OPN Talks with …

Herwig Kogelnik

Lightwave Communications Pioneer and OFC/NFOEC Keynote Speaker

Herwig Kogelnik is a household name in the fiber optics world due to his innovations in lasers, optoelectronics and optical communications. Over the past 40-plus years, he has made significant advances in areas as diverse as holography, photonic switching, optical guided-wave devices and integrated optics. Certainly, his leadership in developing the distributed feedback laser (DFB) and wavelength-division multiplexing (WDM) systems has helped to solidify his status as an industry luminary.

After receiving his Ph.D. from Oxford University in 1960, Austrian-born Herwig Kogelnik came to the United States as part of a program to recruit European scientists to work in America. When he arrived in the United States that year, he had more than 50 interviews with labs, universities and companies, all of which resulted in job offers.

The one that stood out most was his interview at Bell Labs (then owned by AT&T and now owned by Alcatel-Lucent) in Holmdel, N.J. He took a position there as a researcher in optics, electronics and communications, and has been at the company for more than four decades. Today, he serves as the adjunct photonics systems research vice president.

During his tenure at Bell Labs, Kogelnik has made a number of significant contributions to optical communications. For one, in 1971 he and Charles Shank invented the distributed feedback laser, an innovation that today is the light source for almost all optical communication systems. Before DFB lasers, light-pulse signals overlapped and degraded during long-distance transmission due to fiber dispersion and uncontrolled laser spectrum. Kogelnik and Shank addressed the problem of interference by developing DFB lasers that provide spectral control with single, dedicated wavelengths.

> "Ultimately, the success of the DFB laser was due to the need for a single-frequency laser, particularly in the new WDM transmission technology."

"One big challenge we faced in the DFB work was to translate the early experiments with integrated optics dye lasers into the more practical but also more difficult semiconductor technology," Kogelnik says. He points out that many researchers contributed to the success of the laser. "Ultimately, the success of the DFB laser was due to the need for a single-frequency laser, particularly in the new WDM transmission technology, which has strongly contributed to the 100-fold increase in transmission capacity per fiber in the last 10 years."

Looking back on his career, Kogelnik explains that initially he focused on research in areas other than optics. His interests were in microwave research and teaching, electromagnetic radiation in magnetoplasmas and anisotropic media. Kogelnik says his switch to the field of optics came at a time when he was preparing to move to the United States. He had had a conversation in 1960 with Rudi Kompfner, who recruited Kogelnik

during his Ph.D. work at Oxford to come to Bell Labs Research. Kogelnik says that Kompfner persuaded him to pursue optical communications with the simple one-liner: "Think of all that bandwidth."

Kogelnik's contributions to "all that bandwidth" have won him a number of industry accolades. He is a Fellow of both OSA and IEEE, as well as a member of the National Academies of Engineering (1978) and Sciences (1994). He is the recipient of OSA's 1984 Frederic Ives Medal, IEEE's 1989 David Sarnoff Award, the 1990 Joseph Johann Ritter von Prechtl Medal from the Technical University of Vienna, Austria, and the 2001 IEEE Medal of Honor. This past July, Kogelnik was awarded the 2006 United States National Medal of Technology for his pioneering contributions and leadership in the development of the technology of lasers, optoelectronics, integrated optics and lightwave communication systems. His work has been instrumental in driving the tremendous growth capacity of fiber optic transmission systems for the national communications infrastructure.

Bell Labs

Herwig Kogelnik (middle) stands behind the gas laser he designed in the 1960s with Bell Laboratories colleagues (left to right) Don Herriott, Anthony Rustako, Bill Rigrod and Dave Brangaccio.

Kogelnik also served as OSA's president in 1989. He was appointed as an honorary OSA member in 2005, an honor reserved for only 0.001 percent of OSA's membership, and one he shares with other luminaries such as John Hall, Willis Lamb, Charles H. Townes and Emil Wolf.

He will share the plenary session stage at OFC/NFOEC 2008 with Ethernet inventor Robert Metcalfe and Matt Bross, CTO of BT Group. His talk will focus on optical communications as a whole; it will provide an overview of important historical milestones in the field, as well as forward-looking commentary about the challenges and potential bottlenecks in the industry. Kogelnik says he is fascinated by the current large-scale deployment of fiber to the premises, which now reaches millions of users and provides the potential of broadband services such as Gigabit Ethernet to the home and business.

"Optical communications will have to provide this ever-increasing bandwidth for the world's network infrastructure," Kogelnik says. "To achieve that task, there are many challenges, including sophisticated optical integrated circuitry, WDM and switching network architectures, and the use of advanced modulation formats."

Kogelnik is optimistic about the future of optical communications. He points to the fact that the information capacity of long-haul fiber transmission has increased 100-fold in 10 years and currently provides 25 terabits per second for a single fiber—more than 33 million digital voice connections on a single strand. "Lasers and optical communications are such a totally new technology with so many dimensions to their application. And there is continuing growth of their potential." In other words—think of all that bandwidth.

Herwig Kogelnik will deliver the plenary session keynote address "Perspectives on Optical Communications" at the Optical Fiber Communication Conference and Exposition/National Fiber Optic Engineers Conference (OFC/NFOEC) on Tuesday, Feb. 26, 2008, in San Diego. For more information, visit www.ofcnfoec.org.

[Angela Stark (astark@osa.org) is OSA's public and government relations coordinator.]