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# *Silicon Photonics III*

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*Editors*

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# Contents

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**Mario J. Paniccia,** Intel Corporation (USA)

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**Andrew W. Poon,** Hong Kong University of Science and Technology (Hong Kong China)

8 Waveguides II
**Andrew W. Poon,** Hong Kong University of Science and Technology (Hong Kong China)

9 Waveguides III
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10 Interconnects
**Lawrence W. Cahill,** La Trobe University (Australia)

11 Detectors
**Graham T. Reed,** University of Surrey (United Kingdom)

12 Lab-on-a-Chip I
**Adam S. Densmore,** National Research Council Canada (Canada)

13 Lab-on-a-Chip II
**Graham T. Reed,** University of Surrey (United Kingdom)

14 Lab-on-a-Chip III
**Adam S. Densmore,** National Research Council Canada (Canada)

# Introduction

Silicon has a legendary history as the material of choice for microelectronic integration, but has not been the material of choice for optoelectronic integration. That is now beginning to change with the emergence of silicon photonics. Silicon photonic devices have been demonstrated with the capability to emit, modulate, guide, and detect light and can be combined with microelectronics to form electronic and photonic integrated circuits. Silicon photonic circuits and devices are now being fabricated in commercial CMOS foundries, enabling these devices to leverage the $500 billion fabrication infrastructure for integrated circuits. The previous barrier of silicon's indirect bandgap has been overcome through the integration of germanium and III-V materials to form novel in-plane silicon lasers. The Raman effect and nano-engineering of crystalline silicon have also been used to obtain light from silicon and an electrically pumped monolithic silicon laser is on the horizon.

The decrease in waveguide bend radius made possible in silicon due to its high-index contrast, together with increased levels of optical and microelectronic integration, may lead to a new formulation of Moore's Law for silicon photonics. We are now seeing the convergence of communications and computing directly on-chip. The progress in the past few years has been staggering, and one area of particular focus of recent work has been the move toward integration of electronic and photonic functionality in the same silicon layer.

In addition to on-chip communications and signal processing, silicon photonics is also being used to form laboratories on a chip that can detect single biological molecules and protein binding events. The past year has been an exciting time for silicon photonics! We hope you will enjoy the papers detailing these advancements that are included in these conference proceedings.

**Joel A. Kubby**
**Graham T. Reed**