

# To Post-Doc or Not To Post-Doc, That is the Question

-with apologies to W. Shakespeare

- What is a post-doc?
- What can I expect to gain as a post-doc?
  - Training (research, teaching, personnel management, grant writing)
  - Networking
  - New research projects
  - Salary/Benefits
- Do doctoral recipients in all fields do post-docs?
- Will I need to do a post-doc?
  - What are my career goals?
  - What career goals require a post-doc?
- How do I choose a post-doc mentor?
- Who funds post-doctoral research training?
- What resources are available to help plan for a post-doctoral position?

## What is a post-doc?

- The National Institutes of Health (NIH) and the National Science Foundation (NSF) define a postdoctoral position as "a **temporary** and **defined period** of **mentored advanced training** to enhance the professional skills and research independence needed to pursue his or her chosen career path."
- It is estimated that there are approximately **89,000 post-docs** involved in research in the United States (National Science Foundation, Science and Engineering Indicators 2008). The number of post-docs in the U.S. has been **steadily increasing** due to the fact that the post-doc position has become the **de facto next career step** following the receipt of a doctoral degree in many disciplines.

## What Can I Expect to Gain as a Post-Doc?

### -Training

- New techniques
- New discipline
- New research approaches
- New colleagues and competitors
- Potential management of graduate students, technicians, undergraduates
- Grant writing opportunities
- Teaching opportunities

### -Networking

- Your colleagues and peers will be next generation of faculty, grant and manuscript reviewers, journal editors, symposium organizers
- These contacts will be critical for your career development and success

### -Projects

- Your post-doctoral research project(s) will, in all likelihood, be what your research will focus on should you become a faculty member

### -Salary/Benefits

## What Can I Expect to be Paid as a Post-Doc?

### NIH Recommended Post-doctoral Stipend Levels

Career Level	Years of Experience	Stipend for FY 2011
Predoctoral	All	\$21,600
Postdoctoral	0	\$38,496
	1	\$40,548
	2	\$43,476
	3	\$45,192
	4	\$46,884
	5	\$48,900
	6	\$50,832
	7 or More	\$53,112

## What Can I Expect to be Paid as a Post-Doc?

Salary and benefits of U.S. S&E doctorate holders in post-doc positions: 2006					
Field of doctorate	Median salary (\$)			Benefits (%)	
	Academic postdoc	Nonacademic postdoc	Nonpostdocs 1-3 years after degree	Medical	Retirement
All S&E	40,000	48,000	60,000	90.1	48.9
Computer/mathematical sciences	47,000	55,000	72,000	93.0	69.1
Life sciences	40,000	44,000	55,000	92.9	47.7
Physical sciences	40,000	55,000	63,000	92.7	54.7
Social sciences	40,000	50,000	53,000	75.0	44.8
Engineering	40,000	60,000	71,400	92.4	56.2

## What Can I Expect to be Paid as a Post-Doc?

Median annual salary of recent doctorate recipients 1–5 years after receiving degree, by type of employment: 2006 (in dollars)						
Field	All sectors	Private	Tenure track	Postdoc	Other education	Nonprofit/government
<b>All S&amp;E fields</b>	52,000	80,000	53,000	40,000	48,500	68,000
Computer/mathematical sciences	64,000	90,000	62,000	48,500	48,000	S
<b>Life sciences</b>	<b>42,600</b>	<b>74,000</b>	<b>57,000</b>	<b>40,000</b>	<b>48,000</b>	<b>60,000</b>
Physical sciences	53,000	78,000	50,500	42,000	48,000	76,000
Social sciences	51,300	65,000	52,000	39,600	50,000	62,000
Engineering	70,000	80,000	71,000	40,000	56,000	80,000

## Do Doctoral Recipients in All Fields Do Post-Docs?

Not necessarily, the percentage **varies** by discipline but is **increasing** in all disciplines.

Percentage of doctorate recipients with definite commitments who plan postdoctoral study or research, by broad field of study: 1982 and 2002

Field of Study	1982	2002
Biological sciences	72.1	74.4
Physics/astronomy	48.8	66.7
Chemistry	39.8	52.9
Earth, atmospheric, ocean sciences	25.9	51.6
Mathematics	15.8	42.5
Psychology	16.6	38.8
Agricultural sciences	15.9	38.3
Engineering	11.4	24.8
Health sciences	15.4	21.1
Computer sciences	9.1	19.7
Social sciences	7.1	15.0
Humanities	4.8	10.4
Professional fields/other	1.4	6.1
Education	2.5	5.5

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates

## The Number of Post-Docs and the Length of the Average Post-Doc Has Increased Dramatically in the Last 30 Years

- Between 1980 and 1998, the number of post-doctoral researchers **doubled** at academic institutions. Almost **75 percent** of this increase was in the life sciences.
- Concurrent with this growth, the average tenure for a post-doctoral appointment increased. In the early 1970s, 61 percent of the total biomedical doctorates spent **2–4 years** as post-doctoral researchers; this increased to 76 percent by the late 1980s.
- Only 21 percent of doctorates spent **more than 4 years** as post-doctoral scientists in the early 1970s compared with **40 percent** in the late 1980s. In the biological sciences, the median time spent by scientists with U.S.-earned PhDs in a post-doctoral appointment is **more than four years**.

-Committee on Science, Engineering, and Public Policy (COSEPUP). Enhancing the Postdoctoral Experience for Scientists and Engineers: A Guide for Postdoctoral Scholars, Advisers, Institutions, Funding Organizations, and Disciplinary Societies. Washington, DC: National Academy Press; 2000.



## Why Have the Number and Length of Post-Docs Increased so Dramatically?

- One of the main contributing factors is that **there are not enough faculty positions** available in the US to keep up with the growing number of PhDs granted every year.
- Tenure-track faculty positions have **remained fairly stable** since 1991 while PhDs earned have **increased 55%** over the same period. To put this in perspective, there were 168,000 full-time faculty in 2006 and 41,000 science and engineering doctorates awarded the following year alone.
- This trend has led to fewer PhDs employed in academia (down to 45% from 55% over 1973-2006) and of those in academia, a greater proportion are now found in post-doctoral or non-tenured positions.

**Percentage of doctorate recipients holding tenure and tenure-track appointments  
at academic institutions, by years since receipt of doctorate and selected field:  
1993, 2003, and 2006**

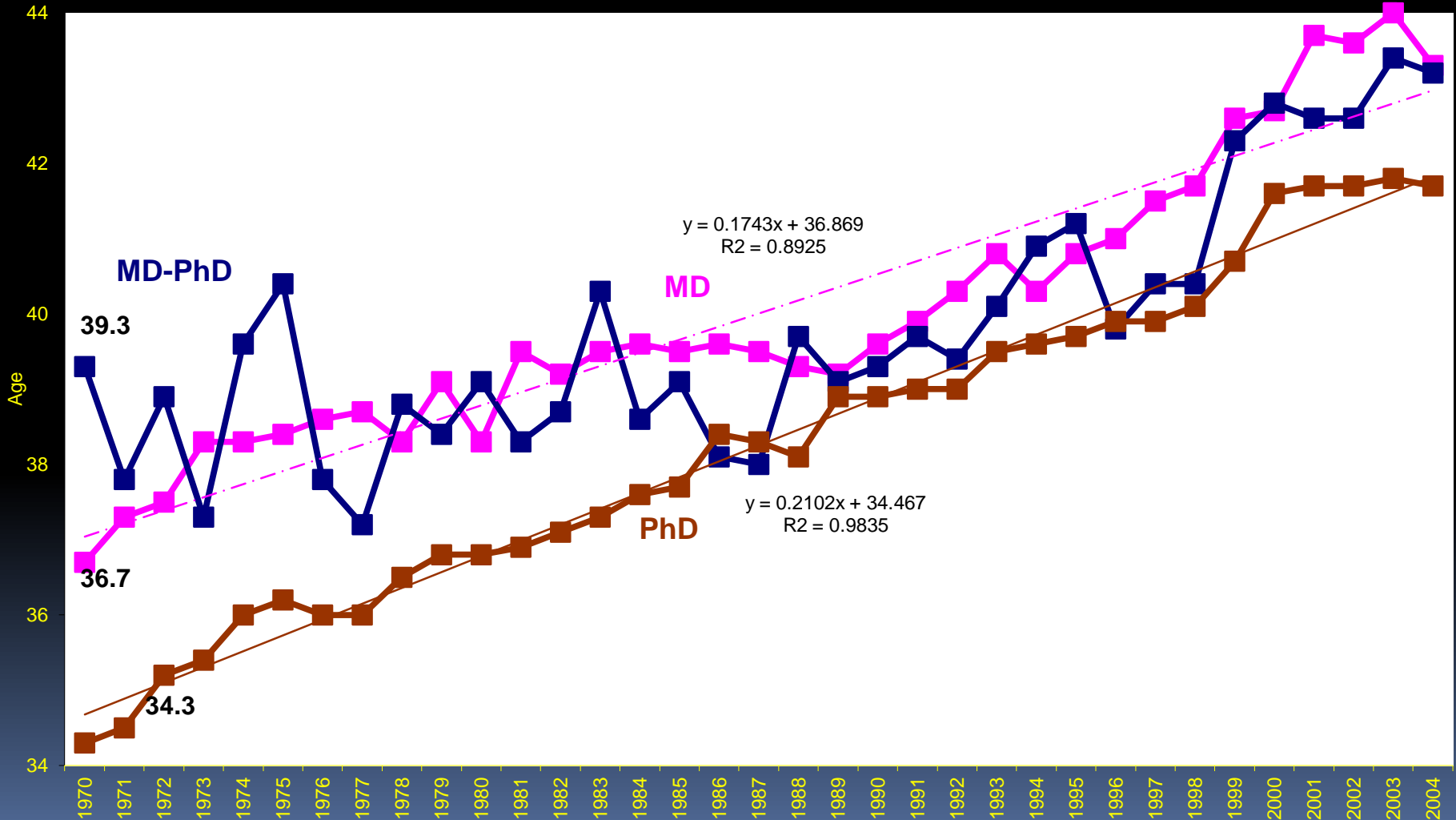
Science & Engineering Field	1993		2003		2006	
	1–3 years	4–6 years	1–3 years	4–6 years	1–3 years	4–6 years
<b>All fields</b>	18.4	26.6	17.8	23.5	19.2	25.8
<b>Computer/mathematical sciences</b>	39.7	54.1	34.5	38.1	36.1	44.0
Computer sciences	37.1	51.5	30.9	30.3	37.8	36.4
Mathematics	41.8	56.0	37.7	43.8	34.7	50.6
<b>Life sciences</b>	12.6	24.8	8.0	20.3	13.4	20.8
Agriculture	15.6	27.0	23.7	35.1	18.9	30.0
Biological sciences	12.1	24.8	6.5	18.6	13.2	20.6
<b>Physical sciences</b>	9.7	18.2	13.7	18.2	10.7	23.8
Chemistry	7.7	16.3	14.5	16.0	11.0	22.2
Geosciences	12.7	26.2	21.6	35.1	13.9	30.5
Physics/astronomy	12.0	17.7	9.4	14.5	8.7	22.5
<b>Social sciences</b>	26.4	29.2	28.3	31.6	29.6	34.2
Economics	46.6	48.6	43.7	32.2	37.4	39.4
Political science	53.9	47.1	45.0	50.6	45.0	51.3
Psychology	12.7	15.5	14.5	21.1	18.7	21.9
Sociology/anthropology	37.9	46.9	43.3	48.0	62.1	65.0
<b>Engineering</b>	16.0	24.6	12.2	16.0	14.7	16.6
Chemical	8.1	14.0	4.9	6.0	8.2	9.4
Electrical	17.6	26.9	11.6	15.3	18.6	15.4
Mechanical	13.5	29.5	11.1	16.0	16.5	14.6

NOTES: Two-year institutions not included. Doctorate recipients in health fields included in life sciences.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Doctorate Recipients (1993, 2003, and 2006), Scientists and Engineers Statistical Data System (SESTAT), <http://sestat.nsf.gov>.

As the average length of post-doctoral experiences has increased, the average age of first-time RO1 recipients has also increased

Average Age of New Investigators at Initial R01 Equivalent award



Bureau of Labor Statistics projections of employment and job openings in S&E occupations: 2006–16 (in Thousands)

Occupation	BLS National Employment Matrix 2006 estimate	BLS projected 2016 employment	Job openings from growth and net replacements, 2006–16	10-year growth in total employment (%)	10-year job openings as percent of 2006 employment
<b>All occupations</b>	150,620	166,220	50,732	10.4	33.7
<b>All S&amp;E</b>	5,187	6,296	2,280	21.4	43.9
Computer/mathematical scientists	2,859	3,694	1,466	29.2	51.3
<b>Life scientists</b>	<b>258</b>	<b>292</b>	<b>103</b>	<b>12.8</b>	<b>40.0</b>
Physical scientists	267	309	109	15.7	41.0
Social scientists/related occupations	291	330	96	13.3	32.9
Engineers	1,512	1,671	505	10.6	33.4
<b>S&amp;E-related occupations</b>					
S&E managers	513	616	200	20.1	39.0
S&E technicians	874	986	303	12.8	34.7
Computer programmers	435	417	91	-4.1	20.9
Physicians and surgeons	633	723	204	14.2	32.3
Health technologists and technicians	2,612	3,094	1,074	18.5	41.1
<b>Selected other occupations</b>					
Postsecondary teachers	1,672	2,054	662	22.9	39.6
Lawyers	761	844	228	11.0	29.9

BLS = Bureau of Labor Statistics

NOTES: Estimates of current and projected employment for 2006–16 period from BLS's National Employment Matrix. Data in matrix from Occupational Employment Statistics (OES) survey and Current Population Survey (CPS). Together, these sources cover paid workers, self-employed workers, and unpaid family workers in all industries, agriculture, and private households. Because derived from multiple sources, data can often differ from employment data provided by OES, CPS, or other employment surveys alone. BLS does not make projections for S&E occupations as a group; numbers in table based on sum of BLS projections in occupations that National Science Foundation considers S&E.

SOURCE: BLS, Office of Occupational Statistics and Employment Projections, National Industry-Occupation Employment Projections, 2006–2016 (2007).

## Will I Need to do a Post-Doc?

- What are my career goals?

-Academia:	Probably <b>YES</b>
-Government:	Probably NO
-Biotech/Pharma:	Probably NO
-Think tanks:	Probably NO
-Science Writer/Editor:	Probably NO
-Biotech/Pharma Stock Analyst:	Probably NO
-Professor at Non-Research 1 University:	Probably NO

- What if I am undecided about my career goals, will a post-doc hurt me? **NO**

## How Do I Choose a Post-doctoral Mentor?

- What research topics are **interesting** to you? What do you envision working on as an **independent investigator**?
  - Choose potential labs based on their **research focus**
- How might you **complement your current skills** with those offered in a post-doctoral lab?
  - Immune cell signaling + host/pathogen interactions
  - Stem cell biology + regenerative medicine
  - Mechanisms of secretion + cystic fibrosis research
  - DNA damage response + breast cancer genes
- What else should I be thinking about?
  - Choose a **well-funded lab** with a clear scientific focus and a **track record** of turning out publications and successful scientists
  - Think of yourself as part of a lab's **pedigree**: have previous post-docs been productive? Did they move on to positions that you could see yourself doing? Have they been successful in these new positions?

## Questions to Consider/Ask When Searching for a Post-Doctoral Mentor

1. What are the adviser's **expectations** of the post-doc?
2. Will the adviser or the post-doc determine the research program?
3. How many post-docs has this adviser had? **Where did they go** afterward?
4. What do current and past lab members think about their experience?
5. Will the adviser have **time for mentoring**? Or should I seek out other mentors?
6. How many others (grad students, staff, post-docs) now work for this adviser?
7. How many papers are being published? Where?
8. What is the adviser's policy on travel to meetings? Authorship? Ownership of ideas?
9. Will I have practice in grant writing? Teaching/mentoring? Oral presentations? Review of manuscripts?
10. Can I expect to **take part of the project away** after the post-doc?
11. How long is **financial support guaranteed**? On what does renewal depend?
12. Can I count on help in finding a position?
13. Will the adviser have adequate research funds to support the proposed research?

## The Relationship Between Post-docs and Mentors is Becoming More Formalized

- NSF now requires that post-doc grant applications must include a one-page **mentoring plan** or these grants will not be reviewed. What is a mentoring plan? A specific set of steps that will be taken to ensure **professional** (becoming a productive and independent researcher) and **career** (providing guidance and resources for identifying and achieving the next career milestone) development.
- Similar requirements are in place, or soon will be, from other funding agencies.
- **Formalization of mentor/post-doc relationship** is becoming increasingly common. Many recommend that specific plans should be adopted for how post-doctoral experiences will address (i) the career goals of the post-doc and (ii) perceived competitive weaknesses.
- Most premier research **universities now have dedicated offices** that focus on post-doctoral needs and career development. These offices often sponsor seminars and workshops geared towards improving career success.



## How are Post-Doctoral Experiences Funded?

- Often a **mentor's research grants** will include slots for post-doctoral stipends. In general, mentors use these slots as leverage to garner additional extramural post-doctoral funding. That is, you might be funded initially in a grant slot but be expected to **write for post-doctoral fellowships** upon or prior to arrival.
- Often institutions have **training grants** that include slots for post-doctoral trainees. These slots are usually competitive, and thus you and the mentor would apply for these funds and be **peer reviewed internally**.
- Many **public and private funding agencies** provide support for post-doctoral training. Some examples:
  - **NIH**, NSF, DoD
  - American Cancer Society, Leukemia and Lymphoma Society, Life Sciences Research Foundation, American Society for Microbiology, American Lung Foundation, American Diabetes Association, American Heart Association, Burroughs Welcome Fund

## NIH Post-Doctoral Fellowship Mechanisms: Lots of Options

### ■ Ruth L. Kirschstein National Research Service Award (NRSA) for Individual Postdoctoral Fellows

- These are highly competitive stipends that provide support to promising applicants with the potential to become productive, independent investigators in scientific health-related research fields relevant to the missions of participating NIH Institutes and Centers. Applicant fellows **must be citizens or non-citizen nationals of the United States or permanent residents.**

### ■ Pathway to Independence Award

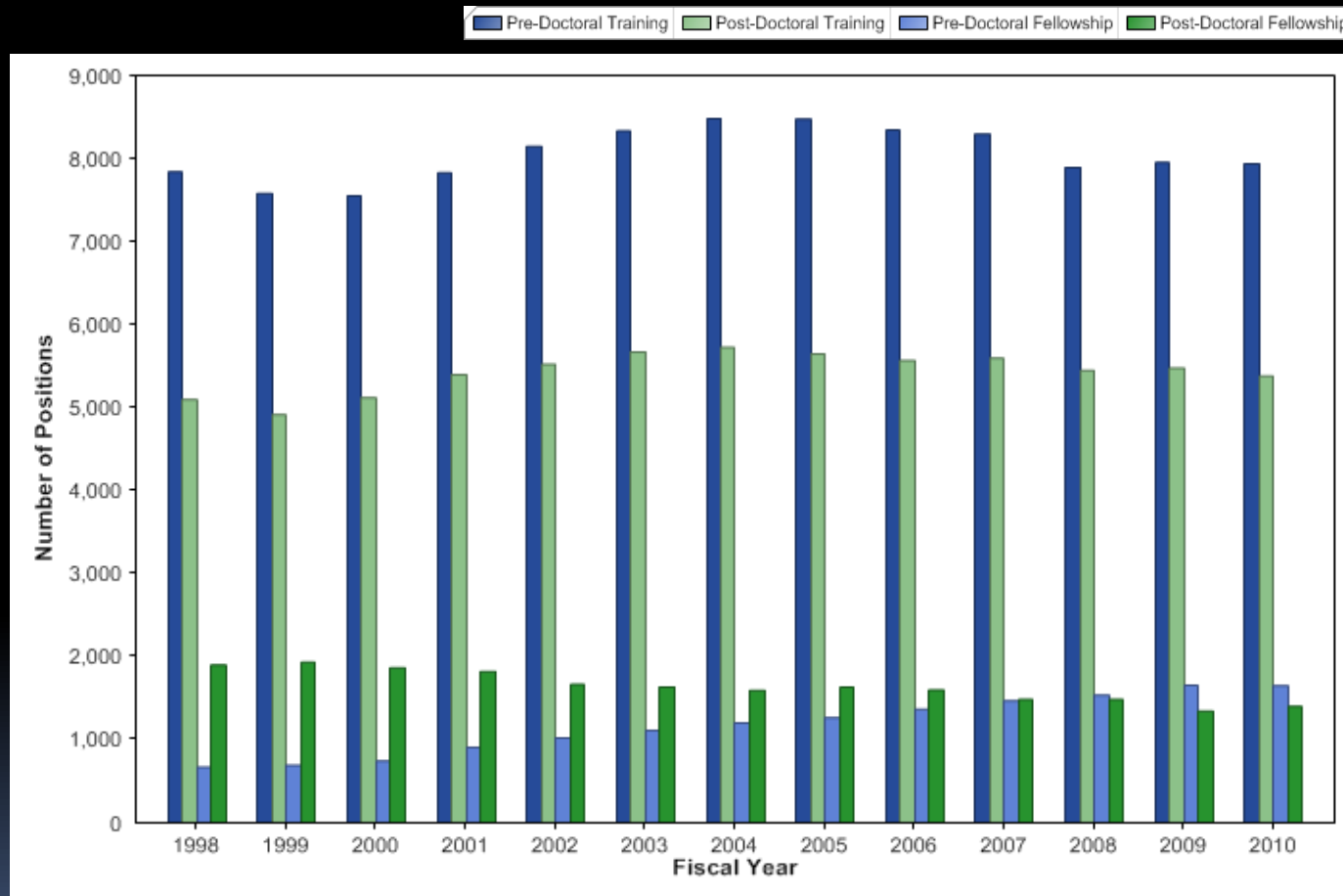
- Provides up to 5 years of support consisting of two phases. The initial phase will provide **1-2 years of mentored support** for post-doctoral research scientists. This phase will be followed by **up to 3 years of independent support** contingent on securing an independent tenure-track or equivalent research position.

### ■ K Awards

Many different types (e.g., some are dedicated for **clinician/scientists**, their purpose sometimes varies by NIH institute)

# Kirschstein-NRSA Training Grants and Fellowships

Pre- and Post-Doctoral full-time training positions awarded



## What Resources are Available to Help Plan For a Post-doctoral Position?

National Post-Doctoral Association: <http://www.nationalpostdoc.org/>

HigherEd Jobs:

<http://www.higheredjobs.com/HigherEdCareers/interviews.cfm?ID=184>

Science:

[http://sciencecareers.sciencemag.org/career\\_magazine/previous\\_issues/articles/2003\\_11\\_21/noDOI.11212074956017904155](http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2003_11_21/noDOI.11212074956017904155)

Science Alliance: <http://www.scienceallianceforum.org/directorsjournal/tag/career-trends>

NCSU: <http://www.ncsu.edu/grad/postdoctoral-affairs/index.php>

NSF: <http://www.nsf.gov/statistics/seind10/>

[http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=503622&org=NSF](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503622&org=NSF)

NIH: <http://grants.nih.gov/training/nrsa.htm>