



NPA

National Postdoctoral Association

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RECOMMENDATIONS TO THE
NATIONAL ACADEMIES OF SCIENCE
BOARD ON HIGHER EDUCATION AND WORKFORCE

“Postdocs are central to this nation’s global leadership in science and engineering...It is largely they who account for the extraordinary productivity of science and engineering research in the United States.”

--National Academy of Sciences, Committee on Science, Engineering and Public Policy¹

EXECUTIVE SUMMARY

The United States is the world's leader in science, technology and engineering, and attracts outstanding scholars from around the world to conduct research in laboratories at its universities and research institutes. The recent unprecedented doubling of the National Institutes of Health's budget reflects the commitment that our nation has made toward maintaining the strength of its research enterprise.

Nevertheless, careers in science have become increasingly unattractive to young people in the United States, and this is a cause of great concern. Research careers entail long periods of training, both as a graduate student and a postdoctoral scholar (postdoc). The period of postdoctoral training has become increasingly long, and is characterized by low wages, poor benefits, insufficient recognition of one's contributions to science, and uncertain career opportunities. While the number of PhDs granted in science and engineering has increased 35 percent since 1972, fewer Americans receive PhDs in these fields than they did 30 years ago². This, of course, has serious implications not only for our nation's researchers, but for the health of the nation and for the economy as a whole, both of which are driven by advances in science and technology.

To help make careers in science and engineering more attractive, we propose the following:

- Facilitate the transition to career independence for postdocs
- Improve compensation and benefits packages for postdocs.
- Increase representation among underrepresented minorities, especially among African-Americans, Latinos, and Native Americans, in science and engineering.
- Limit increases to the aggregate number of PhDs in the basic biomedical sciences.
- Increase data collection and tracking of scientists' career outcomes
- Expand support for multidisciplinary training.

¹ From “Enhancing the Postdoctoral Experience for Scientists and Engineers”, Committee on Science, Engineering and Public Policy, National Academy of Sciences, 2000.

² NSF *Survey of Earned Doctorates*, 2003.

The Role of the National Postdoctoral Association

The National Postdoctoral Association (NPA) is a membership-driven, not-for-profit advocacy organization that provides a unique national voice for postdoctoral researchers from all disciplines. Founded in 2003, the NPA is funded by a grant from the Alfred P. Sloan Foundation and supported by the American Association for the Advancement of Science (AAAS). The NPA seeks to work collaboratively with all stakeholders to advocate for improvements in the postdoctoral experience.

The National Postdoctoral Association defines a postdoctoral scholar (“postdoc”) as an individual holding a doctoral degree who is engaged in a temporary period of mentored research and/or scholarly training for the purpose of acquiring the research and professional skills needed to pursue a career path of his or her choosing. Postdoctoral appointees can pursue basic, clinical or translational projects so long as their primary effort is devoted to their own research. Postdocs are essential to the scholarly missions of the mentor and host institution, and are expected to have the freedom to publish the results of their scholarship.

What distinguishes the NPA from other professional associations or agencies with an interest in postdoctoral affairs is that, first and foremost, the NPA speaks for and represents postdocs. The NPA seeks to achieve its goals by working closely and collaboratively with federal and private funding agencies, professional associations, university administrators, faculty, and postdocs to forge a feasible framework for positive change in the postdoctoral experience.

NPA RECOMMENDATIONS TO THE NATIONAL ACADEMY OF SCIENCES BOARD ON HIGHER EDUCATION AND WORKFORCE

Introduction:

In the past 30 years, basic biomedical research in the United States has led to dramatic progress in both our understanding of biology and our ability to treat diseases. Postdoctoral scientists have played an essential role in the success of this effort. Indeed, postdocs have made extraordinary contributions to discoveries in all fields of biomedical research, and they help to fulfill the mission of the NIH and the university-based research laboratories it funds.

Unfortunately, it appears that science is becoming a less attractive career choice for young Americans. Despite a 35 percent growth in the number of PhDs granted in the hard sciences by American universities from 1972 to 2002, there was a five percent decrease in the number of PhDs granted in those fields to US citizens.³ The difference has been met by an increasing and ready pool of foreign scholars who now comprise over 50 percent of the U.S. postdoctoral

³ National Science Foundation, Division of Science Resource Statistics, *Survey of Earned Doctorates*, 2003.

population.⁴ In addition, there is an increasing culture of dissatisfaction and disillusionment among postdoctoral scholars regardless of national origin, and this will continue to negatively impact the U.S. science and technology enterprise until it is addressed.

Many factors have been proposed to account for the increased dissatisfaction of the postdoctoral population. These include:

- Long duration of training following receipt of PhD
- Poor career options, both real and perceived
- Inadequate compensation and benefits
- Mismatch between expectations and assumptions of the postdoc and the mentor

These factors may, in both the present and the future, discourage our "best and brightest" from embarking on biomedical research careers. Therefore, to improve the postdoctoral experience in biomedical, behavioral and clinical research for young scientists, The NPA recommends the following:

❖ Facilitate the Transition to Career Independence for Postdocs

The transition from postdoctoral researcher to independent scientist is perhaps the most challenging step in the career of a research scientist. Recent data indicate that this transition has become increasingly difficult. The population of postdoctoral researchers in the biomedical sciences has grown rapidly in recent years, more than doubling from 1981-1998. Despite the desire of many Ph.D. researchers to pursue academic careers, the number of tenure-track faculty positions has remained essentially flat over the past 20 years.⁵ Postdocs find it increasingly difficult to secure permanent positions without a source of independent funding, but are often prevented by institutional restrictions from applying for R01-type grants. The paucity of career transition awards contributes to the prolonged period of postdoctoral "training", and is likely to represent one disincentive discouraging America's best graduates from electing to pursue careers in science.⁶

To address this emergent need, the NPA has previously proposed, in a white paper to the NIH⁷, the establishment of a new extramural NIH career-transition granting mechanism based upon the strengths of the current K-series awards and the career development/transition awards of the Burroughs Wellcome Fund⁸ and National Multiple Sclerosis Society⁹. The NPA's intent for these transitional awards is to identify the highest-quality scientists while they are still

⁴ National Science Foundation, Division of Science Resource Statistics, *Graduate Students and Postdoctorates in Science and Engineering*: Fall 2001, NSF 03-320, Project Officer, Joan S. Burrelli (Arlington, VA 2003)

⁵ National Science Foundation, Division of Science Resource Statistics, *Survey of Doctoral Recipients*, 2001, and Scientists and Engineers Statistical Data System (SESTAT database).

⁶ Freeman et al., *Careers and Rewards in Biosciences: the disconnect between scientific progress and career progression*, American Society for Cell Biology, 2001; Freeman et al., *Careers: Competition and Careers in Biosciences*, *Science* 294: 2293-294, 2001; Teitelbaum, M.S., *The US Science and Engineering Workforce: An Unconventional Portrait*, in the Pan-Organizational Summit on the U.S. Science and Engineering Workforce Meeting Summary, National Academy Press, 2003.

⁷ http://www.nationalpostdoc.org/white_paper

⁸ http://www.bwfund.org/programs/biomedical_sciences/career_background.html

⁹ <http://www.nationalmssociety.org/Research-CareerTransition.asp>

postdoctoral fellows, and to give them the financial and scientific independence to develop new projects in anticipation of their obtaining fully independent positions. By providing a clear path for these talented individuals, we will both encourage them to continue to pursue a scientific career and ensure that they will have protected time and resources to be as productive as possible. Given that a crucial part of the NIH's mission is training the next generation of scientists, the NPA encourages the establishment of this type of award mechanism to serve the emergent needs of young biomedical and behavioral researchers.

❖ **Improve Compensation and Benefits Packages for Postdocs**

Concerns over compensation and benefits are frequently noted as critical issues among postdoctoral scholars, institutions, and policy makers. The observations that compensation during postdoctoral training begins at \$35,000 for Kirschstein-NRSA postdoctoral fellows¹⁰, and that career outcome projections are poor, are often cited as important reasons underlying the decrease in the number of U.S. citizens entering biomedical research careers. In addition, the increased period of time spent in training means that postdocs are at a stage of life when they are supporting families and should be saving for retirement, which makes the low level of compensation particularly inappropriate and difficult to bear. Despite recent progress toward improved compensation and benefits by the NIH, there is still considerable work to be done to truly serve the needs of postdoctoral scholars. The NPA recommends the following to ensure that postdocs receive appropriate compensation and benefits, thus improving the economics of entering a biomedical research career:

- Adherence to the proposed schedule for Kirschstein-NRSA postdoctoral stipend increases
- Consistent compensation and benefit support for all postdocs regardless of NIH funding mechanism
- Increased institutional allowances for Kirschstein-NRSA recipients
- Consideration of regional cost of living adjustments to NIH-funded postdoctoral stipends

The NIH has taken great strides toward improving compensation for postdocs. The NPA applauds the NIH for its proposed schedule of increases in Kirschstein-NRSA stipend levels, and for the initial implementation of that plan. Although not intended as such, the Kirschstein-NRSA award has become the standard to which all other funding agencies and institutions compare their stipend levels. It is unfortunate that the President's FY2005 Budget request freezes Kirschstein-NRSA stipend levels at 2004 levels. **The NPA strongly recommends that the NIH do what it can to maintain the current schedule for Kirschstein-NRSA stipend increases, even if that should translate to decreased numbers of awards.**

The low salaries and lack of retirement benefits afforded postdoctoral researchers, combined with the average 12 years it takes after college for a Ph.D. in the biological sciences to obtain a permanent position, paints a bleak picture of the financial future of our young talent. This issue is increasingly important as the current postdoctoral population is older and more likely to be

¹⁰ <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-04-023.html>; National Association of Colleges and Employers, press release on Spring 2004 salaries.

married and have children than postdocs were even 10 years ago.¹¹ As a result, the provision of adequate health care opportunities and retirement planning options is an increasingly important consideration for postdoctoral scientists. Unfortunately, the current institutional allowance provided for as part of a Kirschstein-NRSA fellowship is not sufficient in many cases to adequately cover these expenses as well as providing for the research-related expenses of the grant (e.g., health insurance for a family of four can cost upwards of \$300/month). Recently, the Federation of American Societies for Experimental Biology (FASEB) encouraged the Director of the NIH to consider increasing the NRSA institutional allowance to assist institutions in providing adequate medical coverage and retirement planning options for their postdocs¹². The NPA support this recommendation and **urges the Committee to recommend that the NIH provide increased Kirschstein-NRSA institutional allowances for postdoctoral fellows.** This allowance should be sufficiently large to allow NRSA recipients access to the same fringe benefits offered to all employees, including those postdocs funded by R01 grants, **even if this entails a reduction in the number of NRSA traineeships offered by the NIH.**

Additionally, a single stipend level, without consideration for regional differences in cost-of-living, is inconsistent with the stated purpose of the Kirschstein-NRSA stipends, which is to provide a subsistence allowance to defray living expenses¹³. This disparity could easily be overcome by adjusting Kirschstein-NRSA stipends according to locality. Indeed, such a mechanism already exists for federal employees. Federal salaries are set by Congress and the Executive Branch, and are adjusted on a city-by-city basis.¹⁴ The NPA recommends that the NIH consider setting a base stipend level for Kirschstein-NRSA stipends, and that this stipend be adjusted according to the locality payments calculated by the Office of Personnel Management, thereby providing more equitable support of all fellowship recipients, regardless of location.

❖ Increase Representation among Underrepresented Minorities in the Biomedical, Behavioral and Clinical Sciences

There is a consensus in both the medical and scientific communities that increased representation of underrepresented minorities is necessary for the health of the U.S. Science & Technology enterprise.¹⁵ In 2000, African-Americans, Latinos and Native American tribal peoples together represented approximately 25 percent of the nation's population yet they corresponded to only eight percent of the total population of science and engineering Ph.D. recipients.¹⁶ This represents a disappointing two percent increase in the number of minority S&E PhD's since

¹¹ Freeman et al., *Careers and Rewards in Biosciences: the disconnect between scientific progress and career progression*, American Society for Cell Biology, 2001; Freeman et al., *Careers: Competition and Careers in Biosciences*, Science 294: 2293-294, 2001

¹² http://www.faseb.org/opar/news/docs/KirschstieinNRSA_Jan.pdf

¹³ Ruth L. Kirschstein National Research Service Awards for Individual Postdoctoral Fellows, NIH Program Announcement PA-03-067.

¹⁴ <http://www.opm.gov/oca/04tables/indexGS.asp>

¹⁵ *The Science and Engineering Workforce: Realizing America's Potential*, National Science Board/National Science Foundation, 2003.

¹⁶ U.S. Census Report, 2002

1997.¹⁷ Unfortunately, there are no data that provide guidance on the reasons why so few postdocs are minorities. However, the NPA believes that it is largely a question of economics. Although there are many opportunities for minority participation in both intramural and extramural NIH programs, the current economic structure (see [Improve Compensation and Benefits Packages for Postdocs](#) above) is not attractive to many who may be the first in their families to attend college, or have a significant amount of student loan debt. This applies to many underrepresented minorities, as well as individuals from disadvantaged backgrounds. Minorities are disproportionately positioned below the poverty level, and thus many talented minorities are encouraged to enter into jobs that will provide a degree of financial security that is appropriate to their abilities. The above recommendations for increasing salary and benefits would, the NPA believes, go a long way toward encouraging minorities to enter into academic research. Another suggestion, which can be applied in synergy with the above recommendation and may be outside the scope of this committee, is to begin attracting minorities to science earlier in the educational process. This would involve, specifically, educating minorities at the undergraduate level about the different career choices in science that are available to them.

❖ **Limit Increases to the Aggregate Number of PhDs in the Basic Biomedical Sciences While Targeting Emerging Scientific or Health Needs**

This was a recommendation of the Committee's previous report, and the NPA concurs that this is an important goal. While the annual rate of PhDs conferred in the basic biomedical sciences remained relatively constant from 1997 to 2002 at 5700 per year, this nevertheless contributes to a considerable increase in the total number of PhD-level scientists when combined with the elimination of mandatory retirement across academia.¹⁸ Furthermore, as the Committee noted in its last report, the number of PhD students admitted by universities is driven not by the nation's needs for biomedical scientists, but the universities' needs for research assistants and teaching assistants.

While the NIH does not control graduate school admissions, and indeed only funds approximately 30 percent of students in the life sciences¹⁹, it can exert considerable influence on the aggregate number of students by limiting the number of predoctoral NRSA awardees and graduate students funded on research grants. While the nation's future needs are notoriously difficult to predict, it seems that both the Committee (in its previous report) and the NIH agree that "there is no rationale for growth in the number of PhDs in the basic biomedical sciences".²⁰ **The NPA encourages key stakeholders (i.e., the NIH and funded institutions) to work together to limit the increase in the number of biomedical PhDs. Furthermore, the NPA recommends that the NIH offer priority funding to students in fields where there is an identified need for current or future researchers.**

¹⁷ National Science Foundation, Division of Science Resources Statistics, *Science and Engineering Doctoral Awards*, 2001, NSF 04-300, Susan T. Hill, Project Officer, Arlington, VA, 2002.

¹⁸ NSF *Survey of Earned Doctorates*, 2003.

¹⁹ NIH response to previous NAS report: <http://grants1.nih.gov/grants/guide/notice-files/NOT-OD-01-027.html>

²⁰ Ibid

❖ Increase Data Collection and Tracking of Scientists' Career Outcomes

Despite the essential role that postdocs play in our nation's S&T enterprise, surprisingly little is known in detail about this population. Indeed, a frequent comment voiced at meetings that examine the postdoctoral situation is that there is a remarkable paucity of relevant data.²¹ The NIH supports the single largest pool of postdoctoral scientists in the U.S., and thus is positioned uniquely to closely track the status and career outcomes of the postdocs that it supports. Although the NIH collects considerable data on intramural postdocs, historically it has not paid sufficient attention to its much larger pool of extramural postdocs – particularly those funded on investigator-initiated grants (e.g., RO1s). Recently, the NIH initiated a process (X-Train) that will track each NIH-funded investigator through a “personal profile”. At this time only postdocs funded through Kirschstein-NRSAs (i.e., F-32 and T-32 grants) will be tracked in this system. This is unfortunate because this process ignores the majority of NIH-funded postdocs who receive their support via investigator-initiated grants. **The NPA strongly recommends that the Committee encourage the NIH to collect essential demographic, training, and career data on all postdocs regardless of the specific NIH funding mechanism.**

❖ Expand Support for Multi-Disciplinary/Cross-Disciplinary Training

Biomedical research has become increasingly team-oriented and multi-disciplinary. In some fields, narrow training in a single research area can be a limit on one's ability to advance (in?) the field. The enhancement and expansion of interdisciplinary research is one of the key concepts of Dr. Zerhouni's recently-announced "Roadmap for the NIH", and is a reflection of the movement away from the single-investigator model of a research laboratory. The NPA applauds this move and encourage a broad-based implementation of its concepts and ideas. The NPA is further encouraged by the recent announcement of a new NIH funding mechanism, the T90, which is specifically designed to promote inter- and cross-disciplinary approaches to addressing biological problems. The Burroughs-Wellcome Fund is also sponsoring a series of awards designed to allow chemists, physicists, computer scientists, and mathematicians to bring their expertise to solving biological problems. Efforts such as these are particularly important given the increasingly large data sets that result from experiments such as microarrays, combined with the poor mathematics background of many biologists.²² Every effort should be made to include postdocs in this multidisciplinary experience. The NPA also recommends that NIH rework **individual** research grants for postdocs to foster and enable more interdisciplinary interaction. One way this could be done would be to increase travel funds so that the postdoc could attend scientific meetings in two or more disciplines. **The NPA strongly encourages this Committee to recommend that the NIH fully embrace a multidisciplinary and cross-disciplinary intramural and extramural training approach and work toward mechanisms that enhance its implementation.**

²¹ For example see *Postdocs: What We Know and What We Would Like to Know*, Commission on Professionals in Science and Technology, 2002.

²² W. Bialek and D. Botstein, 2004. Introductory Science and Mathematics Education for 21st Century Biologists. *Science* 303:788-790

Conclusion:

This document highlights several key issues that need to be addressed immediately to ensure that the U.S. will continue to attract and retain the best and brightest biomedical scientists. The increasing attention being focused on postdocs and their needs is laudable and timely, but there is much work that needs to be done. The NPA recognizes that progress toward an improved postdoctoral experience is not the sole responsibility of any one agency or group, but will only come about through the collective efforts of all stakeholders. Nevertheless, the role of the NIH in setting real and de facto standards cannot be overemphasized, and thus the NPA encourages the NAS and the NIH to carefully consider the recommendations contained herein. The NPA offers these recommendations as essential first steps toward the development of a biomedical research culture that encourages and enables dedicated young scientists to pursue their passion for science and research.

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