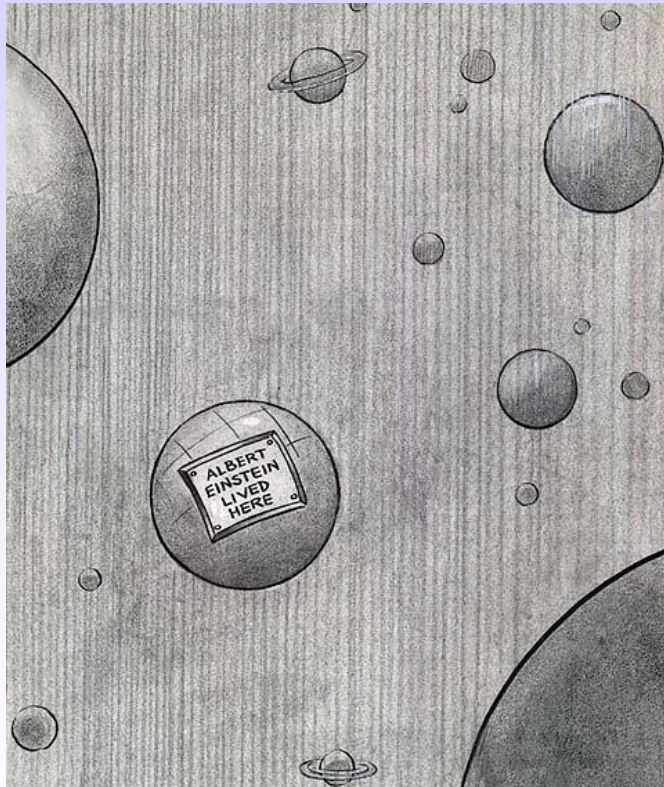


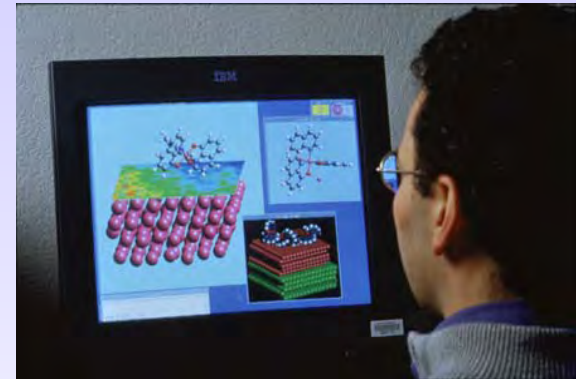
# Why a Ph.D.?



- Many times the PhD is the person in charge – leading exciting projects!
- Research expands the frontiers of human knowledge
- Significant research achievements advance human civilization, and improve the quality of our lives
- Leave a mark behind
- In today's world, PhD is a requirement to pursue a career in research or University level teaching

# Why a PhD in CS?

- All science is impacted by computer science
- Since CS touches on all scientific disciplines, it offers vast and rich opportunities for multidisciplinary research
- CS touches on business, entertainment and politics.
- In fact, it affects our lives very directly, since computers touch almost all human activities
- Practical and usable research
- One can pursue multiple research programs
- Young field: tremendous opportunities for important discoveries
- One of the fastest growing research areas
- Offers FUN + FUTURE + IMPACT



# Career Flexibility – Ph.D. Creates Options:

- Research in corporate or university labs
- Advanced product development
- Start-up company based on your Ph.D. research
- Academic career – University-level research/teaching
- Academic career – Undergraduate teaching emphasis

# Research in Core Computer Science

- Can we build computers based upon novel principles and will they be more powerful?
- Is there a cryptosystem that is absolutely secure?
- Can we ensure privacy?
- What are the limits on computers inferring patterns from examples?

# Research Excitement - Examples

- Build a 1000 node wireless sensor network to detect earthquakes or tornadoes
- Search the internet based on meaning
- Instrument wearable “health shirts” to keep people healthy
- Create realistic 3D graphics for flying through models of the human body or to support video games
- Control robots for use in chemical spill cleanups
- Create solutions for pervasive computing
- Invent the next microprocessor
- Make the Internet look like one large global computer
- Improve computer security so that identity theft is a thing of the past
- Invent new algorithms that save millions of dollars

# Interdisciplinary Research Opportunities

- Robotic Operating Rooms
- Agile and Just-in-Time Manufacturing
- Efficient Transportation Systems
- Predicting Hurricanes
- Financial Services on the WEB
- Bioinformatics
- Intelligent Tutoring Systems
- Emergency Response Systems

# Have a Significant Impact on Society

Improve safety of systems

Improve health systems

Improve financial transactions

Support environmental studies





# Characteristics of C.S. Ph.D. Positions

- On average, provides greater lifelong freedom of movement and more independence
- Typically less involved in corporate hierarchies
- More emphasis on individual creativity
- More self-starting and internally motivated
- More focused on ideas and less on process, politics, or economics
- Working on leading edge ideas and future products
- Very comfortable financially
- Use a wide range of skills (design, analysis, synthesis, working with others, ...)



# Characteristics of Academic Jobs at Research Institutions

- Provide tremendous satisfaction in helping others (students) develop their skills
- Immediate means to leverage ideas – graduate students
- Variety – teach, research, write, give talks, raise funds, travel
- Some amount of pressure, especially prior to tenure
- Freedom to pursue your ideas
- Satisfaction in invention, publications and impact of work
- Relatively high job security and stability
- Comfortable to very good salaries
- Consulting is possible

# Characteristics of Academic Jobs – at Undergraduate Teaching Institutions

- Modest research and publication expectations
- Higher teaching loads than other academic positions
- Typically lower salaries than other academic positions
- Provide tremendous satisfaction in helping others (students) develop their skills
- Ability to work more closely with undergraduates
- Ability to concentrate on teaching

# Characteristics of Research Lab Jobs

- Research focus, but with eye towards company products
- More time for research (no teaching)
- Programming skills utilized
- Some interaction with a few full-time students and interns
- Must provide value to company, hence somewhat less freedom than in academia
- No fundraising (usually)
- Well-equipped labs
- Usually long-term security

# Characteristics of Advanced Development Jobs

- See your ideas become products
- Rewards programming skills
- Consider major concerns of customers and economics
- Develop an understanding of business issues while working with sophisticated technologies
- Opportunity to publish and attend conferences

# Fascinating CS People – Past and Present

- Alan Turing – Founder of Computer Science
- Ivan Sutherland – Creator of Computer Graphics
- John Hennessy – President of Stanford
- Grace Hopper – Admiral U.S. Navy
- Vint Cerf and Bob Kahn – Fathers of the Internet
- Bill Wulf – President of the National Academy of Engineering
- Maria Klawe – Dean, Princeton
- Seymore Cray – Computer Architect; Founder of Supercomputer Company
- Eric Schmidt – CEO Google
- Anita Jones – Former Director of Defense Research and Engineering

# Starting Salaries

- Top Research Universities:
  - \$84K for 9 months + pay for two or three summer months + consulting + lecture fees + book royalties
- Research Labs:
  - \$70K to \$120K for 12 months + sometimes stock options
- Teaching University/College:
  - Salaries lower than research universities
- Advanced Product Development:
  - Salaries may start higher than research labs

# Advice to Graduate Students

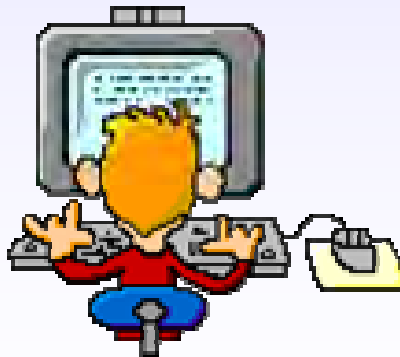
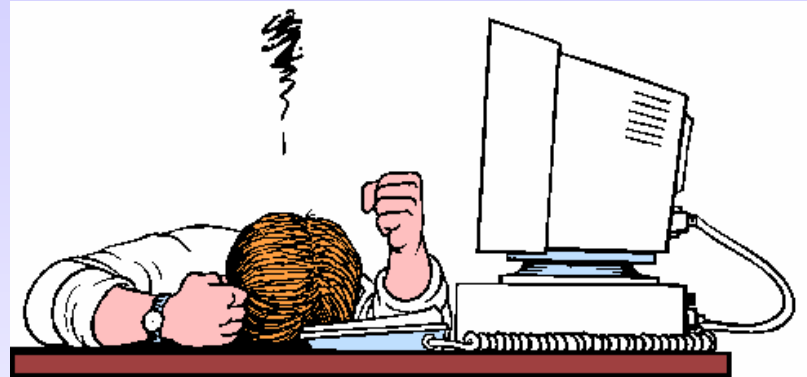
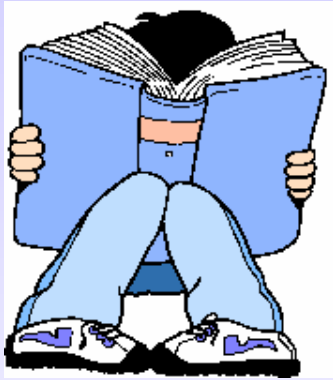
- Master the basics
- Explore several areas of interest in depth
  - You MUST be excited about what you are doing
  - OK to change area
  - Choose school where this is possible
- Become an expert in your area
  - Ultimately know more than your advisor
- Identify a “good” research area
  - Good = achievable + novel
- Focus, Focus, Focus
  - You need not solve the world’s problems
- Work hard!



# Graduate Student Stipends

- ALMOST ALL PHD STUDENTS IN CS DO **NOT** PAY FOR GRADUATE SCHOOL. INSTEAD THEY RECEIVE FREE TUITION AND A STIPEND!!
  - Duties for stipend include:
    - Research Assistant – typically on projects that contribute towards your PhD
    - Teaching Assistant – may include grading, holding office hours, teaching problem sessions, and in some cases teaching class
- Stipends for research and teaching assistants vary from school to school, but are typically in the range of \$1,500 - \$2000 per month.
- Fellowships are also available
- Travel stipends support trips to conferences

# Graduate Student's life



# Graduate Student Life

- Average time to PhD is from 4 to 6 years after an undergraduate degree
  - You must be committed
- Students come directly from undergraduate program OR after some time in industry
  - So, if you go into industry consider returning to grad school after a year or two (or more)
- Piled Higher and Deeper ... Comic Strips on PhD
  - <http://www.phdcomics.com/comics/archive.php?comicid=60>

# Application Process

- Step 1: Find grad programs interesting to you (use the WEB)
  - Do you have a research focus?
  - Get advice from your undergraduate advisor
- Step 2: Take GRE tests (Verbal, Quantitative, Analytical, and Subject)
- Step 3: Find three (faculty) letter writers
  - Not just “I did very well in the course this instructor taught” but “This instructor knows me very well and can write a strong recommendation letter.”
  - If you did research or applicable summer job you can use your boss as one letter writer
- Step 4: Work on personal statements
  - Significantly more research oriented than UG application essays
- Step 5: Apply via on-line application forms