NIH Workshop on Independent Research Fellows

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NIH Campus, Bethesda, MD

EXECUTIVE SUMMARY

The biomedical community in general and the NIH in particular, have been concerned with the increasing time to scientific independence: At present, the average age at appointment to medical school faculty is 38 years and the average age at receipt of the first NIH research grant is 42 years.

Various strategies are in place to address this problem, including the NIH Pathway to Independence K99/R00 award, the NIH Director's New Innovator award, and several programs developed by other organizations. The NIH is open to additional ways to reduce time to independence, including an independent research fellow program building on existing, successful programs that operate without NIH support. Identifying the important features of those programs was the focus of the workshop held in the Natcher Conference Center on May 3, 2010.

Key characteristics of current, successful independent research fellows and programs:

- Small size, informality
- Recognition of the value of "small science" — that a lab of two to three people can be innovative and productive
- Buy-in from existing faculty recognizing that fellows bring energy, innovation and excitement to the organization
- Faculty commitment to high-quality mentoring - tailored to the independent nature of these positions and focused on the career success of the fellow.
- A good fit between the scientific interests of fellow and existing faculty
- A dedicated "home," providing the fellow with ownership of space and resources
- Inclusion of the fellow in faculty activities, such as department faculty meetings and meetings with other labs, etc., but without additional committee or teaching responsibilities

Other issues and/or obstacles:

- Most, but not all, programs are dependent on unsolicited nominations or word-of-mouth recruitment. Some programs advertise and recruit aggressively.
- Although there is gender diversity in the candidate pool there is not much diversity in terms of race or ethnicity or in terms of institutional origins.

- In some programs teaching requirements and other commitments appear to detract from fellow's ability to develop their research and their career

- In some cases, programs allow or encourage fellows to undertake risky but highly innovative projects. This is generally a good thing, accelerating the fellows' career but it can reduce productivity.

- In some cases, the absence of typical, first-author postdoc papers coupled with a poor understanding of the independent fellow-career track can make peer review for NIH research grants difficult.

Considerations for the NIH:

- Any NIH-sponsored model program must be open and transparent with well-defined goals and review criteria.

- An institutional-driven model drew considerable support from workshop participants.

- Substantial institutional commitment was felt to be the number-one driver for the success of independent research fellow programs.

- Diversity — scientific, racial/ethnic, gender, and institutional — must be a key consideration for any NIH supported, independent fellows program.

- The independent research fellow model was seen as an ideal vehicle for the NIH Intramural Program to attract and retain promising young scientists.

- Independent research fellow programs can accommodate M.D.s and other clinicians, including those with dual degrees, who are ready for research independence but are not yet ready for a faculty appointment.

- In general, independent research fellow programs are not well suited for most M.D.s who delay research training until clinical specialty and sub-specialty training has been completed. Because such clinicians are ready for a faculty position based on their clinical expertise, this kind of early, independent fellowship track is generally a poor fit.

    - This population is currently served by existing mechanisms including various NIH career awards, Robert Wood Johnson fellowships, and other opportunities.
    - The NIH may wish to consider alternative interventions for these more typical M.D. career tracks.

MEETING SUMMARY

As one of his five NIH research themes[1], NIH Director Dr. Francis Collins publicly recognized the need to reinvigorate the scientific workforce. The delay in achieving research independence is not a new problem, but there is general agreement that it may constrain the creativity of young scientists. The Common Fund may allow the NIH to pilot new pathways to independence.

Dr. Collins noted in his comments at the workshop that within his own intramural research laboratory, he informally adopted a strategy that aims to foster independence as early as possible. In this approach, he tasks new recruits with a three-month "thinking period" to craft ideas for projects. Through an iterative process, he and the postdoc then refine the research direction until settling on a good fit. The process has been successful in fostering independence and forward thinking, both of which benefit the lab and the junior scientist.

The NIH is interested in learning the critical elements of existing independent fellow programs (see the table on page 10 for those represented at the Workshop). Dr. Collins requested a candid discussion in order to develop a set of best practices that can help the NIH design a pilot program to foster early scientific independence.

IMPORTANT PROGRAM CHARACTERISTICS

The goal of all existing independent research fellow programs is to provide young scientists freedom, ample resources, and protected time to explore bold ideas.

A common, perhaps less appreciated, companion issue is community: Nearly all programs noted that success hinges on the fit between the scientific areas of interest for both fellow and faculty. The programs are very selective, and meeting participants credited their programs' successes to setting a very high bar for incoming fellows. It is also important to avoid distracting and unrelated personnel issues such as the "two-body" problem resulting from dual-career couples. Independent research fellows should be viewed as "ends in themselves" — innovation now, rather than as a way to groom individuals to fill anticipated faculty openings. Most programs have evolved informally over time, and current programs vary significantly in the theory and practice of using fellows as potential recruits for faculty positions in a "try before you buy" recruitment strategy.

The general concept of a hybrid fellowship-faculty position requires belief in the power of "small science" — that a lab of 2 to 3 people can be innovative, productive, and energizing for faculty in an academic environment.

Small size and collegiality are characteristics of current independent research fellow programs. One participant noted that fostering independent research fellows reflects a desire to turn back the clock to the way science used to be when labs were smaller, most investigators had only one R01 grant, and postdoctoral experiences were brief.

[1] Collins FS. Research agenda. Opportunities for research and NIH. *Science*. 2010;327:36-7.

A key feature of a successful program is buy-in from faculty and a strong commitment to quality mentoring.

Although managing a research fellows program can be time-consuming, faculty at institutions that do it agree that the benefit of having access to the creativity that an energetic, new scientist can bring to a department is well worth the effort needed to help nurture a fellows' career. Most have frequent, informal interactions (lab meetings, shared meals and social opportunities, an open-door policy) and many programs have annual seminars and/or meetings for faculty and fellows. Because all programs are small, there is little room to "hide" problems. The availability of multiple potential mentors among existing faculty enables fellows to change course when necessary, and the three- to five-year time period is one that can tolerate at least one "crash-and-burn" episode. Workshop participants who are current or former fellows also report a strong camaraderie, and substantial support, within the fellows cohort at their institutions.

Mostly, programs consider themselves to be funding and/or resource-limited, but feel that staying small is essential for success.

Institutions commit to providing necessary resources for cutting-edge work, and these projects are often expensive. Program directors report that unusual resource requirements can rule out a potential fellow if the department cannot afford the equipment or is not willing to invest in something without guaranteed future use. Space issues also are not trivial and can be defining: Institutions with modular design, such as the Whitehead Institute, report more flexibility in adjusting to the dynamics of rotating fellows with variable scientific interests and technological needs. All existing programs appear to walk a fine line regarding scalability.

IMPORTANT CHARACTERISTICS OF CANDIDATES

The defining quality of a successful independent research fellow is the desire to pursue a novel idea independently and with extraordinary resolve and focus.

Most programs are not interested in fellows that wish to pursue mainstream, incremental science, since other, more traditional venues are more appropriate for that goal. Several workshop participants agreed that independent research fellow positions are not for everyone: Many young scientists seek more formal postdoctoral training and/or the opportunity to learn a new system and/or area of science that can be used as a springboard to a successful career.

Selecting good candidates hinges less on the number of high-profile papers than having an excellent, potentially high-impact ideas. In many cases, a candidate's ideas may not be attractive to traditional funding streams due to risk, length of time, lack of precedent, lack of experience, expense, or all of the above. One less discussed, but critical, criterion for a successful experience is the future fellow's graduate-level mentor — who must be flexible and supportive to permit the fellow to pursue a project related to his/her graduate studies when necessary.

The success of fellows also seems directly related to their ability to recruit talented staff to their research team. Some programs support the salary for one or more technicians and discourage the use of postdocs and graduate students. Other programs allow a fellow to staff his or her lab with postdocs, but find that attracting good postdocs without an established track record can be difficult. Post-baccalaureate students (who are considering graduate or medical school but haven't yet committed) may be a good fit on a temporary basis; undergraduate summer research programs may be targeted to identify suitable post-baccalaureate candidates.

There appears to be a price for the independence and freedom from time-consuming commitments that are nonetheless an important part of a scientist's professional development.

There is concern about potential alienation of fellows as an unintended consequence of protecting their research time; funding eligibility and training status in the eyes of reviewers has been a problem in current programs to date. Most independent research fellows come straight from graduate school (usually a Ph.D.) program. Few report difficulties with entry — likely due to the fact that they are highly independent people, and the flexibility of most programs offers some latitude in assembling resources and getting a project underway. Integration into a small, collegial environment also is easier than starting a lab at a larger institution with multiple competing demands. In addition, it appears that most fellows have little trouble obtaining high-quality academic positions after the fellowship; however, the process may take longer for those in crowded fields such as molecular biology and genetics.

Fellows worry, however, about losing new- and early-stage investigator status (*e.g.*, if they become a principal investigator on a multiple-PI grant). In general, there is some confusion about status — are fellows eligible for K awards or not? Independent research fellows have few of the responsibilities of a junior faculty member since they, in most cases, do not teach, attend recurring faculty meetings, serve on committees, or write grants. For the most part, programs provide extensive, close-knit — but often informal — specifically tailored mentoring, to help fellows gain the professional skills they will need to move into the professoriate. In some cases, peer reviewer has been a problem. Peer reviewers often are unfamiliar with a career tracks involving an independent research fellowship: Summary statements have included comments about the lack of first-author papers after graduate school, even though the fellow provided a list of publications in which he or she was the senior author. Participants expressed strong agreement about the need to address the transition period out of a fellows program into a permanent, competitive position.

Workshop participants did not reach consensus on size of the candidate pool or whether many potential candidate fellows go undiscovered from year to year.

Some participants did not think the supply of qualified candidate fellows would increase substantially with a more transparent and open application process. Some programs have experimented with limited, additional advertising, with reportedly little impact on the number of truly eligible candidates. However, this assessment is limited in the sense that the "universe" of potential fellows, and institutions with established independent research fellows programs, is fairly small and currently limited to leading research institutions. There was general agreement that NIH funding would necessitate the

development of a more open and transparent advertising and selection process that might lead to a larger and more diverse applicant pool.

NIH FUNDING MODELS

Overall, any NIH-sponsored model program will require applicant institutions to present well-defined goals and awards would be based on clearly established review criteria. A larger concern is the scalability of an independent research fellow program. Such programs are likely to be only one small part of a larger solution to the problem of elongated periods of postdoctoral training. To facilitate group discussion, NIH staff created a series of potential models for supporting an NIH independent research fellow program. These include: i) a matchmaking model, ii) a fellow-driven model, and iii) an institution-driven model.

A **matchmaking model** entails what its name suggests: it is a parallel process in which fellows and institutions would apply and NIH would then pair them according to pre-defined criteria. Applicants would be screened for merit and institutional review would ensure that the appropriate environment and support structure exist. Awards would then be made to institutions after matching NIH selected fellow(s) to the program. The group expressed little support for this model and worried about an imbalance of fellows and institutions, or worse, a suboptimal fit. The key argument against this model is the necessity of institutional buy-in and support for an individual candidate. Many saw this approach as too bureaucratic and difficult in practice.

A **fellow-driven model** relies on successful fellow applicants to pursue institutions on their own. In this model, the fellow and his/her project are reviewed in advance and notified of a potential award; the fellow negotiates a position; the NIH administratively reviews the position and its environment; and an award is made to fund the fellow's project. Similar concerns about the potential de-linking of fellows from close institutional matching and support detracted from the popularity of this model. There was also concern that the fellow selection process would not necessarily identify candidates that would fit well within specific programs.

The group overwhelmingly favored an **institution-driven model** in which candidate fellows apply to institutions, who recruit fellows that seem a good fit for scientific and other reasons. Activation of an NIH institutional award would be contingent upon selection of a suitable fellow and institutional commitment to the development of the fellow. Award activation would require approval by NIH program staff and would partially fund the fellow's research project. An additional variation on this model — one which received some support — involves coupling the scenario described with a new NIH funding option for highly innovative projects to assist with the transition to a faculty position after the fellowship ends. Others thought that existing NIH research grants would work quite well in this regard.

Discussion

Institutional commitment is the main driver for success of independent research fellow programs.

Demonstrating interest and the ability to provide a nurturing environment and adequate resources, with internal support, might be a good prerequisite for the NIH to judge an institution's readiness for embarking on a sustained effort supported with federal funds. Any NIH program, however, should extend beyond the current set of institutions with existing independent research fellow programs. While

subsidizing current programs would be desirable since they have a proven track record, the NIH should consider expanding the diversity of institutions that offer high-quality independent research fellow programs. The recently developed P30 grants issued as part of the NIH Recovery Act may be a good starting model for an NIH independent research fellow program, although the group felt that considerably more money would be necessary in order for a fellows program to succeed in the long-term. One participant suggested aligning independent fellows programs with NIH-funded extramural entities, such as cancer centers. This may be a way to build on existing, close-knit sub-groups of researchers within larger institutions. The NIH also is actively considering implementing pilot programs within the intramural research program: Several ICs are already engaged in defining best practices for potential new programs.

Institutions should first demonstrate commitment from faculty and available resources and environment to support independent research fellows that have a role more like junior faculty than postdoctoral fellows.

The group felt very strongly that an NIH-sponsored independent research fellows program cannot be "just another grant mechanism." Other issues also are of potential concern, including review criteria and practices, the possible "gaming" of the system to use the program as a holding pattern for young scientists or other research personnel, and questions about whether to exclude foreign researchers. On the whole, however, a healthy environment for mentoring, full integration of fellows into the existing faculty culture, adequate access to faculty and resources, and stringent protection of research time are likely to be defining features of success. An NIH commitment to broadening this type of experience beyond the current set of institutions may have a wider benefit on expanding institutional fitness for fostering early research independence. In time, demand may grow, generating more potential entrants. There was wide support for linking programs across institutions and sharing of ideas at periodic national meetings for the fellows. Periodic meetings of fellows could also serve as a way to monitor progress and the success of the overall program and to identify problems arising with individual fellows. Close programmatic monitoring will be essential especially in the early phases of this program.

Diversity — scientific, gender, ethnic and institutional — is a key consideration for any taxpayer-funded NIH independent research fellow program.

Much discussion centered on supply and demand: what is the actual universe of qualified young investigators who would thrive in an independent fellows program? Nearly all extant programs employ a highly selective, nomination-based process to choose candidates. This process, while successful in netting top talent, may fall short in the ability to identify underrepresented minorities and candidates who are not conducting research at highly competitive academic research institutions. Most programs recognize the importance of diversity but acknowledged difficulty in achieving racial and ethnic balance when recruiting and selecting fellows. A limiting factor is the underrepresentation of minorities in the candidate pool as well as influential faculty in positions who can serve as mentors and role models, a cycle that perpetuates itself.

Any program that decreases the time to independence may have special benefits for women, by lessening the struggle between career pressures and the “biological clock” defined by childbearing potential. Nonetheless, NIH should consider building in flexibility for re-entry for women or men with family-related conflicts that often collide with scientific productivity. There is some concern about an application requirement that falls during a stressful period of time when a graduate student is completing his/her thesis and writing/submitting manuscripts for publication. Probably, a streamlined application that combines a brief description of a fellow’s research plan/track record with a personal visit/interview will work best.

Table 1: Selected Independent Research Fellows Programs				
Program	**Size**[2]	**Length**	**Recruitment and Selection**	**Special Features**
Carnegie Institution Department of Embryology Staff Associates	1-2 fellows	5 years	Rolling admission, nomination process (informal, word-of-mouth); selection by seminar, interviews, meetings with faculty	Model for many other fellows programs (40-year-plus program)
Cold Spring Harbor Fellows	3 fellows	3-4 years	Informal, word-of-mouth nomination process; selection by interviews, nomination package, visit with faculty	Encourage two projects: one failsafe, one risky
Harvard Junior Fellows	30 fellows	3 years	Nominations (informal, word-of-mouth) due in September, selection by Senior Fellows who are Harvard faculty	Monday night dinners, twice-weekly lunches; Science and humanities eligible; support is stipend only (space and equipment provided by Harvard faculty mentor(s))
Janelia Farm (HHMI)	~ 15 fellows	5 years	Symposium competition (twice/year)	No career stage restriction; some fellows have had full career in science, others are new graduates
Lewis-Sigler Fellows (Princeton)	~ 2 fellows	3-5 years	Nomination process (informal, word-of-mouth)	Required to teach undergraduate lab courses; theory and experimental fellows
NCI Fellows (inactive[3])	5 fellows	4-plus years	Extensive mailing to extramural community; 2-tier selection by external peer review then intramural review panel	Fellows received 3-year extramural K22 award after fellowship period
Robert Wood Johnson Foundation Physician Faculty Scholars	~ 20 fellows	3 years	Nominations (informal, word-of-mouth)	Limited to physicians; 50 percent protected research time (also practice and/or teach); focused on careers in academic medicine
UCSF Fellows	4-5 fellows	5 years	Rolling, nomination process (informal, word-of-mouth); selection includes research plan and presentation, faculty "chalk-talk," interview with faculty	Must be compatible with a current UCSF scientific "neighborhood," many/most become UCSF faculty
UTSW Frank and Sara McKnight Fellows	3-5 fellows	3 years	Nomination process (informal, word-of-mouth); selection informal (interviews, seminars, visits)	Project must align with UTSW Biochemistry department science; must find position outside UTSW
Whitehead Fellows	5 fellows	5 years	Rolling admission, nomination (informal, word-of-mouth)	Thursday lunches for faculty and fellows

[2] Steady-state size

[3] Reasons for the discontinuation of this program include: insufficient Intramural Research Program (IRP) space for fellows and support; difficulty in matching fellow with senior IRP scientist; and unattractiveness of having to move twice in 6 years

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