

Interactive Distributed Learning

Using networked computing and communications tools to bring continuous education to scientists and engineers

Jack M. Wilson
Acting Provost



- Is Learning the "Killer App" of the next generation of computing?



The Fact:



- It is the worlds best communication tool
combined with what will be the
- World's Largest Library
Creating the First and Only
- Global Continuous Learning Environment

Relentlessly changing the way we



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- Labor
- Live
- Love
- and
- Learn

- It's about intellectual capital stupid!
- Intellectual capital demands continuous development.
 - (fish, relatives and intellectual capital spoil after three days.)
- Computing, Communication, and Cognition will change the process tremendously.

- OLD: Physical Capital/Resources
- NEW: Knowledge/Intellectual Capital
 - Growth in market cap over over \$ 1 billion:
 - from 33 to 259 companies
 - exponential growth of market cap
 - internet companies market cap: \$2 B -> 451 B in 4.5 years
 - “worlds largest ‘legal’ creation of wealth
- Frank P. Quattrone, Managing Director and Head of Credit Suisse First Boston Technology Group

Weightings of Selected S&P 500 Industries 1964 versus 1998

<u>Sector</u>	<u>1964</u>	<u>1998</u>
Utilities	19.2%	3.1%
Energy	17.8	5.7
Basic Materials	16.5	3.1
Technology	5.5	19.4

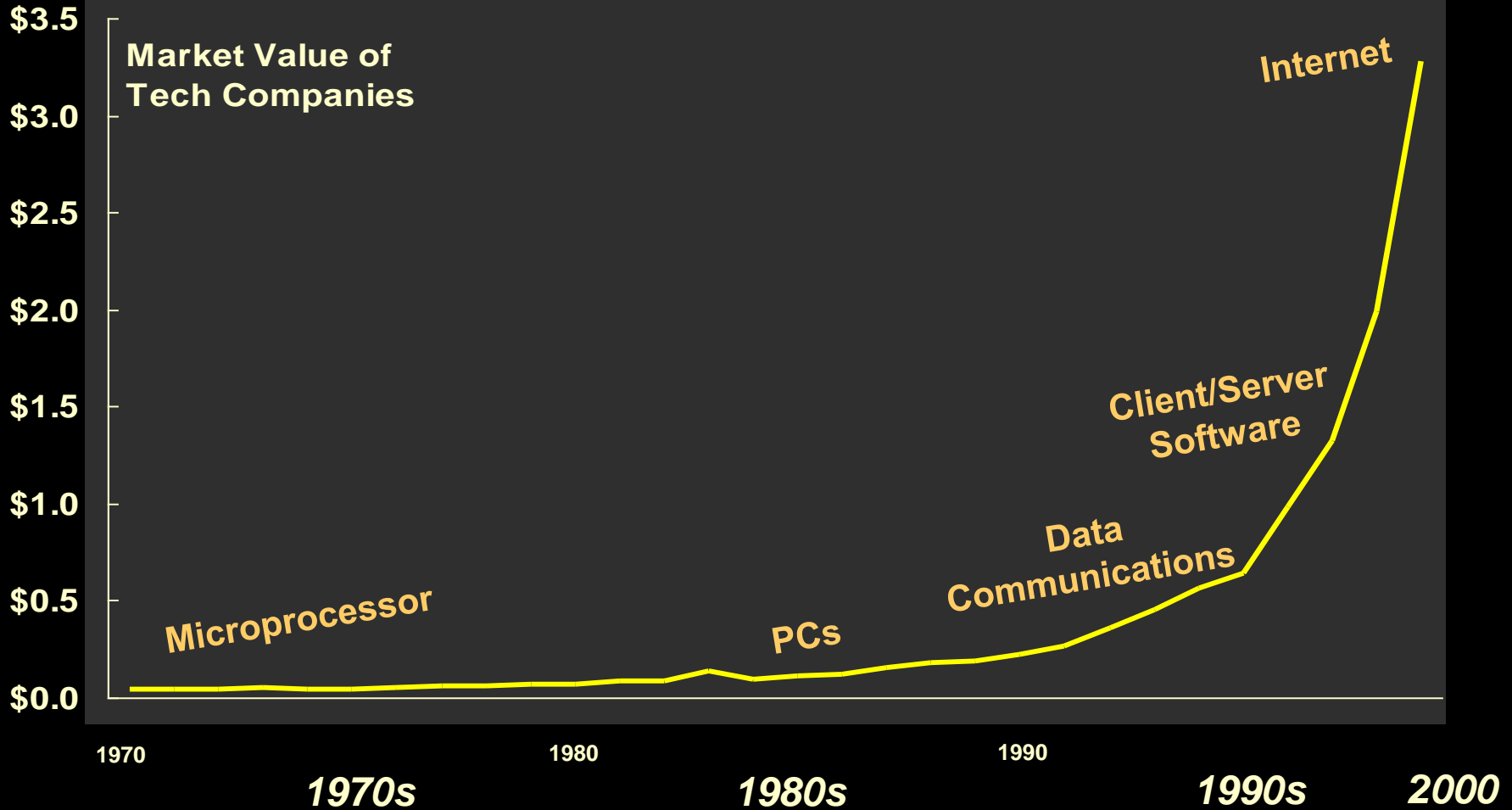
Source: Standard & Poors

Waves of Tech. Revolution

From Chips to the World Wide Web



\$ Trillions



- Assets?
- Earnings?
- Revenues?
- Intellectual Capital
- Customers?
 - Internet Valuation is =
\$25 per eyeball pair per hour

Internet Companies



	1/1/95	1/1/96	1/1/97	1/1/98	1/31/99	Present-*
Number of Public Internet Co's	4	14	33	49	100	162
Combined market value	\$1.9	\$10.2	\$16.8	\$45.5	\$231.1	\$451.3
Combined trailing revenues	\$1.3	\$2.1	\$3.8	\$5.6	\$10.0	\$11.4
Combined trailing losses	\$0.0	(\$0.1)	(\$1.1)	(\$1.2)	(\$1.9)	(\$2.0)

(\$ in Billions)
*Incl. Internet companies currently on file for IPOs

Source: Frank Quattrone
Credit Suisse First Boston

Newcomers Are Taking Over Top 40 US-Traded Tech. Companies



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	04/09/99 <u>Market Value</u> (\$BN)		04/09/99 <u>Market Value</u> (\$BN)
* Microsoft	\$469.7	* TSMC	\$32.1
Intel	204.8	* SAP	31.1
* Cisco Systems	189.7	* Amazon.com	30.1
IBM	167.5	EDS	26.1
* America Online	159.2	* Automatic Data Processing	25.9
* Lucent Technologies	158.6	Applied Materials	23.8
* Dell	105.8	* eBay Inc.	23.0
Nokia	80.4	* Tellabs	21.4
Hewlett-Packard	69.0	* Ascend Communications	20.6
* EMC	66.1	* At Home Corp.	20.3
* Sun Microsystems	53.2	* Computer Associates	18.9
Motorola	49.5	* First Data Corp.	18.2
Northern Telecom	49.0	* STMicroelectronics	16.1
Ericsson	45.5	* Micron Technology	11.3
Texas Instruments	42.1	* Priceline.com	11.1
* Compaq	40.9	* Gateway 2000	10.9
* Yahoo!	40.8	* E*Trade Group	10.8
Siemens	40.6	Computer Sciences Corp.	9.3
Xerox	39.0	* Linear Technology	8.7
* Oracle	37.8	* 3Com	7.8

Source: Frank Quattrone

Credit Suisse First Boston

* IPO since 1980



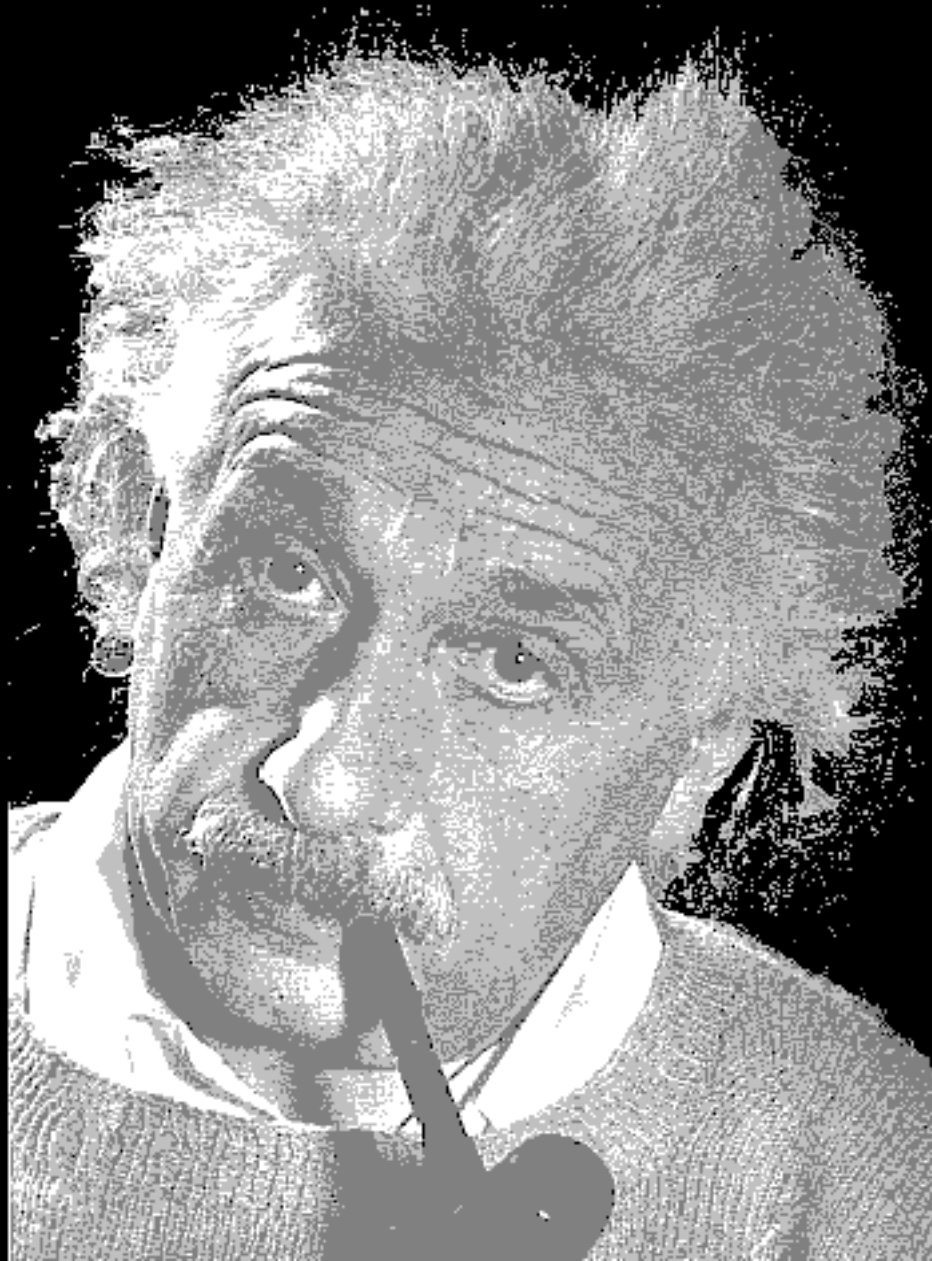
- Christopher Galvin,
President Motorola:
- We are not hiring any
more graduates with
four year degrees.
- We want employees
with forty year degrees

The Studio Classroom

- Hesburgh Award 1995
- Boeing Award 1995
- Pew Prize 1997
- Pew: \$8.8 Million in 1999.

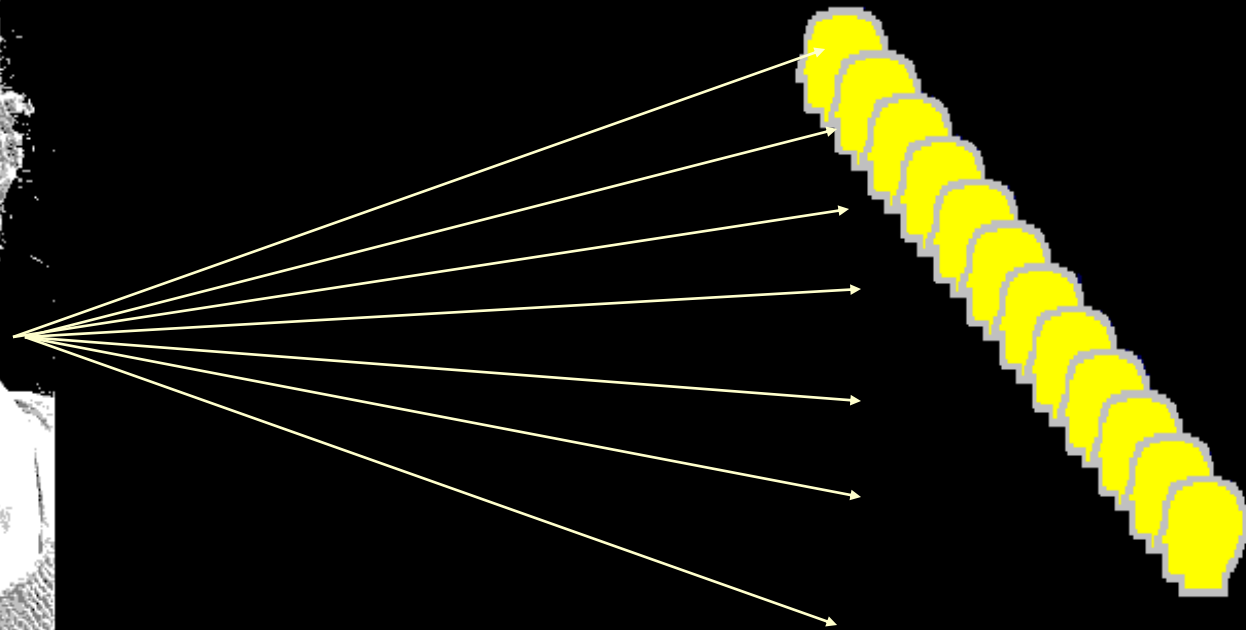
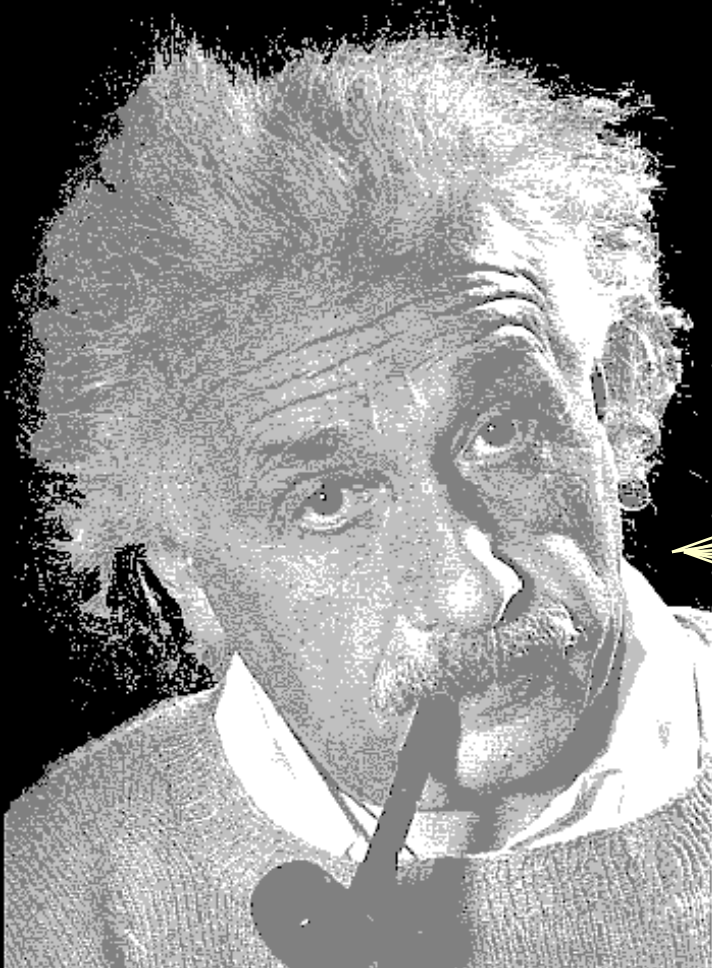


What happens to me?

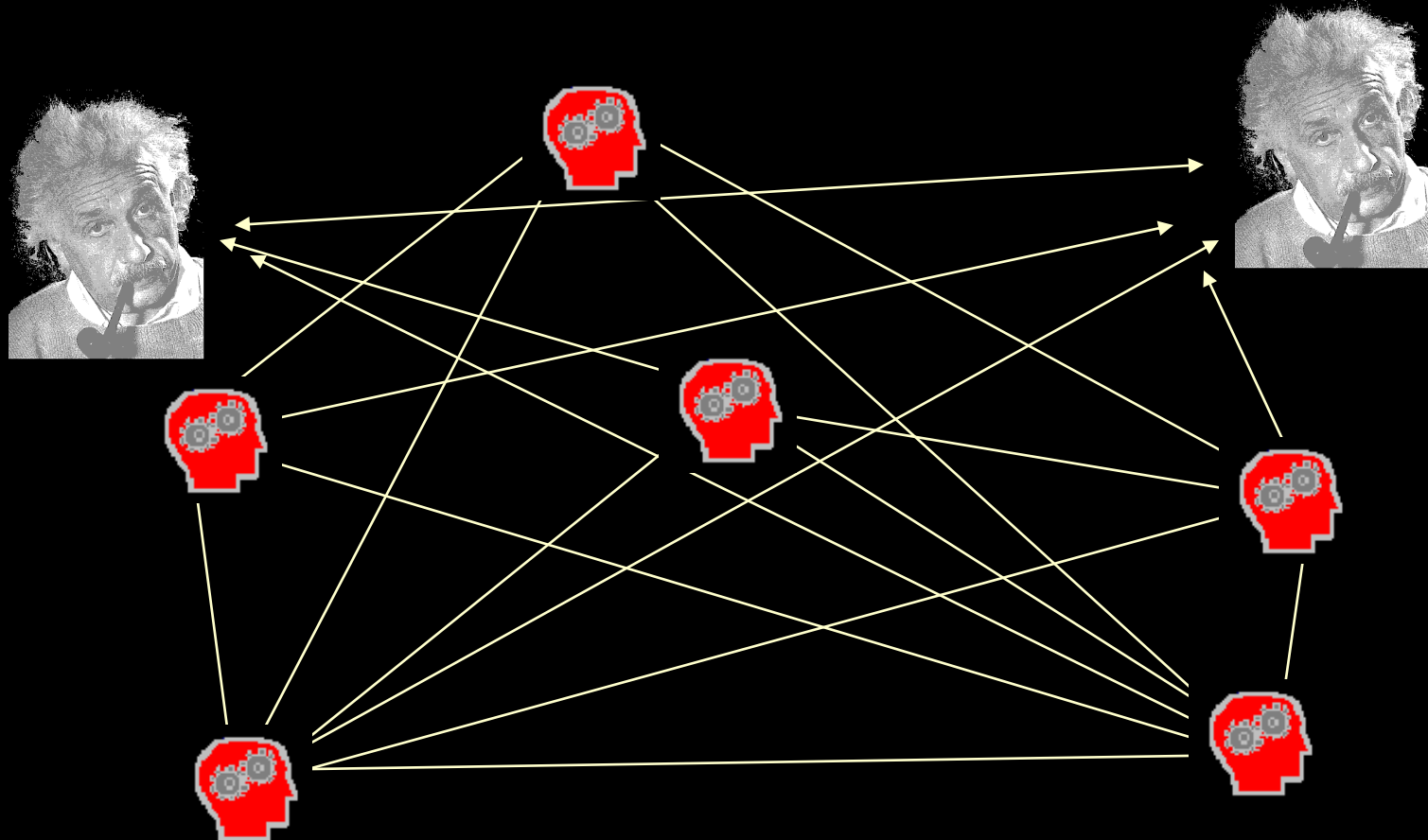


- Will the Web or a CD-ROM Replace your <Blank> Instructor?

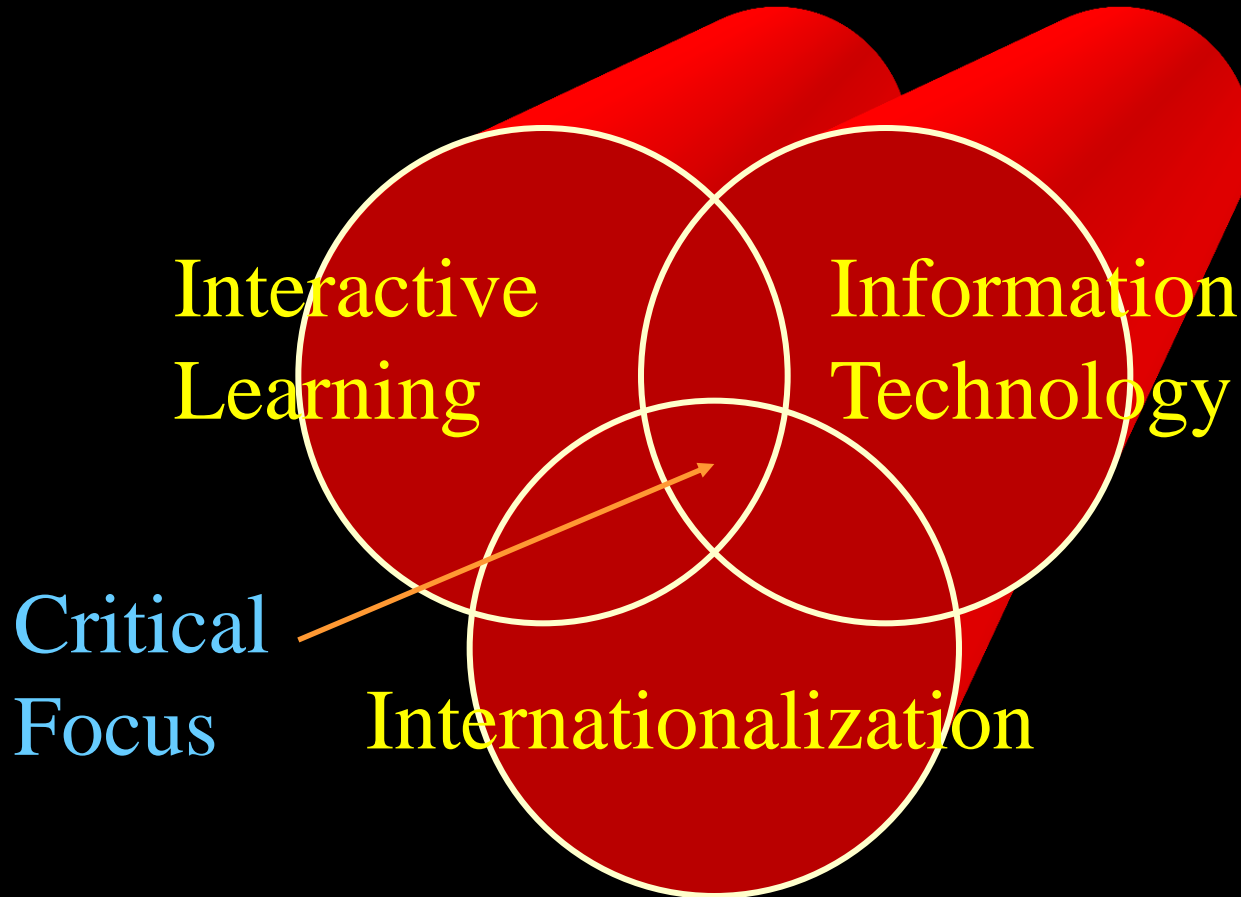
- The mainframe approach



- Distributed Collaborative Model



- The "Client-Server" model.
- Connecting students, instructors, and resources into a rich interacting community of learners.
- Peer Teaching
- Cooperative Learning
- Student-student as well as student-instructor and student-resource interactions
- Synchronous as well as asynchronous
- Video/Audio/ and Multimedia interactions
- The real "World Wide Web"



Technological Entrepreneurship!

- 10 Years +
- '93 Telecon "Best Distance Learning Program"
- '96 USDLA Industry-University Collaboration
- 1066 Students in Credit/Degree Courses(\$99)
- Several hundred more in short courses
- Bringing education to the workplace
 - (GM, IBM, Lockheed Martin, AT&T, Lucent, Con Ed, GE, UTC, Pratt & Whitney, Ford, Intel, Applied Materials, Matsushita, Bugle Boy, Albany International, Key Bank, +++++)

- Follow our corporate partners throughout their own globalization process
 - ex: GM into Mexico, Luxembourg and elsewhere
- Focus on Engineering, Management and Technology, Computer Science, and Information Technology
- Offer old, new, and leading edge technologies.

- Satellite Video
- ISDN Videoconferencing
- CD-ROM Creation
- Mail out materials
- World Wide Web materials
- ILINC LearnLinc
 - Desktop Video (multicast)
 - Network based materials management
 - Classroom management
- Software Spin Off: ILINC

- Severino Center for
Technological Entrepreneurship
 - Mark Rice, Director
(also IRI ROR representative)
 - Focus on the process and practice of TE
 - Discontinuous Innovation
 - (interactive distributed learning is but one example)

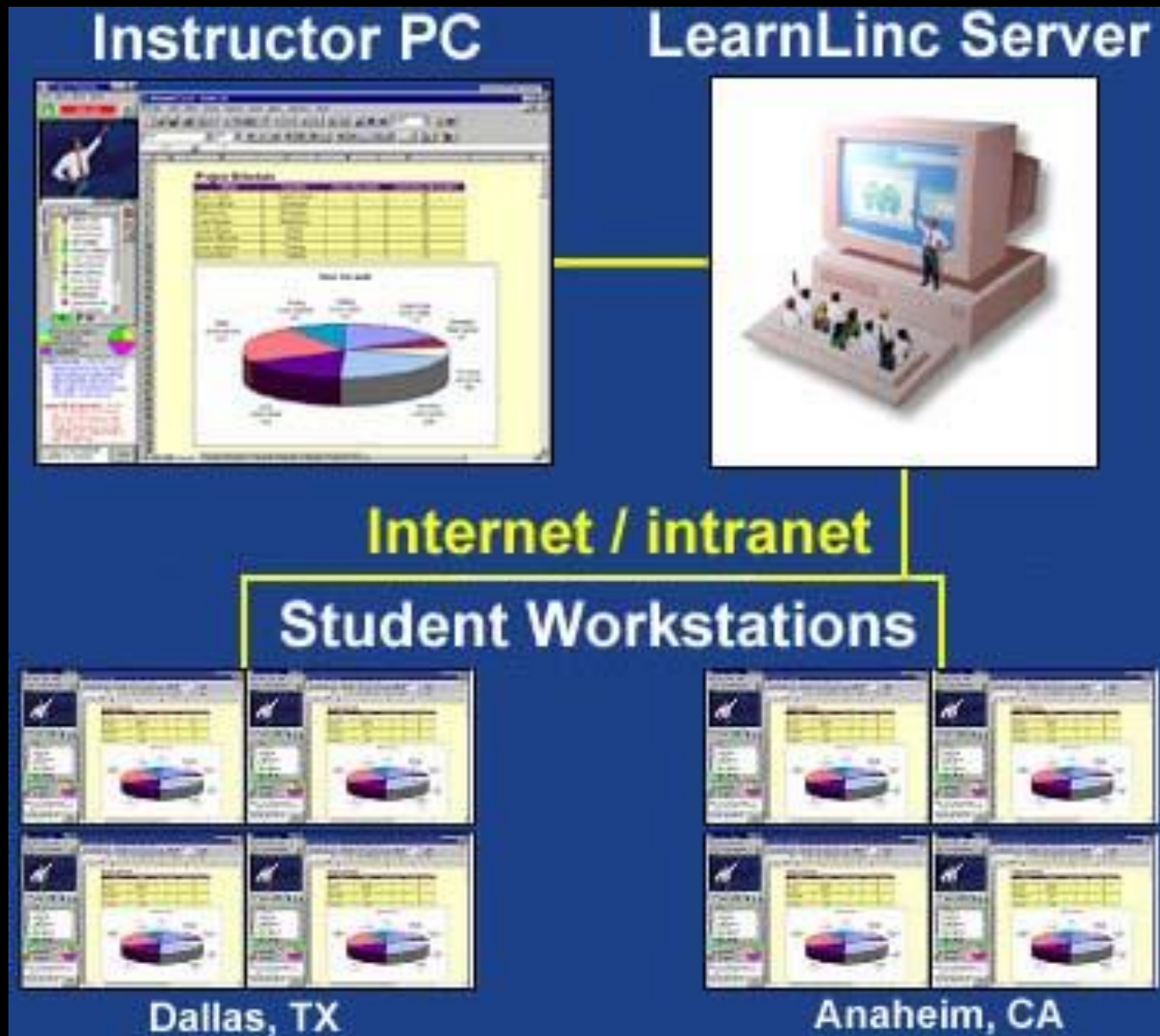
- Founded in 1980;
 - 25 companies, 2 buildings on and 2 off campus
 - Support from students/faculty of Lally SoM&T
 - 9 companies headed by professors, one a Nobel Laureate in Physics
 - 5 companies headed by alumni, one as young as BS in '97 -- action games for PCs
 - 13 companies in IT
 - 80% survival rate (too high!)
 - financially self-supporting

- Twenty buildings of 835,000 ft²
- 250 acres developed
- total park area is 1,250 acres
- Over 50 tenant businesses
 - MapInfo, ILINC, PSINet inc., MetLife, InterScience, Coromed, BellAtlantic, Vicarious Visions, Rhone-Poulenc Silicones VSI, etc.
- Employ over 2,000 people
- Five miles (15 minutes) from campus



- ILINC LearnLinc distributed learning system
 - primarily corporate education (Fortune 1000)
- founded in 1994 by one faculty (Wilson) and two alums (Bernstein and Usluel)
- RPI Research joint with AT&T and Bell Labs
- Began in incubator
- Moved to Tech Park
- Bootstrap start-up and two rounds of venture including one with Intel.





Project Planning ...

ON AIR

Live from Detroit, Michigan

Mute

Participants:

- Jolene Wall
- Dennis Bates
- Luke Hansen
- Jill Donnelly
- Darren Stahlman
- Laura Sheehan
- Suzie Drexel
- Brian LaRosa
- Owen Carter
- Karen Meyer
- Mick Brady
- Janice Marcola
- Robin Jacobs

9 25

Not much progress
 Still working
 Almost finished
 Completed

Robin Jacobs: Welcome to project planning with Excel. During the next two hours, we'll cover the basic functions of Excel as they apply to tracking resources, schedules, and expenses.

Jolene Wall (private): Hi, I'm new to the class and I don't have a lot of experience with Excel. Can you give me some advice I can study outside of class to catch up?

I'll make review materials available to everyone.

Send

Microsoft Excel - Book2.xls

File Edit View Insert Format Tools Data Window Help

100%

117

Name	Function	Hours this week	Total hours for project
Owen Carter	Project Lead	9	80
Brian LaRosa	Developer	3	40
Jill Donnelly	Developer	3	65
Luke Hansen	Marketing	12	10
Karen Meyer	Writer	9	12
Janice Marcola	Writer	12	30
Linda Callahan	Testing	5	30
Dennis Bates	Testing	0	15

Hours this week

Team Member	Function	Hours this week	Percentage
Janice Marcola	Writer	12	20%
Luke Hansen	Marketing	12	22%
Karen Meyer	Writer	9	17%
Owen Carter	Project Lead	9	17%
Jill Donnelly	Developer	3	6%
Brian LaRosa	Developer	3	6%
Linda Callahan	Testing	5	9%
Dennis Bates	Testing	0	0%

Sheet1 / Sheet2 / Sheet3 / Sheet4 / Sheet5 / Sheet6 / Sheet7 / 9

LearnLinc Client

File Run Tools Help

Dr. Geoff Gamache



Live from: San Francisco, CA

Mute

People

Name
Isaiah Beres
Owen Carter
Tom Elliot
Wally Emerson
Ben Frank
Geoff Gamache
Alicia Hoffman

Agenda

2 25

0	<input type="radio"/> Not much progress
5	<input checked="" type="radio"/> Still working
7	<input type="radio"/> Almost finished
13	<input type="radio"/> Completed

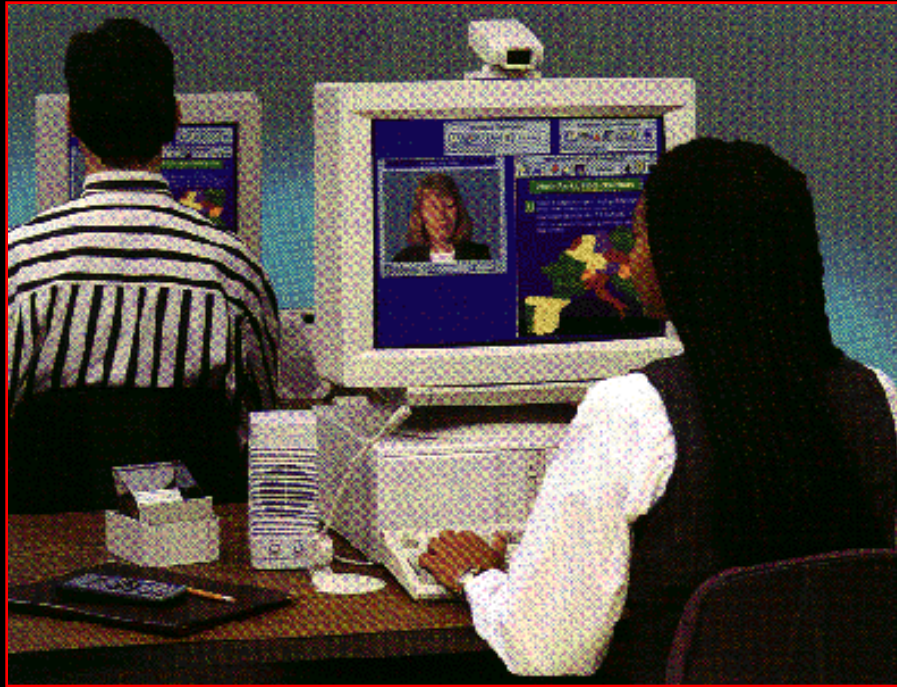


Note: Yes. Could you please review the chapter on formating graphs in Excel?

Raise your hand when you see the AppShare window.

LearnLinc Student Screen





- Hand-raising
- Floor passing
- Annotation
- Q and A
- Feedback
- Application sharing

- Student Centered
- Web of instructors, students, and resources
- Studio model of instruction
- Peer teaching
- Live video and audio plus canned multimedia
- Synchronous (~20%) & Asynchronous instruction
- Lowered unit cost of instruction

Hands-On World Wide Web

- Feb 10 & 17, 1998
- 8000 participants
- 500 sites
- Most successful NTU course ever
- “The future of satellite based education.”
 - Lionel Baldwin, President, NTU

- Survival Skills for Astrophysics
- Professor Chun Ming Leung
 - Graduate Students in Astrophysics
 - Video/Audio/ ILINC Web Data Conf.
 - Both ISDN and Internet connection
 - 7 am Eastern (6 Hong Kong)
 - Student Collaborative Presentations
 - One Semester length

- **Rensselaer Asia Information Technology Conference**

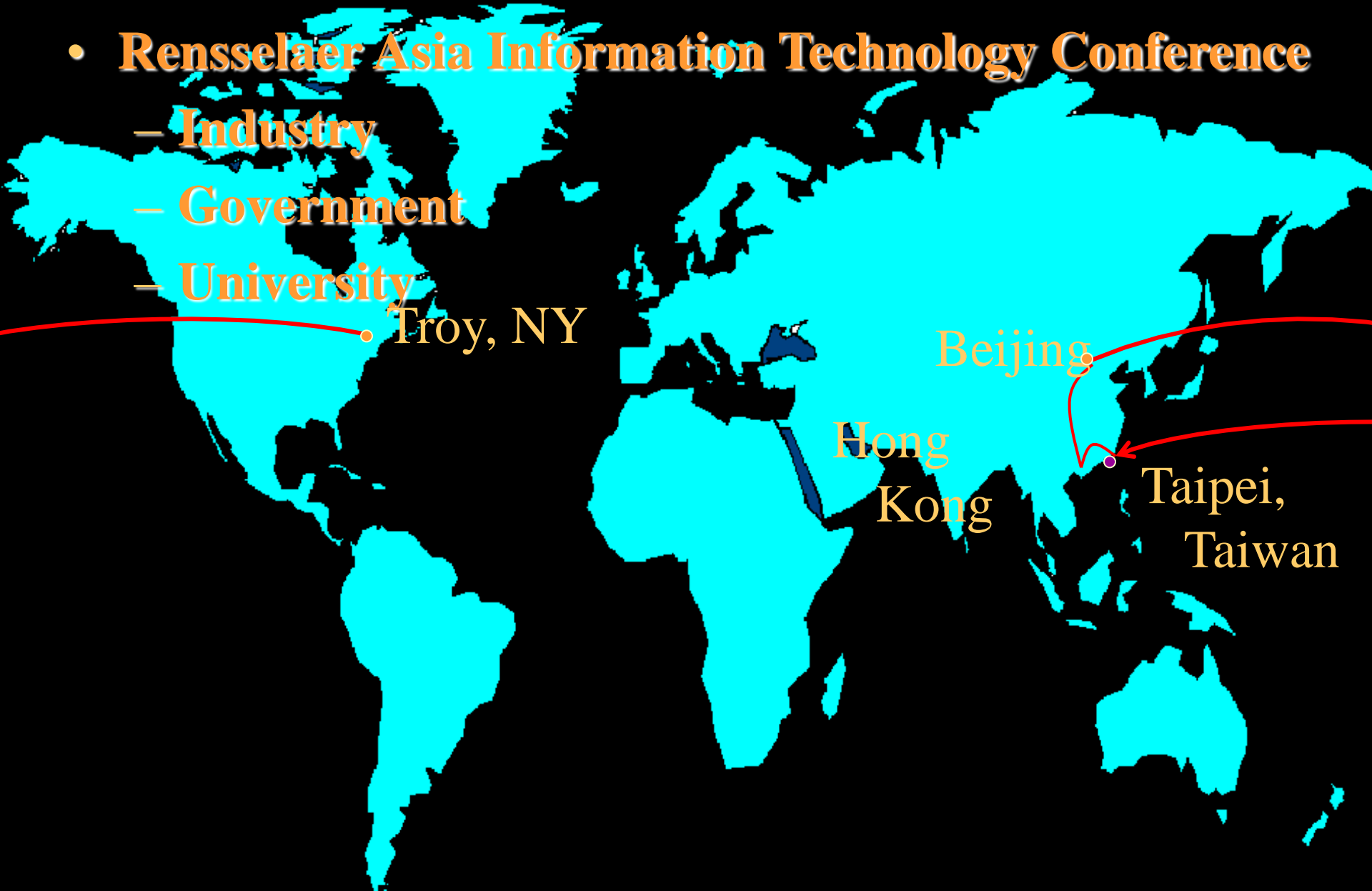
- **Industry**
- **Government**
- **University**

• Troy, NY

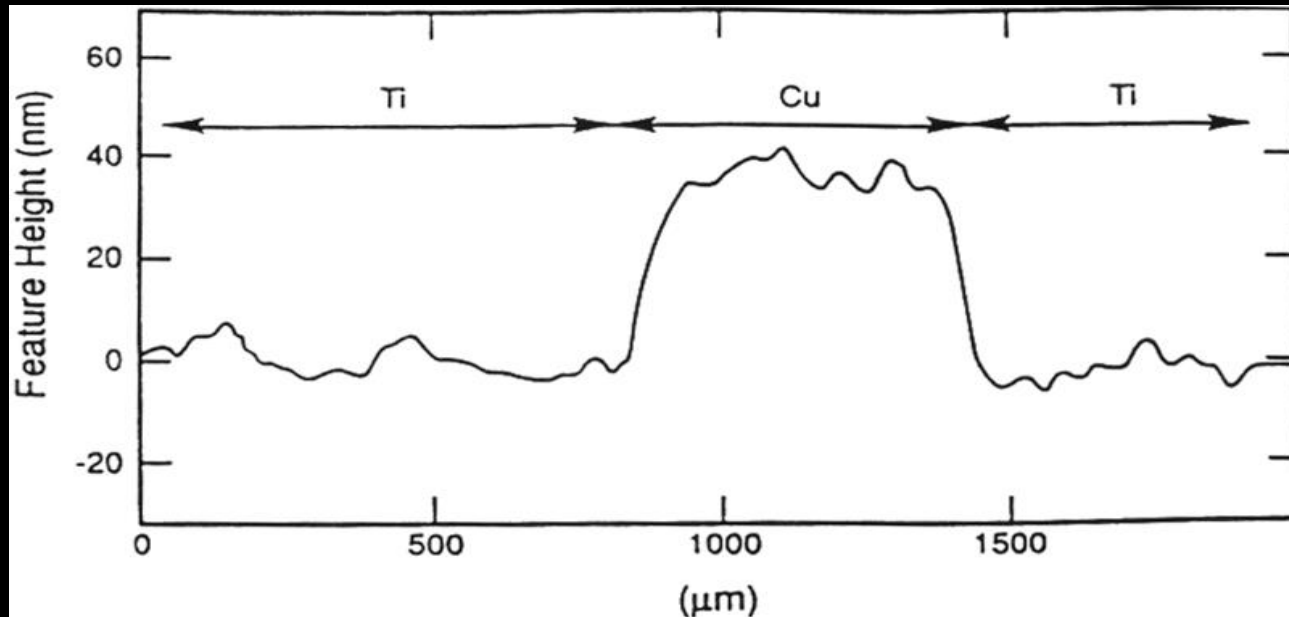
Beijing

Hong
Kong

Taipei,
Taiwan



- RPI/Intel/Applied Mat./ Matsushita/IBM
- Murarka, Schowalter, Duquette
 - (Introduction to Copper Metalization)
 - (Wall Street Journal article)
- Month long course to engineers and scientists in the workplace.
- Video/Audio/ILINC Web data Conf.
 - ISDN and Internet
 - ProShare, PictureTel, Panasonic multipoint



- Profilometer trace showing dishing of the titanium liner relative to the adjacent recessed copper metal. An electrochemical interaction between the copper metal and the titanium accelerated the normally low polish rate of titanium to produce the negative dishing.

The End



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- Satellite broadcast
- Hands On Exercises
- Synchronous Tutoring
- Asynchronous support

The screenshot shows a desktop environment with several windows. On the left, a 'LearnLine Video' window displays a woman's face. Below it, a 'LearnLine Floor Control' window lists attendees: James Lewis, Nicole Smith, and Susan Andrews, with a 'Give the floor' button and an 'ON AIR' indicator. On the right, a 'European Economic Marketplace' window displays 'World Market Place Questions' with a numbered instruction and a map of Europe.

- Management and Technology
 - Gene Simons
 - North America
 - South America
 - Europe
 - Australia
 - Asia
- Face to Face first then PictureTel and Web

- RSVP Reserve Fund
- Strategic Investment Fund
- Our Partners
 - Ex: HCI Certificate and IBM
 - GM
 - Intel and CMP
 - Albany International
- Operations

- Formerly Hartford Graduate Center
- Originally founded by RPI to provide graduate engineering education to Hartford corporations.
- Merged in 1997 with RPI
- Now over 2000 graduate students:
 - 80% Management and Technology,
 - 11 % CompSci
 - 9% Engineering
- Use all the technologies to exchange courses



- MapInfo
 - Founded by four undergraduates and staff member
 - \$60.6 million in 1998 rev.(1999 \$70 M est.)
 - NASDAQ Stock
 - Develops desktop mapping software
 - Offices in Beijing and Hong Kong
 - Research with campus on software design collaboration across distance and culture

- 155 Faculty members
- 4 Student/Faculty
- Doctoral Students: 116 Full 23 Part
- Masters: 109 Full 168 Part
- Research: \$12 million



- Biochemistry and Molecular Biology
- Computer Science and Engineering
- Electrical and Computer Engineering
- Environmental Science and Engineering
- Management in Science and Technology
- Materials Science and Engineering