



# The Astronomical League

A Federation of Astronomical Societies

Astro Note H3 – Professional Astronomer

Astronomy may be the oldest science, but it is one of the youngest in terms of its new discoveries and understanding. We have all had questions as we gaze up into the night sky. Astronomers try to understand these (and many other) questions and to find answers to them.

## **Employment Potential:**

As science professions go, astronomy is a relatively small field, with about 6,000 professional astronomers in North America. Because of its size, astronomers get to know and collaborate with many colleagues across the U.S. and around the world. This can lead to an advantageous dialogue among astronomers.

On the other hand, there is a small turnover of positions each year and, therefore, strong competition for positions. In recent years, there have been about 150 job openings for astronomers in North America, while the number of Ph.D.s conferred annually in recent years has averaged about 125. It is common for astronomers to spend from three to six years in postdoctoral positions before finding a steady position in a university department, national facility, or government lab.

In such a small and popular field, only those with a quality education, ability, and passion for the subject are likely to find a permanent position. Astronomy training, however, emphasizes a remarkably broad set of problem-solving skills. With careful selection of graduate school courses and experiences, one may prepare for an interesting and productive career in a related field, such as industrial research, education, and public information.

## **Where the Jobs Are:**

Most professional astronomers (about 55 percent) are either faculty members at universities and colleges, or affiliated with universities and colleges through observatories and laboratories. (Universities require a Ph.D. for a faculty position and hire new people based on recommendations by the astronomy or astronomy/physics faculty.) For these astronomers, teaching is their major activity. Astronomers in academic positions can spend a portion of their time on their research, depending on their teaching schedule.

Often an astronomer will be a member of a physics department or a physics/astronomy department rather than a separate astronomy department. Such faculty members may be called on to teach some physics courses as well as astronomy courses. Because of their training, both undergraduate and graduate, astronomers are well qualified for this expanded role.

Even though teaching is an academic career, astronomers at leading colleges are a major source of astronomical research activity. In addition to the observatories and research institutions operated by individual universities, there are a number of national observatories and research institutes that make research time available to observational astronomers at academic institutions and to others.

Observational astronomers spend between 10 and 30 nights per year working at an observatory or getting observations from spacecraft, and the rest of their time analyzing the data they've collected. Others, such as theoretical astrophysicists, may not even work with observing equipment but conduct a great deal of their astronomy research using supercomputers. Much of the astronomer's work day consists of analyzing data, interpreting observations, or planning observational programs.

Recent university graduates start their careers at universities, colleges, and other institutions with postdoctoral research positions (one to three years of research work for people with new doctoral degrees) and research associateships that allow full time for research.

Median salaries at universities and colleges depend upon the size, quality, and competitiveness of the school. Starting salaries for assistant professors start at about \$50,000 for 9-10 months, the range for senior professors is \$80,000-100,000 for 9-10 months. Typical postdoc pay ranges between \$35,000-45,000 per year. Contrary to popular belief, scientists at national or government labs earn the highest median salary, followed by those employed by business or industry. Many faculty members augment their salaries with summer work at their universities or with summer research support.

In addition, astronomers as a group are striving to encourage a vigorous affirmative-action approach to recruiting. Significant changes have already occurred in the male-to-female ratios. Already more than one-quarter of the young astronomers are women, and this fraction is growing. It is hoped that future years will see a healthy and more equitable balance of men and women of all races in astronomy.

### **National Observatories and Government Labs:**

About a third of the professional astronomers are directly employed by the federal government or by federally supported national observatories and laboratories. A Ph.D. in astronomy or physics or, in some cases, a specialized field of engineering, is generally required for these positions just as for academic positions. While the individual astronomer may devote some time to research of personal interest, the research area is more often defined by the employer than is the case with universities and colleges.

The national observatories such as the National Astronomy & Ionosphere Center (Arecibo Observatory), [National Radio Astronomy Observatory \(NRAO\)](#), the [National Optical Astronomy Observatory \(NOAO\)](#), and the [Space Telescope Science Institute \(STScI\)](#), encourage individual research. They do require, however, that effort be devoted to instrument design and operation as well as cooperation with visiting scientists. A form of tenure, or guaranteed continued employment, can be granted to scientists in these jobs either according to civil service rules or in a manner similar to that at universities. Salary levels are comparable to those in other government agencies and in the larger universities.

### **Business and Private Industry**

About ten percent of all astronomers work in business or private industry. A few industries, such as the aerospace field, hire astronomers to do research that may give their company a competitive edge. A number of consulting firms supply astronomy talent to the government for specific tasks. In addition, there is a large number of companies that, rather than conduct astronomy research, make use of the background and talents of the astronomer in related areas. Astronomers are generally well-versed in instrumentation, remote sensing, spectral observations, and computer applications to unusual problems. Job security may be somewhat less certain than in government and academia since there is no tenure or civil service in industry. The salaries, however, are often correspondingly higher, especially at mid-management levels and above. In practice, most companies protect their good employees, but the choice of work within a given company may be limited. In exchange for some loss of choice, there is the likelihood of getting a job that is technically challenging and that provides great opportunity for both intellectual and professional growth. Industrial employment offers a wide variety of nontechnical career paths as well. Although a Ph.D. is useful for industrial jobs, it is less often a formal requirement.

### **Other Related Jobs:**

Astronomers working in planetariums, science museums, or in other public service positions provide an important information link between the world of professional astronomy and the general public. These jobs require a broad range of astronomy knowledge and the ability to communicate clearly and effectively with the public. Some jobs are available in secondary schools teaching physics or earth sciences, as well as in the science journalism field. Jobs in these categories generally do not require an advanced degree, although a Ph.D. or master's degree might prove useful at the more technical levels.

Although most astronomers have advanced degrees, people with an undergraduate major in astronomy or physics can find jobs in support positions at national observatories, national laboratories, federal agencies, and sometimes in large astronomy departments at universities. An undergraduate astronomy degree is

excellent preparation for science teachers, laboratory technicians, computer programmers, and science journalists. It can also serve as the basis for graduate degrees in other fields, such as law or medical school. Some universities may not offer a major in astronomy for undergraduates, but may instead have a program in physics with a specialization in astronomy.

**Further Information:**

This introduction to professional astronomy has been condensed from ***Understanding the Universe: A Career in Astronomy*** (rev. 2005) which was published by the American Astronomical Society.

A copy of that booklet can be obtained online from AAS Education Office, at:

<https://aas.org/sites/default/files/2019-10/Careers-in-Astronomy.pdf>

Their page for Career Information and Advice: <https://aas.org/careers/career-resources>