Charles Kao, 2009 Nobel Prize Winner

Compiled by CAF Staff

The 2009 Nobel prize in physics will be awarded to Charles K. Kao (Standard Telecommunication Laboratories, Harlow; UK, and Chinese University of Hong Kong), and Willard S. Boyle and George E. Smith (both of whom worked chiefly at Bell Laboratories, in Murray Hill, NJ, USA) for their work leading to modem telecommunications.

Kao will receive half the prize money for helping to invent modem optical fiber, allowing signals to travel flawlessly thousands of miles. Boyle and Smith will split the other half of the prize for their development of charge coupled devices (CCDs).

The part of this year's award associated with Mr. Kao underscores the fact that optical fibers carry an increasing fraction of phone calls, television programs, and internet traffic into homes. Data can move down silicon fiber more quickly than through copper wire because nothing is faster than light, and light signaling offers higher bandwidth for electronic circuitry. Encoding information in the form of light pulses rather than as electric pulses allows more data to flow down a line.

Kao's principal achievement was in making the fiber more efficient; by excluding impurities in the fiber material, he developed a material that absorbed less of the light carrying signals over long distances.

In 1966, along with George Hockham, Kao did his pioneering work in the realisation of fiber optics as a telecommunications medium, by demonstrating that the high-loss of existing fiber optics arose from impurities in the glass, rather than from an underlying problem with the technology itself. Kao and his colleagues not only considered the optical physics but also the material properties. Their results were first presented by Kao in early 1966 and further published in June.

Kao concluded that the fundamental limitation for glass light attenuation is below 20 *dB/km (Decibels per Kilometer,* is a measure of the attenuation of a signal over a distance), which

Charles Kao

Kao completed his secondary education at St. Joseph's College in Hong Kong. He then graduated in electrical engineering in 1957 from Woolwich Polytechnic (now the University of Greenwich) and obtained his PhD degree in electrical engineering in 1965, from Imperial College London (at that time a constituent college of the University of London). While studying for his PhD degree, Kao also worked as an engineer for Standard Telephones and Cables (STC) at their Standard Telecommunications Laboratories research centre in Harlow, England (now Nortel Networks).

Kao did his groundbreaking works at STL where he was a young engineer and researcher. Since leaving STL, he has worked as director of research at ITT Corporation. He joined the Chinese University of Hong Kong in 1970, and served as the university's Vice-Chancellor from 1987 to 1996.

He then worked as the CEO of Transtech. He is currently Chairman and CEO of ITX Services.

Kao was awarded the Nobel Prize of Physics for his contributions to the study of the transmission of light in fibers for optical communication on October 6, 2009.

is a key threshold value for optical communications. This conclusion opened the drastic race to find low-loss materials and suitable fibers for such communication.

Kao, together with his new team (members including T.W. Davies, M.W. Jones, and C.R. Wright), pursued this goal by testing various materials. They precisely measured the attenuation of light with different wavelengths in glasses and other materials. Notably, during this period, Kao pointed out that the high purity of fused silica (SiO_2) made it an ideal candidate for optical communication. This immediately stimulated a worldwide study and production of low-loss glass fibers.

Kao also played a key role in the engineering and commercial realisation of optical communication.