Scientific Careers in Switzerland and Abroad

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After the conference *We Scientists Shape Science* organized by the Swiss Academy of Sciences in Bern in January, 2017, several participants of the Scientific Careers workshop came together to present what we found were highly relevant points of discussion, including concrete proposals for action.

1. Diversity of PhD Careers

Current Situation

PhD students are frequently trained exclusively for an academic career, despite the number of PhDs drastically exceeding the number of possible tenured positions. Alternative careers are often not considered or made visible, and sometimes even discouraged.

Consequences

- Universities are educating PhD students in a manner not suited for the majority of their future careers, resulting in an ill-prepared workforce, and an inefficient expenditure of educational resources.
- PhD students becoming disillusioned by the lack of realistic support in academia, leading to a loss in diversity of scientific minds, especially among women and minorities.

Goal Situation

- The PhD functions as a certification that the recipient is able to independently conduct long-term research projects.
- The PhD experience is explicitly recognized as part of a career path leading to a wide variety of careers.
- It is transparent throughout the PhD education that only a small percentage of PhDs will reach academic tenure.
- Careers as senior, non-tenured scientists in both academia and industry are encouraged and made available.
- Universities provide guidance for career tracks both within and outside academia.

Suggested Actions and Benefits

- Universities provide PhD students with statistics regarding possible and likely career paths from their own institution, early and regularly.

  - Students have a realistic perspective on their career.

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- Universities facilitate opportunities for PhD students to meet professionals (e.g. alumni) who chose paths other than academia. Example: Lecture series organized by PhD representatives at the Friedrich Miescher Institute.

  - Provides opportunities for networking and possible collaborations.

- Working experience in non-academic positions for 3-6 months is strongly encouraged by universities and is credited towards a successful completion of the PhD (can include time spent in industry before the start of the PhD). Example: UCSF http://gsice.ucsf.edu/

  - Promotes skill transfer between academia and industry.

- Allows PhD students to experience the workplace outside of academia, which is helpful for them even if they stay in academia, as they can better mentor future students, and better collaborate trans-disciplinarily and with society at large.

- Soft and Industry skills such as leadership, presentation skills, team management, project management, teaching, clinical trial knowledge, etc. are considered an integral part of a PhD education.
- Training in these skills is made available by the University (example: Transferable Skills program, University of Basel).
- Acquisition of a subset of these skills is considered a requirement for a successful PhD completion (can include skills gained during previous training: PMI, MBA, Master courses etc.).
- Every PhD student is allowed a time bank (e.g. two weeks per year) to use for professional development, distinct from internships.
- Attending these training sessions is viewed with good grace by all representatives of the Institute and the University, and using this time is a prerequisite for the successful completion of the PhD.

- These skills are beneficial to any lab on the long term for efficiency. Industry is more accepting of employing PhD graduates. Boost in reputation for the university as an career-encouraging employer who attracts a motivated, creative workforce.

- Funding schemes and hiring processes allow for non-linear career paths, which can attract scientists from industry, policy, and science communication back to academia. As academic group leaders, these professionals are highly respected by their students for their variety of perspectives, and they are also likely to foster inclusive and transparent climates concerning career choices.

- Increased diversity, resulting in better science. These steps are necessary to increase diversity among top scientists.

2. Redefining Skills and Prerequisites for Permanent Positions

Current Situation

- Interdisciplinarity is necessary for much of modern science and a contributor to groundbreaking research. The additional learning time required to move between disciplines, and different hiring practices and varying metric requirements between fields, results in interdisciplinarity being discouraged for senior positions.
- Moving from industry to academia is currently a great challenge since years in industry may result in a publication gap unacceptable for current academic hiring practices.
- Professors perform research, network, acquire funding, teach, deal with administrative tasks and mentor. They are also representatives of academia to the public. Current hiring practices often weight a candidate's research excellence much more significantly than their excellence in teaching, mentoring and engagement with society.

Consequences

- Discrimination of candidates from interdisciplinary and industrial backgrounds when compared to their peers, resulting in a hiring bias for candidates focused in a narrow field and from purely academic environments.
- Excessive load on tenured faculty to excel in all aspects of their work leading to an overall reduction in work and scientific output quality.
- Research and fund acquisition are generally prioritized at the expense of teaching and mentoring.

Goal Situation

- Academic careers are diverse with a healthy mix of interdisciplinary, applied, and narrow-focused field researchers in tenured and non-tenured long-term positions.
- Mobility between industry, applied, and foundation science is encouraged and sought.
- Tenured and senior staff are able to dedicate their time to a designated subset of tasks (e.g. fund acquisition, networking) and officially delegate others (teaching, mentoring, research, outreach) to other qualified long-term staff, which is then acknowledged by the university. They are given time for and encouraged to acquire missing soft skills as necessary (leadership, management, presentation and teaching skills).

Suggested Actions and Benefits

- Hiring committees use novel measures of excellence that value soft skills, interdisciplinarity, engagement with society, and risk-taking behaviour. These measures of excellence should be developed by the hiring panel, possibly under the guidance of a professional, before positions are advertised. Experience outside of academia should be valued explicitly as a reasonable alternative to some subset of publications, and interdisciplinary experience should be explicitly valued by taking into account a gap in output during any changes of discipline.

  - Novel ideas from different fields lead to more innovative research.

- Calls for academic positions should be open in rank and topic to encourage a wide diversity of applications. These calls are processed by a central, qualified authority independent of the hiring committee that confirms the wording and the openness of calls.

  - Increase of research quality and novelty due to the reduction of internal bias.

  - Avoid "inbreeding" schemes within departments.

- Hiring committees publish their criteria for excellence, and even consider producing a statement legitimizing their choice of candidate with regard to those criteria, which may or may not be made public.

  - Attract the most suitable candidates, resulting in a decrease in the workload for hiring committees.

- New metrics must be developed to measure interdisciplinarity, engagement with society, teaching success, leadership, management skills, network breadth, risk-taking, etc. The use of metrics will not go away, at least as a baseline for the initial triage of candidates, so a set of metrics that value a more diverse set of features beyond just publications must be made available. Funding agencies can invest resources towards this, in addition to science policy researchers.

  - Providing a variety of baselines increases the diversity within the set of qualified candidates.

- All parties should follow the Leiden Manifesto for research metrics and San Francisco Declaration on Research Assessment (DORA).

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3. Mid-level University Career Positions

Current Situation

The majority of science is performed by PhD students and postdocs that leave academia. The majority of teaching and organisation is performed by people on non-permanent contracts.

Consequences

- Conflict of interest between postdocs and PhD students who both require publications for advancement but are in a mentor-mentee situation.
- A temporary workforce that is discarded leads to a mistrust of the scientific community as an employer resulting in a long-term discouragement of working in a scientific field and ultimately loss of interest in science.
- Loss of in-house knowledge.
- Significant time and resources dedicated to training newly hired individuals, decreasing the time available for research and teaching.

Goal Situation

Many more mid-level scientific researchers such as senior scientists exist at universities. These are positions for trained scientists to perform scientific research, but who are not professors. Similar to industry, these positions are not tenured, but also not fixed-term. Tenured staff are responsible for the general direction of their research with a main focus on grant acquisition, networking, human resources and/or teaching. Mid-level researchers focus mainly on conducting research projects, mentoring, and/or teaching.

Suggested Actions and Benefits

- Establishment of a new scientific career path: long-term, non-tenure senior scientist positions at universities. At the same time, significantly fewer postdocs should be hired. Instead, funding should be put towards hiring and supporting more small research groups and mid-level scientists. This acts to:

    - Increase in quality and stability of science in general, by having a higher percentage of research being performed by and more closely guided by more experienced scientists, instead of a constant turnover of temporary postdocs.

    - Retention of in-house knowledge and experience that flows back into new projects. More long-term scientists are available to engage in long-term, high quality research.

    - Decreases the conflict of interest between PhD students and postdocs who both require publications for advancement but are in a mentor-mentee situation.

    - Increase in teaching and outreach quality, by allowing a subset of these positions to be all or partly teaching- or outreach-focused, for those scientists who have the passion and skill for teaching and outreach.

    - Reduction of the postdoc bubble.

- Some of these positions may be within labs of other professors, while others may be more independent and attached to departments or institutes.

    - Increase of interdisciplinarity and scientific understanding within the university. A lab or department can invest in an individual who can take interdisciplinary risks more than the current system allows of professors.

- If a lab-head retires, leaves, or runs out of research funding, a person holding a mid-level scientist position within their group might be proposed one year of continued employment elsewhere in the university. If the new lab position is considered successful, the position may continue long-term. This

one-year continuation may not be required for more dependent industrial positions such as engineers and lab technicians, but these positions also should not be necessarily fixed-term.

- Retention of in-house knowledge and sufficient time for training new candidates.

- Fund and encourage smaller research groups with 2-3 students and no postdocs, and fewer groups of 10+ PhDs/postdocs. Enable collaboration between small research groups. Such groups could be lead by either tenured professors or mid-level scientists.

- Increase in overall scientific flexibility and quality due to faster communication paths and flatter hierarchies.