Careers in Astronomy

geologists,

astronomers etc.

Interdisciplinary field concerned with the origins, early evolution, distribution, and future of life in the universe. Generally Mathematics includes lab work where scientists study meteorites, Theoretical research work involves comet dust samples, etc. rigorous mathematics, solving

They also work with complex equations, mathematical functions to optimise the performance of algorithms for Chemistry analysing images, aspects of

instrumentation etc. Spectroscopy and chemical modelling to understand; Protoplanetary disk, planet formation, planet interior, nebula, meteorites, comets, asteroids, exoplanets atmosphere and sign of life in the Universe

Physics

Theoretical & Observational Astronomy; analyze & process data, develop physical theories & build computer simulations to model and understand various phenomena in the Universe

Biology Computers

Algorithm development for signal processing, Big data mining, computer modelling, complex computational algorithms for

simulation, etc. Skills: C, C++, Python,

Machine learning

Mechanical

Work includes design, analyse, manufacture instruments and their maintenance. 3D modelling and

designing of mechanical components and assemblies.

Skills: CAD-CAM eg.

Electronics AutoCAD, Pro-E, Remote operation and control CATIA of telescope, embedded systems,

> stellar back-end instrumentation, site survey instrumentation & maintenance, etc. Skills: Embedded, VLSI, PLC design, MATLAB

Electrical

Design of power supplies, constructing receivers and radio amplifiers, antenna, designing circuits, operating control systems & their maintenance Skills: VLSI, PLC and PCB design,

MATLAB

Theoretical & Observational Astronomy (Based on Object specialization)

- Gravitational Waves
- Galactic Astronomy
- Planetary Sciences
- Exoplanets
- Relativistic Astrophysics
- Extragalactic Astronomy
- Stellar Astronomy
- Plasma Astrophysics
- Solar Physics Interstellar
- Astrophysics
- Compact objects
- Astrometry

Astronomy Career Positions

Theoretical Physicist

Software Developer

• Technical Officer

Teaching Faculty

• System Engineer

Astronomer

Postdoctoral Fellow

- Project Student
- Project Assistant / Associate
- Project Scientist
- Scientific Trainee
- Scientific Officer • Data Scientist
- Experimental Physicist

e.g. A **Data Scientist** is a professional responsible for

Outreach & Miscellaneous

- Educator
- Public Relation
- Technical Writer
- Engineering Technician
- Amateur Astronomer
- Designer
- Astrobiology (Inter -Disciplinary)

How do I get in?

In School (9th to 12th)

- Develop an understanding of the concepts and applications of Physics, Chemistry and Maths.
- Relate to these concepts by looking for them outside the classroom.
- Enjoy practical, hands-on activities along with your studies.
- · Read popular literature about astronomy and astronomers.
- Join any active amateur astronomy group near you (e.g. Jyotirvidya Parisanstha, Pune).
- Participate in Olympiads, school level competitions organized by NASA, INTEL, FIRST etc.
- Prepare for scholarship programs such as KVPY, INSPIRE and Tata Education Grants.
- Prepare for merit-based(10th and 12th Grades) entrance for undergraduate admission at universities such as DU and exam-based admission in India through IIT-JEE, IAT, BITSAT, IIST etc. and outside India through SAT, ACT etc.
- There is no program in India to pursue an Astronomy specialization degree just after 12th.
- There are some dual/integrated degree BSc-MSc/B.Tech-M.Tech programs at Indian universities where students can enrol just after 12th.

Resources:

- NCERT and other reference books.
- Online resources: khanacademy.org, saylor.org, coursera.org, edx.org.
- Youtube channels: Pradeep Kshetrapal, Walter Lewin, ExamFear Education, 3Blue1Brown, Veritasium.
- arvindguptatoys.com for hands-on learning experience using science toys.

Exams and Competitions:

UG Entrance Exams:

- BITSAT: Birla Institute of Technology and Science Admission Test
- IAT: IISER Aptitude Test
- IIT-JEE: Indian Institute of Technology-Joint Entrance Exam
- universities at UG level)

• SAT: Scholastic Aptitude Test (for foreign

- PUBDET: Presidency University Bachelor **Degree Entrance Test**
- NEST: National Entrance Screening Test
- Olympiads:
- IAO: International Astronomy Olympiad

Astronomy

collecting, analyzing and interpreting large amounts of astronomical data to identify ways to help in research.

In College (UG & PG)

- Develop an understanding of the concepts and applications of the core subjects. • Develop some skills such as computer coding (e.g. Python), software tools (e.g. SolidWorks) etc.
- Try in internships and Winter/Summer School such as VSRP, SRFP, SURP etc. from the first year of your UG program.
- Numerous foreign universities offer short-term, e.g. 1-week summer schools to students around the world. e.g. Introduction to Astronomical Instrumentation by Dunlap Institute of Astronomy & Astrophysics.
- Internships and summer programs are vital, and to learn valuable skills one should participate in them even if they are not directly related to Astronomy & Astrophysics.
- Pursue your final-year project at a research institute.
- Volunteer as a project student under the guidance of a researcher, or a teacher.
- Participate in various citizen science projects related to astronomy (e.g. planethunters.org).
- Prepare for PG level entrance exam such as JEST, GATE etc. for Indian Universities; GRE General, GRE Subject tests and TOEFL or IELTS (for testing English) for foreign universities.
- Campus France, uni-assist etc. are some of the agencies through which international students need to apply for most French and German universities.

Resources:

- Books recommended by university. • Online Resources: NPTEL, MIT-OCW, UCI Open, Edx, Coursera, SWAYAM, Academic earth,
- 3Blue1Brown, Minute Physics. • Blog for internships and programs outside India: 'How to make an Astrophysicist';
- Blog for internships in India: 'Internshala'.
- 'AstroBetter' is among very few blogs that provide worldwide information and resources related to Astronomy & Astrophysics.

Exams and Competitions:

PG Entrance Exams:

- GATE: Graduate Aptitude Test in Engineering
- GRE: Graduate Record Examinations (for
- foreign universities at PG level) • INAT: IUCAA-NCRA Admission Test
- JAM: Joint Admission Test • JEST: Joint Entrance Screening Test
- Internships/Summer & Winter Schools:

• IISER-PSSP: IISER Pune Summer Student

Program

- LEAPS: The Leiden/ESA Astrophysics Program for Summer Students
- SASP: Space Astronomy Summer Program
- SUPPR: Summer Undergraduate Program
- for Planetary Research • SURF: Summer Undergraduate Research
- Fellowships

• SURP: Summer Undergraduate Research

- Program • VSRP: Visiting Students' Research
- Programme

Note:

Working on real projects and problems in the field of Astronomy & Astrophysics (theory, instrumentation, analysis etc.) requires one to have a basic understanding of each aspect of the problem. Also, there is no hard and fast rule. For example, a person from a mechanical engineering background can perform the work of an electrical engineer, given the person has the required skills. Having the required skill set to execute the task in a project is what matters. One often needs to learn new skills and keep oneself updated according to the requirement of the problem.





• IChO: International Chemistry Olympiad

• IPhO: International Physics Olympiad

• MTSE: Maharashtra Talent Search

Examination (state level)

Scholarship/Fellowships:

Inspired Research

• Tata Education Grants

• IMO: International Mathematics Olympiad

• NTSE: National Talent Search Examination

• INSPIRE: Innovation in Science Pursuit for

• KVPY: Kishore Vaigyanik Protsahan Yojana



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