Guest Editorial Microwave Photonics

AS GUEST EDITORS, we are pleased to introduce the JOURNAL OF LIGHTWAVE TECHNOLOGY's (JLT's) sixth Special Issue on Microwave Photonics. As with the previous five Microwave Photonics special issues, the papers will be made available to subscribers of both *JLT* and the IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, although on this occasion, availability to Members of the Microwave Theory and Techniques Society will be by electronic means rather than by a joint special issue.

Microwave photonics can be defined as the study of photonic devices operating at microwave frequencies and their application to microwave and optical systems. From pioneering experiments during the late 1970s, the field has expanded to produce numerous applications of commercial importance, including high-bit-rate data transmission, the remoting of antennas for satellite and cellular radio applications, cable television signal distribution, optoelectronic probing of devices and circuits, and optical signal processing.

For this special issue, we received 56 manuscripts for consideration from at least ten countries. Included within this total were eight invited papers selected to cover important recent advances in the field. Of the submitted manuscripts, 38 papers were selected for publication in this special issue, with the assistance of an international team of expert reviewers. During the paper selection process, we ensured that for any paper in which one of the Guest Editors had an involvement, responsibility for its handling was allocated entirely to one of the other Guest Editors.

We have divided the papers into six general subject headings. The first two—Microwave Photonic Sources and Microwave Photonic Detectors—cover enabling technologies for the generation and detection of microwave-modulated optical signals, and here it should be understood that *microwave* is interpreted broadly as wavelengths comparable to the dimensions of the devices processing them, with modulation frequencies into the terahertz region being considered. Papers covering these technologies include three invited papers, that by Dr. Strekalov on optoelectronic microwave oscillators and those by Dr. Stoehr and Dr. Murthy on ultrawide-bandwidth traveling-wave photodetectors, and a paper by Dr. Funk on photonic direct sequence generation and detection,

The remaining four subject headings—Signal Processing, Microwave Photonic Transmission, Optical Beam Forming, and Optical Probing—address major applications areas. The use of optical techniques for microwave signal processing is addressed in a group of eight papers. Invited papers here include that by Dr. Han on photonic time stretch analog-to-digital converters and that by Dr. Juodawlkis on optical down-sampling of microwave signals. The largest commercial applications area for microwave photonics is the transmission of wide-bandwidth signals, and this is addressed by nine papers on microwave photonic transmission. Included in this group are invited papers by Dr. Kuri on millimeter-wave-over-fiber systems, Dr. Tsukamoto on optical switching code-division multiple access (CDMA) for fiber radio highway networks, and Dr. Tyler on obtaining terabit-per-second data capacity over multimode optical fiber using combined wavelength and subcarrier multiplexing schemes. The special issue concludes with short sections on optical beam forming for phased-array antennas and the growing area of optoelectronic probing of high-speed devices and circuits.

In preparing this special issue, we benefited greatly from the advice of many distinguished researchers in the field of Microwave Photonics. We would also like to thank Peter Delfyett for his ideas; Alan Willner, Editor-in-Chief of *JLT*, for offering us the opportunity to produce this special issue; and Douglas Hargis, Publications Coordinator, for his great efficiency and unfailing helpfulness in its preparation. We are also very grateful to the large team of expert reviewers who undertook the detailed review of the manuscripts. Their willingness to provide comprehensive technical feedback within a tight time schedule made our work much easier. Finally, we would like to thank all the authors for their support of the special issue, for the submission of papers of outstanding archival quality and for their cooperation in meeting deadlines so as to permit this special issue to meet its scheduled publication date.

We hope that this special issue will provide a useful cross section of the state of the art in Microwave Photonics. Commercial exploitation and new research results in this field progress rapidly, and planning for the next special issue, led by the IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, has already commenced.

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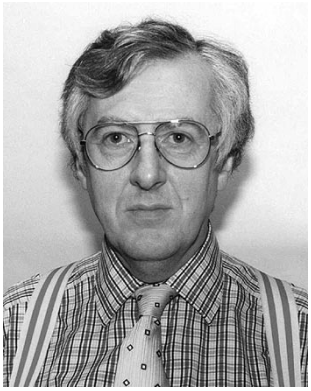

Alwyn J. Seeds (F'97) received the Ph.D. and D.Sc. degrees from the University of London, London, U.K., in 1980 and 2002, respectively.

From 1980 to 1983, he was a Staff Member at Lincoln Laboratory, Massachusetts Institute of Technology, Cambridge, where he worked on GaAs monolithic millimeter-wave integrated circuits for use in phased-array radar. He returned to the U.K. in 1983 to serve an appointment as Lecturer of telecommunications at Queen Mary College, University of London. In 1986, he moved to University College London, where he is now Professor of Opto-Electronics and Head of the Opto-Electronics and Optical Networks Group. He has published more than 200 papers on microwave and optoelectronic devices and their systems applications and is presenter of the video "Microwave Opto-electronics" in the IEEE Emerging Technologies Series. His current research interests include microwave bandwidth tunable semiconductor lasers, semiconductor optical modulators, optical control of microwave devices, mode-locked lasers, optical phase-lock loops, optical frequency synthesis, broad-band radio-over-fiber access systems, dense-wavelength-division-multiplexing networks, and nonlinear processing in optical transmission.

Prof. Seeds is Chairman of the Institution of Electrical Engineers (IEE) Photonics Professional Network and a Fellow of the Royal Academy of Engineering. He has served on the program committees for many international conferences.

Chi H. Lee (F'91) received the B.S. degree in electrical engineering from National Taiwan University, Taipei, in 1959 and the Ph.D. degree from Harvard University, Cambridge, MA, in 1968.

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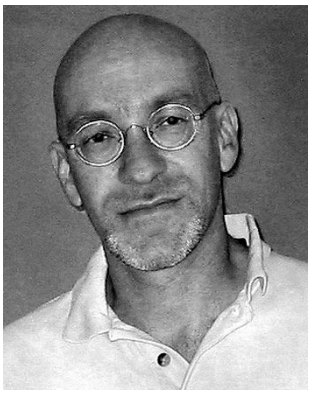
Dr. Lee is a Fellow of the Optical Society of America (OSA) and the Photonic Society of Chinese Americans. He was the Chairman of the Technical Committee on Lightwave Technology in the IEEE Microwave Theory and Techniques (MTT) Society, the program Co-Chair of the topical meeting on "Picosecond Electronics and Optoelectronics" in 1985 and 1987, and the General Co-Chair of the International Meeting on "Microwave Photonics" in 1998. He served as Chairman of the Steering Committee of the International Microwave Photonics Meeting for 1999 and the Chairman of the IEEE/LEOS Technical Committee on Microwave Photonics from 1997 to 2003. He was the General Chair of the IEEE/LEOS Summer Topical Meeting on Photonics Time/Frequency Measurements and Controls, July 14–16, 2003, in Vancouver, BC, Canada.



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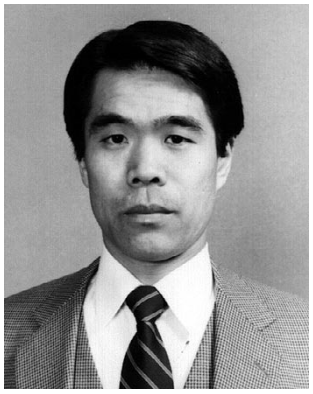
Dr. Funk serves on the Lasers & Electro-Optics Society (LEOS) Technical Program Committee and has served as Chair of the Washington, DC, chapter of the Microwave Theory and Techniques Society.



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