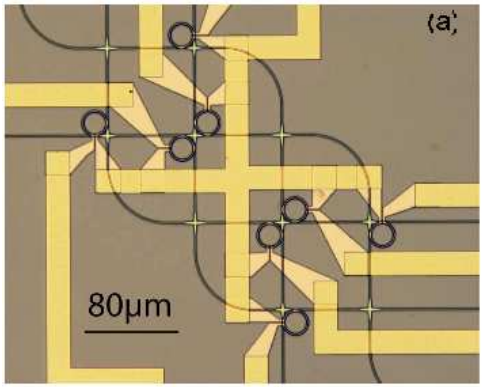
# WINDS 2010
# Workshop on the Interaction between Nanophotonic Devices and Systems

Christopher Batten

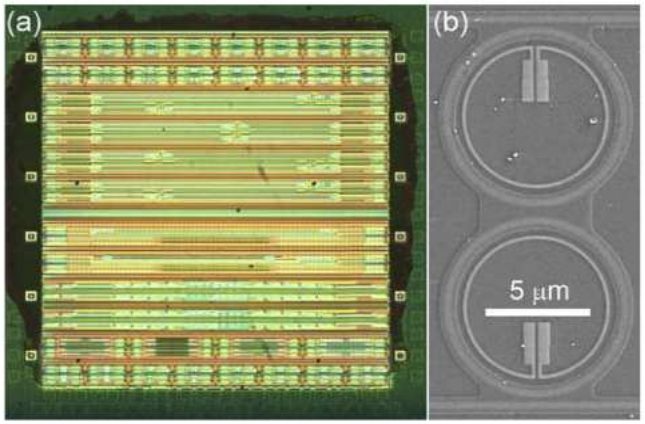
Computer Systems Laboratory
Cornell University

December 2010

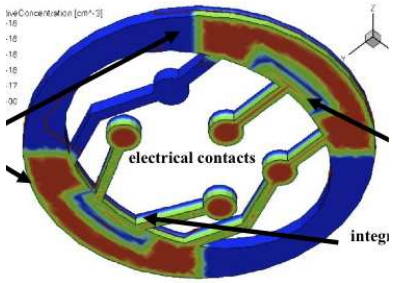
# Recent Nanophotonic Device-Level Work



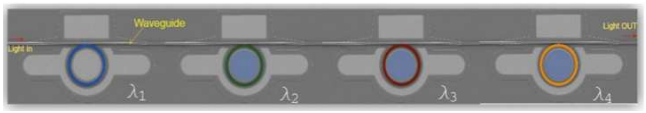

Sherwood-Droz, OptExp'08



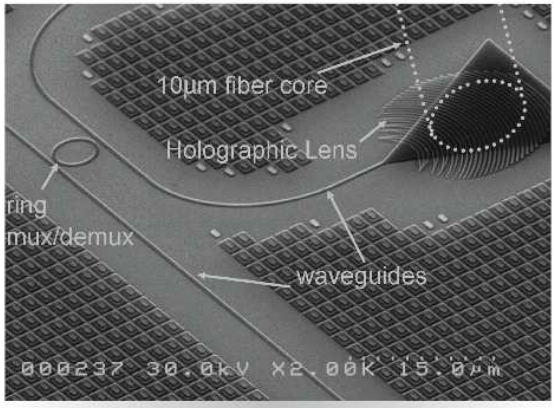

Orcutt, PS'09



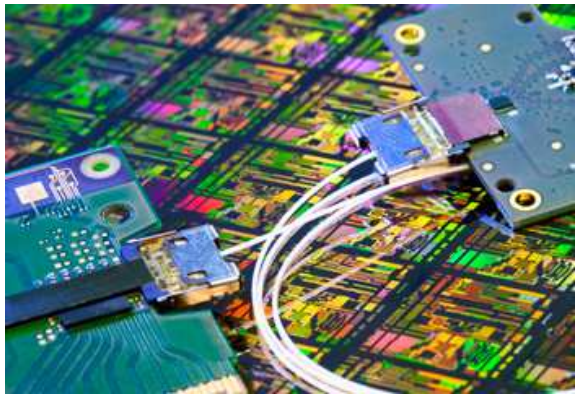

DeRose, CLEO'10




Manipatruni, OptExp'10



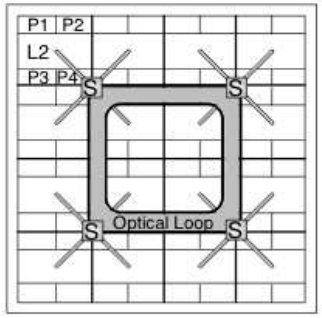

Luxtera 2006



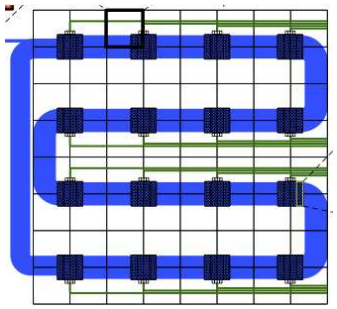
Intel 2010

IBM 2010

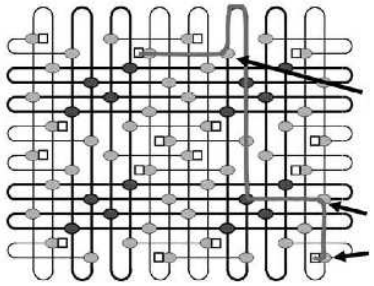
# Recent Nanophotonic System-Level Work



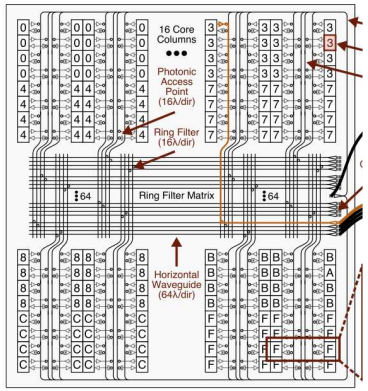

Kirman, MICRO'06



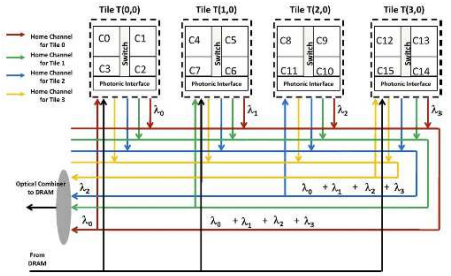
Vantrease, ISCA'08



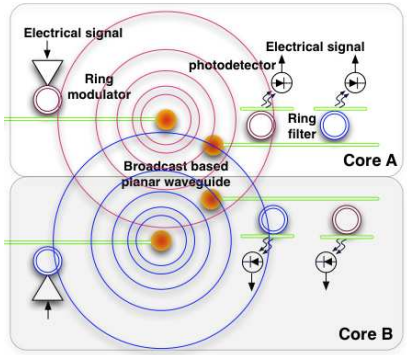
Shacham, TOC'08



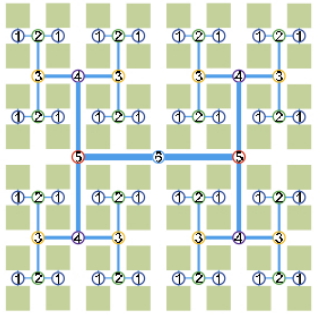

Batten, IEEE Micro'09



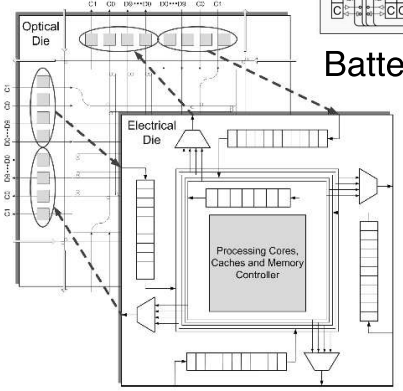

Morris, JSTQE'10



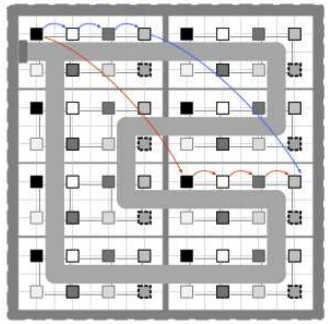

Li, DAC'09



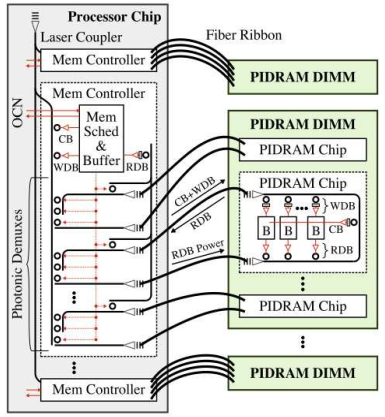
Gu, DATE'09



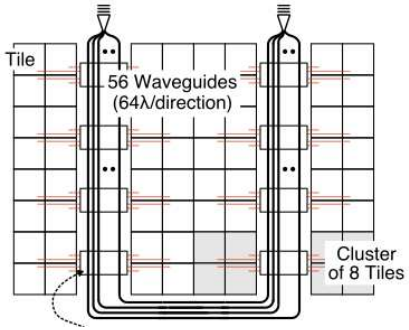

Cianchetti, ISCA'09



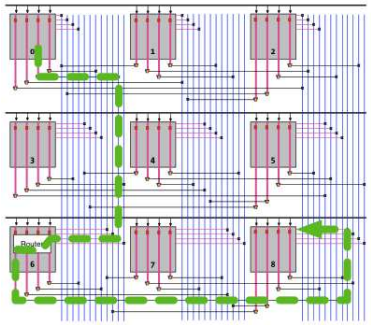
Pan, ISCA'09



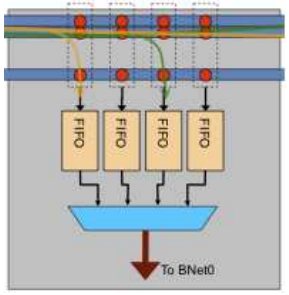

Beamer, ISCA'10



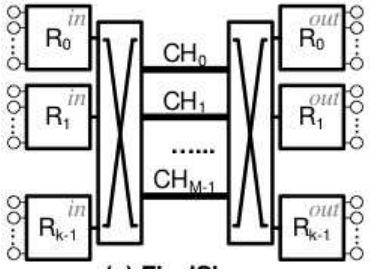

Joshi, NOCS'09



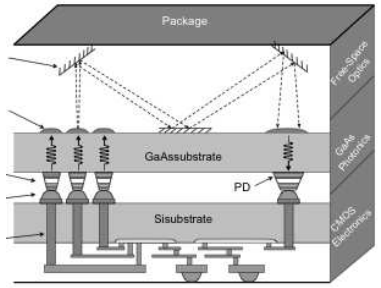
Koka, ISCA'10




Kurian, PACT'10

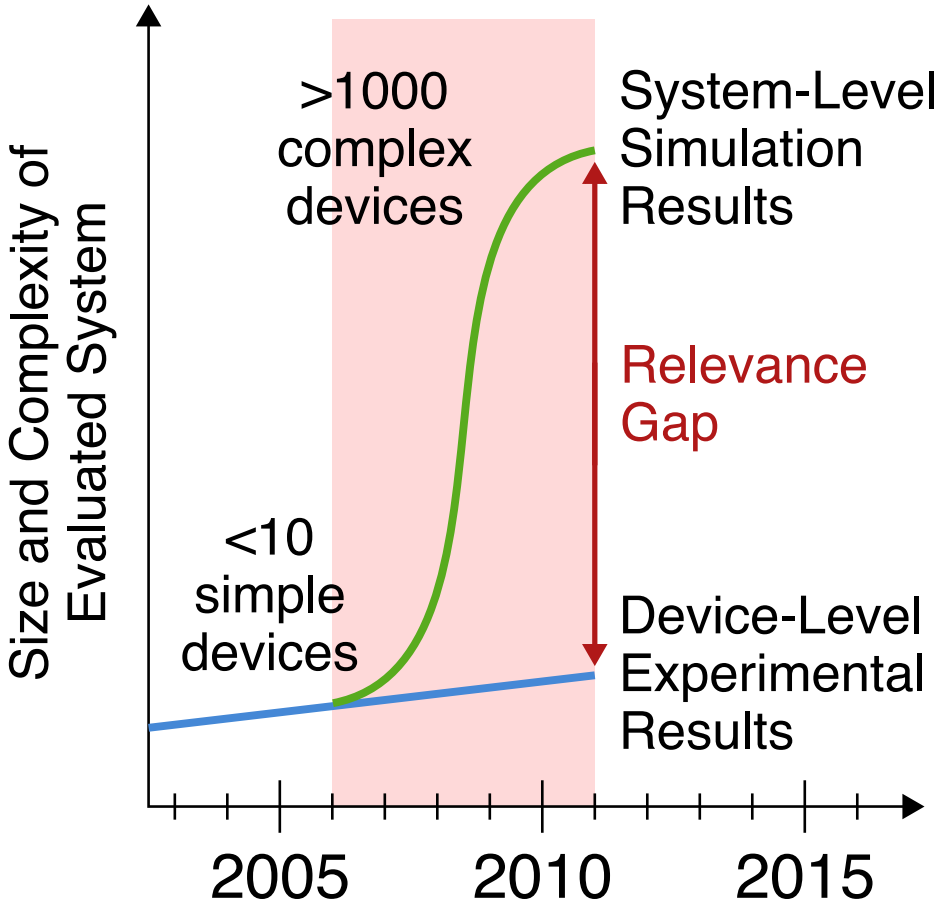



Pan, HPCA'10



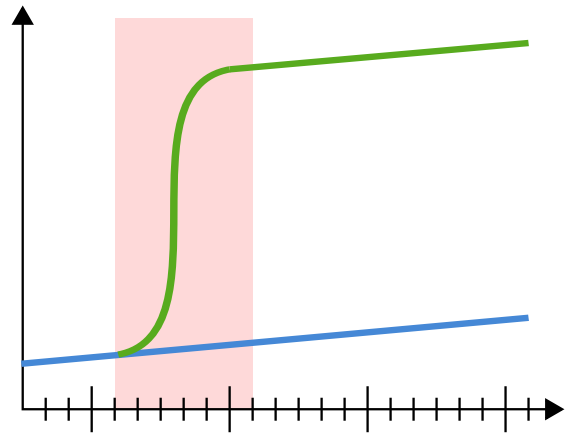

Xue, ISCA'10

# Honeymoon Period of Nanophotonic System-Level Research

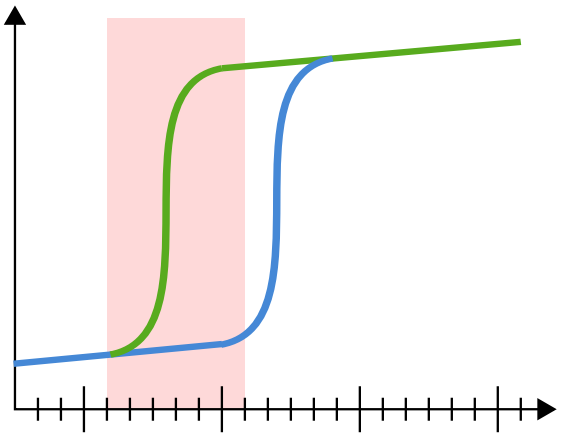



- Drove excitement in system-level community about this technology
- Illustrated potential benefit albeit with projected device parameters
- Less emphasis on practical issues required to really achieve these benefits
  - Transceiver circuits
  - Clocking
  - Off-chip laser design
  - Thermal tuning
  - Manufacturing
  - Reliability

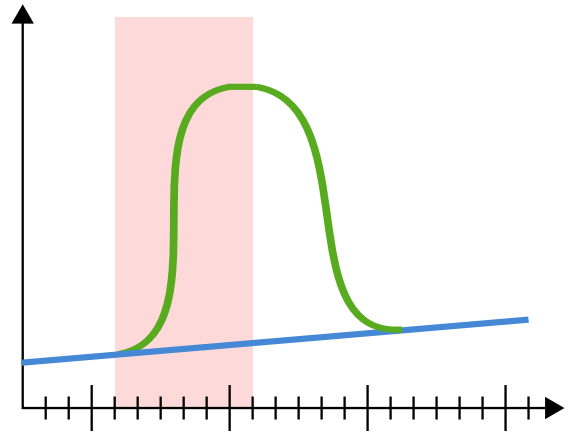
# Possible Post-Honeymoon Research Trajectories?



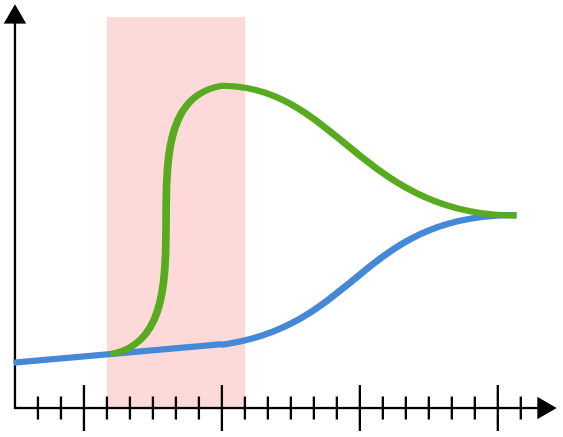
Communities Diverge
Maintaining Relevance Gap



Disruptive Device Breakthrough
Solves All Challenges

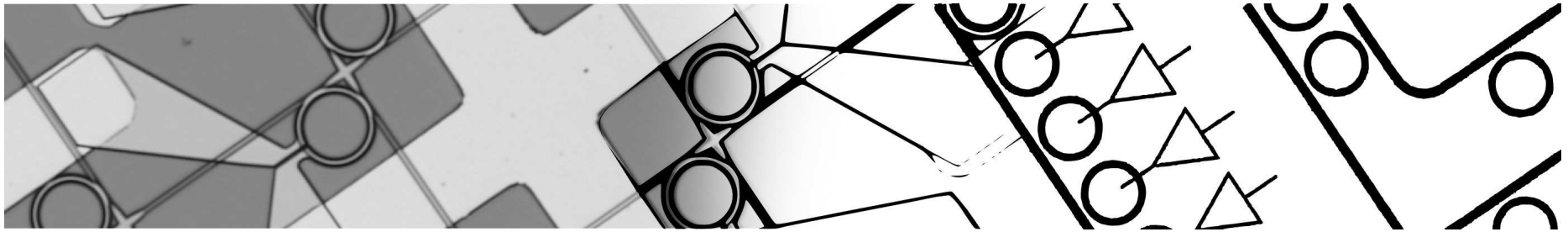


Stop Large-Scale System Research



Meet in the Middle

# Goal for WINDS 2010



Device-Level

System-Level

To begin to move beyond the honeymoon period
by bringing together device-level and system-level
nanophotonic researchers to talk about their work
and to share their experiences
with this emerging technology

# Workshop Agenda: Morning Sessions

- **9:00 – 10:00 am : Invited Tutorials**
  - *Microphotonics for Next Generation Computers*
    Michael Watts (MIT)
  - *Designing Nanophotonic Interconnection Networks*
    Christopher Batten (Cornell)
- **10:30 – 12:00 am : Invited Talks**
  - *Future State-of-the-Art Electrical Interconnect*
    Byungsub Kim (Intel)
  - *Scaling and Designing Nanomodulators for Chip-Level Integration*
    Sasikanth Manipatruni (GE Global Research)
  - *Keynote: The Oracle Macrochip: Architecture and Devices*
    Frankie Liu and Michael O. McCracken (Oracle, Sun Labs)

# Workshop Agenda: Afternoon Sessions

- **1:30 – 2:50 pm : Early Afternoon Session**
  - *EOS: A Monolithic CMOS Photonic Platform*
    V. Stojanović et al. (MIT)
  - *Scalable Nanophotonic Interconnect for Cache-Coherent Multicores*
    R.W. Morris and A.K. Kodi (Ohio University)
  - *Device Guidelines for WDM Interconnects Using Silicon Microrings*
    N. Sherwood-Droz, K. Preston, J.S. Levy, and M. Lipson (Cornell)
  - *System-Level Trimming Issues in On-Chip Nanophotonic Networks*
    C. Nitta, M. Farrens, and V. Akella (U.C. Davis)

# Workshop Agenda: Afternoon Sessions

- **3:30 – 4:50 pm : Late Afternoon Session**
  - *Initial Results of Prototyping a 3D Integrated Intra-Chip Free-Space Optical Interconnect*
    B. Ciftcioglu et al. (University of Rochester)
  - *Towards Chip-Scale Plasmonic Interconnects*
    H.M.G. Wassel et al. (UCSB/Stanford)
  - *Exploring Benefits and Designs of Optically Connected Disintegrated Processor Architecture*
    Y. Pan, Y. Demir, N. Hardavellas, J. Kim, and G. Memik (Northwestern/KAIST)
  - *Implementing System-in-Package with Nanophotonic Interconnect*
    M. Cianchetti, N. Sherwood-Droz, and C. Batten (Cornell)

# Workshop Committee

- **Program Committee Chairs**
  - David Albonesi (Cornell University)
  - José Martínez (Cornell University)
- **Program Committee**
  - Nathan Binkert (HP Labs)
  - Luca Carloni (Columbia University)
  - Ajay Joshi (Boston University)
  - Nevin Kırman (Intel Labs)
  - Herb Schwetman (Oracle, Sun Labs)