

Guest Editorial

Optical Networks

OVER the past ten years, we have seen optical networking technology move from a "gleam in the eye" of researchers to a major component of the telecommunications industry. In the process, there has been significant advancement on a number of fronts, beginning with substantially expanded capabilities in the physical layer in the form of new or more advanced component technologies and in the new network elements and optical systems they enable. In the more recent past, the focus has been on developing network control mechanisms and management capabilities to exploit the capacity and reconfigurability of optical layer technologies. The major applications of these control capabilities will be fast restoration and rapid deployment of new services and applications. A critical emphasis here has been on the development of algorithms that support rapid recovery from a network failure in mesh networks and on the development of "wavelength-management" methodologies, which enable the most efficient use of expensive resources (wavelengths) in provisioning a service. Another major thrust has been the development of multiprotocol label switching/generalized multiprotocol label switching (MPLS/GMPLS), which is being exploited to move deployed systems toward a flexible, "intelligent," and more autonomous multiservice optical layer, or perhaps—as Internet traffic continues to drive network design and deployment—Internet protocol (IP)/optical networks. The major driver behind the work on management and control is cost reduction: built-in mechanisms for more efficient network operations translate into huge savings for carriers. The powerful combination of technology and expanded network intelligence has, in turn, stimulated the development of, and research into, a new paradigm: the "customer-controlled" network.

Against this background, the current special issue includes a wide range of topics, spanning physical layer technologies, network architectures, and network management and control. The issue contains 41 contributed papers and eight invited papers. These invited papers carry forward the themes mentioned previously. They include papers on optical regeneration at 40 Gb and beyond, on optical switch fabrics for enabling ultrahigh-capacity routers, and next-generation cross-connects that enhance network performance. They also include several papers related to MPLS/GMPLS, ranging from a photonic planar lightwave circuit (PLC)-based MPLS router, to a major IP/MPLS/ASON/GMPLS testbed investigating the interworking of IP/MPLS and optical layers, and to routing for protection in such networks. Of the remaining invited papers, one provides an overview of research on customer-controlled optical networks, based on the experience of the CANARIE

research program in Canada, and the other reflects a completely different dimension of optical networking, focusing on optical satellite networks.

The contributed paper topic list is also a broad and exciting one. It includes optical packet routing, burst switching, optical code-division multiple-access networks, optical time-division multiplexing (TDM), optical multicast, and control and management protocols/algorithms addressing connection provisioning, survivability, and contention resolution. It cannot go without notice here that our industry is experiencing an extremely challenging time, and yet, as this issue illustrates, researchers around the world continue to push the boundaries of optical networking with new technologies that advance both network performance and cost effectiveness.

This issue has come about through the time and effort of a number of people. First and foremost, we would like to thank the authors of all the papers contained here, as well as the reviewers who, despite many competing demands, found the time to review them. We would also like to thank the IEEE publications staff for their general support, and Douglas Hargis in particular for his excellent organizational skills, energy, and resourcefulness in helping us make the deadline. We would also like to thank Dr. Alan E. Willner, Editor-in-Chief of the JOURNAL OF LIGHTWAVE TECHNOLOGY for stimulating this special issue.

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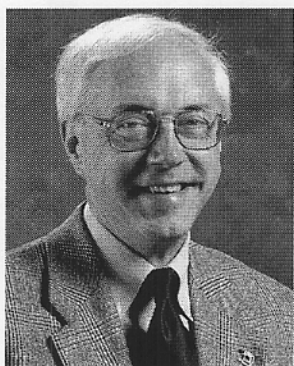
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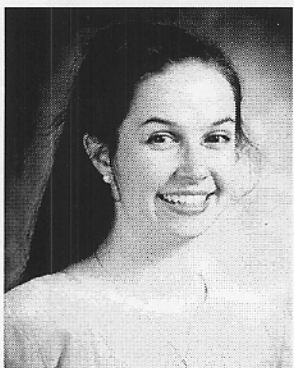
Dr. Jinno received the Young Engineer Award from the IEICE of Japan in 1993, the Best Paper Award in 1997 and in 1998 from the Technical Program Committee of the Second and Third Optoelectronics and Communications Conference (OECC), the Best Paper Award from the Technical Program Committee of the European Conference on Networks and Optical Communications (NOC) in 1998, and the NTT President Award in 2000. He is a member of the IEICE.



Frederick J. Leonberger (S'69–M'69–SM'81–F'85) received the B.S.E. degree from the University of Michigan in 1969 and the S.M., E.E., and Ph.D. degrees from the Massachusetts Institute of Technology (MIT), Cambridge, all in electrical engineering, in 1971, 1972, and 1975, respectively.

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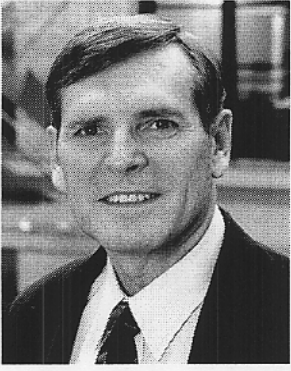
Dr. Leonberger is a Member of the National Academy of Engineering and a Fellow of the Optical Society of America (OSA) and has been a Chairman of several IEEE/OSA conferences. He has served as President of the IEEE Lasers and Electro-Optics Society (LEOS) and as an Associate Editor of the IEEE JOURNAL OF QUANTUM ELECTRONICS and of *Optics Letters*. He has been awarded the IEEE Quantum Electronics Award and Mellenium Medal and the UTC George Meade Medal.



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Dr. Medard was awarded the IEEE Leon K. Kirchmayer Prize Paper Award in 2002 for her paper "The Effect Upon Channel Capacity in Wireless Communications of Perfect and Imperfect Knowledge of the Channel." She is also an Associate Editor for the IEEE TRANSACTIONS ON INFORMATION THEORY and the Optical Communications and Networking Series of the IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS. She was formerly an Associate Editor for the Optical Society of America (OSA) *Journal of Optical Networking*.



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Ann Von Lehmen received the Ph.D. degree in applied physics from Cornell University, Ithaca, NY.

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Dr. Von Lehmen has served on a number of technical conference committees.