



Welcome to

Astronomy

an introduction to sky watching



Introduction

Our own Sun is a middle-age star.

Since the beginning of civilisation people have wondered about the stars. They have attempted to explain the seasons, the movements of the Sun, Moon and planets by incorporating them into their cultures.

Nowadays the science of astronomy uses scientific techniques to probe our Universe, showing it to be even stranger and bigger than we ever realised. We have discovered a Universe containing unusual places and objects like planetary nebulae, red giant stars, hot white dwarf stars, multiple star systems, colliding galaxies and black holes. While cosmologists try to explain the beginnings of the Universe by trying to understand the properties of the Big Bang, the study of stars has led us to realise that our own Sun is a middle-age star, in a part of the galaxy we call the Milky Way.

The stars are accessible to

The stars are accessible to everyone on any dark night making it one form of science where you can make observations of the Universe from your backyard. Amateur astronomers pursue such a hobby in their spare time, purely for the pleasure of it.

This booklet will tell you about the variety of activities undertaken by amateur astronomers, the types of objects they observe, how to get started, and more advanced activities to which the newcomer can aspire.

Welcome to astronomy!



An Australian perspective

Stars and planets form part of Aboriginal dreaming stories.

Astronomy has been part of Australian heritage since James Cook first sailed to Tahiti (and then to Australia) on a mission to watch a transit of Venus across the Sun. Knowledge of the stars and planets make up a large part of Aboriginal tribal beliefs and dreaming stories, including day-to-day knowledge used to follow the change of the seasons.

The establishment of state observatories in the major Australian cities reached a height in the late 1800s, typified by the construction of the Great Melbourne Telescope. Astronomers soon realised that light pollution from streetlights and other outdoor lighting was limiting observations in cities so remote mountain sites such as Siding Spring were developed during the 20th century. After World War II, facilities such as the radio observatory at Parkes enabled astronomers to look at the sky in a different way.

Amateur astronomers, too, have established observatories in and around the major cities of Australia which have become a focal point for many local astronomy clubs and societies. Such associations often run public nights at their observatories or other local sites. Many observers also have a dome or shed with detachable roof in their backyard for private use.

Amateur astronomers discover new objects.

Amateur astronomers interact with professional astronomers by discovering new objects such as comets, providing back up observations and alerting major observatories (including those operating orbiting observatories) of activity in variable stars, supernovae and similar phenomena.

Books and magazines about amateur astronomy are written and published in Australia, providing a relevant local

Starting out

Simple and enjoyable astronomy can be done with just your

Many people think of astronomy as requiring a costly high magnification telescope. In fact the simplest and often most enjoyable astronomy can be done with just your eyes. The motions of the planets, Moon and constellations have fascinated people for centuries and are all basic observations that require no equipment.

Familiarisation with the sky usually begins with learning to identify the brightest stars, the more obvious constellations (such as Orion, the zodiac constellations, the Southern Cross), and other bright naked eye objects such as the Milky Way and Magellanic Clouds. Occasionally a bright comet or meteor shower can be viewed for a few weeks. The planets will move over the weeks among the constellations, often meeting in conjunctions. All one needs to view these types of objects is some patience, a basic guidebook, and a cloudless night sky!

Once the “clockwork” of how the sky moves is learned, it is easier to understand the more complex concepts of orbits, precession, stellar evolution and cosmology, which are all part of the modern science of astronomy.

Binoculars reveal a wealth of detail under a dark sky.

Use of binoculars is the next natural step and reveals a wealth of detail under a dark sky, including Jupiter’s moons, lunar features, star clusters and the brighter nebulae. The higher magnification provided by binoculars or a low power telescope also make it easy to get lost among the constellations so a star atlas or guidebook is always handy. To prevent glare reducing the night sensitivity of the eye most astronomers use red tinted torches when using star charts.



Astronomy clubs

Buying a telescope can be a costly exercise...

a cheaper alternative is to make your own.

Amateur astronomy clubs hold regular viewing nights.

Buying a telescope can be a costly exercise and should be carefully thought through and discussed. Attending an amateur astronomy club meeting will allow the beginner to discuss their requirements and observing interests with experienced observers as well as providing the opportunity to meet others who already own telescopes. It always helps to make the effort to learn the sky first with binoculars or the naked eye before trying to use a telescope. Even the newer computer-controlled telescopes require calibration on known bright stars.

A cheaper alternative to buying a telescope is to make your own. Amateurs have been making reflector and refractor telescope for decades and have developed cheap, easy-to-learn techniques in optical construction and testing. Many clubs run telescope making classes or can advise on where to obtain materials. There are few things more thrilling than viewing a dark clear night sky through a telescope you built yourself!

Amateur astronomy attracts a wide variety of people with diverse backgrounds which often makes it a fun social activity. Amateur astronomy clubs hold regular viewing nights and meetings where talks and lectures from amateur and professional astronomers inform the audience of the latest in astronomical advances. Topics discussed at meetings can range from “How to build a telescope” to “What is a gamma ray burster?”

As well as meetings within the club itself, most clubs are actively involved in promoting public education of astronomy by visiting schools, running public viewing nights, and appearing on radio or TV. Given the high level of public interest in space science and astronomy, it is not uncommon for amateur clubs to run several public nights a month around the metropolitan area.

Other social activities run by clubs include BBQs, weekend camps, workshops and even car rallies!

Things to see in the sky

Comet discoveries are made by amateur astronomers.

Amateur astronomers can easily observe the Solar System, including the five naked eye planets (Mercury, Venus, Mars, Jupiter and Saturn), the outer planets and their moons, asteroids, comets. Comets in particular can change their appearance in a matter of days. Amateurs contribute to planetary science by observing cloud features in the atmospheres of Mars, Jupiter and Saturn. Comet discoveries are sometimes made by amateur astronomers.

Amateurs are not limited by telescope access or time.

Deep sky objects, beyond our Solar System, have long been popular with amateur astronomers. Observing non-stellar objects such as nebulae and galaxies requires a moonless night and a dark country sky for observation. A large telescope is required to view fainter objects. Magnification is not as important as the size of the mirror or lens of the telescope.

Watching variations in brightness of stars requires many observations over long periods of time (even years) — an ideal task for amateurs, who are not limited by telescope access or time. Many amateur astronomers monitor active star systems such as novae. Double stars are also observed by amateurs.

Eclipses and occultations (where the Moon or a planet passes in front of a star) allow amateurs to make important measurements of Solar System bodies such as the Moon, Sun and asteroids. By timing such events amateurs have increased the knowledge of asteroids and outer planets. To observe an occultation event one needs to be in the right place at the right time. Amateurs achieve this by observing from home or by mobile expeditions to nearby sites.



Getting more involved

Amateurs use simple camera equipment to capture the beauty of astronomical objects.

Astronomy has always been a science at the forefront of new technology, especially with regards to computational requirements, optical advances and light sensors. Amateur astronomers continue to make use of the latest advances in personal computers, telescope design and astrophotography. As well as using off-the-shelf commercial equipment, many amateurs design their own optics, write their own software and experiment with new film types. Amateur astronomical societies and magazines provide a forum where amateur astronomers can share equipment, results and ideas.

Photography of the night sky (astrophotography) is popular with amateur astronomers. Amateurs use simple camera equipment and time exposures to capture the beauty and colour of a variety of astronomical objects. Many process their own black and white or colour film and are willing to show others how to do this. Needless to say, slide shows are a popular feature of many astronomy club meetings!

Astronomy is real science.

Astronomy is *real* science. Although few amateurs eventually become professional astronomers, many use their skill, patience, creativity and time to forward the science of astronomy. Well known Australian amateurs such as Bill Bradfield (South Australian discoverer of 17 comets) and Bob Evans (NSW discoverer of supernovae) are examples of amateurs who have used simple equipment to pursue long term, low cost observing projects. Such observations complement those of professional astronomers. Scientific observations by amateurs are co-ordinated worldwide by international amateur bodies.

The past decade has seen amateurs making use of CCD (Charge Coupled Device) technology for astronomical imaging. CCDs involve light sensitive electronics which can convert light into a digital signal. The data can then be stored and processed using a computer to measure brightness, position and colour measurements of astronomical objects.

Finding out more

Your local school, council or university library is a good source for astronomical material, including astronomical textbooks, telescope making manuals, yearly data books, astronomy magazines and even astronomical software!

Some camera shops can supply astronomical equipment, and most bookshops have a science or astronomy section. Specialist shops exist in some of the major cities, which sell binoculars, telescopes, astronomical equipment and books. Science museums usually have a good selection of astronomy books and aids, and can put you in touch with your local astronomy club.

The Internet has proved very popular with both professional astronomers and amateur groups. Web sites include links to astronomical space programs, professional and amateur observatories, amateur astronomy societies. Web sites now exist for most major astronomical product suppliers such as telescope manufacturers, producers of astronomical software, CCD camera manufacturers, astronomy book and poster suppliers, and astronomy magazine publishers. University astronomy departments also have interesting Web sites relating to current research in astronomy.

Professional observatories have visitor centres which are open during the day, and several planetariums exist in Australia, which allows you to find out about the stars even when it is cloudy!

Contact your local astronomical society! Most astronomical societies have a club house or astronomical site near a major city. Check the phone book, call and find out when their next viewing night is happening.

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