-field optical microscope. Most of these scanning probe microscopes are standard instruments used today for nano-scale characterization.

In 2000, he was appointed IBM Fellow - the company's highest technical honor - by Lou Gerstner, Chairman and CEO of IBM. In 2001, Wickramasinghe moved to IBM Almaden Research Center to lead the development of technology aimed at increasing the data density of magnetic hard-disk drives. He was named senior manager of nanoscale science and technology in 2002. He initiated and led the work on Storage Class Memory; a novel semiconductor memory aimed at replacing mobile disk drives. In 2005, he was made CTO of Science and Technology at Almaden. In 2006, he joined the Henry Samueli School of Engineering at the University of California, Irvine and was named The Henry Samueli Endowed Chair and Professor of Electrical Engineering and Computer Science and Professor of Biomedical Engineering.

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