

Phys 7857 Graduate Seminar

“How to get a job in physics”

Today: jobs at universities

The American university evolved from the British institutions like Oxford and Cambridge. Harvard was the first university in North America having been founded in 1636 (interestingly, Santo Domingo, Dominican Republic 1538, Peru and Mexico 1551, and Cordoba, Argentina 1613 are older).

All this is nice, but largely irrelevant. Those institutions have very little to do with the modern university. Universities in the US took an important acceleration in 1861 with the Morrill Land-Grant act. This was a law passed by Congress after the Civil War in which gave 30,000 acres of federal land to each state per each member of Congress the state had. Proceeds from the sale of these lands were used to fund universities by the states. Most of the universities so founded are the current large “state universities” (LSU, Southern are examples). A notable exception is Cornell, which is private.

U. of Arizona, U. of Alaska, Colorado State, U. of Connecticut, Delaware State, U. of Delaware, Florida A&M, U. of Florida, U. of Georgia, UIUC, Purdue, U. of Maryland, Mississippi State, Rutgers, NCSU, Ohio State, PennState, Clemson, SC State, Texas A&M, Virginia State, Washington State, U. of Wyoming, etc.

You may also hear sea-grant, space-grant (LSU is both) and sun-grant universities. Those are separate more recent programs that do not really involve a grant.

Some of the structures of modern research universities got established after the land grant act. Yet, those institutions were also quite different from modern universities. For instance, PennState, which currently is a university system with 24 campuses and 84,000 students, started as a single building in State College, PA “Old Main” which housed the four faculty and all the students, administration and lecture halls. Most of the teaching was at the undergraduate level and there was no “externally supported” research.

Things started to shape up after World War II. There two things happened:

a) The Servicemen’s readjustment act of 1944 (“GI bill”) provided financial support for World War II veterans to go to college. Many universities saw enrolments soar (e.g. Syracuse University in New York State went from 6,000 students to 19,000 almost overnight).

b) Research became an industrial activity. This started with the involvement of research in military applications in the war (e.g. Manhattan project). The US government realized that large scale research was needed and that the best quality of research may require looser control than that provided in a government or military lab.



Vannevar Bush was an engineer, did research in analog computing in the 1920's, became dean of engineering in MIT immediately before the war. He lobbied intensely with other prominent scientists for the creation of a research funding agency in the government. In a meeting with Roosevelt in 1940 he convinced him to create such an agency.

Called Office of Scientific Research and Development (OSRD) it coordinated scientific research during WWII, including the development of key technologies like radar, sonar, proximity fuses, the Norden bomb sight and the Manhattan project. At some point 2/3rd of all US physicists were contracted to OSRD.

Unfortunately after the war OSRD decayed in importance in the government and by 1947 it had been reduced to a skeleton staff (at its peaked it funded over 30,000 people).

Bush was expecting that an agency similar to OSRD would continue in peacetime. He articulated this in a report to the president in 1945 titled "[Science, the endless frontier](#)". This report became the basis for the creation, in 1950, of the National Science Foundation.

He was also the author of a prescient essay in The Atlantic in 1945 where he describes a hypothetical device called “Memex”. Today we would recognize it as an internet connected laptop, including... Wikipedia!!!

"Wholly new forms of encyclopedias will appear, ready-made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified."

http://en.wikipedia.org/wiki/As_We_May_Think

In the 1960's further consolidations of federal research agencies take place. In 1957 NASA is created, and the 1960's see the withdrawal of the US Armed Forces from direct research funding, military related research gets channeled through various offices of the Department of Defense.

With the consolidation of the government agencies funding research, the research enterprise in universities boomed into what we see today. Most research, at least in the sciences, becomes “externally funded”.

Various types of universities:

There are approximately **3600 (!)** (1600 public, 2000 private) accredited institutions of higher education in the US. Given the sheer number, it is obvious that one can more or less find an example (or a counterexample) of any sort of behavior.

Therefore the following comments can only be taken in broad lines.

The Carnegie Foundation for the Advancement of Teaching classifies the institutions into 11 types: Research Universities I&II, Doctoral Universities I&II, Master's I&II, Baccalaureate I&II, Associate of Arts, Professional Schools, Specialized Institutions.

Table 1.1 The 1994 Carnegie Classification of Definitions for Four-Year Institutions

	CLASS I	CLASS II
Research Universities	These institutions offer a full range of baccalaureate programs, are committed to graduate education through the doctorate, and give high priority to research. They award 50 or more doctorate degrees each year. In addition, they receive annually \$40 million or more in federal support.	These institutions offer a full range of baccalaureate programs, are committed to graduate education through the doctorate, and give high priority to research. They award 50 or more doctorate degrees each year. In addition, they receive annually between \$15.5 million and \$40 million in federal support.
Doctoral Universities	These institutions offer a full range of baccalaureate programs and are committed to graduate education through the doctorate. They award at least 40 doctorate degrees annually in five or more disciplines.	These institutions offer a full range of baccalaureate programs and are committed to graduate education through the doctorate. They award annually at least 10 doctorate degrees—in three or more disciplines—or 20 or more doctorate degrees in one or more disciplines.
Master's (Comprehensive) Colleges and Universities	These institutions offer a full range of baccalaureate programs and are committed to graduate education through the master's degree. They award 40 or more master's degrees annually in three or more disciplines.	These institutions offer a full range of baccalaureate programs and are committed to graduate education through the master's degree. They award 20 or more master's degrees annually in three or more disciplines.
Baccalaureate (Liberal Arts) Colleges	These institutions are primarily undergraduate colleges with major emphasis on baccalaureate degree programs. They award 40% or more of their baccalaureate degrees in liberal arts fields and are restrictive in admissions.	These institutions are primarily undergraduate colleges with major emphasis on baccalaureate degree programs. They award fewer than 40% of their baccalaureate degrees in liberal arts fields or are less restrictive in admissions.

Some examples:

Research I: Arizona State, Boston U, Caltech, CMU, CWRU, Columbia, Cornell PennState, Purdue, Texas, Texas A&M, LSU, University of Utah, Utah State, Yale. (main campuses).

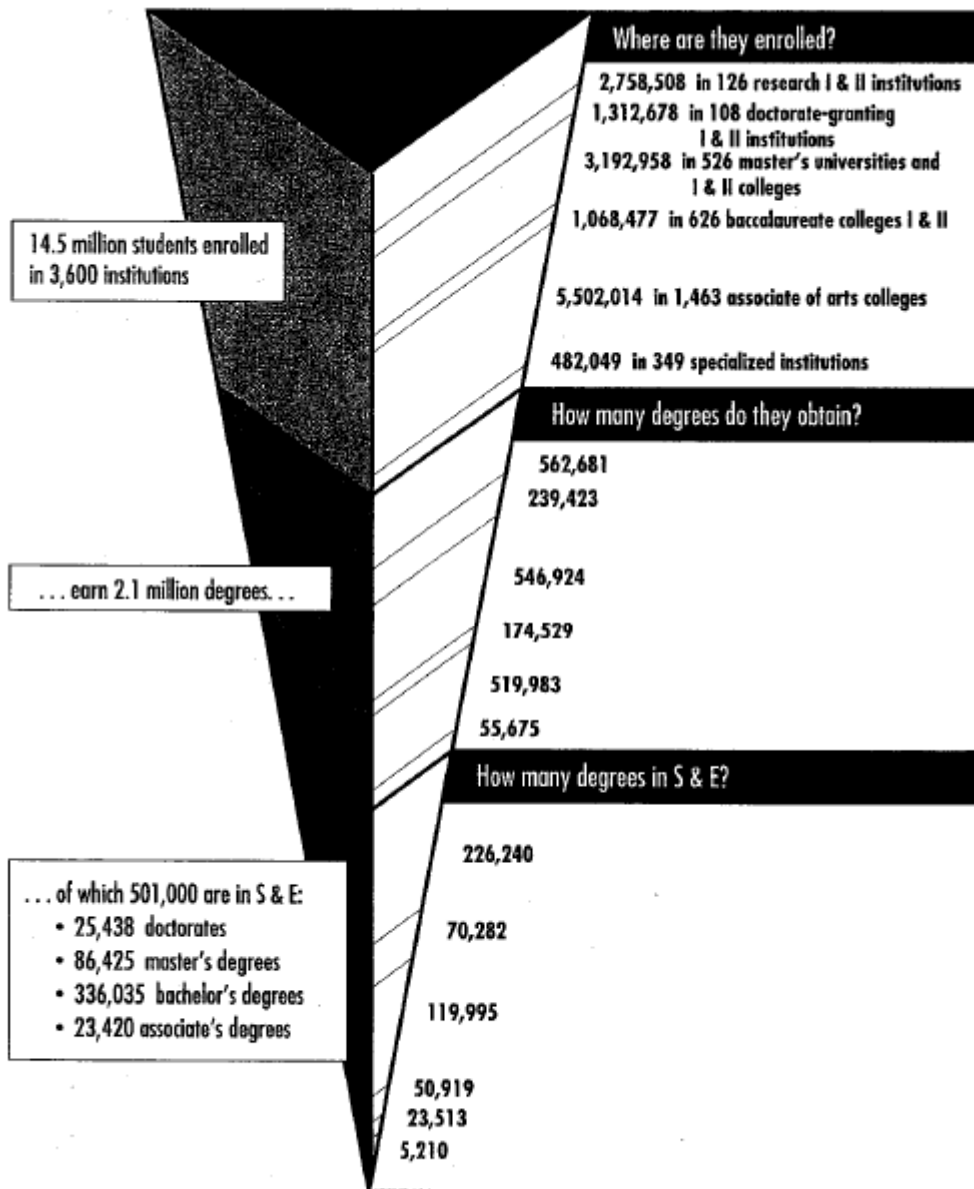
Research II: Auburn, Kansas State, Kent State, Ohio, Oklahoma State, Rice, Syracuse, Ole Miss, Tulane, Notre Dame, Washington State.

Doctoral I: Adelphi, Bowling Green, Ball State, Georgia State, Marquette, Alabama, Denver, Louisville, UMD Baltimore County, North Texas, UT Dallas.

Doctoral II: Baylor, Clarkson, Colorado School of Mines, Idaho State, LA Tech, Montana State, NJIT, Seattle, Texas Christian, Texas Southern, Alabama-Huntsville, UN Reno, UNO.

It should be noted that the Carnegie Foundation reworked how it classifies Institutions in 2005, and the categories listed above are not used anymore. They are widely still used colloquially and the new categorizations are more “politically correct” and harder to read.

http://en.wikipedia.org/wiki/Carnegie_Classification_of_Institutions_of_Higher_Education



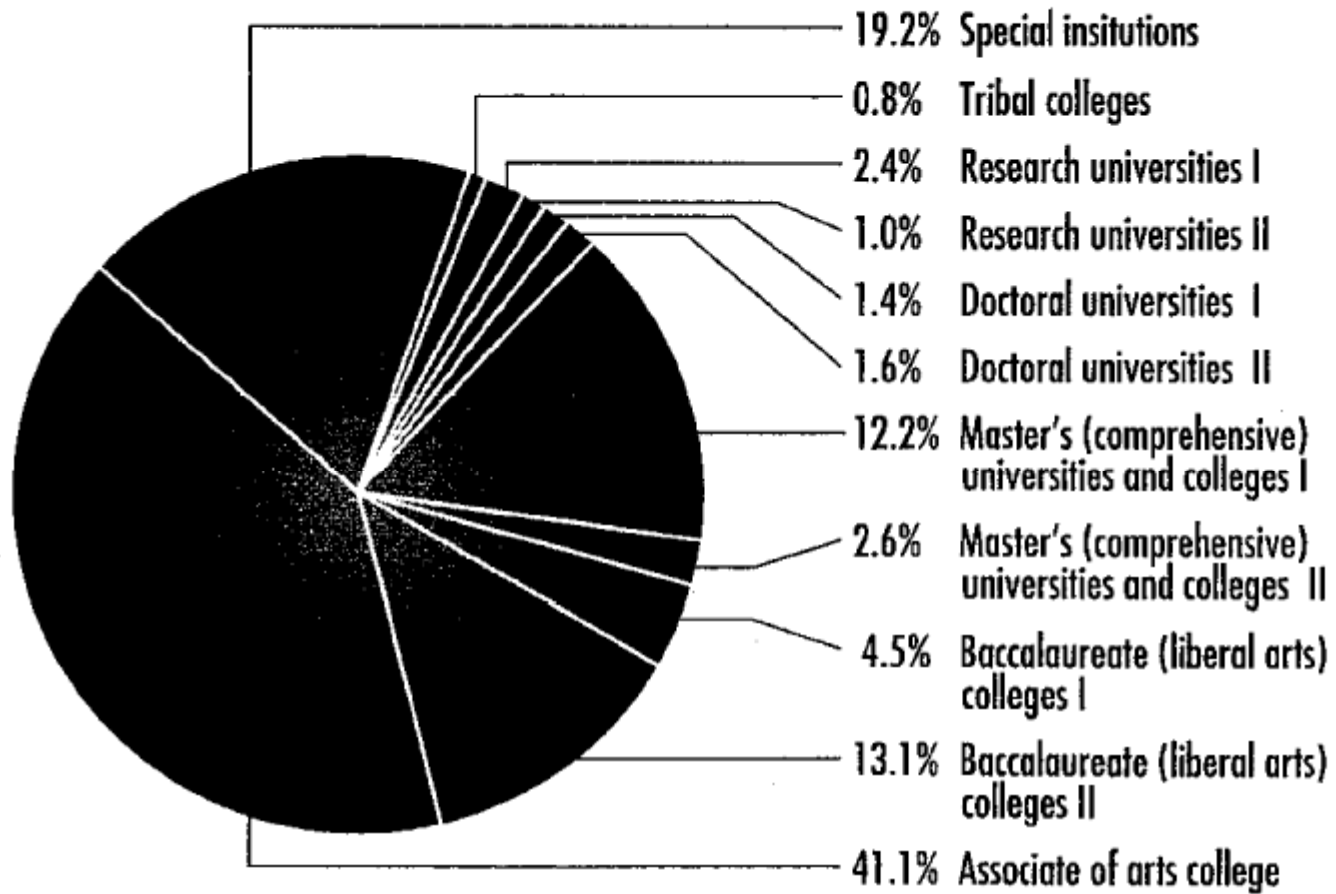
Source: The Science & Engineering Indicators, 1996

Table 1.2 Number of Colleges and Universities by Carnegie Classification, 1994

INSTITUTIONS	TOTAL
Doctorate-granting	236
Research I	88
Research II	37
Doctorate I	52
Doctorate II	59
Master's-granting	532
MA I	439
MA II	93
Baccalaureate-granting	633
BA I	163
BA II	470
Associate of Arts colleges	1,480
Professional schools and specialized institutions	690
Tribal colleges	29
Total	3,600

Figure 1-1

Proportions of institutions by Carnegie Classification, 1994.



Note: Figures do not add to 100 percent because of rounding

Total : 3,600 Institutions

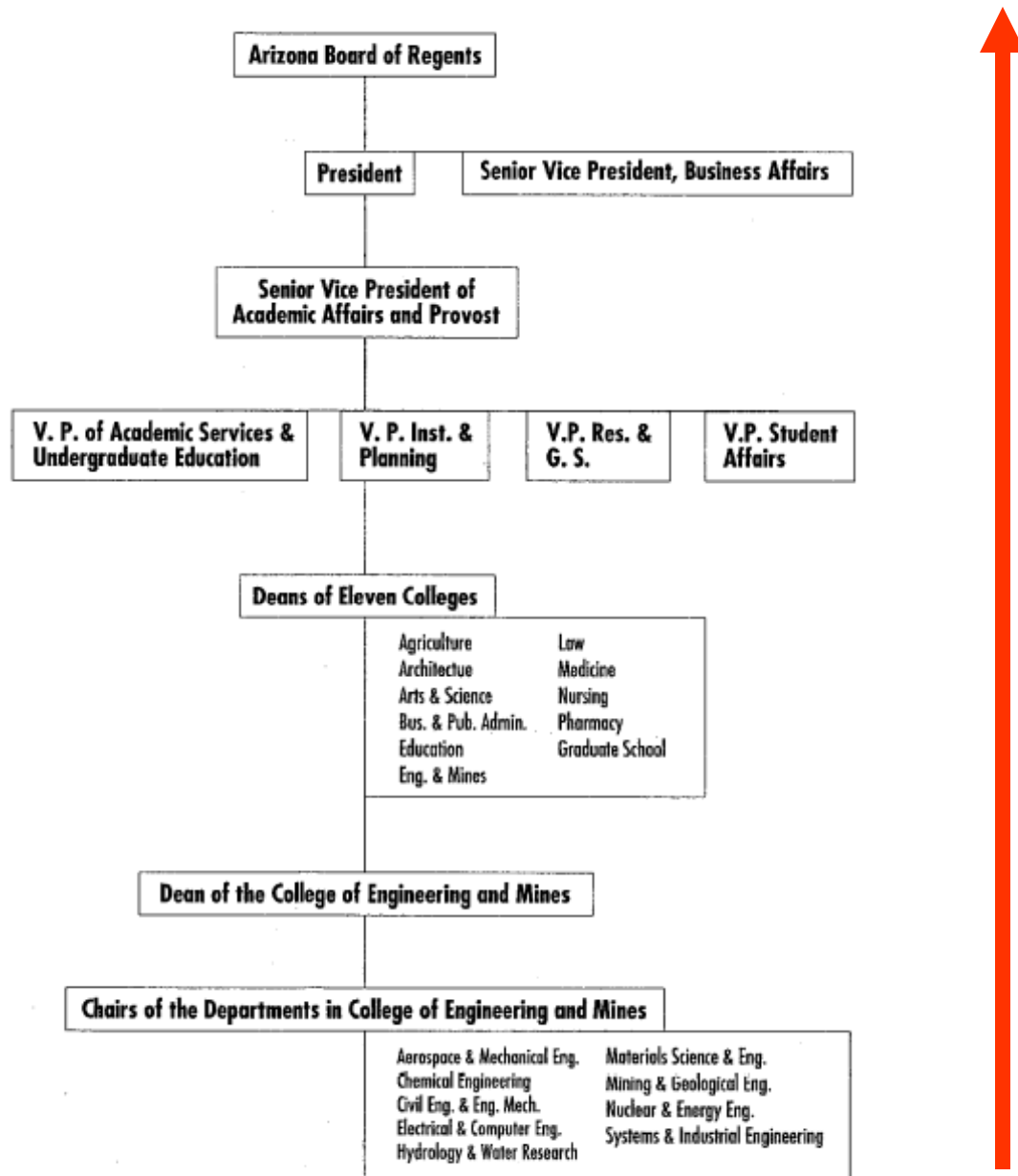
Table 1.3

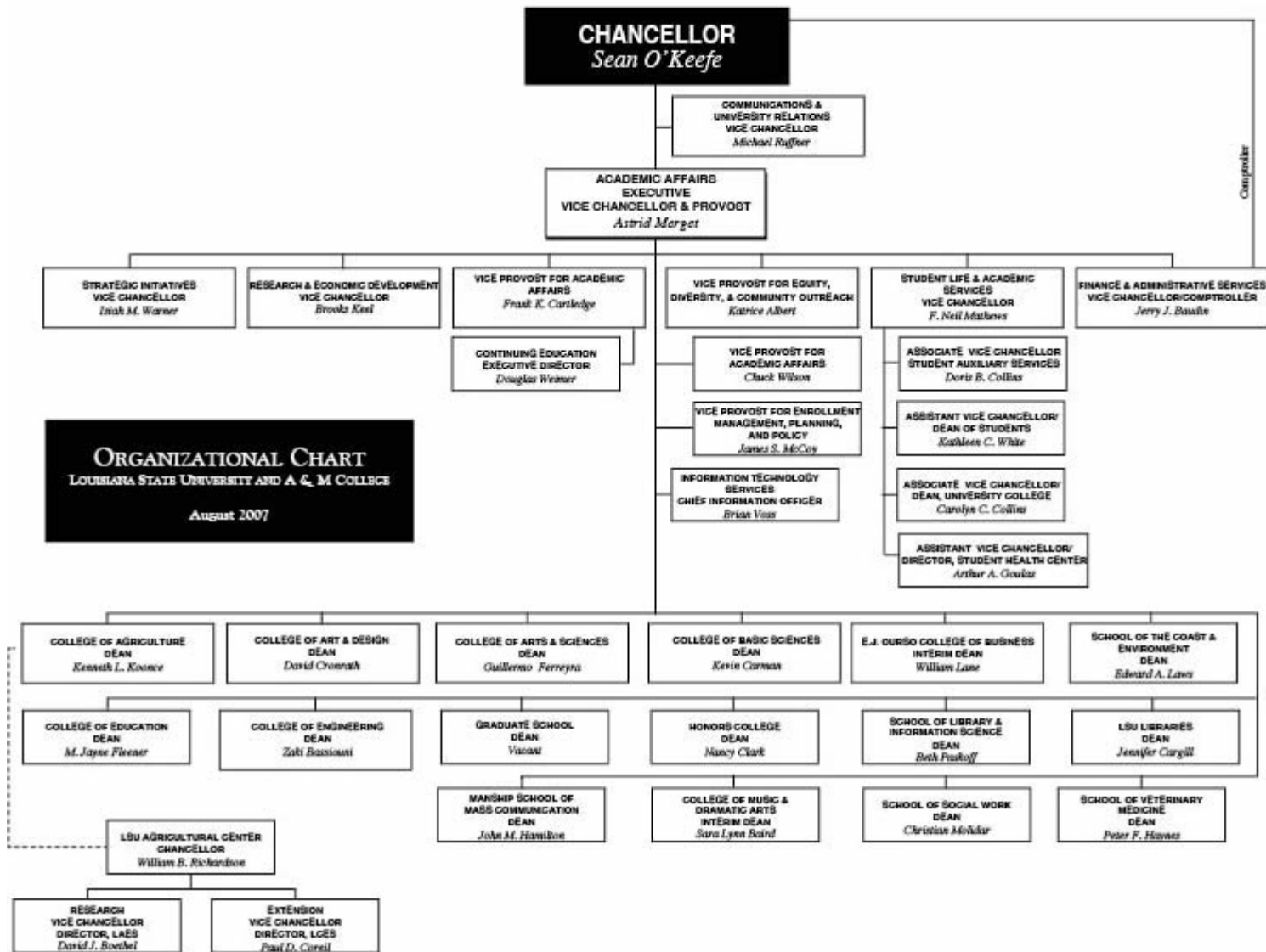
Impact of Teaching and Research on Tenure Decisions at Various Types of Colleges and Universities

Percentage of faculty who answered "very important" to the following questions, by type of institution:

QUESTIONS	RES. I&II	DOC. I&II	MASTER'S I&II	L.A. I&II
How important is the number of publications for granting tenure in your department?	56	55	30	8
How important are research grants received by the scholar for granting tenure in your department?	40	35	19	9
How important are student evaluations of courses taught in granting tenure in your department?	10	9	37	45
How important are observations of teaching by colleagues and/or administrators for granting tenure in your department?	4	6	20	29
How important are recommendations from current or former students for granting tenure in your department?	3	6	13	30

Source: E. L. Boyer, *Scholarship Reconsidered: Priorities of the Professoriate*. Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching, 1990, Appendix A—National Survey of Faculty, 1989. Reprinted with permission.





The bottom up view affects you directly: it is vastly more important to you how good your department rather than how good the university is. Usually these two things are correlated, but there may be imperfections in the correlation.

<http://www.nationalacademies.org/careerguides.html> (1995)

1	Harvard University
2	Princeton University
3	Massachusetts Inst of Technology
4	University of California-Berkeley
5	California Institute Technology
6	Cornell University
7	University of Chicago
8	U of Illinois at Urbana-Champaign
9	Stanford University
10	Univ of California-Santa Barbara
11	University of Texas at Austin
12	Columbia University
13	Yale University
14	University of Washington
15	Univ of California-Los Angeles
16	Univ of California-San Diego
17	University of Pennsylvania
18	University of Maryland College Park
19	University of Michigan
20	Rutgers State Univ-New Brunswick
21	University of Wisconsin-Madison
22	State U of New York-Stony Brook
23	University of Minnesota
24	Ohio State University
25	University of Rochester "
26	Brown University
27	University of Rochester
28	Carnegie Mellon University
29	Johns Hopkins University
30	Rockefeller University

31	Purdue University
32	Michigan State University
33	University of California-Irvine
34	Indiana University
35	CUNY - Grad Sch & Univ Center
36	University of Florida
37	Northwestern University
38	University of Colorado
39	Boston University
40	University of Pittsburgh
41	Duke University
42	Florida State University
43	Rice University
44	Brandeis University
45	University of Arizona
46	University of Virginia
47	Texas A&M University
48	Univ of California-Santa Cruz
49	Iowa State University
50	University of Southern California
51	North Carolina State University
52	Washington University
53	New York University
54	U of North Carolina-Chapel Hill
55	Pennsylvania State University
56	University of Notre Dame
57	Syracuse University
58	Vanderbilt University
59	University of Utah
60	University of Oregon

61	University of Houston
62	Georgia Institute of Technology
63	College of William & Mary
64	U of Massachusetts at Amherst
65	Case Western Reserve Univ
66	Northeastern University
67	University of California-Davis
68	Rensselaer Polytechnic Inst
69	Univ of California-Riverside
70	Arizona State University
71	Virginia Polytech Inst & State U
72	University of Tennessee-Knoxville
73	University of Iowa
74	University of Delaware
75	University of Georgia
76	Oregon State University
77	Tufts University
78	Kent State University
79	Louisiana State U & A&M College
80	University of Nebraska-Lincoln
81	Drexel University

<http://graduate-school.phds.org/rankings/physics>

The amount of time available for research may also be predicted by noting the mission of the institution vs. the size of the faculty.

For example: PennState has a Ph.D. and undergraduate program in physics and does service teaching with 45 faculty members in physics.

LSU has Ph.D. and undergraduate programs in physics and does service teaching, plus runs a medical physics program with 32 faculty members.

Ole Miss has Ph.D. and undergraduate programs in physics and does service teaching with 21 faculty members.

U Wisconsin-Milwaukee has Ph.D. and undergraduate programs in physics and does service teaching with 23 faculty members.

Public vs. Private?

From what I've been able to see, the differences within each group of institutions is larger than the private vs. public difference.

Private institutions may choose to be a less bit bureaucratic.

They may be better shielded from the fortunes of the state's economies (truer for richer schools).

They may have fewer "mandates" (real or perceived).

They may have more academic (and other types of) freedom.

They may pay higher salaries.

State institutions usually have a small proportion of unusually gifted students (people who couldn't afford anything better).

Several "state" schools are now operating with a significant portion of their budget from non-state sources (either federal grants or private funds).

How does one apply for a job at one of these institutions?

Most US and Canadian jobs in physics are advertised in Physics Today.

<http://www.aip.org>,


Assistant Professor		POSTED: Jan 01	
Salary:	Open	Location:	University, Mississippi
Employer:	University of Mississippi	Type:	Full Time - Entry Level
Sector:	Academic	Preferred Education:	Doctoral
< Back		Apply For This Job	
Email Job		Save Job	

Description
<p>The University of Mississippi invites applications for a tenure-track assistant professor appointment in the Department of Physics and Astronomy beginning August 2008. Interested parties must apply online at https://jobs.olemiss.edu. A curriculum vitae, a list of publications, a letter of application describing teaching and research experience as well as research plans and start-up needs should be included in the application package. Applicants must also arrange to have three letters of reference to be sent directly to: Search Committee Chair, Department of Physics and Astronomy, The University of Mississippi, P. O. Box 1848, University, MS 38677-1848. Review of applications will begin immediately. The search will remain open until an adequate applicant pool is established or until the position is filled. Based on data compiled and published by the National Science Foundation, our department's physics research expenditures rank 20th of U.S. higher education institutions. The University has excellent computing facilities which include the Mississippi Center for Supercomputing Research and a departmental linux computer farm; the University is a member of the Internet 2 consortium. The University of Mississippi is an EEO/AA/TitleVI/TitleIX/Section504/ADA/ADEA Employer.</p> <p>NOTES: International Candidates Will Be Considered</p>

What is the mechanics of the selection process? Typically there is a “search committee”, a group of 3-4 faculty, who scans the incoming applications. The committee will usually draft a “short list” of three candidates that will be invited to visit for an interview. Sometimes phone interviews are conducted.

After the visits are over, the search committee will usually rank the candidates and present the ranking as a recommendation to the whole faculty of the department in a faculty meeting. The files of all the applicants are available to all the faculty prior to the meeting. In most places a vote takes place at the meeting. The results of this vote are then communicated to the dean of the college by the department chairperson. Usually the dean goes along with the recommendation.

What about “instructor” positions? Most research universities, in addition to “tenure-track faculty” employ “Instructors”. The main function of an instructor is to teach. Usually the teaching loads are heavy (3-4 courses per semester). The pay is quite low (\$3-6k per course). The positions are on renewable contracts. Some are better than others (3 year contracts), some are atrocious “can you teach a course this semester?”.

 Job Detail

Undergraduate Teaching Position		POSTED: Jan 20
Salary:	Open	Location: Waltham, Massachusetts
Employer:	BRANDEIS UNIVERSITY	Type: Full Time - Experienced (non-manager)
Sector:	Academic	Category: College/University Faculty
Preferred Education:	Doctoral	

Description

Undergraduate Teaching Position

BRANDEIS UNIVERSITY The Physics Department seeks a full-time faculty member to teach physics laboratory, lecture and inquiry-based classes to begin in Fall 2008. The candidate should have a Ph.D. in physics, postdoctoral and/or teaching experience and be committed to undergraduate education. This will be a three-year, renewable appointment and salary and rank will be commensurate with experience.

Applicants should submit their CV and a statement on teaching philosophy, and arrange for three letters of reference to be sent to:

John Wardle, Physics Search

Summary:

- Research institutions are a small percentage of institutions of higher education.
- Even within the small group, there are significant variations in emphasis in research/teaching and other crucial details.
- You need to research the institution you are applying to!