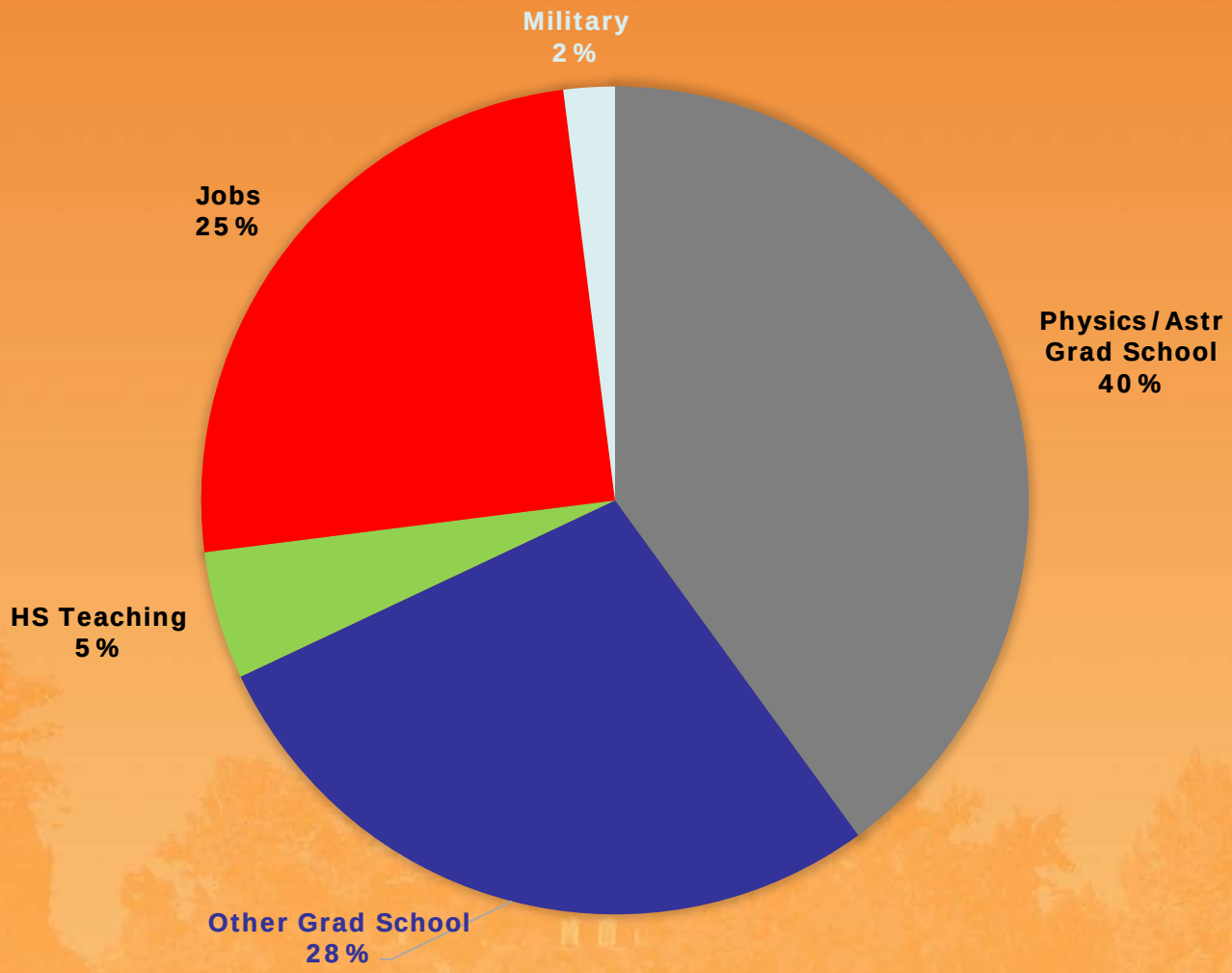
New Student Pizza Party!

PHYSICS ILLINOIS GRADUATES (2011-2013)



Outcomes

JOBS

- Accenture Consulting
- Belvedere Trading
- Chicago Tech Academy
- CISCO Systems
- Creat-a-Soft
- Crystal Lake Central HS
- Department of Defense
- Elk Grove HS
- Epic
- Google
- Green Line Engineering
- HRL Labs
- IBM
- IMC Finance
- Inservice Engineering
- Intel
- Jump Trading
- Lake Forest Academy
- Olenick & Associates
- Qualcomm
- Simplex Investments
- Studio 222
- Twitch LLC
- U-Line Distributor
- U.S. Military
- Viasat

Graduate Schools

Areas

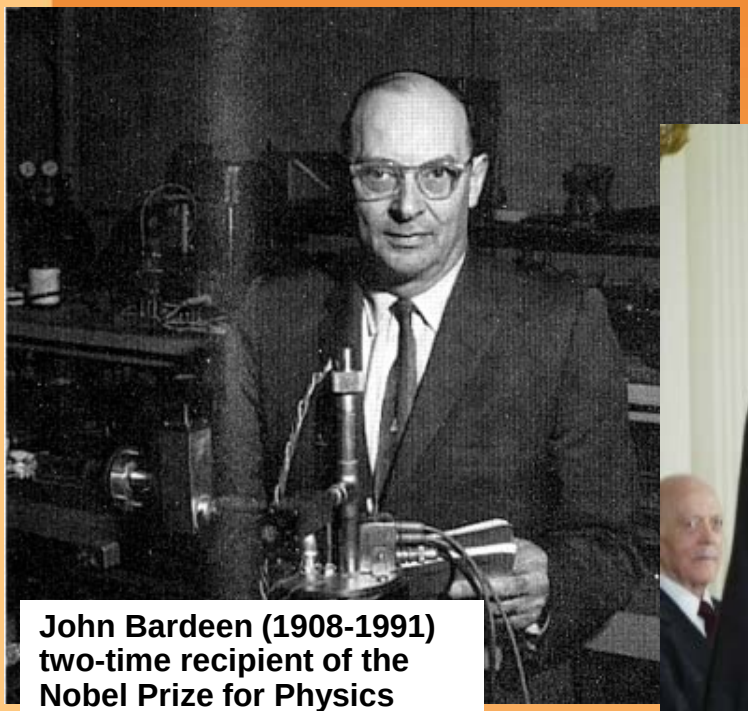
- Physics
- Applied Physics
- Applied Statistics
- Architectural Acoustics
- Biomedical Engineering
- Computer science
- Electrical Engineering
- Finance
- Geophysics
- Journalism
- Law School
- Material Science
- Mathematics
- Neuroscience
- Nuclear Engineering
- Secondary Education

Schools

- Caltech
- Case-Western
- Colorado
- Cornell
- Florida
- Harvard
- Indiana
- Johns Hopkins
- Maryland
- Michigan
- Michigan State
- Minnesota
- MIT
- Northwestern
- Notre Dame
- Ohio State
- Ohio University
- Oxford
- Penn State
- Princeton
- Stanford
- U Chicago
- UIUC
- University of California
- Virginia
- Washington
- Wisconsin

Physics at the University of Illinois

A tradition of excellence



John Bardeen (1908-1991) two-time recipient of the Nobel Prize for Physics (1956, 1972)

Charles Slichter receiving the National Medal of Science (2008)

Tony Leggett receiving the Nobel Prize for Physics (2003)

Our mission is to serve the people of the State of Illinois, the nation, and the world through leadership in physics research, science education, public outreach, and professional service.

Physics at the University of Illinois

Featuring world leading research in:

- Astrophysics
- Atomic and Molecular Optics
- Biological Physics
- Complex Systems
- Condensed Matter
- Cosmology
- High-Energy Physics
- Nuclear Physics
- Physics Education
- Quantum Information

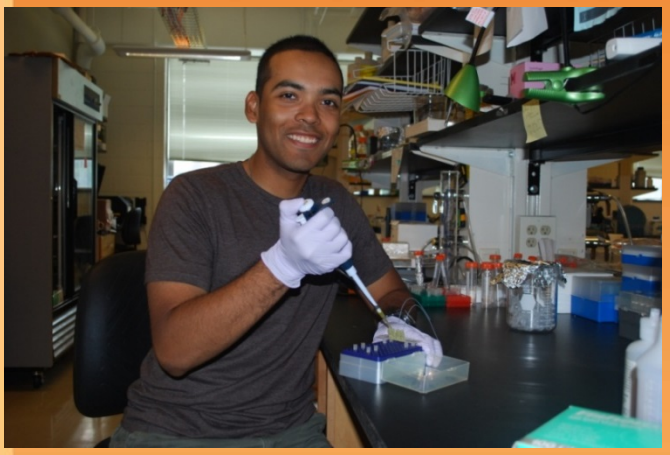
Close research ties with:

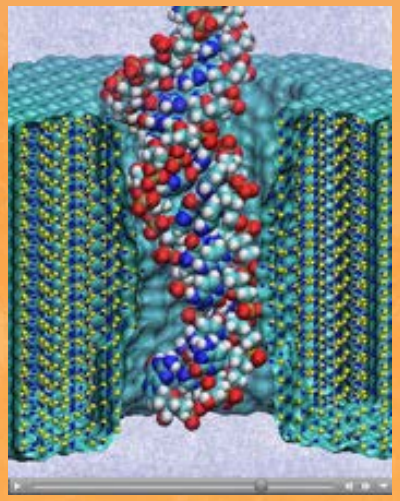
National Center for Supercomputer Applications (NCSA)

Fermi National Accelerator Laboratory

Argonne National Laboratory

Physics at the University of Illinois



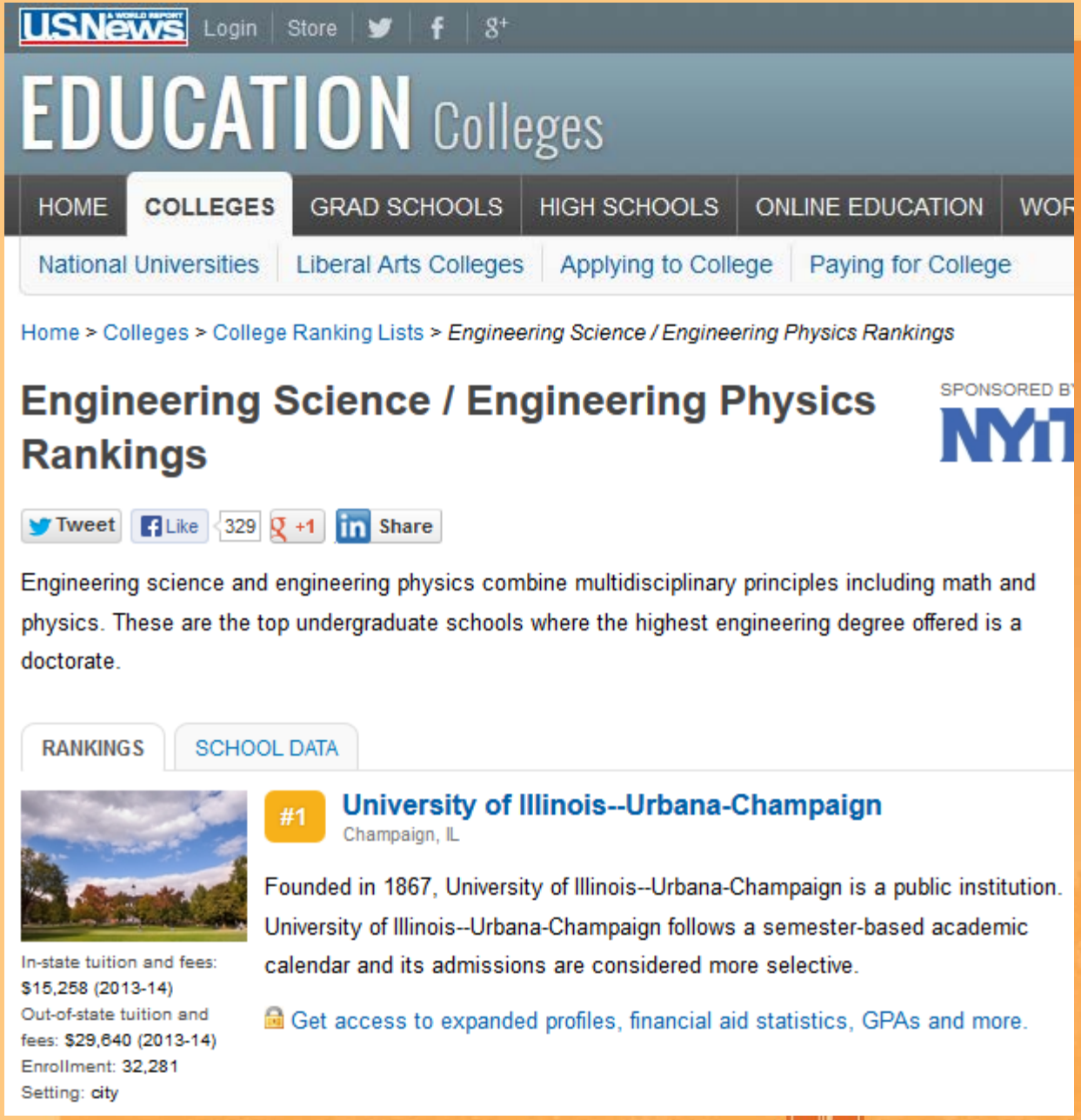


National Rankings:

- **Ranked #8 overall (two surveys)**

- **Other national rankings:**
  - **#2 in condensed matter physics**
  - **#7 in quantum information**
  - **#8 in nuclear physics**
  - **#12 in elementary particle physics**

- **Ranked #1 in the nation in undergraduate engineering physics**



Engineering Physics

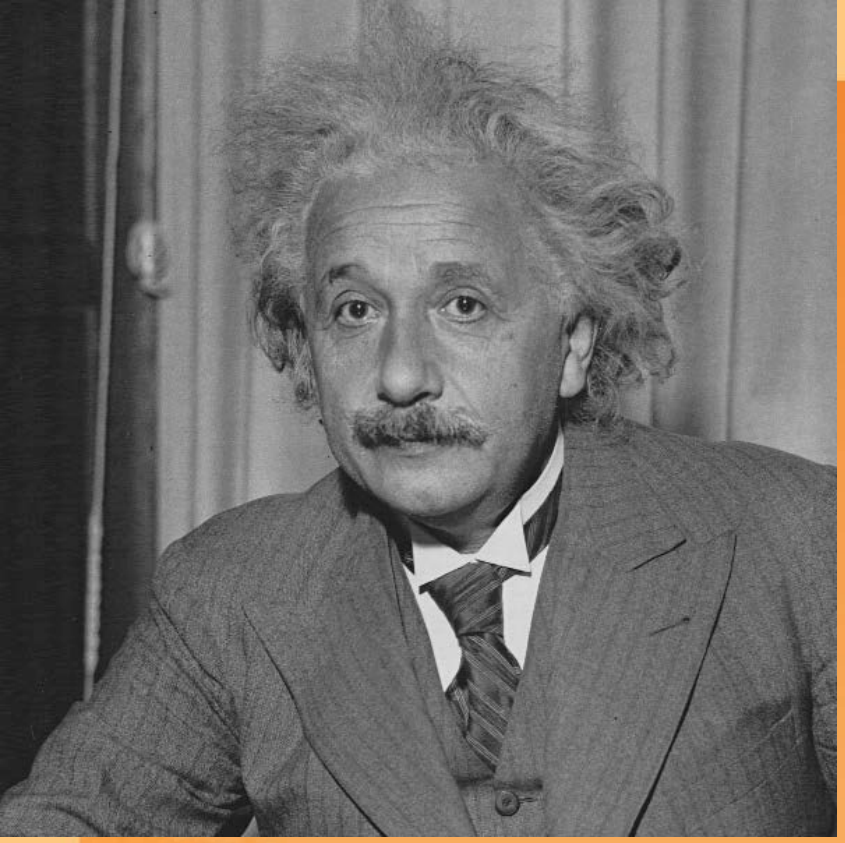
1. UIUC
2. Cornell
3. MIT
3. Stanford
3. Berkeley
6. Caltech
7. Harvard
8. Michigan
8. Virginia Tech
10. Penn State

Physics

- What is physics?
- Research areas
- Academic programs
- Careers

Physics at the University of Illinois

Excellence in research, education and outreach



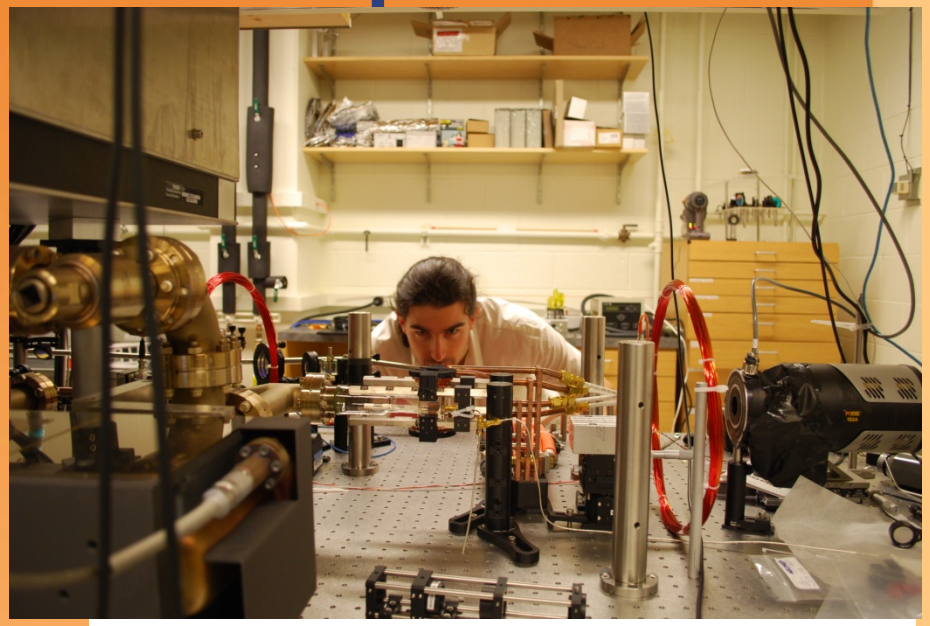
"The most incomprehensible thing about the world is that it is comprehensible."

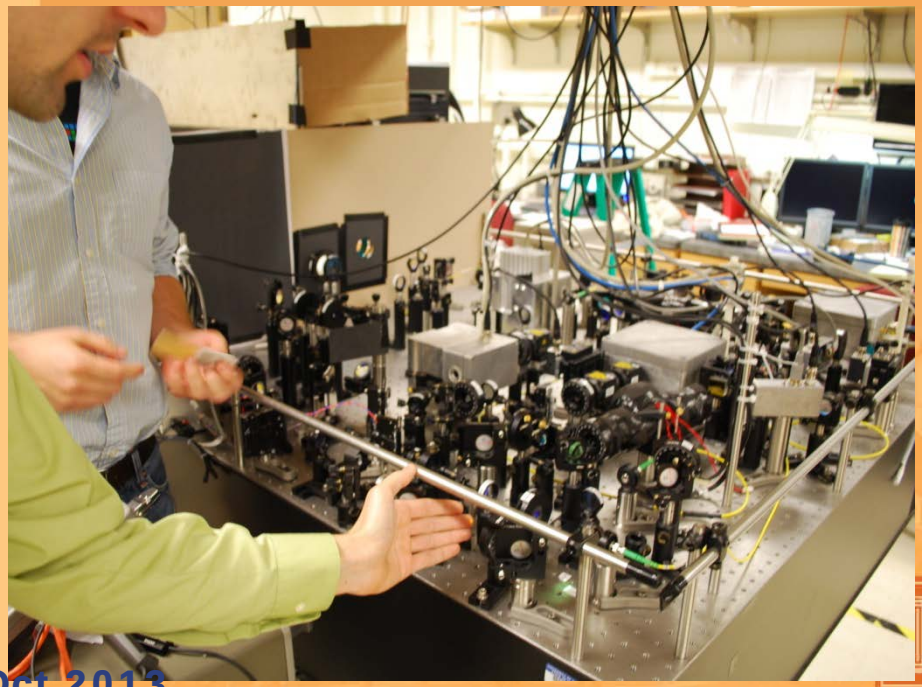
What is physics?

- Physics is the science of matter, energy, space, and time.
- We ask questions like why? and how?
- We study things ranging from the universe to atoms, from music to cells.
- In trying to answer these questions, we learn about how nature works and how we can develop new technologies.

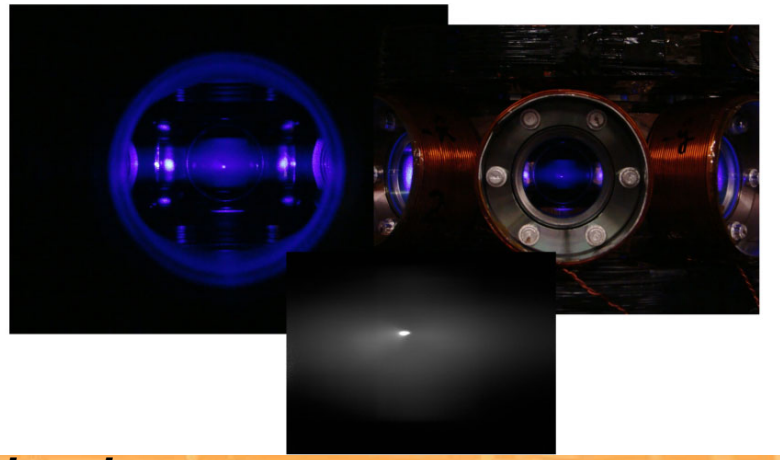
Atomic and Molecular Optics

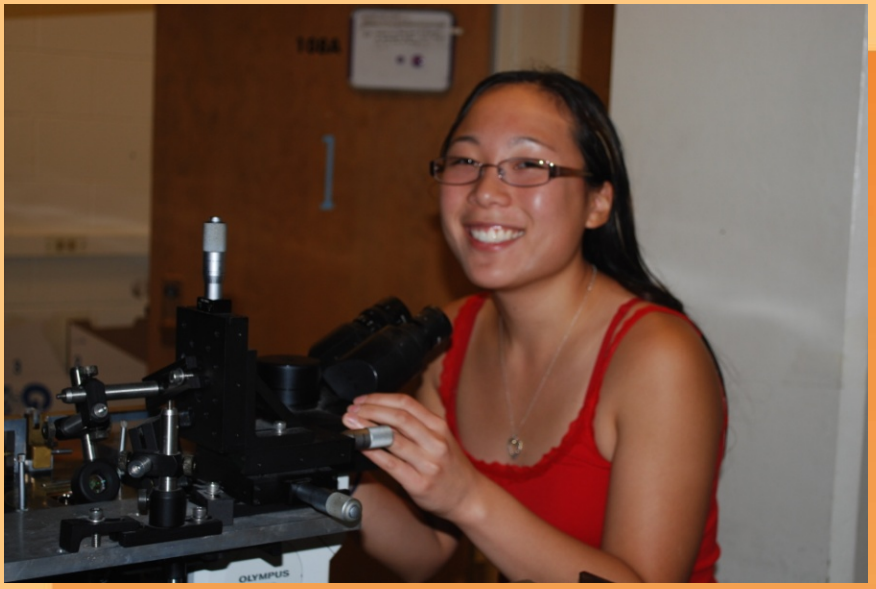
- **Study of the behavior of atoms and light.**
  - **Quantum computing**
  - **Quantum encryption**
  - **New states of matter**





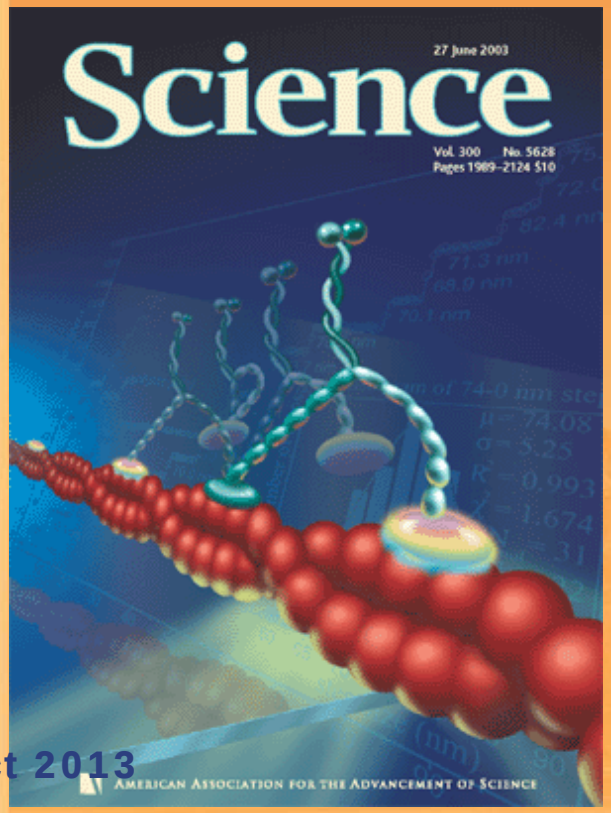
First Dysprosium MOT
(^{164}Dy, ^{163}Dy, ^{162}Dy, ^{161}Dy, & ^{160}Dy)
LevLab, UIUC, 4/10/09, 5:05 pm

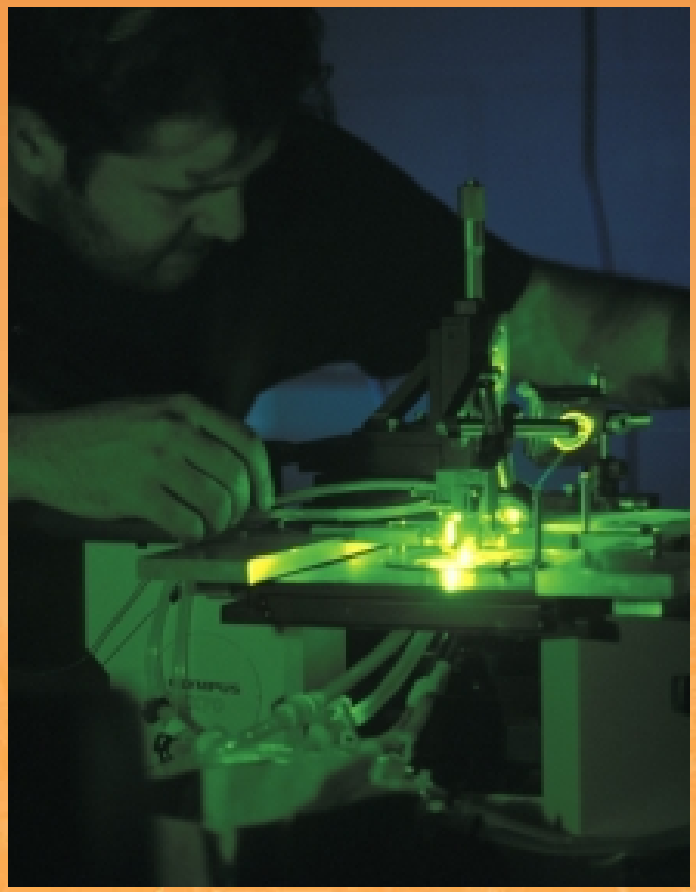




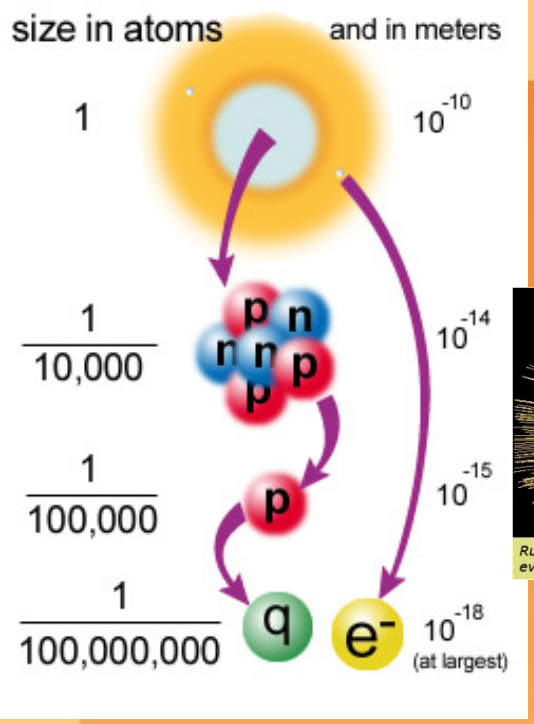
Biophysics

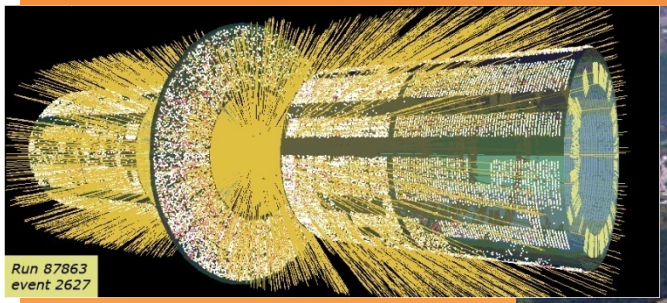
- How do living systems work?
- Relevance
  - Disease mechanisms, drug develoment

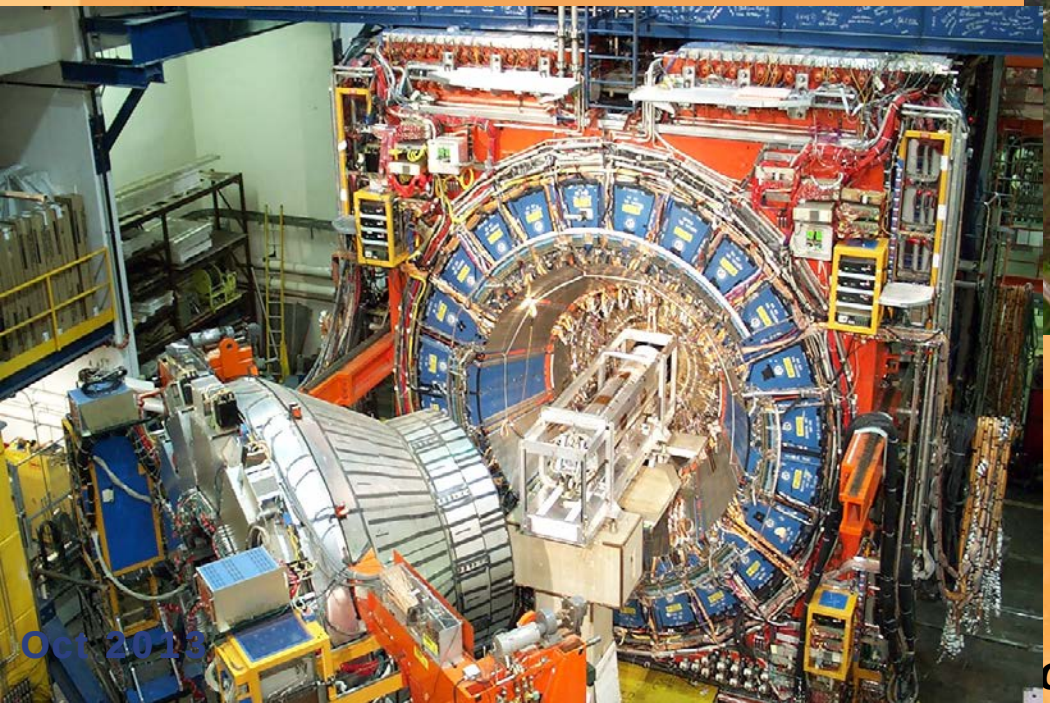




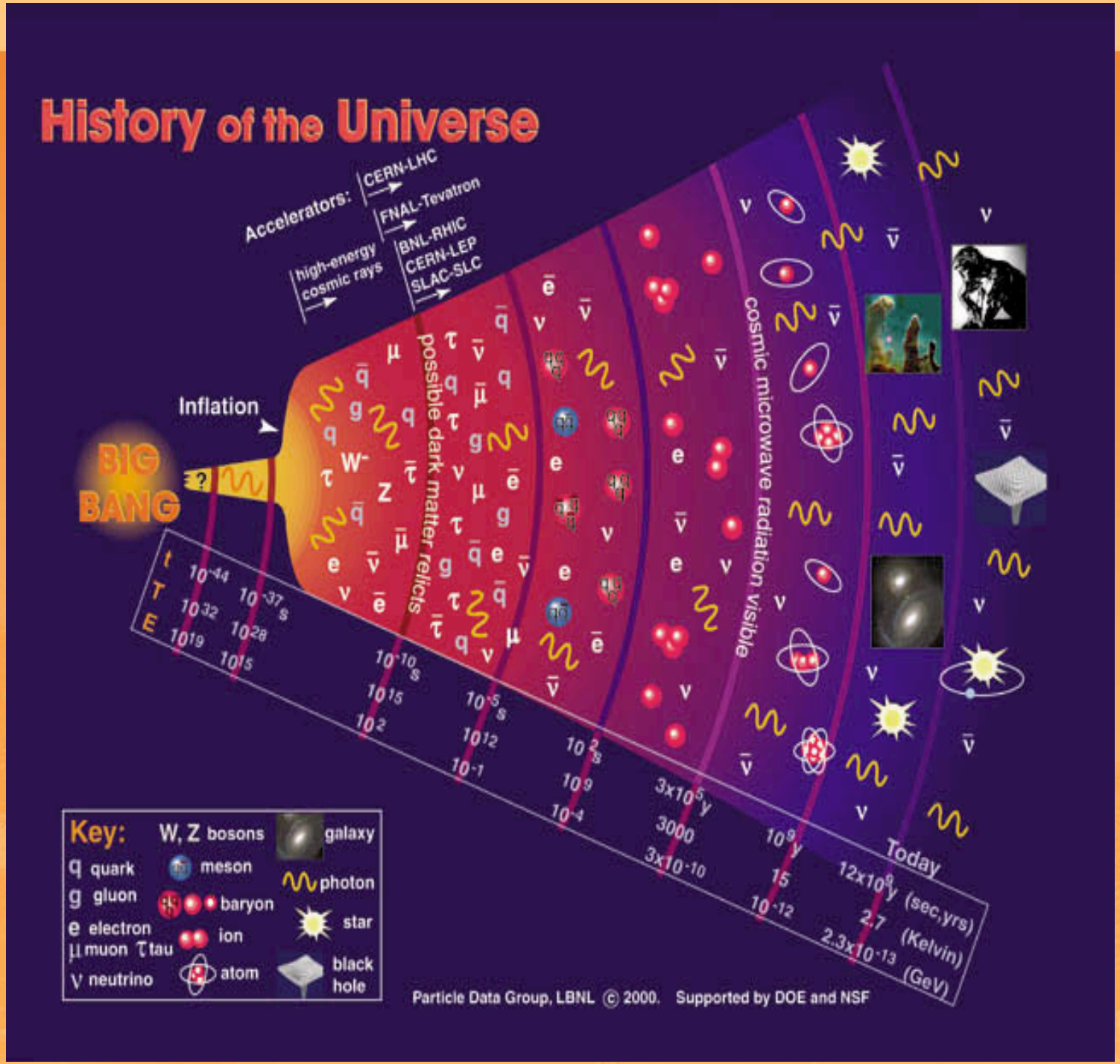
High Energy/Nuclear Physics





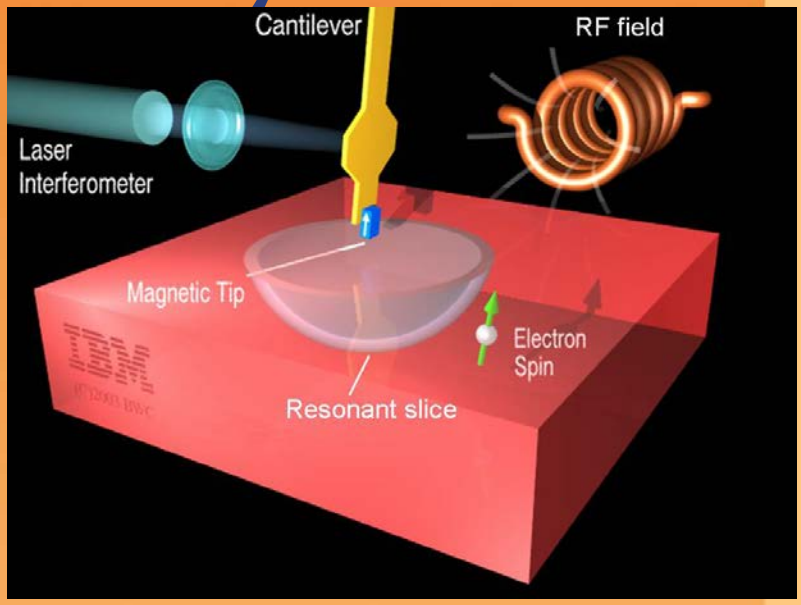


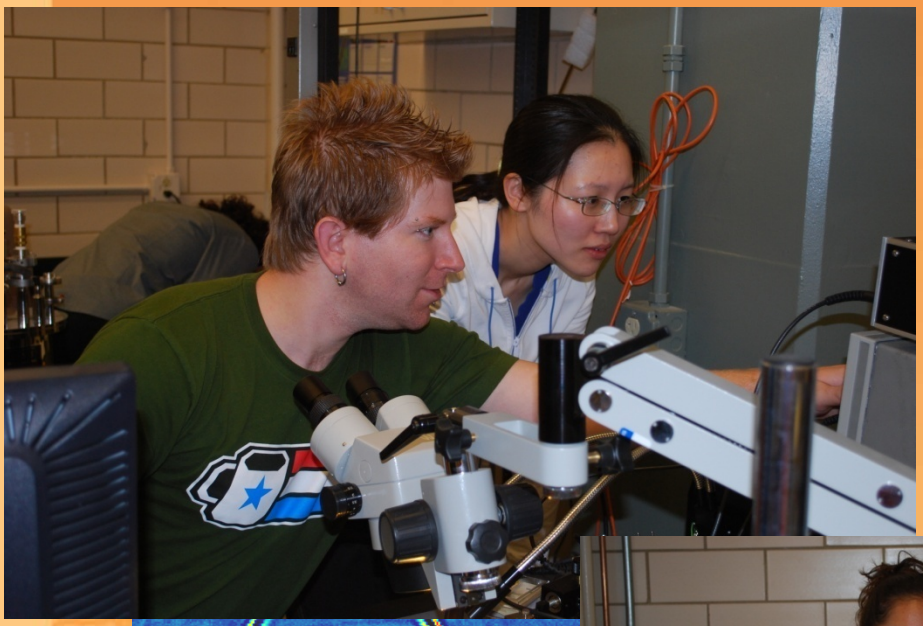
Studying nature at its smallest level

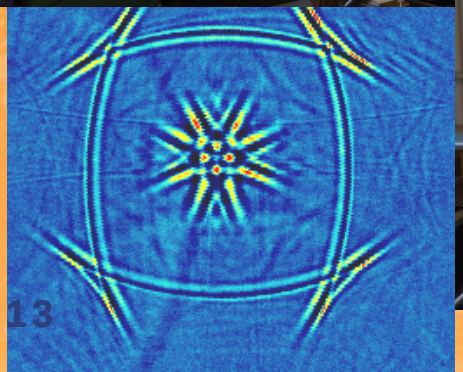

History of the Universe
Accelerators:
CERN-LHC
FNAL-Tevatron
BNL-RHIC
CERN-LEP
SLAC-SLC
high-energy cosmic rays
Inflation
BIG BANG
?
possible dark matter relicts
cosmic microwave radiation visible
Today
t
T
E
10-44 s
10-37 s
10-10 s
10-5 s
2 s
3x10^5 y
10^9 y
12x10^9 y (sec,yrs)
10^32
10^28
10^19
10^15
10^2
10^12
10^9
3000
15
2.7 (Kelvin)
10-32
10-1
10-4
3x10-10
10-12
2.3x10-13 (GeV)
Key:
q quark
g gluon
e electron
μ muon τ tau
ν neutrino
W, Z bosons
meson
baryon
ion
atom
galaxy
photon
star
black hole
Particle Data Group, LBNL © 2000. Supported by DOE and NSF

Condensed Matter Physics

- **Studying properties of materials like semiconductors, superconductors systems of many particles.**







Introductory Courses

- **Introductory sequence (3 semesters)**
  - PHYS 211 -- Mechanics
  - PHYS 212 -- Electricity and Magnetism
  - PHYS 213 -- Thermal Physics (half-semester)
  - PHYS 214 -- Waves and Quantum Physics (half-semester)
  - PHYS 225 – Relativity and Math Methods (new)

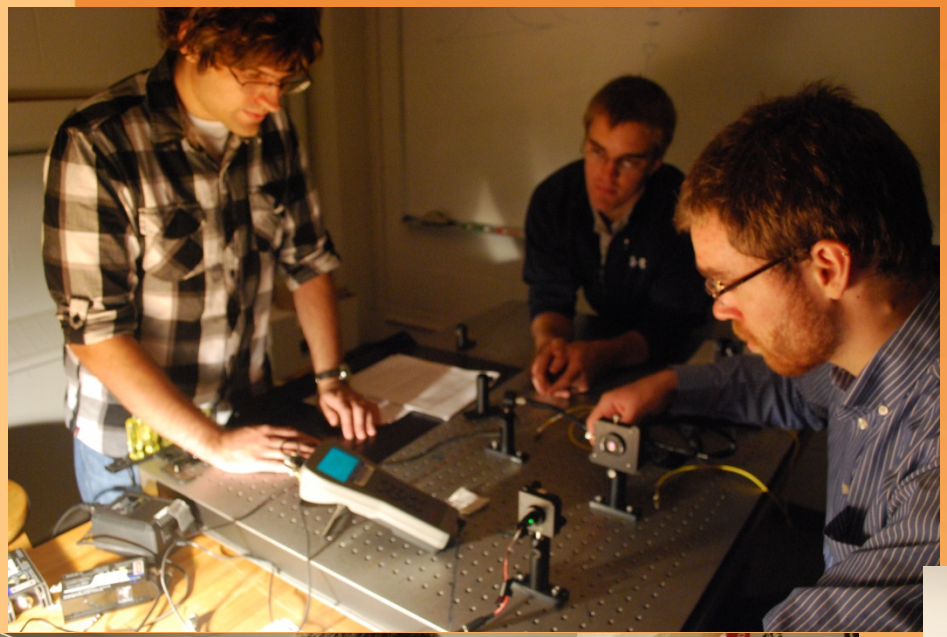
Semester	Math	Physics
N	MA 220/221 Calc I	
N+1	MA 231 Calc II	Phys 211 (4)
N+2	MA 241 Calc III	Phys 212 (4) Phys 225 (2)
N+3	MA 285 Diff EQ	Phys 213/214 (2+2) Phys 325 (3)

- **Notes:**
  - Take Phys 225 the same semester you take Phys 212
  - Phys 213 and 214 are two half-semester courses (for practical purposes, it's a single four hour course)

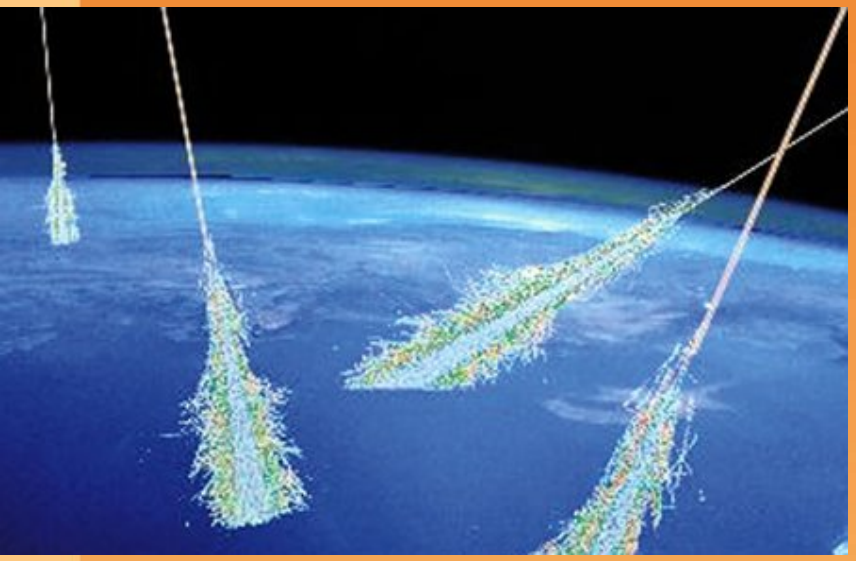
Upper level Courses

- "Core" physics
  - Classical mechanics
  - Electricity and magnetism
  - Quantum Mechanics
  - Thermodynamics and statistical physics
  - Classical laboratory
  - Modern laboratory
- Subject areas
  - Biophysics
  - Condensed matter physics
  - Subatomic physics
  - Atomic physics
  - Light / optics laboratory
  - Physics of music
  - Plasma / fusion
- Capstone
  - Intro to physics research
  - Senior thesis

Modern Physics Lab

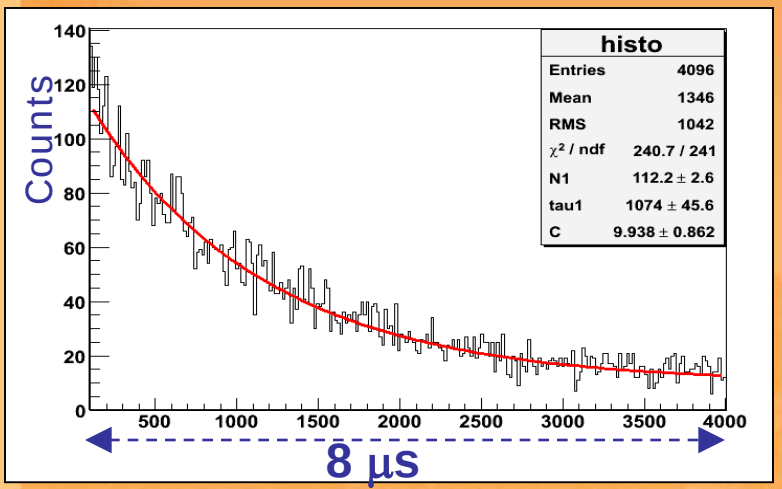


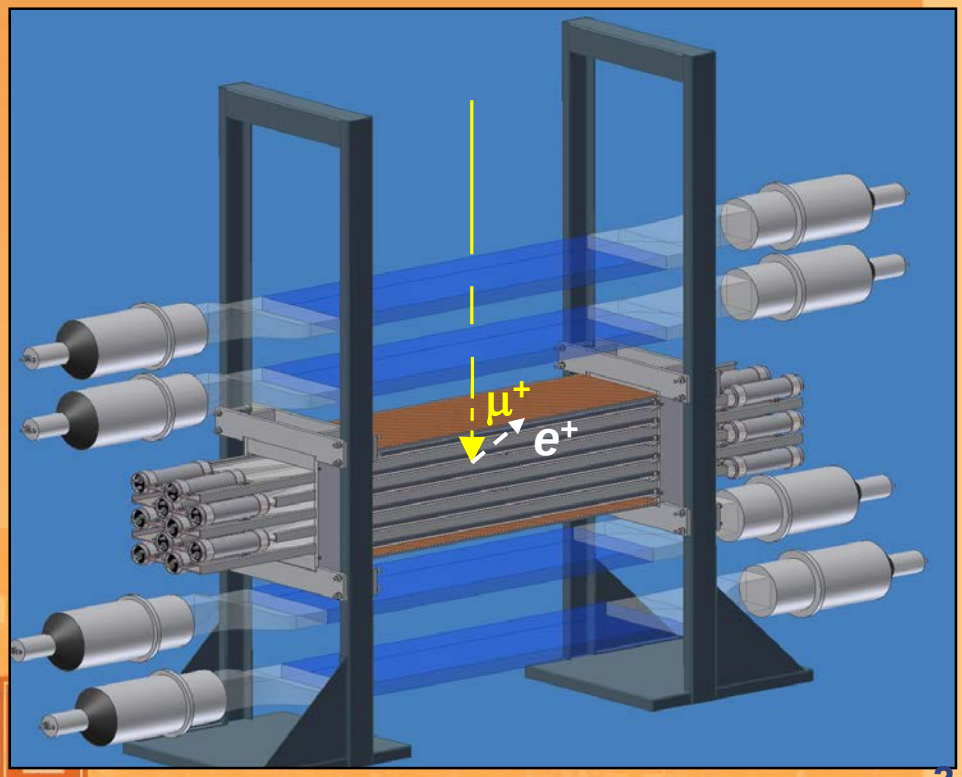
In Modern Physics Lab, you might…



… catch some muons from cosmic rays and measure how long they live

Answer: 2 millionth's of a second





Elective Options

- **Allows students to tailor curriculum to their needs and interests.**
- **Examples:**
  - **Professional Physics *(this is the grad school track)***
  - **Astrophysics**
  - **Biophysics**
  - **Bioengineering**
  - **Computational Physics**
  - **Materials Science**
  - **Physical Electronics**
  - **Earth Science**
  - **Science Writing**
  - **Pre-law**
  - **Pre-med**

Engineering vs. LAS Physics

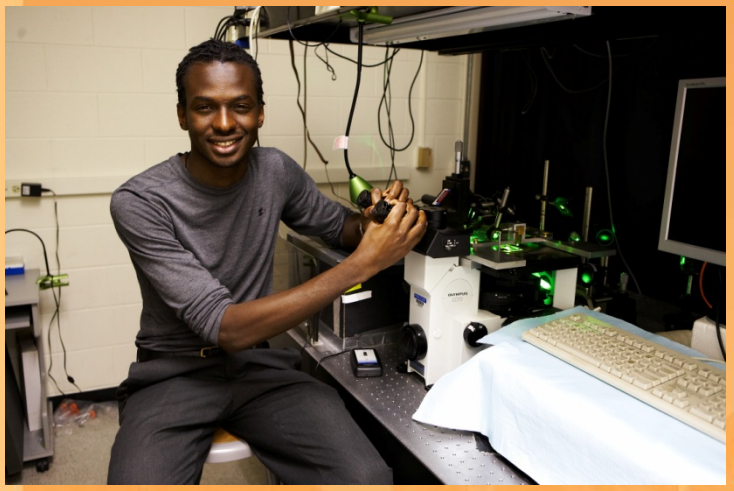
- Same programs available through both colleges.
- Differences in gen ed and foreign language.
- Math, physics, technical courses all the same.

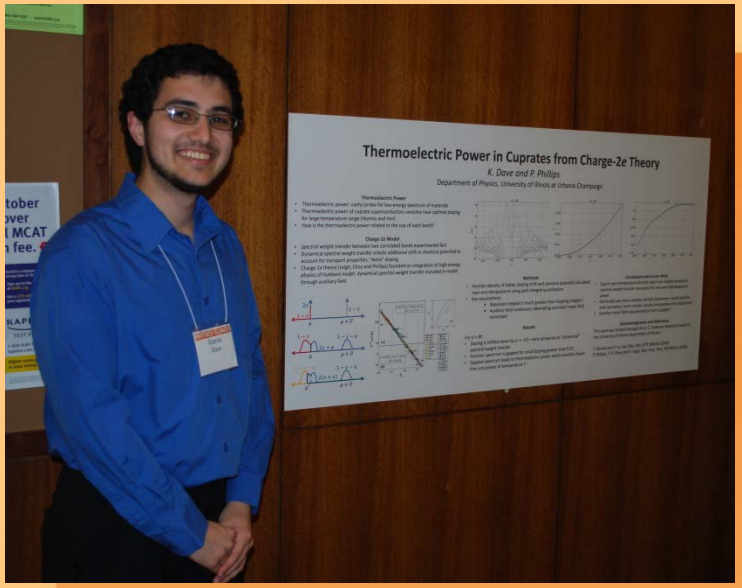
- To transfer into physics.
  - Follow the guidelines of the college (LAS/Engineering)
  - Follow the instructions here: http://physics.illinois.edu/undergrad/transfer-in.asp
  - Visit the chief academic advisor
  - We want to see your grades in PHYS 211-225, Calc I-III
  - Take PHYS 225 the same semester you take PHYS 212!!

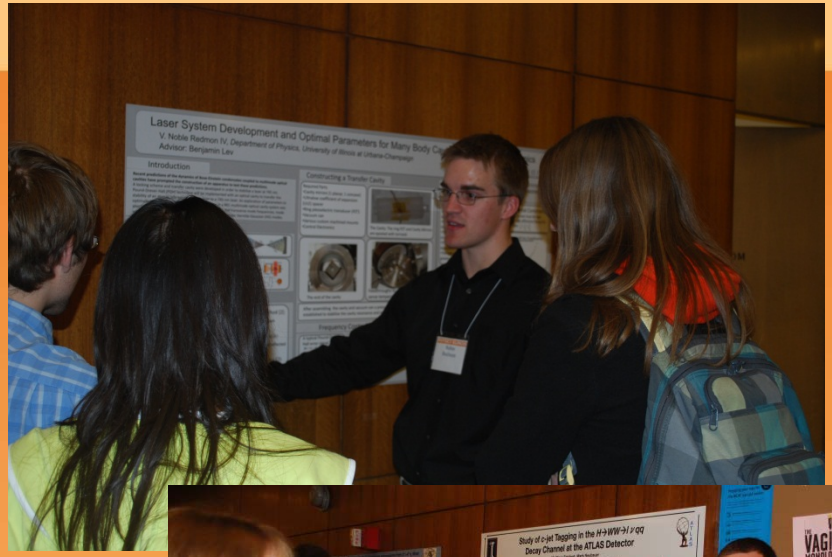
Undergrad Research

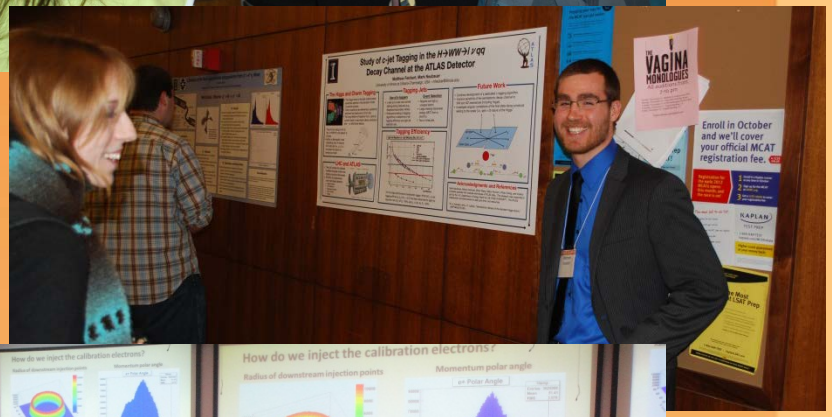
- **An important component of your education**

- **Summer 2013**
  - **120 undergrads doing research in physics**

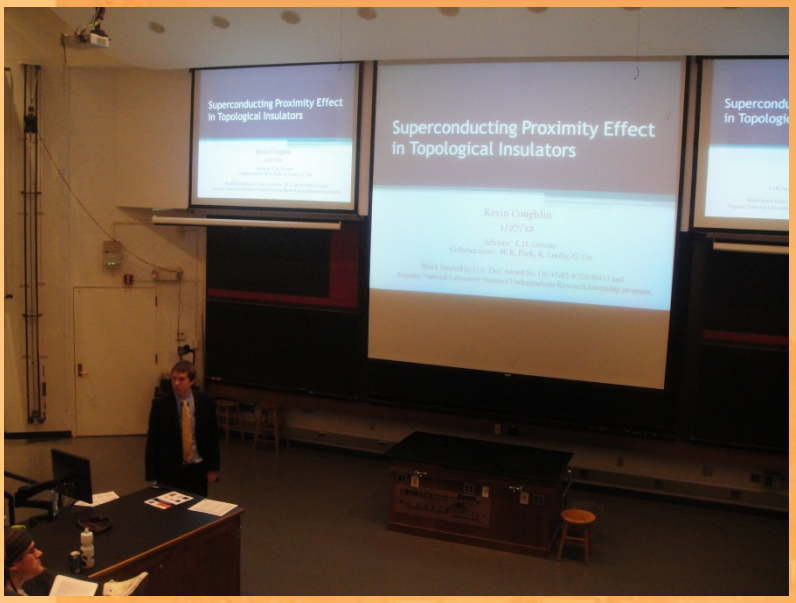


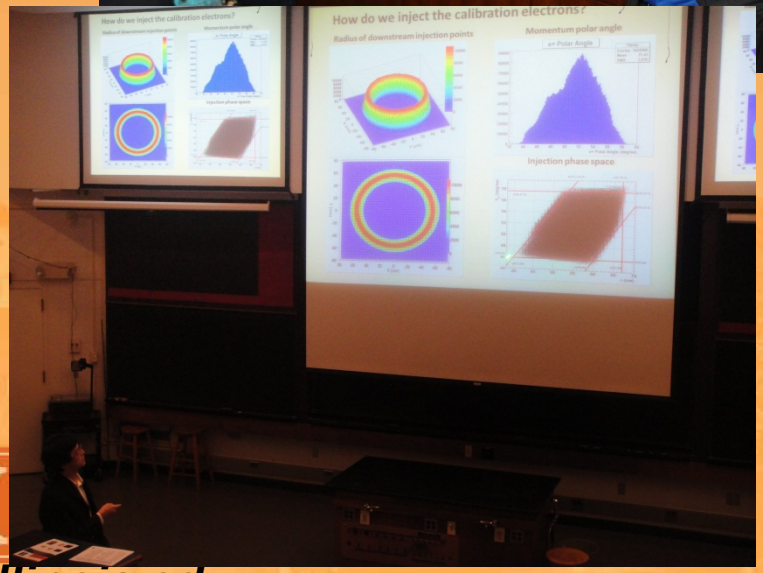






Undergrad Research Poster Session
Undergrad Research Symposium





Teaching Option

- If you are interested in teaching high school physics
  - Program offered through Liberal Arts and Sciences in conjunction with the College of Education
  - Must complete a secondary education minor

- Great program, but not offered through Engineering College
- Contact advisor Prof. Mats Selen (mats@illinois.edu)

Physics Minor

- Phys 211 Mechanics (4 hrs)
- Phys 212 Electricity & Magnetism (4 hrs)
- Phys 213 Thermo **or** Phys 214 Quantum (2 hrs)
- Phys 225 Relativity and Math Methods (2 hrs)
  - Try to take this when you take calc II or calc III
- Phys 325 Intermediate Mechanics (3 hrs)
- Two other 300/400-level physics courses
  - Phys 419/420 excluded
  - Upper level E&M, Quantum, Thermo, condensed matter, Biophysics, optics, subatomic physics, etc.

Student Environment

- **Physics Society**
  - **http://physoc.physics.illinois.edu/**
- **Society for Women in Physics**
  - **http://physics.illinois.edu/groups/WIPHYS/**
- **Physics Van**
  - **http://van.physics.uiuc.edu/**

Careers in Physics

Class of 2013

- Total number of graduates: 60
- Physics grad school: Minnesota, Maryland, Michigan, MIT, Princeton, Case-Western, Ohio University, UIUC, U Chicago, Virginia, Johns Hopkins
- Other grad school: MatSE, Finance, Applied Stats, Law, Geophysics, ECE, Journalism, CS, Math, Nucl Eng
- Jobs: Viasat, Studio 222, IMC Finance, EPIC (2), Inservice Engineering, Creat-a-Soft, U-Line distributor, Qualcomm, Google, Twitch LLC, HS teaching (3), software startup, Jump Trading, Green Line, Olenick & Associates
- Several people "looking" taking a "gap year" or staying here for a year of research.

Class of 2012

About 60 grads, where did they go?

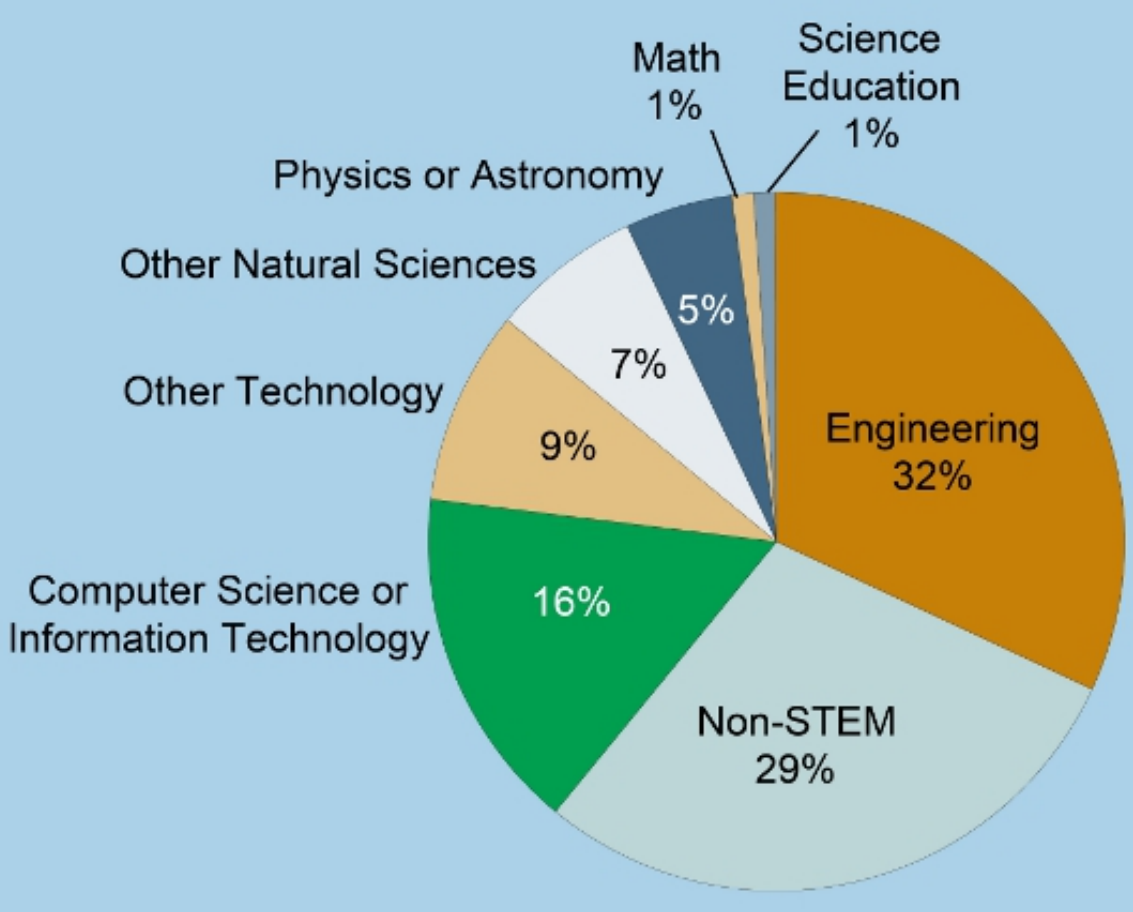
- **Grad school: Stanford, Princeton, Ohio State, Virginia, Notre Dame, MIT, Cornell, Michigan, Michigan State, Indiana.**
- **Related fields: economics, applied physics, architectural acoustics, biomedical engineering, secondary education, law school, neuroscience, astronomy and materials science**
- **Jobs: software firms, the Department of Defense, IBM, Google, and HRL Labs**

Class of 2011

About 55 grads, where did they go?

- **50% grad school in physics**
  - ***Schools:*** ***Stanford, Cornell, Princeton, Harvard, Caltech, Illinois, Northwestern, Michigan, Indiana, Washington, MIT, Colorado, University of California, University of Chicago, Wisconsin, Florida, Penn State, Carnegie Mellon, Maryland.***
  - ***Fields:*** ***Atomic and molecular optics, biophysics, high energy physics, astrophysics, condensed matter physics, quantum computing, nuclear physics, nanotechnology.***
- **20% grad school in other field(CS, EE, NuclE, MatSE, Math)**
- **20% industry**
  - ***Software engineer (CISCO Systems), manufacturing systems (Intel), information technology (Simplex Investments, Accenture Consulting), finance (Belvedere Trading Company), public policy.***
- **5% teaching**
- **5% military (service or teaching)**

Field of employment for physics bachelor's in the private sector, classes of 2006 & 2007.



STEM: Natural Science, Technology, Engineering and Math

http://www.aip.org/statistics

PHYSICS TRENDS

Contact: Rachel Ivie
rivie@aip.org

Spring 2001

What Do Physics Bachelors Do?

Type of Job	Percent
Software	24
Engineering	19
Science & Lab Technician	9
Management, Owner & Finance	20
Education	12
Active Military	6
Service and Other Non-Technical	10

Type of employment of physics bachelors 5 to 7 years after earning their degrees, 1999.

Source: 1998 Bachelors Plus Five Study

AMERICAN INSTITUTE OF PHYSICS

Statistical Research Center
www.aip.org/statistics

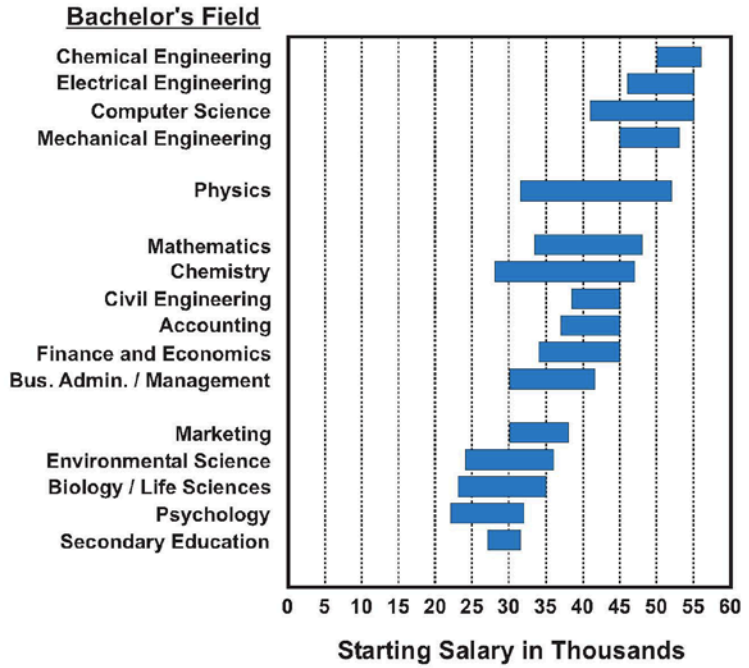
PHYSICS TRENDS

Contact: Patrick J. Mulvey
pmulvey@aip.org

Fall 2003

What's a Bachelor's Degree Worth?

Typical Salaries Offered by Campus Recruiters, 2002-2003



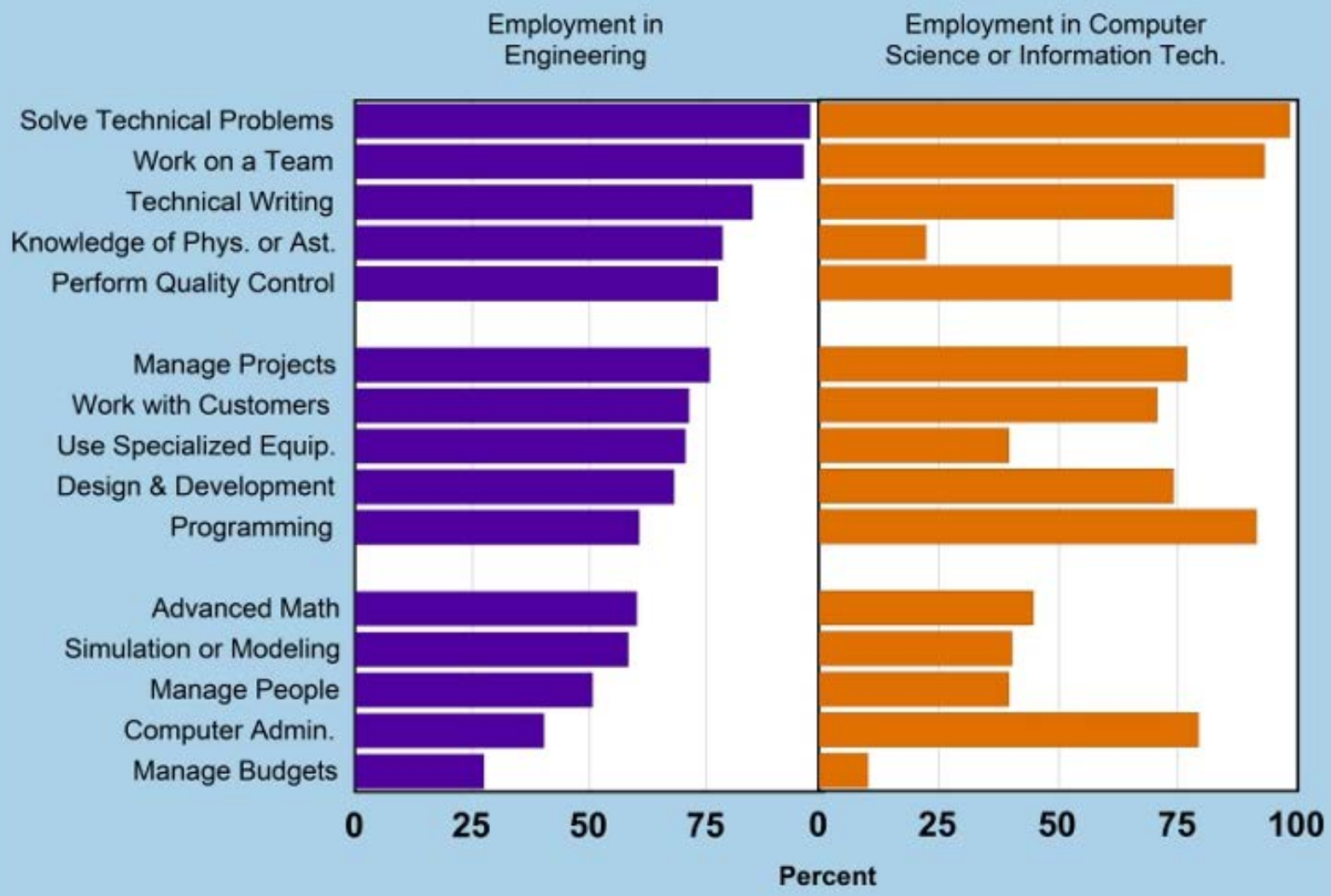
Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles.

AMERICAN INSTITUTE OF PHYSICS

Statistical Research Center
www.aip.org/statistics

Degree recipients who do not go to graduate school.

Physics bachelor's who regularly perform the following activities or use the following skills, class of 2007.



Percentages represent the proportion of physics bachelor's who chose "daily", "weekly", or "monthly" on a four-point scale that also included "never or rarely".

http://www.aip.org/statistics

PHYSICS →

Average MCAT Scores by Selected Majors, 2009.

	Physical Sciences	Biological Sciences	Verbal reasoning	Number of applicants
Biomedical Engineering	10.9	10.7	9.6	1,005
Physics	11.1	10.3	9.6	207
Electrical Engineering	10.9	10.5	9.4	195
Economics	10.4	10.5	9.7	566
Neuroscience	9.9	10.6	9.5	1,066
Mathematics	10.3	10.1	9.6	374
English	9.4	9.9	10.3	434
Biochemistry	9.9	10.3	9.1	2,594
Chemistry	9.8	9.9	9.0	2,091
Microbiology (or Bacteriology)	9.0	9.9	8.7	775
Psychology	8.8	9.4	9.1	2,421
Biology	8.7	9.5	8.7	12,705
Premedical	8.3	9.0	8.4	663
All Majors	9.2	9.8	9.0	41,487

The Medical College Admissions Test (MCAT) has three sections of standardized multiple choice questions (total of 219 items) with an additional writing sample comprised of two essays. Scores of 9.5 to 11 in each section are considered competitive by most medical schools.

Source: Association of American Medical Colleges, Data Warehouse

http://www.aip.org/statistics

PHYSICS →

Average LSAT Scores* by Selected Majors, 2009.

	Mean score	Number of applicants
Physics	161.5	180
Mathematics	159.7	336
Economics	157.4	3,047
Electrical Engineering	156.3	546
Mechanical Engineering	156.0	427
Chemistry	155.7	355
English	154.7	5,120
Biology	154.5	1,055
Computer Science	154.0	682
Political Science	153.0	14,964
Psychology	152.5	4,355
Pre Law	148.3	1,078
Criminal Justice	145.5	3,306
All Majors	152.6	81,530

*The scores in the table are for individuals who applied to Law school for the 2007-08 academic year. All test takers are not represented. Individuals may have taken the LSAT months or possibly years earlier.

Source: AIP Statistical Research Center compiled data from the Law School Admission Council, Newton PA.

http://www.aip.org/statistics

Graduate School: Who/What/How?

- **Grad school may be for you if you want to…**
  - do research and development
  - work at a national laboratory
  - teach / research at the college / university level.
- **Duration**
  - 1-2 year Master's, 5-6 year Ph.D.
- **Grad school**
  - Typically get remitted tuition + ~$20k per year
  - Two years of course work (+ teach + research)
  - Three-four years of research + dissertation

More About Our Courses

Go to:

http://physics.illinois.edu/

Under info for undergraduates:

- **Curricula/Programs**

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More about careers

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CAREERS IN PHYSICS, PARTS 1-10

By Kevin Pitts
August 31, 2012

Over the past year, I've posted many times about potential career paths. It might be hard for new readers to follow the older threads, so this post is an "index" of career posts. Several of these posts came from guest bloggers. Here is one example of the need for people trained in science.

Careers in Physics

Part I Job skills What skills do employers want that physics majors have?

Part II Elective options What are my curriculum choices for different career paths?

Part III Law Ever consider a career as an attorney? Physics is a good path to the law.

Part IV Salaries How much can you expect to make with a physics degree?

Part V Public service Many scientists work for the government.

Part VI the mysterious missing blog post

Part VII Atmospheric science Weather and climate are all physics.

Part VIII Medical imaging CT scans, MRI, PET scans, radiation therapy, all physics.

Part IX Teaching physics. We need more high school teachers! More on this here.

Part X Music Acoustical engineering, architectural acoustics.

Other posts of interest:

Internships A great way to get experience.

Career fairs. Learn about what's available and market yourself.

Are there really jobs in physics? Answer is yes.

Summer research here and **here**. A different kind of internship.

I have many more to come, so this is by no means the end of the list. We may never know what happened to the mysterious 6th post, but I will keep trying to update this post when I add more parts to this series.

If you have questions about the Physics Illinois Undergraduate Program , contact the Undergraduate Office, 217.333.4361.

If you have any feedback or suggestions for this blog, please contact Kevin Pitts.

Recent Posts

- Science Issues in Congressional Elections
- New Student Pizza Party
- The Benefits of Scientific Research
- Excellent Teachers
- The Value of a Ph.D.
- Posts on undergraduate and graduate programs
- Careers in Physics, Parts 1-10
- Students getting active!
- UIUC Physics by the Numbers
- The American Student

217.333.3946

"Physically Speaking"

Undergrad physics blog

Careers, science, happenings, relevance

http://physics.illinois.edu/undergrad/posts.asp

Summary

- **Physics provides an outstanding education in:**
  - Fundamental science and the underpinnings of engineering
  - Detailed analysis and problem solving
  - Mathematical analysis
  - Working in teams
  - Laboratory and instrumentation skills
  - Learning new things and adapting to new technologies
  - Modeling of complex systems

- **Career options are extremely flexible**
  - We are working with Eng Career Services to educate prospective employers about the benefits of hiring physicists