



MARCONI SOCIETY
Columbia University
500 West 120th Street, 500 Mudd Building
New York, New York 10027
Tel: 212 854-7676 Fax: 212 854-9191
www.marconisociety.org

**TWO PIONEERS OF THE SCIENCE OF OPTICAL NONLINEARITIES IN
FIBER OPTIC COMMUNICATION SYSTEMS WIN MARCONI PRIZE**
*Bell Labs scientists developed the concept of dispersion management
and significantly advanced transmission technology*

NEW YORK, NY. July 7, 2009— Alcatel-Lucent (Euronext Paris and NYSE: ALU) Bell Labs scientists Andrew R. Chraplyvy and Robert W. Tkach, research partners for more than two decades, have been awarded the 2009 Marconi Fellowship and Prize for their research into optical fiber nonlinearities and their development of novel mitigation techniques that vastly increased the transmission speed and capacity of optical fiber communications systems.

The duo will receive the award October 9th at the annual Marconi Awards Dinner at the Palazzo Re Enzo in Bologna, Italy. The dinner and the preceding two-day Marconi Symposium are being hosted by the Bologna-based Fondazione Guglielmo Marconi.

The Marconi Society, established in 1975, annually recognizes a living scientist whose work in the field of communications and information technology advances the social, economic and cultural improvement of all humanity. Recent winners have included Professor David Payne of the University of Southampton in the UK, another optical fiber pioneer who led the development of the erbium-doped optical fiber amplifier; Google founders Sergey Brin and Larry Page; MIT Professor Ron Rivest, co-inventor of RSA encryption; Stanford Professor John Cioffi, the inventor of modern high speed modems that enabled DSL; and French Professor Claude Berrou, whose discovery of turbo codes led to important advances in mobile telephony, satellite and radio communications.

"By demonstrating the dramatic capacity limitations imposed by nonlinearities on long-distance transmission via fiber, Andy and Bob not only brought attention and resources to address the challenge but went on to find novel mitigation techniques," said Robert Lucky, chairman of the Marconi Society and a former Bell Labs colleague and manager of the two scientists. "They developed the concept of dispersion management--and also conceived a new optical fiber type. The effect of these innovations was to enable

wavelength-division-multiplexed (WDM) fiber transmission systems with capacities beyond one Terabit/second per fiber--a 100-fold capacity increase in a mere ten years."

Optical fibers, used in communications systems to carry voice, data and images that have been translated into laser light pulses, are the backbone of the Internet and modern telecommunications systems. However, when optical fibers first were installed, few scientists anticipated how quickly capacity limitations would come into play. Volume has exploded over the past 20 years, and engineers have raced to stay ahead of the demand.

That helps explain the importance of the contributions of Chraplyvy and Tkach. Even before they invented the new optical fiber that has become an industry standard – and subsequently developed their innovative dispersion management techniques to mitigate fiber nonlinearities--they faced the uphill battle of convincing other scientists that this was a problem worthy of significant attention.

In what he described as an “idle calculation” while raking leaves in his backyard, Chraplyvy realized at what point optical nonlinearities in communication fibers would severely limit the fibers’ ability to carry large amounts of information and that the world’s communications networks could reach gridlock in a matter of years rather than the decades that had been assumed. The incremental approach to improving transmission efficiency that had sufficed until then was no longer an option.

As luck would have it, at about that same time, Tkach joined Bell Laboratories. He proved the ideal collaborator and the two became inseparable investigators of optical fiber nonlinearities and how to overcome their damaging effects.

A powerful technique called dense wavelength division multiplexing (WDM) had been under development at Bell Labs during the 1980s and 1990s to enhance fiber optic capacity. Encoding separate streams of information onto separate colors (wavelengths) of light made it possible to send multiple streams of information down the same optical fiber. Unfortunately the two existing standard fiber types of the day were not able to support large numbers of wavelengths carrying very high-speed signals.

By careful investigations of the effects on optical nonlinearities of an inherent material property in optical fibers (called chromatic dispersion) Tkach and Chraplyvy realized that a new type of optical fiber with precisely controlled chromatic dispersion would be able to support large numbers of wavelengths carrying high-speed signals. Implementing these discoveries and working with a Bell Labs development team in Atlanta, they devised a new type of fiber, branded TrueWave® Fiber that optimizes transmission capacity of communications systems. The new fiber, now known generically as Non-Zero Dispersion Fiber (NZDF), has become an industry standard that has enabled the explosive growth in communications bandwidth. Roughly 50 million miles of NZDF have been installed worldwide.

Based on NZDF Chraplyvy and Tkach went on to invent the concept of dispersion management, which further increased fiber optic capacity and is now used in all high-speed, high-capacity fiber optic communications systems throughout the world. By 1996, their technological innovations had led to breaking the Terabit/second (one trillion bits per second on a single fiber) barrier.

Andy and Bob's groundbreaking research paved the way towards meeting society's growing need for high bandwidth applications such as telemedicine, enhanced conferencing and other emerging applications," said Jeong Kim President of Bell Labs "Andy and Bob exemplify the caliber of people who work at Bell labs and the pre-eminent research they perform.," he added.

Chraplyvy and Tkach work at the fabled Crawford Hill Laboratory of Bell Labs (now part of Alcatel-Lucent) where fiber optic research began in the 1960s and where so many communications breakthroughs have taken place.

Chraplyvy joined Bell Labs in 1980 after working three years in the Physics Department at General Motors Research Laboratories where he studied ultra-high resolution spectroscopy of gases and impurity modes in solids. Prior to joining GM he had received his undergraduate degree in physics from Washington University in St. Louis, and M.S. and Ph.D. degrees from Cornell University.

He currently is Optical Transport Networks Research Vice President at Bell Labs. He holds over 30 patents in the areas of lightwave systems and fiber optics and is the recipient of many of the industry's highest honors, including the 2003 John Tyndall Award, the 1999 Thomas Alva Edison Patent Award, the 1999 New Jersey Inventor of the Year Award, and the 1998 Lucent Technologies Patent Award. He is a Bell Labs Fellow, a member of the National Academy of Engineering, Fellow of the Optical Society of America and Fellow of IEEE.

After receiving undergraduate degrees in Physics and Math from the University of Cincinnati and M.S. and Ph.D. degrees from Cornell University, Tkach joined Bell Labs in 1984 where he quickly teamed up with Chraplyvy. They jointly addressed the challenges of optical nonlinearities and dispersion management. Tkach joined AT&T Labs in 1996 and Celion Networks in 2000. He rejoined Bell Labs in 2006 and happily returned to Crawford Hill where he is now Director of Transmission Systems and Networks Research.

Tkach is extraordinarily active in his industry, serving as Chair of the Optical Fiber Communications Conference (OFC) Steering Committee and on the Technical Advisory Board of the Optoelectronics Industry Data Association (OIDA). He has been General Co-Chair of OFC, Vice-President of the Optical Internetworking Forum, Associate Editor of the Journal of Lightwave Technology and a member of the IEEE LEOS Board of Governors. He has received the Thomas Alva Edison Patent Award from the Research and Development Council of New Jersey and is a Fellow of the Optical Society of

America, the IEEE, and AT&T. Tkach received the 2008 John Tyndall Award jointly sponsored by the OSA and IEEE and in 2009 was elected to the National Academy of Engineering.

"What strikes me about Andy and Bob is how well they exemplify the great tradition of Bell Laboratories," said Lucky. "It is a tradition where leadership emanates from technical or scientific expertise. Although they were relatively junior at the time, when Andy or Bob spoke at a meeting, everyone listened respectfully. Of the research projects for which I had responsibility, the optical transmission project was steadily fruitful--and Bob and Andy deserve an enormous amount of credit for its ultimate success. Their foundational individual scientific contributions and subsequent R&D leadership were critical to advancing transmission technology and essential to unleashing the large scale deployment of WDM systems that have revolutionized the Internet and the telecommunications industry."

Very few scientists have accomplished what Andy Chraplyvy and Bob Tkach have," said Rod Alferness, Bell Labs Chief Scientist. "Over the course of their careers they have not only made numerous breakthroughs that have revolutionized optical technology, but in the process have improved the research of others and made the organization successful through unflinching collaboration, passion, and inventiveness."

About the Marconi Society

The Marconi Society at Columbia University was established in 1974 through an endowment set up by Gioia Marconi Braga, daughter of Guglielmo Marconi, the Nobel laureate who invented radio (wireless telegraphy). It is best known for the Marconi Prize, awarded annually to an outstanding individual whose scope of work and influence emulate the principle of "creativity in service to humanity" that inspired Marconi. Through symposia, conferences, forums and publications, the Marconi Society promotes awareness of major innovations in communication theory, technology and applications with particular attention to understanding how they change and benefit society.

Additional information about the Marconi Society and the Marconi Fellows can be found at www.marconisociety.org.

###

Contact:

Hatti Hamlin

Public Affairs Director

The Marconi Society

925.872.4328

hattihamlin@aol.com