

Welcome CAP Executive Board



Oct 2, 2008

CAP 2008 - 2009 Leadership



CAP Chairman:
Rich Goldberg
VP, Corporate Quality, Cisco



CAP Vice Chairman:
Danny Brown
VP, Technology Development, Cymer

Thanks to Dave Esbeck for the *Spirit of Solar* cruise Monday, September 8



Welcome Distinguished Students

Jacobs School Scholars and Fellows

TESC President Sara Richardson, BioEng '10

DECaF Chairman Katherine Lee, BioEng '10

NSBE President Chisolm Egbuonye, MAE '09

**2008 Summer Intern Program (TIP) representative
Stephan Kemper, CSE '10**



Distinguished Student



***Jacobs School of Engineering
TESC President
Sara Richardson
Bioengineering '10***

Triton Engineering Student Council 2008-2009 Mission Statement

TESC strives to:

- Enrich the collegiate experience through engagement in the local community, Jacobs School traditions and culture, and engineering organizations
- Advance the reputation of the Jacobs School and promote academic integrity, excellence, and ingenuity
- Provide students with opportunities to improve their leadership skills, develop professionally, and interact with faculty, staff, alumni, and industry

TESC Events

- Dinner with the Deans (quarterly)
November 20, 2008
- National Engineers Week: *February 15-21, 2009*
 - Tuesday: E-Games
 - Wednesday: Enspire – Introducing Engineering Futures to our Youth
 - Thursday: Research Expo / EUReka
 - Friday: DECaf, Mixer, and Impulse
- Junkyard Derby: *May 2009*



Engage with Students

- Dinner with the Deans
 - Interact with student leaders and faculty from the Jacobs School and learn about student orgs
- Enspire
 - Sponsor TESC's largest outreach event to help bring 400 middle school students to UCSD
- Junkyard Derby
 - Support engineering innovation and tradition

Sara Richardson,

serichardson@ucsd.edu

TESC President, tesc.ucsd.edu

Distinguished Student

***Jacobs School of Engineering
DECaF Chairman
Katherine Lee
Bioengineering '10***





Friday, February 20, 2009

9:30 am – 2:00 pm

UCSD Price Center Ballrooms

Registration is Open!

<http://tesc.ucsd.edu/decaf>

Katherine Lee, DECaF Chair, BioEng '10

Emily Almaraz, DECaF Business Relations, Mech Eng '10

Eunice Choi, DECaF Logistics Lead, Mech Eng '10

About DECaF

- Largest Student-Run Career Fair
 - Organized by TESC in conjunction with 18 engineering student organizations
- All proceeds fund engineering student organization projects and activities
- DECaF 2008
 - 90 Attending Companies
 - 1,500 Student Attendees
 - Recruiter/Volunteer Mixer
 - Industry Led Professional Workshops



DECaF 2009

- What's New
 - New DECaF Logo!
 - Addition of New Price Center Ballroom to DECaF Event Space
 - New Joint Sponsorship Packages with Research EXPO
- 2009 Sponsorship Packages
 - DECaF Corporate/EXPO Luncheon Sponsorship - \$15,000 **New!**
 - DECaF/EXPO Joint Corporate Sponsorship - \$7,500 **New!**
 - DECaF Corporate Sponsorship - \$2,500
 - Standard Sponsorship - \$700 before Oct. 31, \$750 after Nov. 1



DECaF and CAP

- CAP Café
- CAP Resume Database
- 24 CAP Companies Attended DECaF 2008
- Corporate Sponsors



Distinguished Student



***Jacobs School of Engineering
NSBE President
Chisom Egbuonye
Mechanical and Aerospace Engineering '09***

NSBE UCSD



Mission is to increase the number of culturally responsible Black engineers who excel academically, succeed professionally and positively impact the community.

www.nsbe.ucsd.edu

Goals for 2008-2009

- Increase membership
- Collaborate with other organizations and companies
- Community service
- Night of Industry
- Corporate Guests
- National Convention



Night of Industry (NOI)

About NOI

- Career fair to recruit qualified students
- Student research/internship presentations
- Business casual environment to promote dialogue

Sponsorship

- To register your company contact Chisom Egbuonye @ 858-337-1084 or Cegbuony@ucsd.edu
- Registration deadline: Friday, October 17th
- More Information available on www.nsbe.ucsd.edu



Wednesday, November 19, 2008

5 - 8PM

Price Center Ballrooms AB

Distinguished Student

***Jacobs School of Engineering
Stephan Kemper
Computer Science Engineering '10
Summer 2008 TIP Experience***





ViaSat Knowledge Database

UCSD Team Internship Project

Joshua Cerny, Virginia Tech

Greg Hart, UCLA

Stephan Kemper, UCSD

Project Description



- Data spread out all over corporate network
- Locating relevant project information difficult
 - Constantly growing infrastructure
 - Data in shares, CMS, wiki, SharePoint, etc.
- Surveys showed large amounts of wasted time
- Not an intern coding project
- Initial timeline was optimistic

The Solution



- Research search vendors
- Meet with representatives
- Run Proof of Concepts
- Gather employee feedback
 - Latest stage: beta testing, Aug 28 - 29
- Retrain software, repeat
- Pick a vendor, and install!

Benefits for ViaSat



- Engineers who are excited to be there
- Fresh, innovative talent
- Less supervision required
- Bigger projects possible
- Cost Efficient Labor



Benefits for Students



- Engineering is done in teams
- Experience the classroom can't give
- Corporate work in your field
- Business and engineering sides of a project
- Paying summer job!



Welcome CAP Member



BD

BD Biosciences

Bob Balderas, VP of R&D

Dean's Report:

Jacobs School of Engineering *Dean Frieder Seible*



Jacobs School of Engineering Dean Takes Flight



UC San Diego Moves Up to 6th in Federal Research Funding

- *Almost \$800 million for R&D*
- *UC San Diego moved to 6th place up from the 2007 ranking of 7th*

* National Science Foundation



2008 New Faculty Hires



Yuri Bazilevs, SE

Jennifer Cha, NE



Adam Engler, BE



Ingolf Krueger, CSE



Zhaowei Liu, ECE

Lelli van den Einde, SE

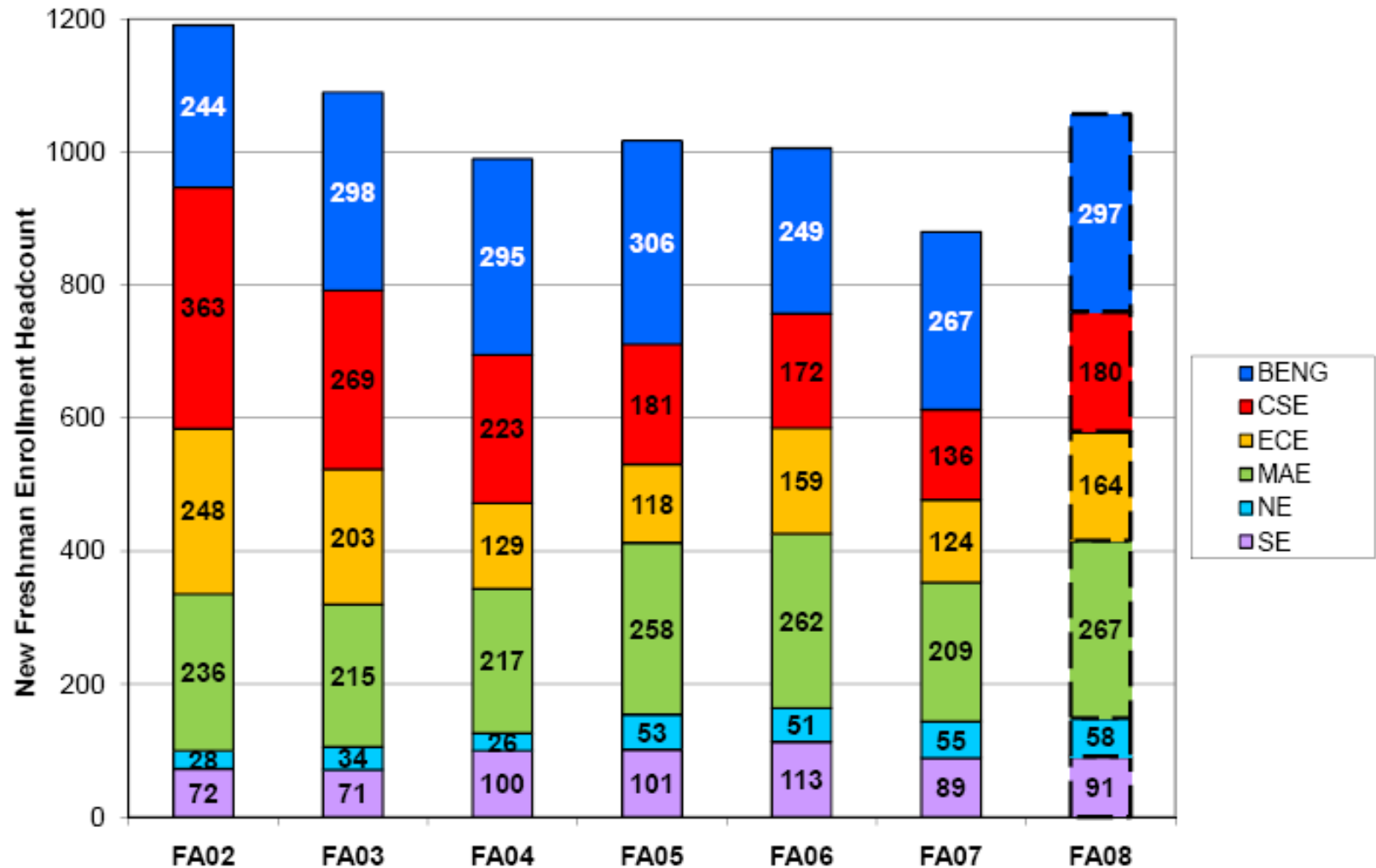


Joe Wang, NE



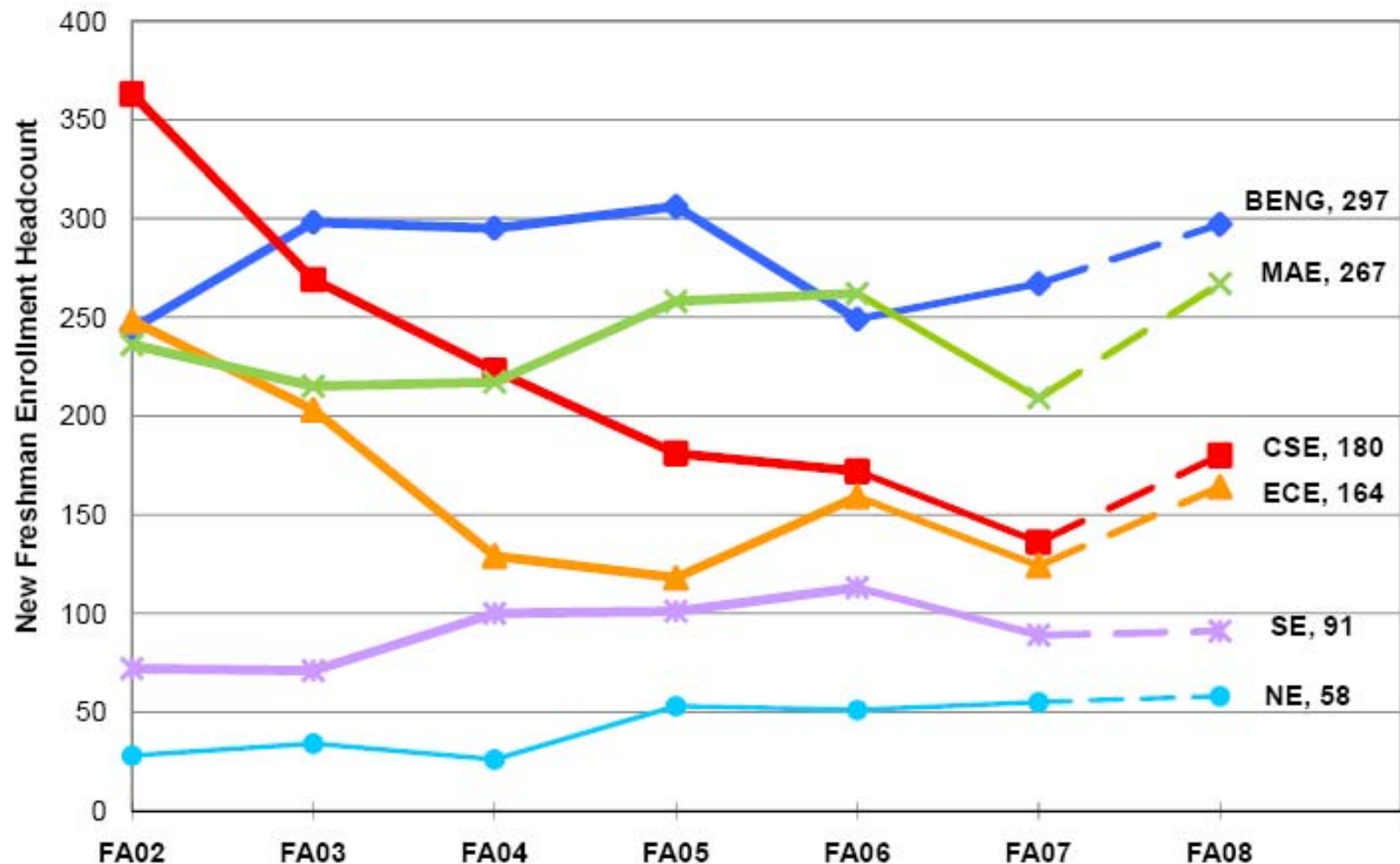
Liangfang Zhang, NE

Jacobs School New Freshman & Transfer Enrollment



Source: UCSD third week enrollment tables FA02-FA07 and FA08 accepts as of 9/29/08.

Jacobs School New Freshman & Transfer Enrollment



Source: UCSD third week enrollment tables FA02-FA07 and FA08 accepts as of 9/29/08.

New Center and Research Initiative



December 12, 2008, Friday
Institute of Engineering in Medicine
Inaugural Ceremony
and Reception
3:00 p.m.

Synergize unique strengths
and integrate engineering
principles and novel
technologies at UC San
Diego with biomedical and
translational research.



Shu Chien, M.D., Ph.D., is a professor of bioengineering and medicine, and founding director of the Institute of Engineering in Medicine at UC San Diego.



Structural and Materials Engineering Building

(EBU IV)

- **Groundbreaking:** Oct 24, 2008
- **Building Open:** 2010
- **110,000 a.s.f.**
- **Structural Engineering, NanoEngineering, Visual Arts**
- **Architect:** Miller|Hull Partnership, LLP and Safdie Rabines Architects





SDSC

New Building Dedication

Friday, October 14, 2008
San Diego Supercomputer Center
UC San Diego

80,000 square-foot addition

Agenda

7:00 – 7:30 AM Continental Breakfast / Networking

7:30 – 8:45 AM Program Begins

9:00 – 9:30 AM Tour of New Building & Data Center

Formal dedication ceremony, starts at 10:45 AM.

RSVP to: industrybreakfast@sdsc.edu

Craig Mundie

Chief Research & Strategy Officer

Come meet
Bill Gates'
successor!

Friday
10.10.08

11:15

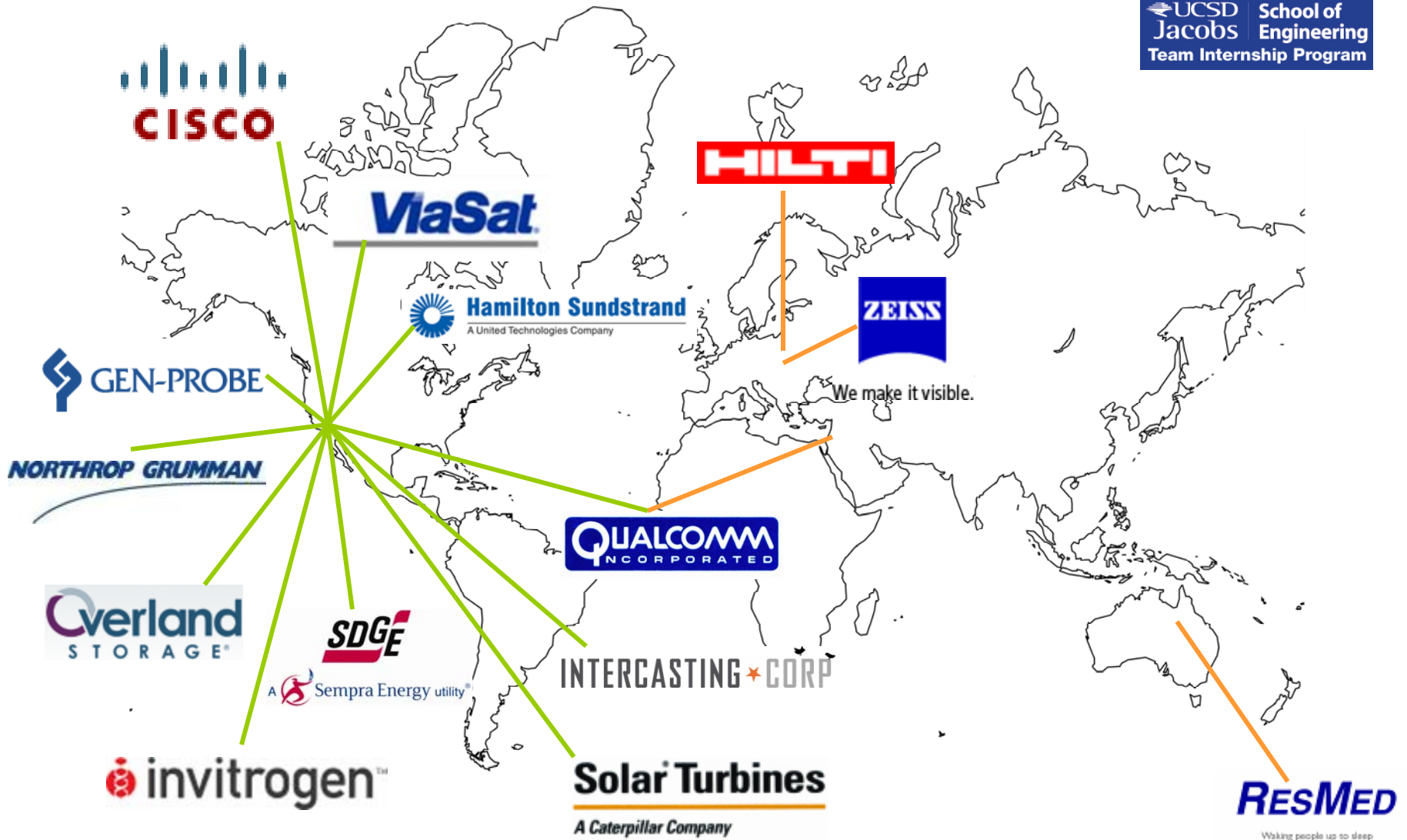
*Shaping the
Future with
Technology*

Ballroom
East

Price
Center

This Years' TIP Sponsors: 2008 Global Footprint

UCSD Jacobs School of Engineering
Team Internship Program



Team Internship Program: International Team Projects 2008



Liechtenstein and Germany

- Project #1: Create a more intuitive User Interface for HILTI's Anchor Design Software and test with clients
- Project #2: Define a design concept for an electrical plug system feasible for handheld electrical equipment in underground mining applications



Germany

- Project #1: Identify new product lines for Zeiss in the Personal Health market
- Project #2: Evaluate market opportunities for Zeiss in the Nanoparticles market



Waking people up to sleep

Australia

- Optimize a nocturnal blood pressure monitoring device to monitor effects of blood pressure on sleep-disordered breathing



Israel

- Project #1: Enhance Universal Broadcast (Mobile TV) Module Performance Tools
- Project #2: Study and enhance various data streams over USB and SD/SDIO interfaces of the mobile phone / cellular modem
- Project #3: Re-architecture of Data Networking API for the Qualcomm Component Model

COSMOS



- Pipeline to STEM
- 150 HS Students, 4-week residential summer school
- Inquiry-based, hands-on experience
- Summer internships at Cisco and Qualcomm and scholarships for COSMOS alumni

“COSMOS was awesome. I loved being able to learn more about science with students who shared a common interest.”

“COSMOS was a life-altering experience. I learned so much and created so many memories.”



How Will US Elections Change US-China Cooperation?

- UC San Diego, in partnership with Tsinghua University, will host a symposium focused on how the US Elections will change the agenda for US-China cooperation.
- Monday, November 10, 2008 in Beijing at the School of Management at Tsinghua University.
- Speakers include:
 - Peter Cowhey, Dean, Graduate School of International Relations and Pacific Studies, UCSD
 - Frieder Seible, Dean, Jacobs School of Engineering, UCSD
 - Jim Fallows, prominent American journalist
 - Leaders from Tsinghua University

<http://www.jacobsschool.ucsd.edu/events/china-symposium/>



Faculty Presentation

James Buckwalter, Ph.D.

Assistant Professor,

Department of Electrical & Computer Engineering

The I/O Revolution and Prospects of Traveling Wave Integrated Circuits

James Buckwalter

Assistant Professor

Department of Electrical and Computer Engineering

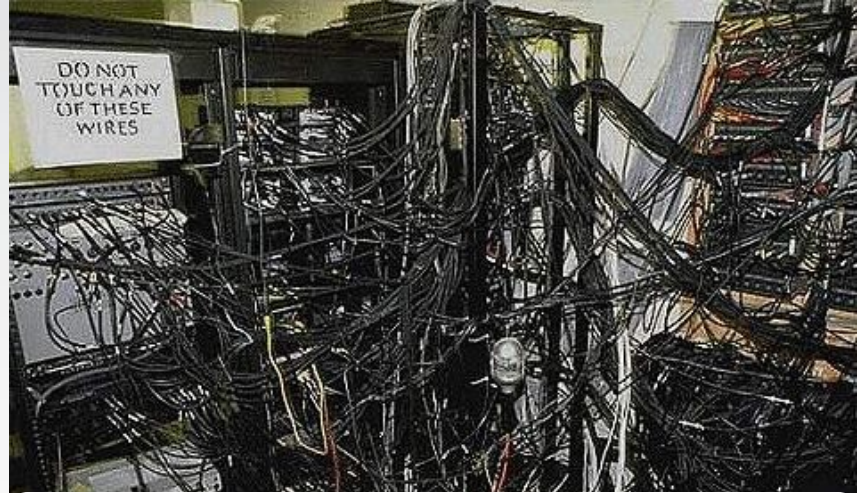
University of California- San Diego

La Jolla, CA 92093

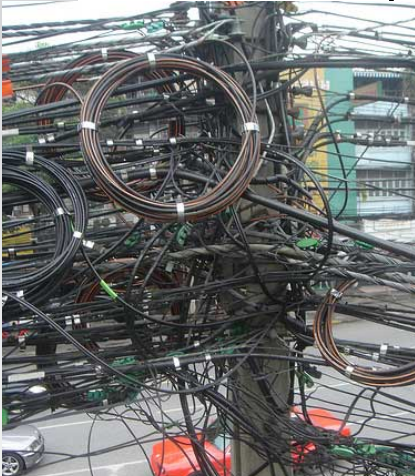
Broadband Communication: Wrapped Up in Knots?



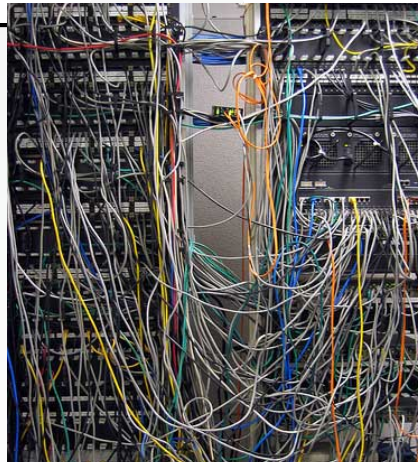
1900s: Telephone Line



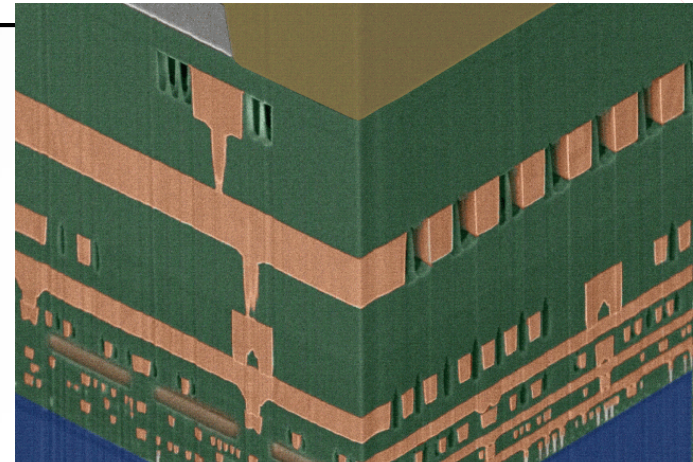
1950s: Computer



1990s: Telephone Line



2000s: Server



2008: Microprocessor

Electrical Interconnects

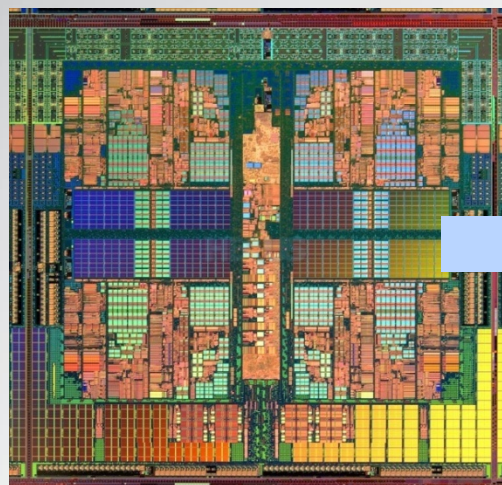
- The societal impact:
 - High-speed serial I/O is a power hog.
 - 65nm multicore processor: 30W for on-chip/off-chip interconnects.
 - 32bit memory bus operating at 6.4Gb/s (PCI) burns roughly 4W.
 - 200M computers + 20M servers = 880MW/yr.
 - Energy costs \$44,000/hr or \$385M/yr.
 - Data centers in the US expect to require 25 power plants by 2011; More greenhouse gases than jet travel by 2020.
 - Real dollars, real pollution.
 - Fractional improvements can save millions.



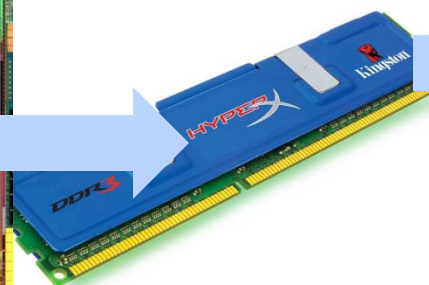
Reach

Where are broadband communication links important?

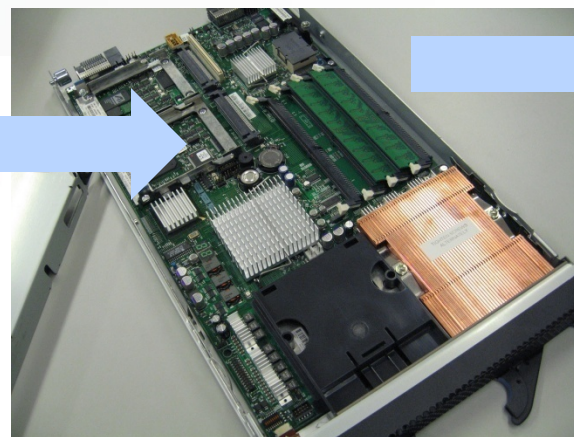
Distance	Applications	Standards
<1cm	Chip/module scale	Undefined
<10cm	Chip-to-chip	RapidIO, PCIeexpress
<10m-100m	Card-to-card, SAN	Infiniband, GbE, FibreChannel,
~1km	Last mile, LAN	GbE



Multicore Processor



Memory Card



Blade card



Server

Rate Demands

Distance	Parallel Links	Serial Rate	Aggregate Rate
<1cm (Multicore)	64	4Gb/s	256Gb/s
<10cm (XDR2)	32	12.4Gb/s	409Gb/s
<10m-100m (GbE)	1	10Gb/s	10Gb/s
~1km	1	1-40Gb/s	1-40Gb/s

At every level of physical scale, higher capacities are being demanded.

Distance	Aggregate Rate	Power	Energy/bit
<1cm (multicore)	256Gb/s	30W	1.46pJ
<10cm (XDR2)	409Gb/s	17W	41pJ
<10m-100m (GbE)	10Gb/s	6W	600pJ
~1km	1-40Gb/s	???	> 1000pJ

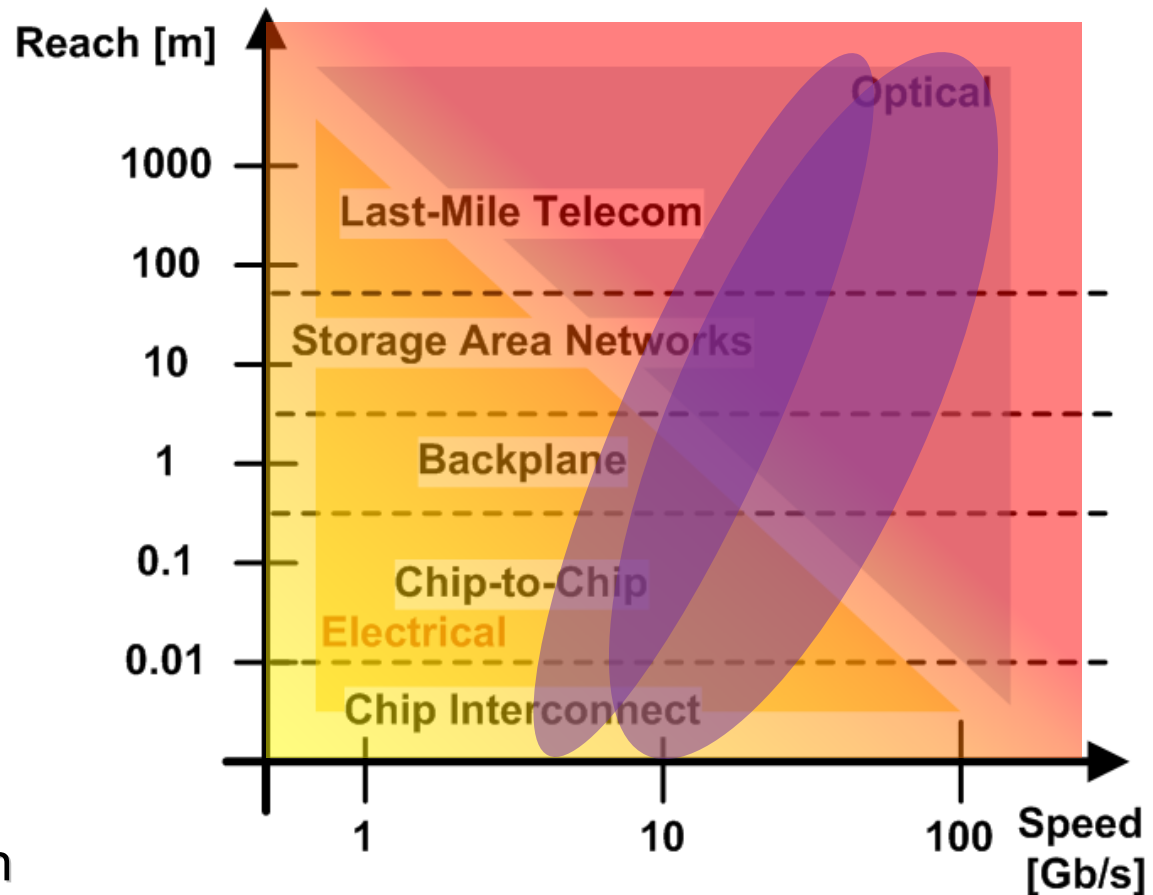
Power is basically fixed at each scale, energy efficiency is closely tracking distance.

Sources: Intel/Rambus XDR2/SolarFlare



Trend Summary

- Energy efficiency
= Power/Rate
- Higher speeds are required.
- Power consumption cannot change.
- What are the options?
 - Replace electrical interconnects?
Optics/Wireless
 - Can we do better with current approaches?



An Historic Convergence

Economics:
Costs of
Hardware,
Installation,
Operation.






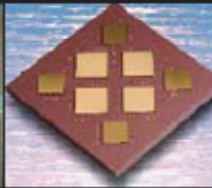
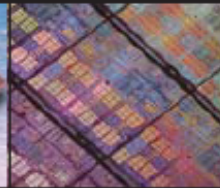
Physics:
Channels,
Propagation

Communication
Theory:
Coding,
Signal Processing

Devices/Circuits:
Silicon/III-V,
RF/Analog/Mixed Signal

Broadband Optics

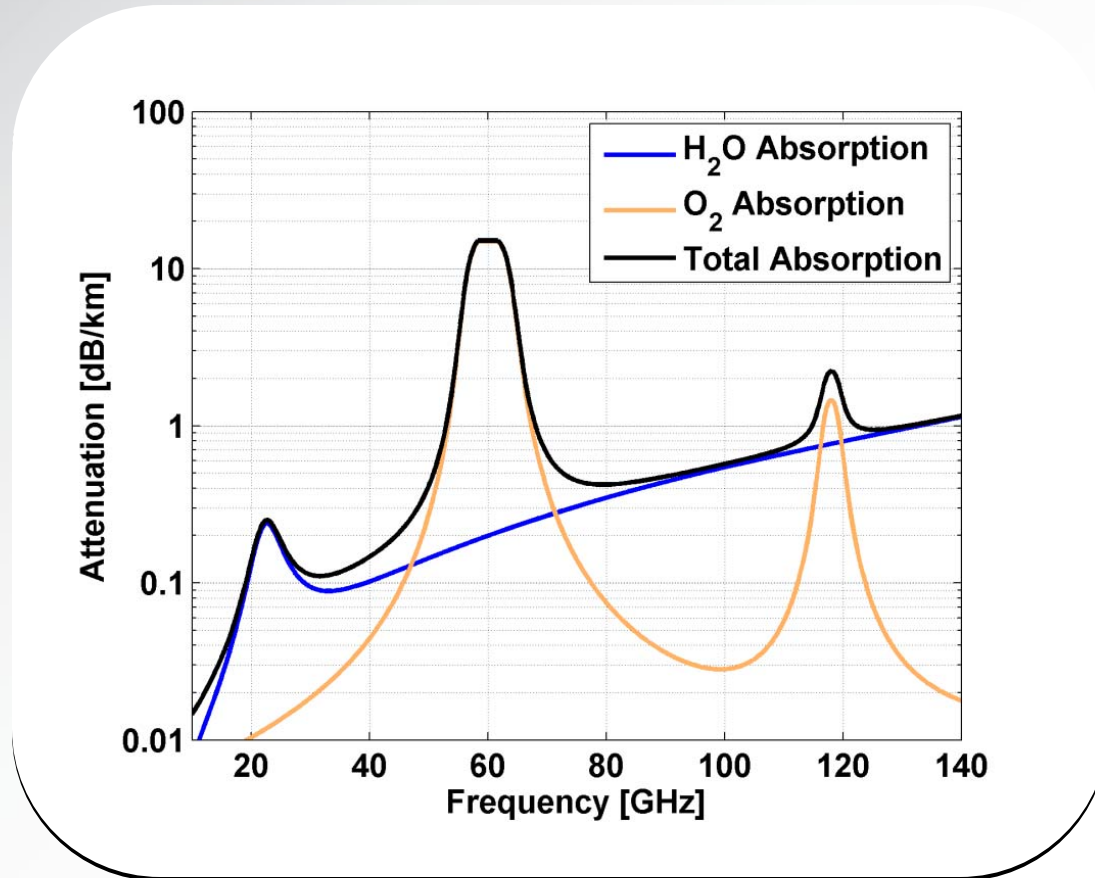
Source:
IBM

	MAN/WAN	Cables—long	Cables—short	Card-to-card	Intra-card	Intra-module	Intra-chip
							
Length	Multi-km	10–300 m	1–10 m	0.3–1 m	0.1–0.3 m	5–100 mm	0–20 mm
No. of lines per link	One	One to tens	One to tens	One to hundreds	One to hundreds	One to hundreds	One to hundreds
No. of lines per system	Tens	Tens to thousands	Tens to thousands	Tens to thousands	Thousands	Approximately ten thousand	Hundreds of thousands
Standards	Internet Protocol, SONET, ATM	LAN/SAN (Ethernet, InfiniBand, Fibre Channel)	Design-specific, LAN/SAN (Ethernet, InfiniBand)	Design-specific and standards (PCI, backplane InfiniBand and Ethernet)	Design-specific, generally	Design-specific	Design-specific
Use of optics	Since the 1980s	Since the 1990s	Present time, or very soon	2005–2010 with effort	2010–2015	Probably after 2015	Later

- Optics is well established for >100m distances.
- Expensive (>\$200 per 10Gb/s module), Silicon Photonics?
- Extremely promising at chip scales.

Broadband Wireless

- Allocated bands
 - 57-64GHz
 - 71-76 GHz
 - 81-86 GHz
 - 92-95 GHz
- 60GHz for short range video links.
- 80GHz for last mile links.
- Other applications?
 - High-speed I/O
 - Low power
 - Highly directive



Band	Technology	Energy
60GHz	SiBeam (4Gb/s)	500pJ/b
60GHz	Panasonic (OOK, 1Gb/S)	30pJ/b
3-10GHz	UWB (480Mb/s)	200pJ/b

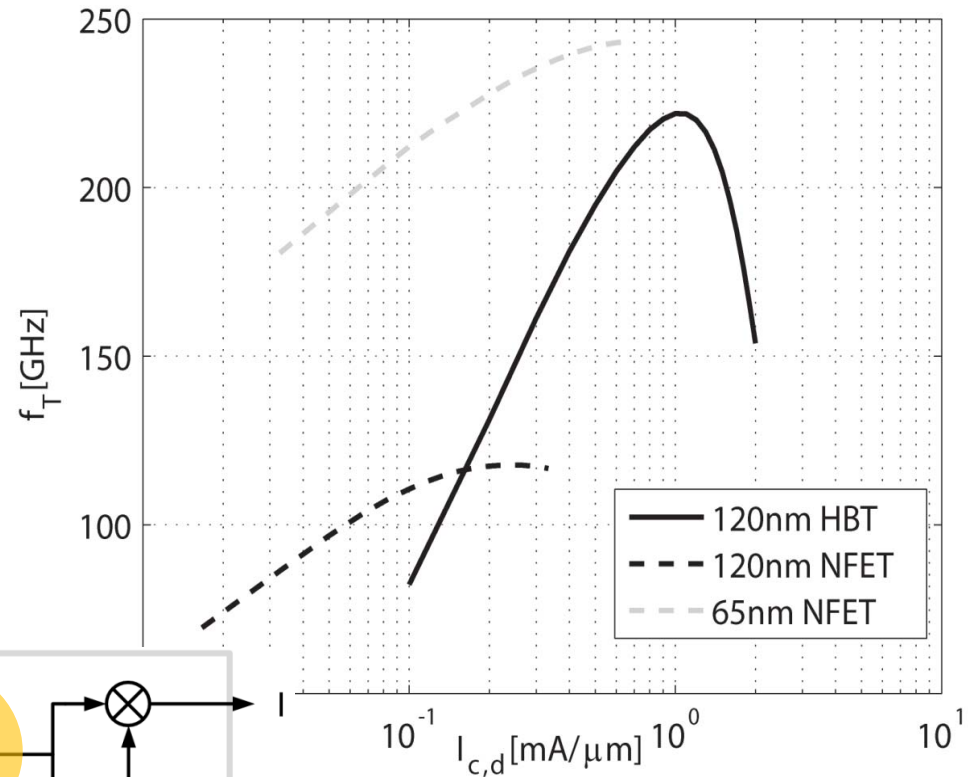
Broadband Circuits Research @ UCSD

- Energy efficient mixed-signal circuits
 - Optimal Coding/Signal Processing for
 - Channel (Bandwidth-limited)
 - Deep-submicron CMOS (Dynamic Range-limited)
- Broadband (10-40Gb/s) traveling wave circuits for optical and electrical links
 - High-bandwidth / Multiband
 - Impedance matching/ Low noise
 - Getting the most out of modern silicon devices.

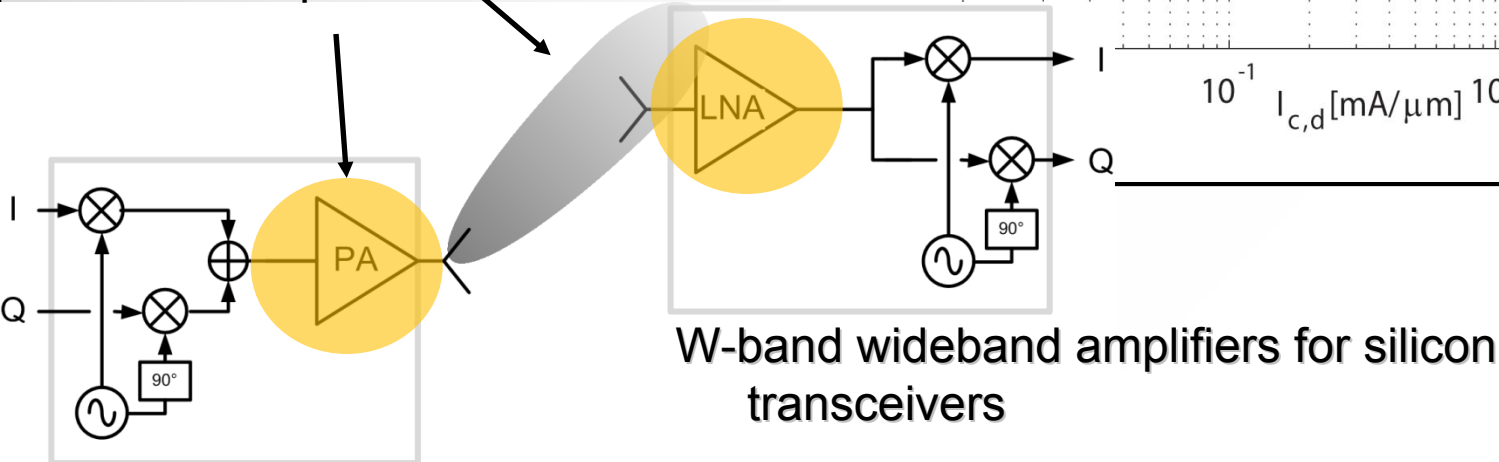


High-Speed Silicon Devices

- Fast Devices >200GHz
 - 65nm CMOS
 - $f_T = 220\text{GHz}$
 - $V_{ds} = 1\text{V}$
 - 120nm SiGe BiCMOS
 - $f_T = 210\text{GHz}$
 - $V_{ce} = 2.5\text{V}$



Amplifiers



Classic Amplifier Topologies

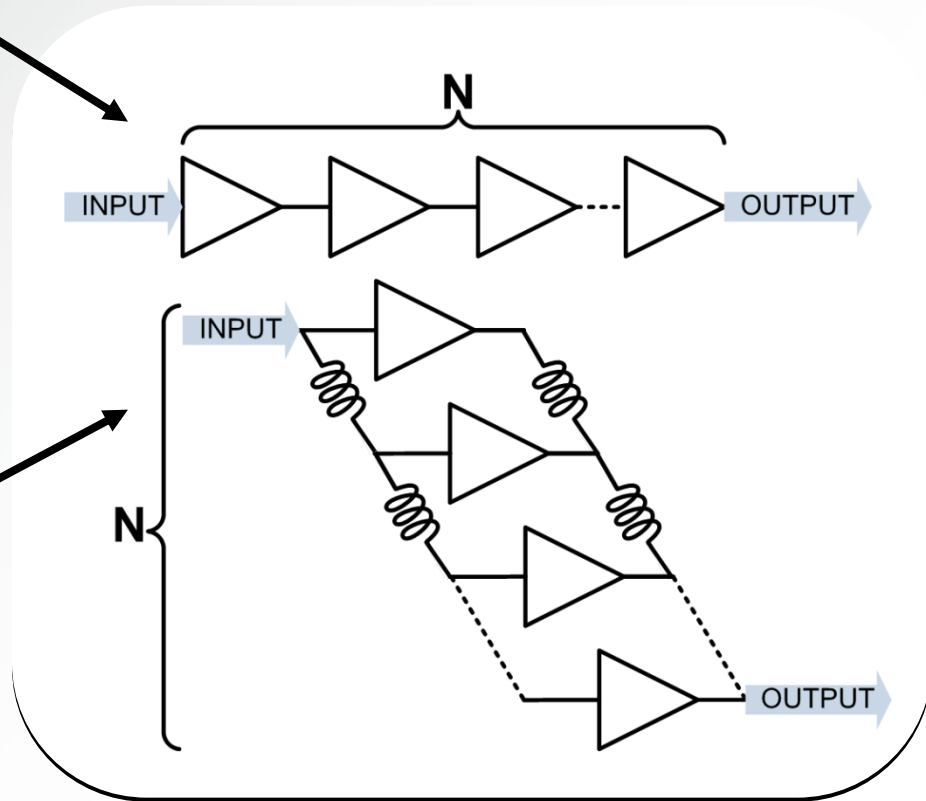
■ Cascaded Amplifiers

- Lumped Element Circuit
- Gain [dB] $\sim N$
- Bandwidth falls off with N !

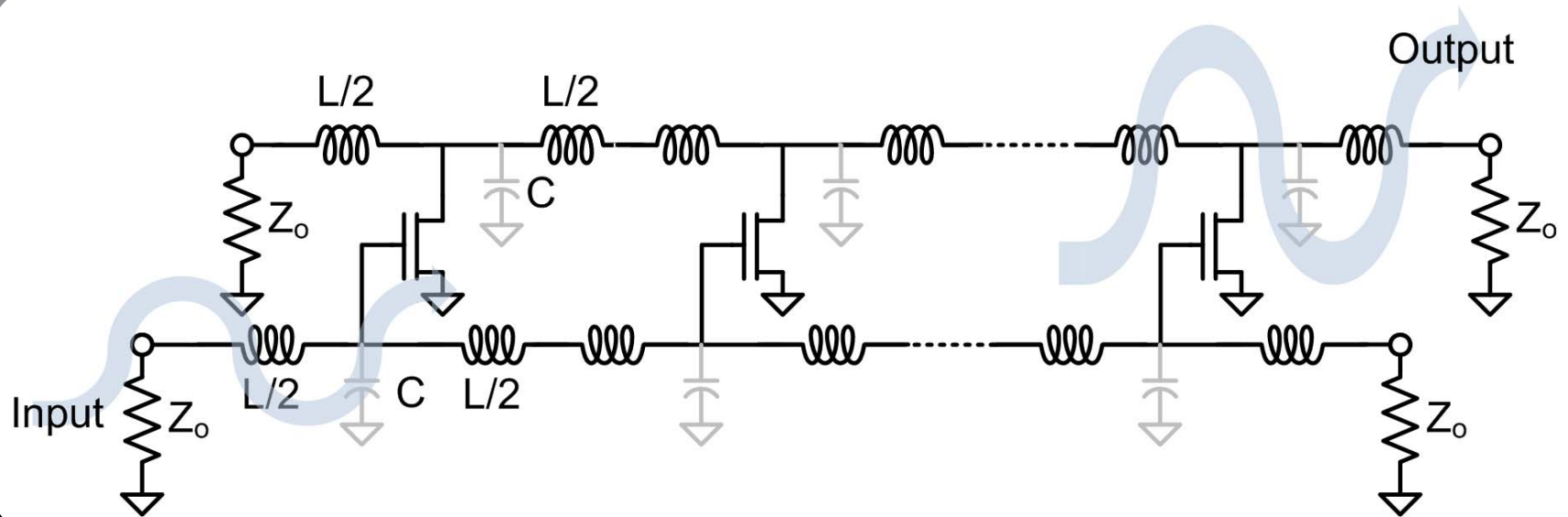
$$BW = f_T \frac{\sqrt{2^{1/N} - 1}}{\sqrt[N]{A_v}}$$

■ Distributed Amplifiers

- Traveling Wave Circuit
- Gain [dB] $\sim \log N$
- Bandwidth \sim constant
(fixed at Bragg Frequency)



Traveling Wave Amplifiers



- **Our goal: How do we get the most gain-bandwidth out of modern silicon devices?**
- Distribute device capacitances along gate and drain into a transmission line.
- Traveling waves along input and output.

Overall Gain

Voltage Gain:

$$A_v = \sum A_{v,stage} = N \frac{g_m Z_{o,d}}{2}$$

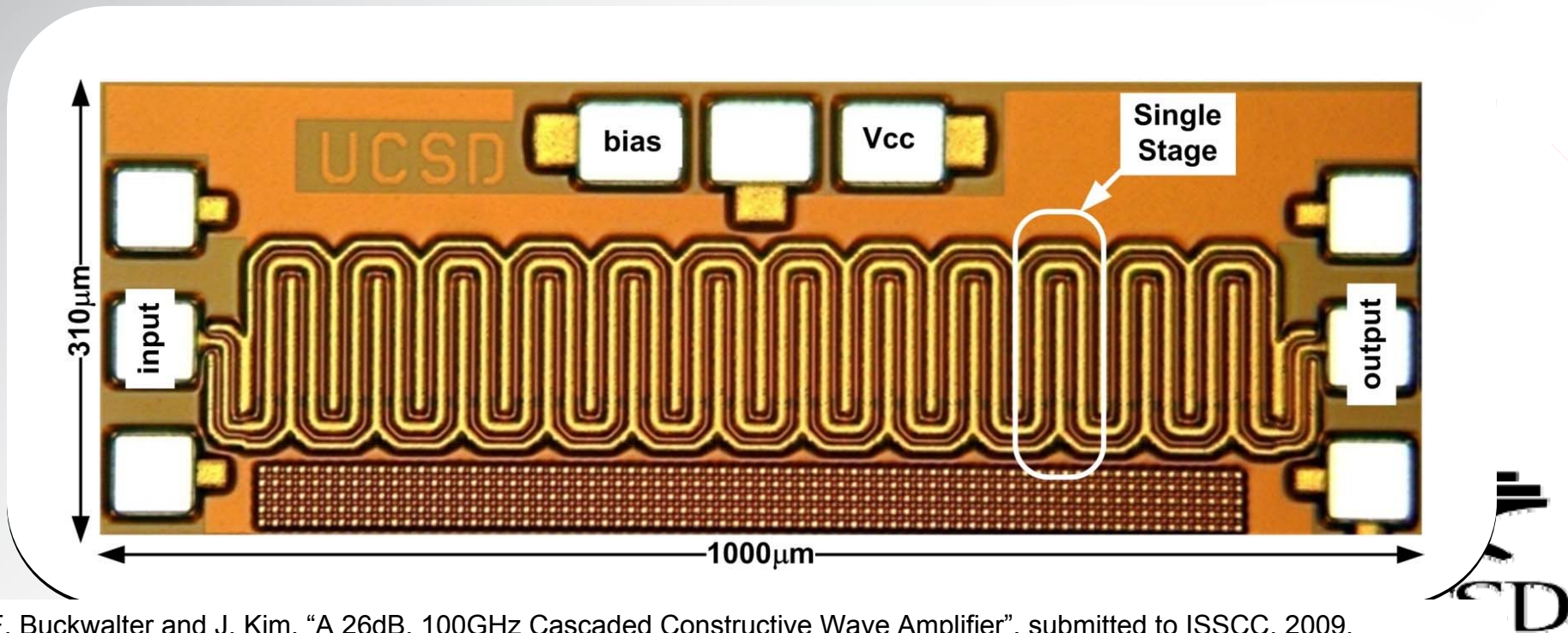
Gain Bandwidth:

$$GBW = \frac{A_v}{2\pi\sqrt{LC}} \propto Nf_T$$

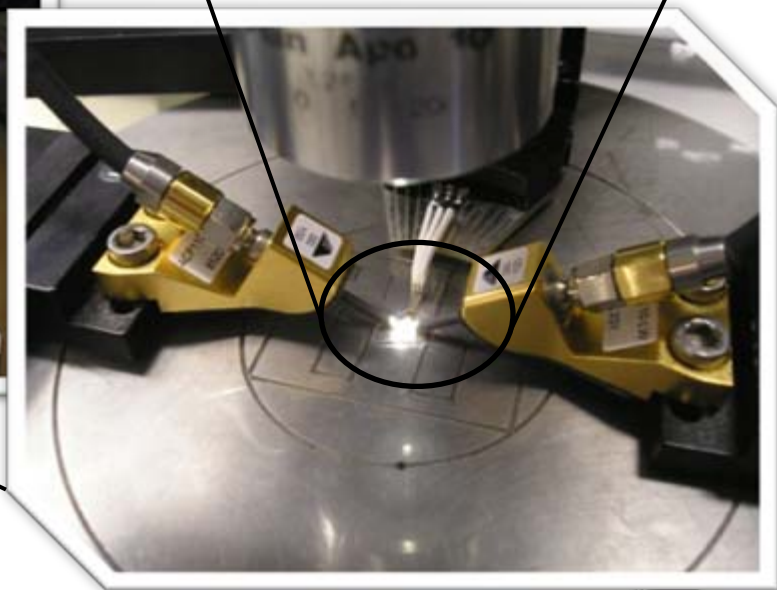
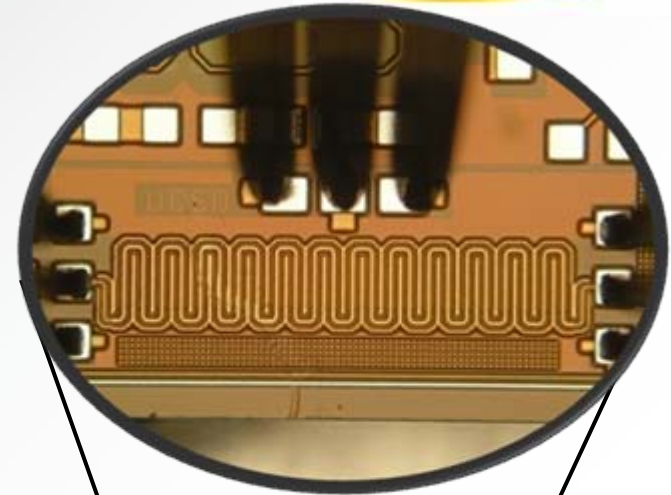
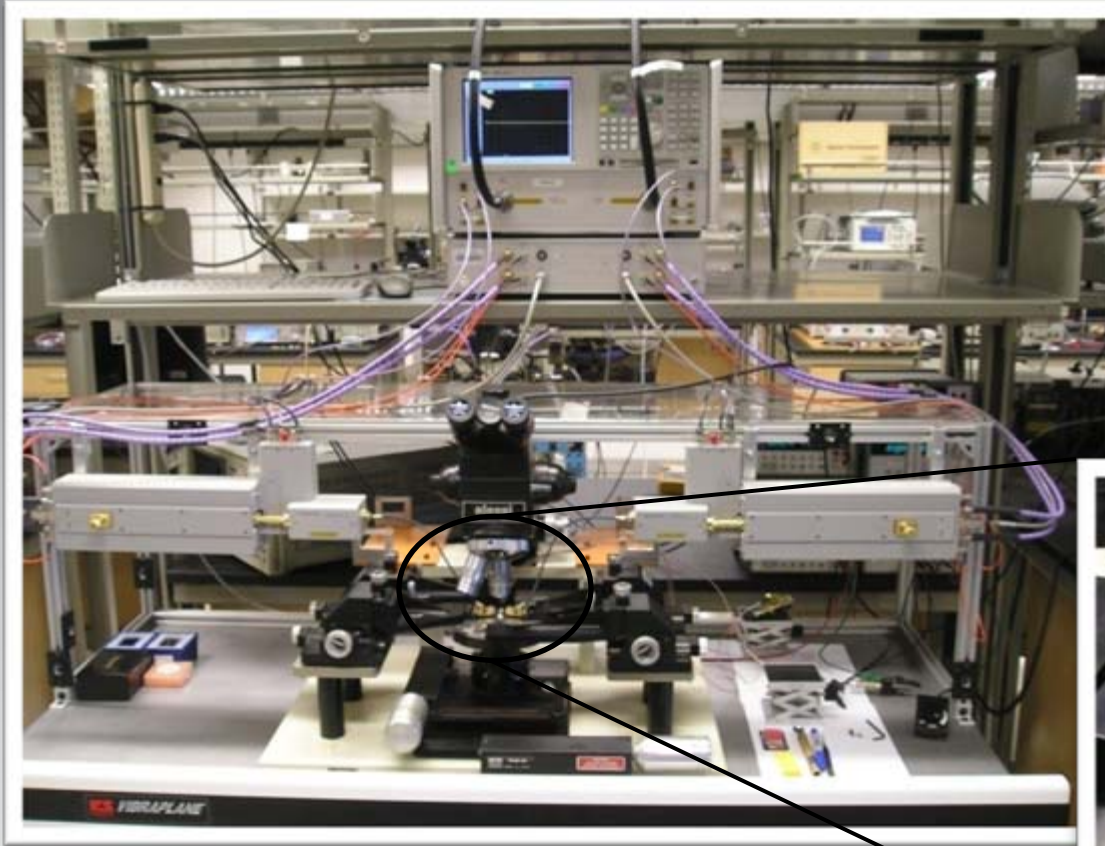
A 100GHz Cascaded Constructive Wave Amplifier



- Millimeter-wave Wideband Amplifier
- 120nm Silicon Germanium BiCMOS
- Chip area: $330\mu\text{m}$ by $1\text{mm} = 0.330\text{ mm}^2$

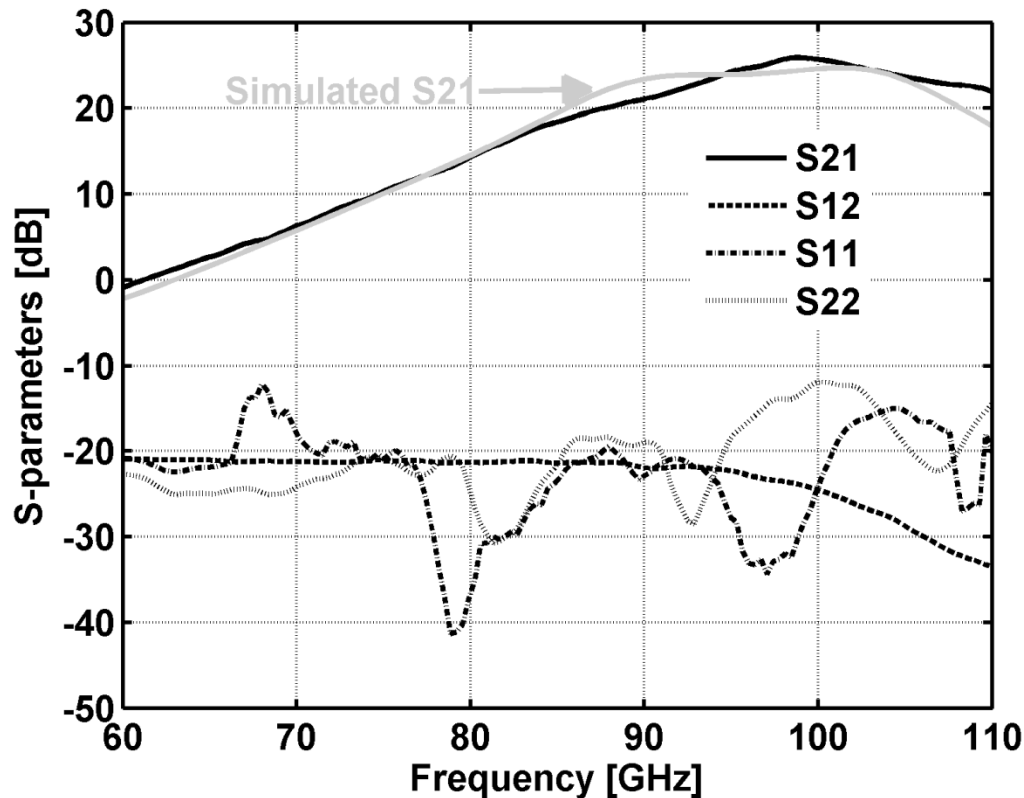


100GHz Measurement



- Agilent E8361 with N5260A (10MHz – 110GHz)
- Cascade ACP-110-LW 100um Probes
- Calibration (On-wafer and CS-5)

S-parameter Measurements



- S21: 26dB @ 99GHz
- BW: 14GHz
- S12: -24dB @ 99GHz
- Input Return Loss < -15dB,
- Output Return Loss < -12dB
- GBW = 300GHz
- Pdc = 76mW

These are records for performance in silicon!

Summary

- Broadband communication is entering an era of revolution;
 - Driven by energy efficiency, rate demands
 - Electrical, optical, wireless channels
 - High fT (>200GHz) silicon devices offer
 - High-speed signal processing
 - Optimized source/channel coding
 - Millimeter-wave Performance: Traveling wave circuits for broadbands/high-frequencies.
- Traveling wave mm-Wave/Analog/Digital on one-chip



CAP Business:

Anne O'Donnell

Director, Corporate Affiliates Program (CAP)

Senior Design Projects

Nate Delson, Ph.D.

Director, Mechanical Engineering Design Center

We Are Looking For a Few Good Mechanical Engineering Capstone Design Projects

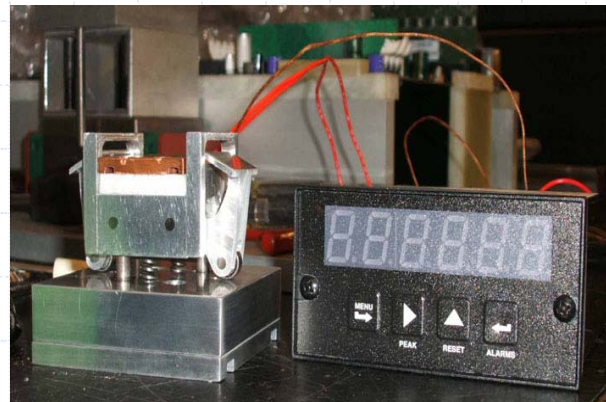
Nathan Delson, Ph.D.

Director, Mechanical Engineering Design Center

Dept. of Mechanical and Aerospace Engineering

Teams of Mechanical Engineering Seniors Work on Developing Working Prototypes

- ◆ Mechanical
- ◆ Electro-mechanical
- ◆ Fluids
- ◆ Heat transfer
- ◆ Control



What Course Provides

- ◆ Teams of 3-6 students
- ◆ 15 week duration projects
- ◆ Support from full machine shop and electronics shop
- ◆ CAD and simulation software
- ◆ Instructor guidance on a weekly basis



Sponsor Responsibility

- ◆ Project Description
- ◆ Weekly meetings
- ◆ Budget
 - Parts and Materials
 - \$1500 shared machine shop expensive



Project Descriptions Due Dates

- ❖ October 15 for Fall-Winter projects
 - project kickoff at beginning of November
 - project completion in mid March
- ❖ January 15th for Winter-Spring projects
 - project kickoff in mid February
 - project completion in mid June



***New Initiatives with your employees
and our alumni***

Tatis Cervantes
Assistant Director of Alumni Affairs
Jacobs School of Engineering

New CAP Benefits

Building a Community Between CAP/Alumni/Students/Faculty

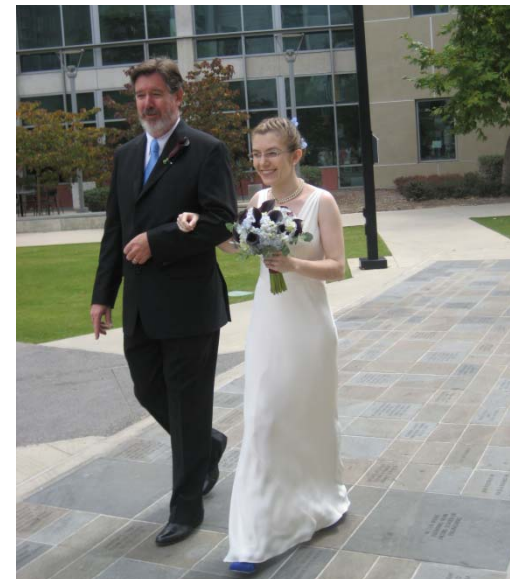


Building a Community and Touching Base



Building Relationships & Families with the Jacobs School

Jacobs Scholars Wedding Engineering Courtyard Ed Wu '04 & Simone McCloskey '07



Be Part of Jacobs School *Legacy Walk*



BAE SYSTEMS



NORTHROP GRUMMAN





*Day @ Your
Company*



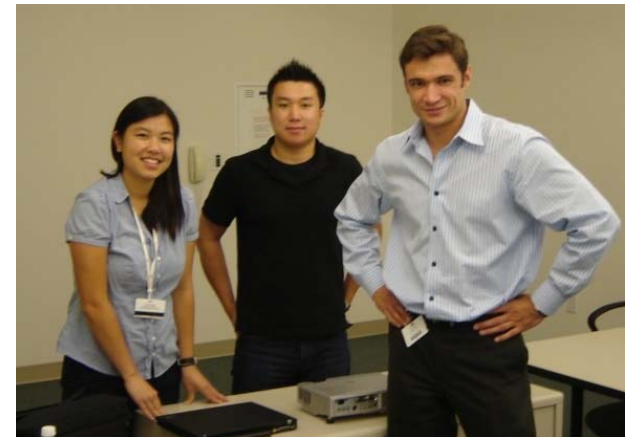
You Pick the Tech-Topic. We'll Pick the Faculty!

- Provide alumni and your employees an update of cutting-edge research at the Jacobs School of Engineering
- Create a Jacobs School community within your company
- Build a Bridge between your employees/Jacobs alumni to engage with the Jacobs School faculty and students



Adopt a Future Engineer **- a Jacobs School Student- for a Day**

- ***One:One*** opportunity to guide and inspire students with their career goals and aspirations
- ***Job Shadowing*** - Students witness firsthand
 - your company culture
 - technical skills in practice
 - career options
- **Two-way Informational Interviews**



Yahoo! Hack Week

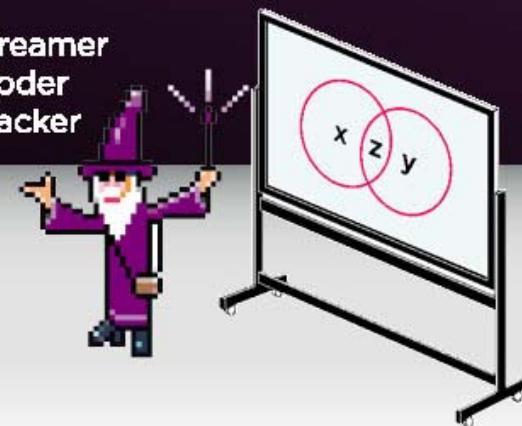
JOIN US FOR THESE HACK EVENTS:

October 13th	BBQ & Hack Kickoff Featuring Rasmus Lerdorf
October 14th	Mobile Widget & SearchMonkey Brain Jam
October 15th	Future Open Technology Tech Talk
October 16th	24-Hour Hack Competition Begins
October 17th	Demos, Judging, Awards, After Party

For more details, developer tools and examples of past university hacks visit:
<http://developer.yahoo.com/hacku>

Questions? Email us at: hacku@yahoo-inc.com

X = Dreamer
Y = Coder
Z = Hacker



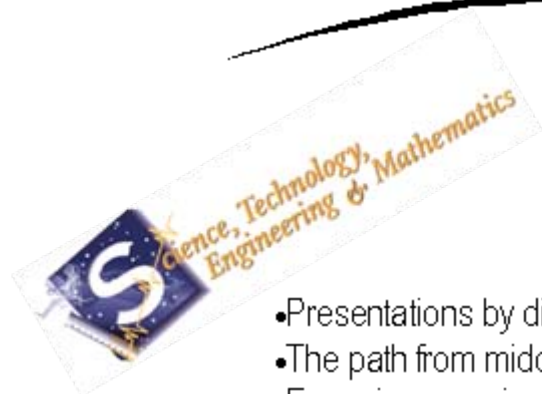
YAHOO!

Please join us to celebrate women in science & engineering!

SPAWAR Systems Center San Diego (SSC SD)
And

UCSD Jacobs School of Engineering

Girl's Night Out!



This fun filled evening will feature:

- Presentations by distinguished women already in the field
- The path from middle school to college pursuing science & engineering-related disciplines
- Engaging experiments led by UCSD students, SSC-SD professionals, & industry partners
- Summer opportunities to study science and engineering

Inspiring young girls to become educated women

2008 results:

- ViaSat hosted lunch with faculty
- Keynote speaker on innovation from Northrop Grumman Space Technology
- **YAHOO!** and NORTHROP GRUMMAN Sponsorship
- You can sponsor the 2009 event!



Expo Excellence

gallery@calit2 reflects the nexus of innovation implicit in Calit2's vision, and aims to advance our understanding and appreciation of the dynamic interplay among art, science and technology.

gallery@calit2
First Floor, Atkinson Hall
9500 Gilman Drive
University of California,
San Diego
La Jolla, CA 92093

<http://gallery.calit2.net>

GALLERY HOURS:
Summer:
August 6 through September 19
Wednesday - Friday 11AM - 5PM

Fall:
September 22 through October 3
Monday - Friday 11AM - 5PM

Free Admission

Map & Directions:
<http://atkinsonhall.calit2.net/directions/>
<http://gallery.calit2.net>



SPECFLIC 2.6

INSIDE GALLERY

INSTALLATION BY ADRIENE JENIK

AUGUST 6-OCTOBER 3, 2008

gallery@calit2 reflects the nexus of innovation implicit in Calit2's vision, and aims to advance our understanding and appreciation of the dynamic interplay among art, science and technology.

gallery@calit2
First Floor, Atkinson Hall
9500 Gilman Drive
University of California,
San Diego
La Jolla, CA 92093

<http://gallery.calit2.net>

GALLERY HOURS:
Summer:
August 6 through September 19
Wednesday - Friday 11AM - 5PM

Fall:
September 22 through October 3
Monday - Friday 11AM - 5PM

Free Admission

Map & Directions:
<http://atkinsonhall.calit2.net/directions/>
<http://gallery.calit2.net>



Gallery @ CALIT2

Exhibit

Specflc

and

Particles of Interest

PARTICLES OF INTEREST

INSTALLATION BY *PARTICLE GROUP*
IN FRONT OF GALLERY

AUGUST 6-OCTOBER 3, 2008

thursday, october 2

panel discussion: 4:30-6pm
calit2 theater

closing reception: 6-8pm
gallery hallway

Reception
following
Board Meeting
in CALIT2



UCSD
Jacobs

School of
Engineering