

Introduction to the Issue on Semiconductor Lasers

THE guest editors of the IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS (JSTQE) are pleased to introduce this biannual issue on Semiconductor Lasers. This publication, which is traditionally associated with the IEEE International Semiconductor Laser Conference, covers new research topics, and state-of-the-art developments in the area of semiconductor lasers and related photonic devices.

The 63 papers in this issue, which originate from 20 different countries, describe some of the most exciting work in the field, and are a testament to the creativity and continuing vitality of the subject area across the globe. There are 20 invited papers written by leading researchers that comprehensively treat ten main topics as diverse as tunable lasers and photonic integration, mode-locked lasers, vertical-cavity surface-emitting lasers (VCSELs), quantum dot devices, laser dynamics, microcavities, high-power lasers, high-speed lasers, novel materials, and midinfrared and terahertz lasers. The remaining 43 contributed papers are no less important in their discussion of important results in subtopics such as injection locking and feedback, optoelectronic oscillators, the quest for laser integration with silicon, and light sources for imaging systems.

This special issue would not have been possible without the professionalism, dedication, and expertise of all the members of our publication team. In particular, the guest editors would like to express thanks to the authors, both invited and contributed, for submitting comprehensive and thought-provoking papers. A special thanks goes out to the international peer reviewers who donated their time and skill to maintain the technical quality of this special edition while also staying within tight deadlines. The coordination of this issue was handled with skill and grace by Chin Tan-Yan, and the production tasks were resourcefully managed by the IEEE staff. We are sincerely grateful to these

individuals for their assistance and support. Finally, the editors would like to thank Dr. R. Shori, former Editor-in-Chief of JSTQE for inviting us to serve the semiconductor laser community and Dr. Fil Bartoli for helping us complete this complex, but always rewarding task.

LUKE F. LESTER, *Primary Guest Editor*
Department of Electrical and Computer Engineering
University of New Mexico
Albuquerque, NM 87106 USA
luke@chtm.unm.edu

THOMAS L. KOCH, *Guest Editor*
Center for Optical Technologies, Lehigh University
Bethlehem, PA 18015 USA
tlkoch@lehigh.edu

JOHANN PETER REITHMAIER, *Guest Editor*
Institute of Nanostructure Technologies and Analytics
University of Kassel
Kassel 34132, Germany
jpreith@ina.uni-kassel.de

SHING-CHUNG WANG, *Guest Editor*
Department of Photonics and
the Institute of Electro-Optical Engineering
National Chiao Tung University
Hsinchu 300, Taiwan
scwang@mail.nctu.edu.tw



Luke F. Lester (SM'00) received the B.S. degree in engineering physics and the Ph.D. degree in electrical engineering from Cornell University, Ithaca, NY, in 1984 and 1992, respectively.

For six years, he was an Engineer at the General Electric Electronics Laboratory, Syracuse, NY, where he was engaged in high-electron-mobility transistors for millimeter-wave applications. He joined the University of New Mexico (UNM), Albuquerque, in 1994, where he is currently a Professor in the Department of Electrical and Computer Engineering, the Endowed Chair Professor in Microelectronics, and the General Chair of the Optical Science and Engineering Graduate Program. He has nearly 25 years of experience in III-V semiconductor devices and advanced fabrication techniques. During 2001, he was a Co-Founder and the Chief Technology Officer of Zia Laser, Inc., a startup company using quantum dot laser technology to develop products for communications and computer/microprocessor applications. The company was later acquired by Innolume, GmbH. From 2006 to 2007, he was a U.S. Air Force Summer Faculty Fellow. He has authored or coauthored more than 85 journal articles and more than 100 conference papers.

Dr. Lester is an active organizer and participant in the IEEE Photonics Society's conferences, workshops, and journals. He received the 1998 UNM School of Engineering Research Award, the 1994 Martin Marietta Manager's Award, and the 2007 UNM ECE Teaching Award.

Prof. Lester is a Senior Member of the IEEE.



Thomas L. Koch (M'88–F'95) received the B.A. degree in physics from Princeton University, Princeton, NJ, in 1977, and the Ph.D. degree in applied physics from the California Institute of Technology, Pasadena, in 1982.

He is currently the Daniel E. '39 and the Patricia M. Smith Endowed Chair of Director in the Center for Optical Technologies, Lehigh University, Bethlehem, PA, where he is also a joint Professor in electrical and computer engineering (ECE) and physics. He was the Vice President at SDL, Lucent, and most recently at Agere Systems, where he was responsible for research and development of the underlying materials and device technologies required to support Agere's optoelectronic and IC product portfolio. He has authored or coauthored more than 300 conference and journal publications, book chapters, and books. His current research interests include improving the spectral properties, modulation characteristics, and tunability of semiconductor lasers used in high-capacity optical-fiber communications systems. He has contributed a number of basic advances in the area of semiconductor photonic integrated circuits (PICs), which contin-

ues to be his primary research interest.

Prof. Koch was the chair of numerous major international conferences and has also served on numerous conference and governance positions with the IEEE Laser Electrooptics Society (LEOS). He has received the Eric E. Sumner Award from the IEEE, and the William Streifer Award for Scientific Achievement and the Distinguished Lecturer Award from the IEEE LEOS. He is a Fellow of Bell Laboratories, the Optical Society of America, and a member of the National Academy of Engineering.



Johann Peter Reithmaier was born in 1960. He received the Ph.D. degree in physics from the Technical University (TU) Munich, Germany, in 1990, in the frame of a joint work with Siemens Central Research Laboratory on molecular beam epitaxy of strained layer III–V material.

Until 1992, he was with IBM Research Laboratory, Rüschlikon, where he was engaged in the research on semiconductor lasers. In 1992, he joined the University of Würzburg, where he built up a research group on fabrication, optical properties, and device applications of nanostructured semiconductors. From 1997 through 2005, he was a faculty member at Würzburg. Since 2005, he has been a Full Professor in the University of Kassel, Kassel, Germany, where he is also the Director of the Institute of Nanostructure Technologies and Analytics. His current research interests include investigation of new types of optoelectronic devices based on nanostructured semiconductors and their fabrication technologies. He has authored or coauthored more than 420 papers (more than 215 papers published in refereed journals).

Prof. Reithmaier is a member of the German Physical Society.



Shing Chung Wang received the Ph.D. degree in electrical engineering from Stanford University, Stanford, CA, in 1971.

He has an extensive professional career both in the academic and industrial research institutions for more than 30 years. From 1965 to 1967, he was a faculty member at the Institute of Electronics, National Chiao Tung University (NCTU), Hsinchu, Taiwan, where he rejoined as a faculty member in 1995 and taught semiconductor lasers course and conducted research on wide-bandgap semiconductor laser materials and lasers, and is currently an Honorary Professor Emeritus in the Department of Photonics and the Institute of Electro-Optical Engineering, where he also leads a research team conducting research on GaN-based blue VCSELs and GaN light-emitting devices. He was a Postdoctoral Research Associate at Stanford University, where he was engaged in laser frequency stabilization and saturation spectroscopy. From 1974 to 1985, he was a Senior Research Scientist at Xerox Corporation, where he was involved in research on metal–vapor lasers and invented the white-light laser emitting three prime colors simultaneously. From 1985 to 1995, he

was a Consulting Scientist at Lockheed-Martin Palo Alto Research Laboratories, where he was engaged in conducting research on GaAs-based vertical-cavity surface-emitting lasers (VCSELs), monolithic integration of GaAs VCSEL with MESFET, and diode-pumped blue and green lasers. GaN quantum cascade laser, and nanophotonic devices. He has authored or coauthored more than 200 technical papers and a book on *Introduction to Semiconductor Lasers* (2008) in Chinese based on his lecture notes with his colleague. He holds about twenty laser-related patents.

Prof. Wang is a Fellow of the Optical Society of America.