Commission on Professionals in Science and Technology (CPST)
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Report of a CPST Workshop on

EMPLOYMENT OUTCOMES OF DOCTORATES IN SCIENCE AND ENGINEERING

June 1998

Sponsored by the **Alfred P. Sloan Foundation**

Michael Teitelbaum, Program Officer

PART I: WORKSHOP OVERVIEW

Geoff Davis, Dartmouth College
Consultant to CPST

INTRODUCTION

The market for new Ph.D.s in science and engineering has undergone important structural changes over the last 20 years. Increasing numbers of new S&E Ph.D.s are finding employment outside of the traditional academic sector, and the career paths of new doctorates working in academia are very different than those of their advisors. In these changing times, students need to know what programs are most likely to lead them to the successful attainment of their career goals. Faculty members need to have an understanding of the new career paths available to their students so that they can provide effective mentoring, and they need to know what skills their students will need to succeed in non-traditional careers. Policy makers seeking support for science education and research need to know what kinds of investments in the educational infrastructure will yield maximal returns in productive new doctorates.

To address these needs, the National Academy of Sciences has called for the creation of a publicly accessible national database of information on graduate outcomes, both in its 1995 COSEPUP report[1] and in its subsequent convocation on graduate education. Congressman George Brown, Jr., the ranking Democratic member of the House Science Committee, has recently echoed this call for better information.[2]

> Policymakers and institutions can take several steps to improve graduate education…. [T]he lack of accurate, timely, and accessible data on employment trends, careers, and sources of student support is a serious flaw in the graduate-education system. A national database that covers such issues as financial aid, time to degree, and placement rates—including information gathered and disseminated through the Internet—could help students and their advisers to make informed decisions about professional careers. Such a database, which should be designed and managed by the research community, could be used both by students and by their advisers to learn more about graduate programs and possible career tracks.
>
> *"Preparing for the 21st Century: Science and Technology Policy in a New Era," A Statement from the Presidents of the National Academies, 1997.*

In response to these calls, the Commission on Professionals in Science and Technology (CPST) organized a workshop to bring together the major organizations that collect and disseminate data on postgraduate career outcomes. A number of important efforts to provide outcome data are underway, and these are described in detail in Part II of this document. However, there is considerable work to be done if the National Academy's vision for enabling students and their advisers to make informed career decisions is to become a reality. Outcome data have potentially tremendous benefits for students, faculty, and science as a whole. What is needed is the leadership to make the National Academy's vision a reality.

INFORMING STUDENTS

The Ph.D.: A Risky Investment

Earning a Ph.D. entails an enormous investment of a student's time and effort. Science and engineering students are enrolled for a median of 6.9 years in pursuit of a doctorate.[3] Students incur opportunity costs ranging into the hundreds of thousands of dollars, and a substantial fraction dip into savings or incur debt to cover tuition and living expenses. In 1995, 85% of US students reported some reliance on their families and personal savings for support.[3]

Field	Unemployment rate	IOF rate
Chemistry	2.1%	4.1%
Biology	2.2%	2.8%
Geosciences	1.7%	6.8%
Math	4.0%	9.3%
Physics	2.9%	6.7%

1995 unemployment rates and involuntarily out of field (IOF) rates for new science Ph.D.s 1-3 years after degree. Source: NSF Issue Brief 97-321.

This educational investment is a risky one, for which the long-term success is by no means assured. While the unemployment rates for recent Ph.D.s are lower than the 5.7% rate for all civilian workers, they are "unusually high for such a highly skilled group."[4] More telling, involuntarily out of field rates for new science Ph.D.s (the percentage reporting that they are unable to find full-time employment "closely related" or "somewhat related" to their degrees) range from 3% to as high as 9% for some fields.[4]

While, as Jules LaPidus emphasizes in a recent Chronicle editorial, "Students have to decide for themselves if they believe that doctoral education is a good investment of their funds and their time," the trouble is that students are almost completely uninformed of the risks involved when making their investment. "We don't invest in the stock market or buy a house without adequate information about our potential investment. Why do we tolerate inadequate performance information in our higher education investments?" asks Congressman George Brown, Jr.[2]

> Pursuing the Ph.D. has always been a risky business. Students may not be accepted by the graduate program of their choice, may not get financial support, may not complete their programs, and may not get the jobs they want. Sometimes everything works out, sometimes it doesn't… Students have to decide for themselves if they believe that doctoral education is a good investment of their funds and their time. If they do, they will go to graduate school. If they don't, they will do something else. In either case, the decision is theirs.
>
> *Jules B. LaPidus, Council of Graduate Schools,* Chronicle of Higher Education, *Nov. 14, 1997*

Departments, argues Donald Kennedy, have a *duty* to better inform students as to their prospects and should be *required* to do so. Kennedy notes that "…even the National Collegiate Athletic Association (NCAA) now publishes graduation rates for athletes; an equivalent requirement for these heavily recruited prospective scholars [Ph.D.s] does not seem so unreasonable!"

What Information Students Want

What kinds of information do students want in order to assess graduate programs? An informal online experiment at the web site **http://www.phds.org/ratings** has provided a way to gauge student interest levels in a variety of types of outcome data. The site allows students to create customized ratings of graduate programs based on 23 different criteria. Students assign an importance weight to each criterion, and the site generates composite ratings accordingly using data from a National Research Council study. Based on the importance weights from over 3,000 ratings generated in the first two months of 1998, the top student concerns, in order, are as follows:

1. **Program/faculty reputation**
2. **Employment prospects for recent program graduates**
3. **Availability of research and teaching assistantships**
4. **Graduation rate**
5. **Time to degree**

Up-to-date assessments of these quantities are readily available for graduate programs in medicine, law, and business. In stark contrast, corresponding information for programs in science and engineering is either unavailable or updated so infrequently as to be of little practical use for much of the time.

> Full and honest disclosure of the employment prospects in the field, as best they can be known, is surely one important institutional responsibility. ...departments should be required to tell their incoming graduate students… the percentage of students entering the program during the past decade who have earned their degrees… an accounting of the average time taken to obtain the degree… [and] for each member of some substantial recent cohort of doctoral degree recipients, his or her employment history…
>
> It is plainly time for a dose of reality. No more leveraged version of academic duty exists anywhere. If change is to happen, this is where it begins.
>
> *Donald Kennedy, former president, Stanford University,* Academic Duty, *1997*

The CPST has initiated an important effort to coordinate the gathering and reporting of discipline-level outcome data for recent graduates. Such outcome data can help students decide whether to pursue a doctorate in a particular field and helps to shape career goals and expectations. However, it provides little guidance for students trying to decide *where* to pursue graduate studies or in what kind of program to enroll. Better student access to department-level information would enable students to better assess both the risks and rewards involved in the decision to pursue graduate studies, and it would help them form realistic career expectations.

INFORMING DEPARTMENTS

Rethinking Graduate Education

The career paths of S&E Ph.D.s have changed considerably over the last decade. One of the most significant changes is the increasing fraction of new Ph.D.s working in industry. The majority of new S&E Ph.D.s now find employment outside of academia. The skills required by students pursuing these new career paths are very different from those required in academia, and faculty advisers, many of whom have never worked outside the university, need to be kept informed of the changing needs of their students.

> Here is a typical comment to our committee from a representative of a multinational corporation: "...Skills like project management, leadership, planning and organizing, interpersonal skills, adaptability, negotiation, written and oral communication and solid computer knowledge are critical. If you walk on water technically but can't explain or promote your ideas and your science, you won't get hired. "
>
> *Phillip A. Griffiths, Director, Institute for Advanced Study, testimony before the House Science Committee hearings on "Attracting and Graduating Scientists and Engineers Prepared to Succeed in Academia and Industry," April 1, 1998.*

Change is occurring within the academy as well, as tenure-track positions become increasingly scarce. Between 1987 and 1992, the number of part-time faculty grew by 47.7%; part-time faculty now comprise roughly 45-46% of all faculty members.[5] By one estimate, "as few as 38-40% of all faculty appointments made in recent years are 'traditional' in the sense of being full-time and either tenured or tenurable."[5] The result has been a burgeoning of the ranks of postdoctoral researchers, temporary hires, and adjunct faculty members, whose long-term career prospects are the subject of increasing concern. This newly created class of migrant researchers has a much more pressing need for basic career survival skills, such as networking and communication skills, than did students in the past.

Proposals for changes in graduate education to meet the changing needs of today's doctoral students have not been universally embraced by the scientific community. A 1995 survey of mathematics department chairs indicated that few departments were considering implementing such "dramatic" changes as those recommended by the National Academy's 1995 COSEPUP report. "I don't think we can ask people to become mathematicians in a reasonable amount of time and at the same time give a lot of attention to things outside of mathematics," objects David Vogan of MIT. Indeed, asks Douglas Kurtz, head of the math department at New Mexico State University, "why would you change the best system of graduate education in the world?"[6]

Are proposed changes in graduate education effective in producing world-class scientists and engineers? If so, which specific changes yield the highest return on departmental investment of time and resources? How should changes be implemented? One reasonable approach to answering such questions is to look to the departments that have strong track records of producing successful scientists to see what can be learned from them.

> The ultimate measure of success in graduate education is the extent to which all students are well prepared for their careers.
>
> *"Preparing for the 21st Century: Science and Technology Policy in a New Era", A Statement from the Presidents of the National Academies, 1997*

Programs That Work

Outcome data provide an important way to gauge departmental educational effectiveness. Information about where a department's graduates find employment both in the short term and the long term provides a way to answer the question, "How well do the career outcomes of a program's graduates correspond to the program's stated mission?" The outcome data that are at present publicly available are insufficient to answer this question.

An increasing number of science graduate education groups are providing employment outcomes data on their web sites, as described in the second section of this report. These leaders provide models for other programs to follow

INFORMING POLICY MAKERS

The federal government currently funds approximately 60,000 full-time graduate students per year[7]. Funding agencies and policy makers need to address a number of key questions to ensure that these funds are administered and distributed in the most effective possible manner. For example, how should funds be allocated to various fields to meet national needs? In what form should funds be disbursed? And, perhaps most importantly in the present age of increased governmental accountability, are the taxpayers getting their money's worth from their investment in graduate education? The substantial recent changes in the working environment of scientists make these questions especially relevant.

States have begun to ask similar questions about the nature of their investments in doctoral education at publicly funded institutions. Outcome data have played an important role in the difficult task of making quality assessments and tradeoffs about what programs should be funded, and preliminary results appear promising. Given outcome data's vital role in evaluating educational change, the establishment of mechanisms for the regular gathering and dissemination of such data should be a high priority.

…we have to be concerned about the productivity of our investment in intellectual capital in the same way that we are concerned about our productivity in other areas. Just simply spending more cannot be an adequate test…. Clearly, issues of productivity in research and technology have to be dealt with and if we did not want to, we are going to be required to, simply from the creation of a new act called the Government Performance and Results Act that requires all federal agencies to set forth goals that they intend to work toward, and measures of their performance.

Franklin Raines, Director, Office of Management and Budget, keynote address, National Academies of Science and Engineering summer retreat, 1997

SUMMARY

Students, faculty, and policy makers all stand to benefit considerably from better availability of employment outcome data for S&E doctorates. The provision of such information is more than a practical consideration: as Donald Kennedy asserts, it is an institutional *duty* to better inform students. What is most needed is the leadership to make an informed student population a reality. In Kennedy's words, "If change is to happen, this is where it begins."

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[1] *Reshaping the Graduate Education of Scientists and Engineers,* Committee on Science, Engineering, and Public Policy (COSEPUP), National Academy Press, Washington, DC, 1995.
[2] "Past and prologue: Why I am optimistic about the future," Congressman George E. Brown, Jr., William D. Carey Lecture, April 29, 1998, AAAS, Washington DC.
[3] *Summary Report 1995: Doctorate Recipients from United States Universities,* National Academy Press, Washington, DC, 1996.
[4] "What's Happening in the Labor Market for Recent Science and Engineering Ph.D. Recipients?" Mark Regets, NSF Division of Science Resources Studies Issue Brief, NSF 97-321, September 23, 1997.
[5] "Reconfiguring the Professoriate: An Overview," Jack Schuster, *Academe*, Vol. 84, No. 1, January-February 1998, 49-53.
[6] "Should doctoral education change?" Allyn Jackson, *Notices of the American Mathematical Society*, Vol. 43, No. 1, January 1996, 19-24.
[7] *Selected Data on Graduate Students and Postdoctorates in Science and Engineering: Fall 1995, Supplementary Data Release Number 3: by Source of Major Support,* National Science Foundation.

WORKSHOP SUMMARY AND RECOMMENDATIONS

Catherine Gaddy, CPST

The need for employment outcomes data for doctoral scientists and engineers has increased in recent years as the job market in traditional sectors has tightened, the diversity of employment destinations has increased, and many organizations have come under increased scrutiny about their investments in education and research.

Employment outcome assessment can be **mutually beneficial** to: (1) students and scientists who want to know about employment and careers in the sciences, (2) faculty of doctoral programs who want to know about outcomes of their students, and (3) funding departments/agencies/organizations who want to gauge the impact of their programs and decide how to improve them.

A number of organizations are doing an admirable job of collecting data, many examples of which were collected as part of this project, but work remains to be done:

- **Researchers** should ensure that they are "mining" existing databases, and disseminating their results in usable formats via accessible mediums such as the web. They should develop new survey questions/response choices that are sensitive to an environment in which graduates are pursuing diverse careers.
- **Policy makers** should ensure that they are collecting outcome data for their programs; funding for employment/career outcome evaluation should be proportional to the magnitude of the program being funded (e.g., graduate fellowships, postdocs, etc.).
- **Students** should ask for employment outcome data for graduate programs they are considering.
- **Faculty and administrators** should provide employment outcome data on alumni of their programs/departments for all graduates (and not just the "superstars"). Data on more recent graduates will help inform current students. Periodic data on later careers of graduates (especially post-postdoc) will inform curriculum reviews.
- **Professional societies** should follow up on recent graduates to assess the current job market for those embarking on their careers, and as a way in which to welcome new "professionally young" members to the disciplinary professional societies.
- **Funding agencies** should support employment outcome data collection, and ensure their grantees are coordinating data collection efforts with existing efforts to ensure comparable data to the extent possible and minimize unnecessary duplication of effort.
- **Scientists** should respond to periodic surveys, which have reasonable content and length, to help inform these efforts.

At CPST, we are committed to continuing to pursue data collection and dissemination for and about scientists among professional societies, academic institutions, R&D intensive corporations, government agencies, non-profits, and the public at large. Please let us know your thoughts, and tell us about your data and how they have been used (cgaddy@aaas.org).

APPENDIX TO PART I:
WORKSHOP AGENDA

Employment Outcomes of Doctorates in Science and Engineering

Held Tuesday, March 3, 1998 at AAAS Headquarters, Washington, DC

9:00 - 9:30 Welcome, Objectives and Overview (Geoff Davis, Dartmouth; Catherine Gaddy, CPST)

9:30 - 10:30 Outcomes Data in Higher Education

- AAU/ETS longitudinal project (Rocco Russo, ETS)
- UC-B/CGS 10-year follow up of doctorates (Maresi Nerad, UC-B)
- Accreditation Data (Michael Nugent, Council for Higher Education Accreditation)

10:45 - 11:15 Outcomes Data in Higher Education (Continued)

- State Reviews of Doctoral Programs (Garrison Walters, Ohio Board of Regents)
- Good Practices in Reporting by Graduate Programs (Peter Syverson, CGS)

11:15 - Noon Moderated Discussion/Q&A (facilitator - Daryl Chubin, NSF)

12:30 - 2:00 Other Sources of Outcomes Data

- Overview of Professional Society Data (Catherine Gaddy, CPST)
- Media Sources (Cindy Schaller, *US News & World Report*)
- Federal Data Collection
  - -- Mary Golladay, NSF
  - -- Georgine Pion, on behalf of NIH

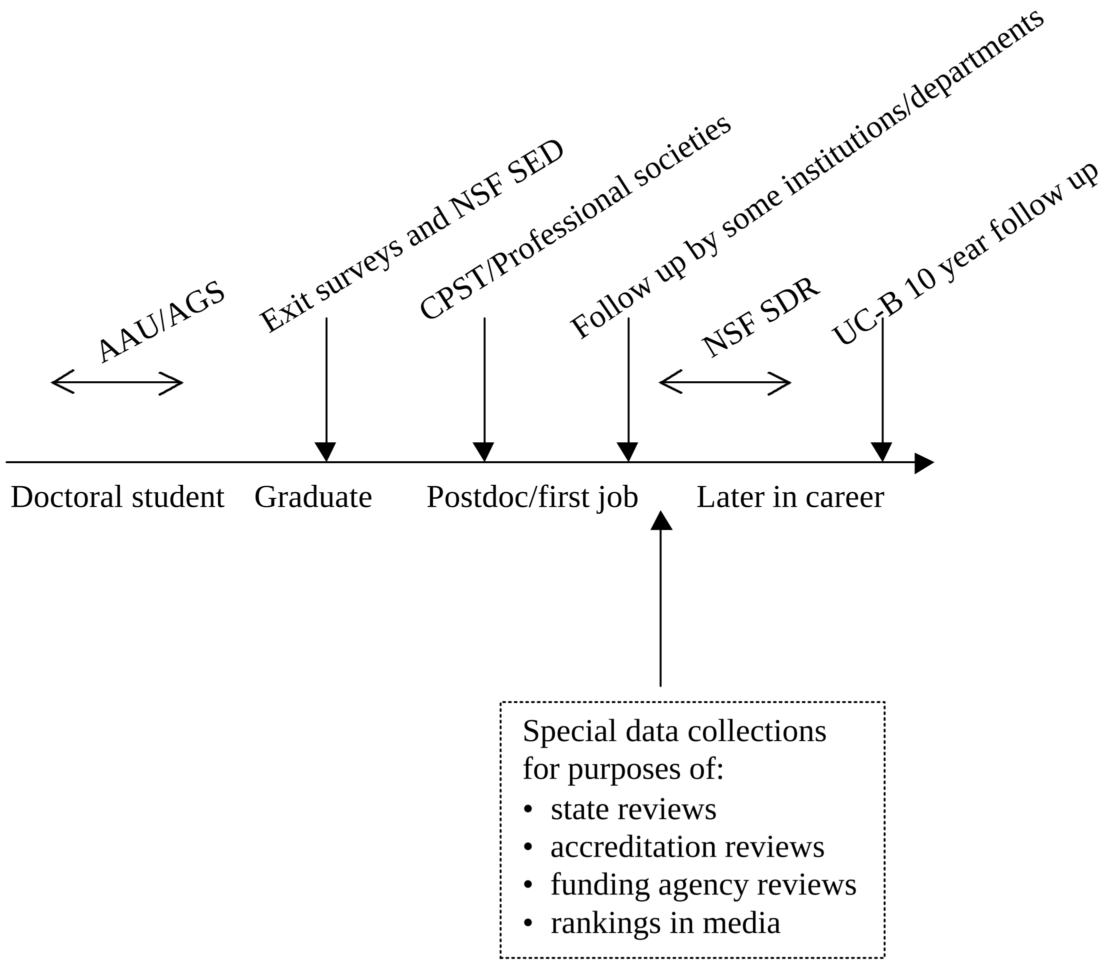
2:15 - 3:30 Other Needs and Suggestions

- Student/postdoc (Kevin Boyer, NAGPS and Robert Rich, ASP)
- Outcomes for Diverse Populations (Shirley Malcom, AAAS)
- Faculty Advisors and Administrators (Douglas Boyd, UT)
- Industrial Employers (Robert Burkart, IRI)

3:30 - 4:00 Recommendations for Reporting and Follow-up Collaboration

Part II. Sources of Data
Compiled by CPST

Points at Which Studies Currently Follow Up on Employment of Doctorates



A. Outcomes Data in Higher Education

1. AAU/AGS

Name: Association of American Universities (AAU)/Association of Graduate Schools (AGS) Project for Research on Doctoral Education

Purpose: Longitudinal data base to track the flow of students into and through doctoral programs

Population: Doctoral students in the following 10 fields:

- Biochemistry
- Chemical engineering
- Economics
- English
- History
- Mathematics
- Mechanical engineering
- Physics
- Political science
- Psychology

Frequency of Survey: Data requested annually

Sample Size: All doctoral students in programs for participating AAU institutions

Response Rate: N/A

Reports: Annual Report series, Program Profile series, and Fact Sheet series

Variables Include:

- Demographics including race/ethnicity and citizenship
- Previous undergraduate/graduate institutions
- GRE scores
- Students' progress/status in Ph.D. program
- Financial aid data

Contact: Rocco Russo at rrusso@ets.org or see web site at http://www.tulane.edu/~aau/agsindex.html

2. UC-B

Name: University of California-Berkeley (UC-B), Graduate Division, Ph.D.s -- Ten Years Later

Purpose: Follow up with Ph.D.s approximately ten years after graduation; describe their career paths and employment patterns; request their retrospective evaluations of their doctoral education

Population: 1983-1985 doctoral recipients from 61 U.S. universities in the following six fields:

- Biochemistry
- Computer science
- Electrical engineering
- English
- Mathematics
- Political science

Frequency of Survey: One time

Sample Size: 5,859, including 70 in-depth interviews

Response Rate: 66% from U.S.; 51% from international

Reports: Report available summer 1999; book forthcoming

Variables Include:

- Overall career path from time of Ph.D. (including postdocs)
- Search for first job after Ph.D.
- Retrospective evaluation of doctoral program
- Opinion of usefulness of doctoral degree
- Salary and household income in 1995
- Demographic information
- Recommendations

Contact: Maresi Nerad at phd10yr@uclink.berkeley.edu

3. Accreditation

Name: Council for Higher Education Accreditation

Purpose: Promote quality among higher education institutions through non-governmental self study and peer review

Population: Regional accreditation available for two-year and four-year colleges and universities, and specialized accreditation available for education/training programs associated with professions that serve the public directly (e.g., engineering)

Frequency of Survey: Periodic; varies by institution and type of accreditation (regional, specialized, etc.)

Sample Size: N/A

Response Rate: N/A

Reports: Colleges, universities, and professional education/training programs are encouraged to make appropriate portions of their self-studies public information

Variables Include:

- Does program have faculty appropriate for its mission?

Contact: Michael Nugent at nugent@chea.org

4. Board of Regents

Name: Ohio Board of Regents (as example of a state that reviewed doctoral programs and considered employment prospects of graduates in its evaluation)

Purpose: At same time that the state budget was shrinking, costs of doctoral education were rising; concerns about quality of education/research and apparently unnecessary duplication among programs; regents could not shut down a program but could remove state funding

Population: Doctoral programs in Ohio in fields of:

- Business
- Chemistry
- Computer science
- Education
- Engineering
- English
- History
- Law
- Life sciences
- Physics
- Psychology

Frequency of Survey: Periodic

Sample Size: 13 public doctoral universities with programs in selected fields in Ohio

Response Rate: N/A

Reports: Report issued February 1997

Variables Include:

- Was there significant employment/job placement of Ph.D.s within three years of graduation (some of these reports were audited to provide spot checks)?
- If program graduates went to postdocs (especially in the life sciences), the programs will be evaluated again in three years to follow up on what happened to the graduates after the postdocs were completed.
- Number of full-time equivalent (FTE) students, which turned out not to be a good metric for allocating funding to graduate programs (i.e., more students at the graduate level were not necessarily better)

Contact: Garrison Walters at gwalters@summit.bor.ohio.gov

5. Council of Graduate Schools

Name: Council of Graduate Schools (CGS), as representative of most major doctoral graduate schools/programs in the United States

Purpose: CGS contacted Deans via electronic mail to ascertain their practices in following up on doctoral graduates' employment

Population: Doctoral

Frequency of Survey: Most departments/programs conduct exit surveys to determine graduates' plans at graduation; fewer follow up later unless some specific need arises; some follow up on the first job placement, while others follow up over the graduates' careers

Sample Size: Varies

Response Rate: Varies

Reports: Examples of universities with different types of employment follow-up activities include:

- *Exit surveys:*
  University of Iowa
  UCLA
- *As need arises:*
  Columbia
  Northern Illinois University
- *Departmental:*
  University of Dayton
  University of Hawaii
  University of Pittsburgh
  University of Texas, Arlington
- *First job placement:*
  Cal Polytechnic, San Luis Obispo (masters only granted but serves as good example)
  Indiana University
  Princeton
  Southern Illinois University
  Texas Tech
  UCLA
  UC San Diego
  University of Minnesota
  Washington State University
  Washington University
- *Follow up over career:*
  Bryn Mawr
  Harvard

LSU
Oregon State System of Higher Education
UC San Diego

Variables Include:

Varies, but as examples

- UC San Diego has outcome data for 1995-1996 Ph.D. recipients including number and percent who took were: teaching (college/university and tenure track or not; or other teaching), postdocs, in other employment (career research position, management/administration, professional artist, post-MD residency or internship), pursuing further education, or still seeking employment.
- Harvard has outcome data at exit (i.e., graduation) and at three-plus years out for those in academic, postdoc and non-academic positions, broken out by broad fields (natural and social sciences).

Contact: Peter Syverson at psyverson@cgs.nche.edu; for information on specific universities, please contact the campuses directly

6. ***Douglas Boyd et al.***

Name: 10 year follow up of 1987 Ph.D.s in tumor biology from one institution (as a model)

Purpose: To follow up on 1997 employment status these Ph.D.s; Dr. Boyd reported his surprise and concern that 30% were still in postdoctoral appointments ten years after graduation, while only 22% had the tenure-track positions for which the program trained them.

Population: Ph.D. graduates from one institution in 1987

Frequency of Survey: One time

Sample Size: 23

Response Rate: 100%

Reports: http://gsbs.gs.uth.tmc.edu/alumni/87survey/87survey.html

Variables Include:

- Sector of employment (academia, industry, etc.)
- Tenure/tenure track status if applicable
- Postdoctoral appointment if applicable
- Clinical careers in medicine if applicable
- Administrative positions if applicable

Contact: Douglas Boyd at douglasdw@odin.mdacc.tmc.edu

B. Other Sources of Outcome Data

1. CPST/Professional Societies

Name: Commission on Professionals in Science and Technology (CPST)/professional societies' projects to follow up on employment of recent doctorates

Purpose: Coordinate collection of cross-sectional data from graduates within a year of graduation so comparable data is available across fields

Population: Recent doctoral graduates in 13 fields of:

- Biochemistry and molecular biology
- Chemistry and chemical engineering
- Computer science
- Earth & space sciences
- Economics
- Engineering
- Mathematics
- Microbiology
- Physics
- Physiology
- Political science
- Psychology
- Sociology

Frequency of Survey: Initial start up funding was provided by Alfred P. Sloan Foundation, the National Science Foundation, and the Burroughs Wellcome Fund to establish programs and perform a pilot test and one additional survey. Goal for societies to support surveys in out years via proceeds from sales based on data and/or as part of new member recruitment

Sample Size: All doctoral graduates provided by participating departments for recent year (July 1- June 30)

Response Rate: Varies

Reports: http://www.nextwave.org/survey1.htm; also *Road Map for Conducting Employment Surveys of Doctoral Graduates in S&E*, May 1998, available from CPST (202-326-7080 or cgaddy@aaas.org)

Variables Include:

Core set of data include the following (many societies are collecting additional data for their respective fields)

- Demographics
- Education (doctoral only)
- Employment (employed, permanent versus temporary, unemployed and seeking, sector of employment, work activities, salary, job search methods, etc.)

Contact: Catherine Gaddy at cgaddy@aaas.org

2. American Chemical Society

Name: American Chemical Society (ACS) membership survey

Purpose: To collect demographic and employment information on professional society members

Population: Members of ACS (who have not retired)

Frequency of Survey: Annual

Sample Size: Sampling frame is 20,000; complete census in years divisible by five

Response Rate: Typically 53-55%

Reports: www.chemcenter.org

Variables Include:

- Employment status
- Salaries
- Demographics

Contact: Mary Jordan at ***m_jordan@acs.org***

3. American Institute of Physics

Name: American Institute of Physics (AIP) membership sample survey

Purpose: To collect demographic and employment information on professional society members

Population: Individuals who belong to 10 AIP member societies and reside in the U.S.; about half of respondents have Ph.D.s, the majority of which are in physics and astronomy

Frequency of Survey: Biennial

Sample Size: Sampling frame is 90,000-100,000; sample is 16,000-17,000

Response Rate: Typically 63-67%

Reports: Free two-page summaries; small fee for full report, *Salaries: Society Membership Survey*; www.aip.org/statistics/

Variables Include:

- Salaries
- Sector
- Work activity
- Sub-field of work

Contact: Patrick Mulvey at pmulvey@aip.acp.org

4. US News & World Report

Name: *US News & World Report* (as example of one major media outlet for data on graduate programs)

Purpose: Provide consumers (i.e., potential students and their parents/guardians) with rankings of the best graduate programs.

Population: Art, business, education, engineering, law, medicine, sciences

Frequency of Survey: Annual

Sample Size: Varies

Response Rate: Varies

Reports: http://www.usnews.com

Variables Include: To date, at the graduate degree level, placement rates and salary are available only for business and law schools.

Contact: Cindy Schaller at cschaller@usnews.com

5. National Science Foundation

Name: National Science Foundation (NSF) Science Resources Studies (SRS) Division, Survey of Doctorate Recipients (SDR)

Purpose: Produce congressionally mandated report on *Women, Minorities and Persons with Disabilities in Science and Engineering*. As past of mandate, collect data on education and employment of scientists and engineers.

Population: Individuals under age 76 who received a research doctorate in science and engineering from a U.S. institution and were residing in the U.S. in April of the survey year

Frequency of Survey: Biennial, odd-numbered years

Sample Size: Approximately 50,000; sampling frame is the file from the annual Survey of Earned Doctorates (which all doctorates complete at graduation)

Response Rate: Typically good

Reports: www.nsf.gov/sbe/srs/stats.htm

Variables Include:

- Labor force status
- Employer's main business
- Additional detail for those employed in educational institutions
- Alternative/temporary work arrangements
- Primary work activity
- Annual salary and household income
- Job security concerns, reasons for leaving the work force
- Professional society activity
- Continuing education
- Special emphasis modules (one or more selected years only); 1995 module on Post-doctoral Experiences; 1997 module on Career Goals and Job Search Experiences for Recent (1990-1995) Doctorates

Contact: Mary Golladay at mgollada@nsf.gov

6. National Institutes of Health

Name: National Institutes of Health (NIH) - wide efforts and specific institute/program initiatives

Purpose: To assess the career outcomes of the predoctoral and postdoctoral research training programs funded by the NIH in the biomedical, behavioral, and clinical sciences; to identify research needs and priorities so as to better meet the demand for productive investigators in these areas. These programs include both training grants to institutions and individual fellowships.

Population: Researchers in biomedical, behavioral, and clinical sciences. Study group populations as well as those used for appropriate comparison groups vary, depending on the specific programs being assessed and the major evaluation questions of interest. Special studies currently underway include assessments of the career outcomes of predoctoral and postdoctoral trainees and fellows (i.e., recipients of National Research Service Awards), including Ph.D.s, M.D.s. and other health professional doctorates (e.g., D.D.S.s. and D.V.M.s), and M.D./Ph.D.s.

Frequency of Survey: Variable for large-scale evaluations. Recipients of training grants are required to track the outcomes of their trainees for 5 years after their NIH-supported training has ended.

Sample Size: Varies

Response Rate: Varies

Reports: Previous assessments include: P. E. Coggeshall & P. W. Brown, *The Career Achievements of NIH Predoctoral Trainees and Fellows*, 1984; H. H. Garrison & P. W. Brown, *The Career Achievements of NIH Postdoctoral Trainees and Fellows*, 1986; and National Research Council, *Meeting the Nation's Needs for Biomedical and Behavioral Scientists*, 1994. Data on NIH-supported training (e.g., trends in award recipients) and forthcoming reports can be found at www.nih.gov .

Variables Include: Those that are available from existing data sets developed, supported, or obtained by the NIH (e.g., SED, SDR, NIH data sets on grant applications and awards, and bibliometric databases), and are relevant to goals and expected outcomes of the respective NIH training program(s):

- Completion of the doctorate (SED)
- Time-to-degree (SED)
- Field of degree (SED)
- Pursuit of research career after Ph.D. receipt (including additional postdoctoral research training and employment in a research-intensive position)
- Focus on health-related research
- Receipt of NIH and other external research support
- Publications and citations

Contact: Walter Schaffer at schaffew@odrockm1.od.nih.gov

7. Steven Smith et al.

Name: Physical Science Ph.D. Careers Project

Purpose: In-depth study of careers and work activities of recently graduated physical science Ph.D.s.

Population: 1990-1994 physical science (physics, chemistry, astronomy, and atmospheric science) graduates of 6-8 medium to large universities

Frequency of Survey: One time

Sample Size: Approximately 1,500; including 45 in-depth interviews and follow up survey of entire cohort

Response Rate: TBD

Reports: NSF project report forthcoming

Variables Include:

- Career paths
- Work activities
- Graduate training
- Relationships among above

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