Careers in Neuroscience / Career Paths: Academic Research

In a nutshell: A career in neuroscience at an academic institution involves research and teaching, albeit in different proportions. As a general rule, faculty members at an undergraduate institution tend to devote considerably more time to teaching than those at a research-intensive university or medical school. In those settings, scientists can focus more on research. At all institutions, however, professors strive for excellence in both research and teaching, taking advantage of opportunities to make exciting discoveries and educate the next generation of neuroscientists. Faculty members at both large and small institutions also face the challenge of maintaining a steady funding stream to support their research program.

A Love of Learning

A career in academic research gives neuroscientists an opportunity for lifelong learning in their area of interest. As Principal investigators (PIs) of a lab, neuroscientists develop research questions that they want to pursue. Because the field is changing so quickly, they often have to learn new laboratory techniques to use in experiments designed to answer increasingly complex questions. Collaborating with colleagues is an important way to stay current with advances in neuroscience. Part of the investigators' research responsibilities also includes publishing papers in highly regarded scientific journals.

To ensure that the highest level of research is being done, investigators apply for competitive grants that undergo scrutiny from their peers. Depending on the setting, some scientists must fund a portion of their salary and that of their team, while others may just have to fund their research. Landing grants has always been competitive, but in this economic climate, it is even more so. But as one investigator noted, "it is worth it for those days when you go into your lab and observe something that no one else has ever seen before. The joy of discovery is exhilarating."

Teaching in the Classroom and in the Lab

Teaching is part of a career in academic research, but the amount of time spent on it varies from setting to setting. For neuroscientists at small liberal arts colleges, teaching is the centerpiece of the career. Neuroscientists at these institutions teach undergraduates, guide them in their learning, expose them to neuroscience research, and introduce them to basic tools they will need in graduate school.

Large, more research-intensive institutions that offer degrees ranging from a bachelor's degree to doctorate may have a different set of expectations. Research is emphasized, as well as training graduate students and postdocs. Part of the training for graduate students and postdocs often involves teaching classes under the professor's supervision. At the medical school level,

professors do not do as much teaching, but they are expected to serve as mentors to the graduate students and post-docs in their lab.

A Mix of Skills Required

A range of skills is needed to be successful as a researcher in any setting. In the lab, expertise in particular techniques, such as working with western blots or proficiency using a type of equipment, such as an electron microscope, is valuable and can be utilized in individual and team research projects. Efficiency, good management skills, the ability to synthesize large amounts of information also are crucial.

Teaching requires a different set of skills. In a lecture, the professor must be able to sustain the class for the whole period, while in a seminar, the challenge is engaging students in discussion. In both instances, teachers must be able to make complex information accessible to their students. A successful teacher is often a "people" person who enjoys interacting with students and serving as a mentor.

Proficiency in writing and oral communication is key to success in the profession. To communicate research findings to colleagues, neuroscientists must be comfortable preparing posters for conferences and writing comprehensive papers for publication in peer-reviewed journals. A different set of writing skills is needed for grant writing. To become adept at this skill, postdocs can take advantage of available writing groups where peer advisors critique papers and grants. For established researchers, it's always a good idea to have a friend or colleague review grants. Most faculty members will agree to do so if asked; this kind of task is considered a form of mentoring. One researcher notes that there is no magic formula for writing a successful grant, but there are several resources available online that provide instruction and help to demystify the process (e.g., http://www.ninds.nih.gov/funding/write_grant_doc.htm).

Work Description

The work of a neuroscientist in academia is defined by the setting. The expectations for a scientist in an undergraduate institution are vastly different than for those in large research institutions and medical schools. The following descriptions explain these career paths by setting.

Academic Research in a Small, Liberal Arts College

A typical day in this position involves far more teaching than research. Young professors new to the field will be asked to teach introductory courses in a range of topics, such as biology or

genetics. As professors gain experience, they will progress to teaching neuroscience courses at higher levels, as well as supervising senior research projects.

The essence of working in a small, liberal arts college is interaction with the students. For this reason, neuroscientists who choose this career path must enjoy young people in this age group and be committed to helping them mature academically, socially, and emotionally. "This is a great time of life," notes one undergraduate professor. "Students are learning and have many 'Gee whiz' moments." Another professor observes that by having to simplify the material for students, the teacher also learns the material more deeply.

The reality of working in a small undergraduate institution, however, is that research has to be scaled to fit. Most research assistance comes from undergraduates or research technicians. High-end equipment is probably not available, and animal models have to be chosen carefully. Yet even with these caveats, many undergraduate professors report that their research program is robust. "Pick a niche and work at a modest pace," advises one professor. "It is possible to do significant research in these kinds of institutions."

Academic Research in a Comprehensive Research Institution

At this type of institution, neuroscientists are expected to perform higher-level research than their colleagues at small colleges. As scientists gain seniority, their teaching responsibilities often decrease, taken over by junior faculty, as well as graduate students and postdocs. As a result, more time can be spent writing grants to keep their lab going, mentoring graduate students and postdocs, and managing the research process. Professors also are expected to serve on internal committees and stay engaged in the university community.

Universities tend to develop their own policies about research. At many institutions, the research must comply with overall objectives and fit in with the work of one or more departments or an interdisciplinary group. In some instances, the institution may be focused on building a particular niche, such as sensory neuroscience, and will recruit faculty in that area and seek grants to cover research on this topic. Usually, an office designated to monitor research will manage such grants, some of which may fund graduate students, postdocs, and salary increases for faculty.

Another way that institutions can increase their external funding base is by applying for grants by cluster or as a group of departments. This approach allows them to be competitive for larger grants, potentially bringing in more revenue to the institution (e.g. http://grants.nih.gov/grants/funding/funding_program.htm).

Academic Research in a Medical School

Neuroscientists working in medical schools are mostly responsible for setting up a robust research program. At some medical schools, faculty are also expected to collaborate actively with others with an aim toward larger-scale research (e.g., center, program project) or training grants. Helping to build translational research bridges between basic and clinical neuroscience is often part of the mix. As a result, medical school researchers will spend about 70%-90% of the time in the lab.

Winning a competitive, federally funded grant, often from the National Institutes of Health (NIH), the National Science Foundation (NSF), or the Department of Defense (DoD), means that a scientist on this career path can set up a state-of-the-art lab and hire the necessary staff to move the research forward. With fluctuations in government funding, researchers also need to be on the lookout for other funding opportunities. Potential funders may be found through professional organizations such as the American Association of Medical Colleges (AAMC), pharmaceutical companies, and foundations. These kinds of options need to be explored on a regular basis.

Neuroscientists with a PhD spend about 10%-30% of their time teaching graduate and medical students, serving as mentors for graduate students and postdoctoral trainees, and participating in service initiatives that benefit the school. These efforts may include serving on institutional committees. In addition, many academic researchers participate in activities outside the institution, including serving on grant review panels, engaging in manuscript review, and participating in professional organizations and societies. MD/PhD researchers also teach, along with spending about 20% of their time seeing patients in the clinic. This percentage can vary depending on the institution and needs of the clinical department.

Place(s) of Employment

Academia encompasses small, liberal arts colleges, mid-sized institutions with graduate programs, large universities offering a range of graduate and doctoral, and medical schools. According to the National Institutes of Health, the number of new PhDs in the biomedical sciences far exceeds the number of tenure-track positions. About 26% will find a tenure-track position, compared to 34% in 1993. The proportion of non-tenure track positions has remained constant. (Source: http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2012_06_22/caredit.a1200069).

Medical schools vary in size and complexity and can be divided into clinical departments, basic science departments, clinical centers, and institutes. All of these divisions are potential places of employment for neuroscientists.

Personal Characteristics

Although all neuroscientists working in academia engage with students, those in small, liberal arts colleges have more involvement with undergraduates. Characteristics they need to be successful include patience, the ability to connect to students, and a commitment to developing the next generation of scientists.

On the research side, scientists must be patient, creative, and focused, with a clear idea of the kinds of research questions they want to pursue. They also must be able to function in a competitive environment, where there is ongoing pressure to write grants and receive funding to support their lab. Equally important is the ability to work collaboratively in the lab and to help create a spirit of camaraderie in this small microcosm of the university or medical center. For those working in smaller institutions, they must be able to scale their program to match the space and equipment available, as well as the expertise of their lab assistants.

Researchers also need to be flexible and able to switch gears to keep their labs going. For example, one professor at a medical school received a grant from a foundation to conduct research related to Parkinson's disease. Although most of this professor's work is focused on how connections form in the developing brain using autism models, she was able to adapt her research program to a different area. This kind of flexibility is becoming increasingly important for researchers in academic institutions.

Education/Training

Typically, individuals on this career path will have trained in neuroscience for several years, but this is not a requirement. As an undergraduate, they may have majored in a related area, such as math, computer science, biology, physics, chemistry, or psychology, and will then go to graduate school in neuroscience, earning a PhD. Advanced degrees outside neuroscience, in areas like physiology, pharmacology, and genetics, are also common. Following the PhD, the expectation is that academic researchers will receive postdoctoral training for three to seven years. This experience provides a solid foundation for launching a successful career as an academic researcher.

It is also important to note that researchers from abroad come to the United States to study, and vice versa. For example, a neuroscientist from the Republic of Trinidad and Tobago began his undergraduate career in the United States but then decided to go to Great Britain to complete his undergraduate degree and PhD. He then applied for a postdoc in the United States where he has worked ever since. Similarly, a neuroscientist completed her PhD in the United States and then went to Italy to do her first postdoc. American neuroscientists who study abroad tend to return home to start their career. For neuroscientists from other countries, if their postdoctoral work abroad was funded by their home country, there is some expectation

for them to go back and work, but many establish laboratories in the countries in which they trained as postdocs.

Large research institutions may develop partnerships with other countries so that they conduct research abroad and bring international scientists to their home institution. These partnerships may be with academic institutions, scientific organizations such as an international academy of sciences, or a nonprofit group.

For PhDs from other countries looking to do their post-doctoral training in the United States, SfN and other nonprofit organizations, as well as foundations, may facilitate this by offering different avenues. The Society offers traveling fellowships so that young PhDs can attend the Annual Meeting. The meeting is a perfect place to meet potential mentors and identify possible post-doctoral experiences in the U.S.

Career Trajectories

A traditional career on the faculty of an academic institution typically begins as an assistant professor on a tenure track. After three to five years of success at teaching, procuring funds and maintaining a productive research lab, the faculty member is promoted to associate professor. The criteria for promotion to full professor and the stage at which tenure are granted varies greatly among institutions. At small institutions, the quality of teaching and service to the institution are considered important and are reviewed, along with a sustained track record of publication and funding. At many but not all larger institutions and medical schools, teaching and service are valued, but they generally take a secondary role to research and procurement of funds.

The emphasis on research is reflected in the salary structure, which is usually shared by the investigator and the institution. At large research-intensive institutions and medical schools, grant funding or fellowships are expected to cover graduate students and postdocs and typically, at least 50% of the investigator’s salary. If an investigator is not on a tenure track, that individual may be expected to cover 100% of his/her salary. In those instances, however, the individual is not expected to teach or serve on institution committees.

For new faculty, there are ample resources available to advise and assist them in obtaining grant funding. Additionally, NSF offers special awards for early career investigators, and NIH has modified the review process for early investigators to ensure that their proposals can compete successfully with those from seasoned researchers. In addition, several resources are available that can be used to improve teaching methods. For example, young faculty may consider joining a professional organization, such as Faculty for Undergraduate Education (FUN). This group, which meets at SfN's Annual Meeting, brings together professionals interested in improving neuroscience education at the undergraduate level.

Employment Outlook

Different people have different opinions about the employment outlook for neuroscientists. On the one hand, according to the Bureau of Labor Statistics, over the next several years, individuals in the biological sciences, including neuroscience, will experience a 19% increase in academic jobs. But that optimistic view does not factor in changes in the budgets of funding agencies, such as the NIH. If agency budgets do not increase to accommodate the increased positions, fewer research dollars will be available for academic research, making it harder for researchers to sustain their labs. Some researchers believe that there are enough jobs for the PhDs being trained, but not all of those individuals will secure tenure-track academic positions.

If tenure-track positions are not available but scientists want to remain in an academic setting other avenues are open to them. Scientists can secure a position as an adjunct faculty member at a two-or four-year institution. These positions serve as an entree to an academic institution, with the advantage of giving scientists teaching experience. The down side, however, is that there is little job security, and pay is linked directly to numbers of classes taught.

Another option is to take a job as a staff scientist in charge of a core facility at an academic institution. These jobs often involve running a lab with a specific type of equipment, such as an MRI, or directing a project in one of the university's centers or core facilities. For example, at one major Midwestern public research university, between 700 and 800 of the academic staff are PhD scientists. Like tenure-track positions, these jobs are largely supported by grant funds. Staff scientists typically travel less, have fewer administrative responsibilities, and are not expected to teach.

Medical schools also have non-tenure track positions. Referred to as "research track positions" they are supported by funds from grants awarded to the individual or to an established tenured faculty with a strong research program. In the latter case, the research track faculty member helps direct the tenured faculty member's research program. An individual can stay in such a position for 10-15 years.

Salary Information

The salaries for academic researchers vary considerably. According to the Bureau of Labor Statistics, entry-level professors earn about $41,000--an admittedly low estimate. Mid-level academics earn between $75,000 and $100,00, and senior-level professors earn between salaries closer to the $150,000 mark.

What You Can Do Now

Undergraduate Student: It is never too soon to begin gaining research experience. A good way to start is by volunteering in the lab of a professor at your undergraduate institution. Many undergraduate institutions have in-house research fellowships and/or Howard Hughes Medical Institute Fellowships for which sophomores, juniors, and seniors may apply. Between the junior and senior years, students may also explore and apply for internships at a wide array of schools, institutes and government agencies. If a student is interested in taking time off before graduate school, the NIH and many medical schools offer post-baccalaureate programs that provide new graduates with an opportunity to enrich their research experiences prior to entering graduate school. Many students also gain research experience by working as laboratory technicians. Publishing a paper or presenting research work at a scientific conference strengthens an application to graduate school.

Graduate Student: Throughout graduate school, it is important to continue honing skills that laboratories find attractive, such as expertise in a novel technique or with a type of equipment and to establish a record of productivity by publishing research. Graduate students should also be encouraged to seek fellowships. For international students, this is the time to take advantage of training programs and fellowships offered by SfN and other organizations. Students in U.S. graduate programs can consider exchange programs or participating in collaborative projects. If a graduate student develops an interest in teaching, this is an excellent time to volunteer in schools, after-school clubs, or Brain Awareness Week activities to find out more about this career path. If the interest builds, it may be possible to serve as a teaching assistant, get a job at a science-oriented summer camp, or tutor high school students. Such experiences are important when applying for jobs with an emphasis on teaching.

Early Career: In most cases, rising neuroscientists must complete at least one postdoctoral fellowship. Such positions should be chosen with clear career goals in order to maximize the training opportunity. Postdocs should apply for independent fellowships. Toward the end of postdoctoral training, successful postdocs may be eligible for grant awards, such as the K awards offered by NIH, which are designed to help transition postdocs to independent academic positions. For those postdoctoral fellows wishing to pursue a career that includes significant teaching, it is important to be sure that the postdoctoral position and its funding permits opportunities to gain teaching experience.

Mid-Career: At this stage, an academic researcher has moved beyond assistant professor and has been reappointed as an associate professor, a process that takes three to five years. The researcher may receive tenure at this time. On average, it takes about 15

years to become a full professor. The degree of job security that comes with tenure varies according to the institution.

Retirees: Some institutions offer retiring faculty the option of an emeritus appointment or, at medical schools, a conjoint appointment within a school of medicine. Those receiving such appointments are typically highly valued members of a faculty and often spend more time teaching and mentoring than they do conducting research. The office and lab space available to such appointees varies greatly and can depend on external funds.

For More Information

The following websites have valuable information:

Science Magazine:
http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2012_06_22/caredit.a1200069

The Life Sciences Salary Survey: http://www.the-scientist.com/?articles.view/articleNo/32918/title/Life-Sciences-Salary-Survey-2012/

Faculty for Undergraduate Neuroscience (FUN): http://www.funfaculty.org/drupal/

Research Initiative for Scientific Enhancement (RISE):
http://www.nigms.nih.gov/Training/MBRS/RISEDescription.htm

Post-baccalaureate Intramural Research Training Award (Post-bac IRTA):
http://www.genome.gov/12011109

Mount Sinai School of Medicine http://www:.mssm.edu/

University of Maryland:
http://www.provost.umd.edu/SP07/colleges/CLFS_Strategic_Plan_final_2009.pdf

Princeton University:

http://www.princeton.edu/dof/policies/publ/fac/rules_toc/chapter8/#comp000045d572a900000003d24af9http://www.princeton.edu/dof/policies/publ/fac/rules_toc/chapter8/#comp000045d572a900000003d24af9

NIH Funding Information: http://grants.nih.gov/grants/funding/funding_program.htm

Online Grant-Writing Support: http://www.ninds.nih.gov/funding/write_grant_doc.htm

Professor Salaries: http://www.ehow.com/info_7797427_average-salary-professor-neuroscience.html