Skywatch

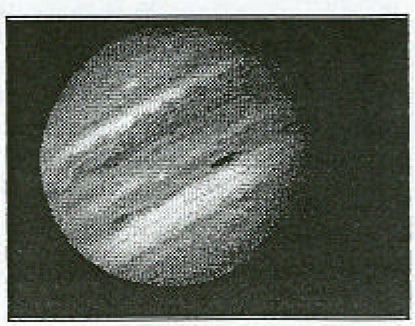
'Serving Mobile's Amateur Astronomy Community'

May-June 1995 • Issue 3, Volume 4

The Return of the King

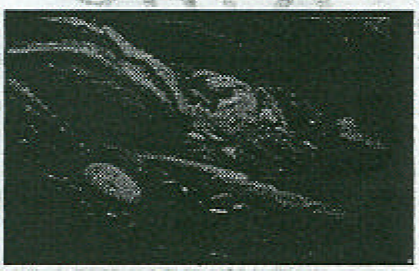
The King of the Planets, that is--Jupiter! While the giant of our solar system is **still** rising around midnight as I write (early April), by mid-June, Jupiter is high enough (30 degrees) in the southern sky by about 9:00 pm to be worthy of serious observation. During this apparition, Jupiter is in the southern constellation Scorpius, so this is *one* time to be thankful that we live on the Gulf Coast! Though our skies are (seemingly) always humid and full of bugs, we are far enough south in latitude to put Jupiter reasonably high in the heavens.

During every apparition of Jupiter, the astronomy magazines run features along the lines of 'Get Ready for Jupiter.' While this is helpful, there always seems to be a bit of stuffiness in these articles which is absent from other observational astronomy pieces. Some of the authors leave me with the feeling that if I don't use a **Takahashi** APO refractor to time Great Red Spot Transits and make drawings for submittal to the Association of Lunar and Planetary Observers, I'm not 'worthy' of observing Jupiter. I think it's **laudable** if an amateur astronomer wants to try to make scientifically useful observations, but *most* of us are in this hobby 'merely' for fun (and for some liberal stimulation of our sense of wonder). So what is needed for a nice **(relaxed)** night of Jupiter observing?



Jupiter is a facinating spectacle in even the smallest telescope!

A telescope: You'll hear a *lot* about what sort of telescope is 'required' for 'serious' observation of our friendly neighborhood gas giant. Currently, apochromatic refractors (**big $$**) or long-focus (f10+) Newtonian reflectors (hard to find) seem favored by the cognoscenti. The truth is, though, that **any decent telescope** will do a wonderful job on Jupiter. I have had excellent observing runs with every one of my scopes (4" f11, 6" f8, 8"f7 , and 12.5" f4.8 Newtonians; and my 8" f10 SCT). All of these telescopes--including the 4"--reveal a *wealth* of features on the Jovian disk (often more than I can draw). While the 12.5" shows more details than the other telescopes when the seeing is good, I have recently started using my new SCT for extended observing sessions. The fact that the C-8 is on an equatorial mount with a good clock drive makes a lot of difference when I'm trying to make-out subtle features. Having to constantly nudge a Dobsonian tends to distract me a little (though a good Dob is so smooth that you tend to **forget that you're nudging the scope** after a while). Also, the naturally comfortable viewing offered by SCTs (**seated** with all accessories within easy reach) encourages longer observing runs. But I've stood mesmerized by the beauty of Jupiter even when my only instrument was **a borrowed 60mm Tasco refractor** (during my Air Force days).



The Great Red Spot has faded quite a bit in recent years, but it's still easily visible in telescopes as small as 6 inches!

Eyepieces/magnification: What I said about using high magnifications in my article on Mars in the last issue of *Skywatch* is also true for Jupiter (though to a lesser extent)--i.e. use all the magnification that your scope/seeing conditions will allow. Since Jupiter's average angular diameter (about 45" or so) is much greater than Mars' (not much more than 12" during the recent opposition), you can get away with a *somewhat* lower power, which will often let you have some nice views of the planet on nights when seeing is just not good enough to support high-power. If you *really* want to see a wealth of detail on the Jovian disk, though, I suggest that you try to use a magnification of around 200X most of the time. If you find that you don't own a decent high-power eyepiece, maybe now is a good time to invest in one. It's not necessary to invest in an extremely expensive giant-field multi-element hunk of glass, either. If you intend to use your high-power eyepiece mainly for the planets, it really doesn't **matter** how wide your field of view is; you usually put Jupiter smack in the middle of the field and leave it there (though a wide-field eyepiece may be a wise purchase for an undriven scope, since it will give you a little more viewing time between nudges). Though most observers tend to favor Plossl eyepieces these days, in my opinion, *Orthoscopics* are often sharper (and sometimes cheaper). I have been using a 7mm Orthoscopic that I purchased from Orion for several years with good success. This eyepiece only set me back about $40.00 and has been worth every penny. Similarly priced Orthos are also available from University Optics, and numerous other vendors. In addition to your high-power eyepiece, you may also find that an 80A (blue) eyepiece filter makes it easier to distinguish the planet's many belts and zones. Eyepiece filters are available from many astronomy dealers and are both reasonably priced and very useful for solar system observing.

Other accessories: *Number one* on my list of additional accessories is a can of **Deep Woods Off**. It is simply the *only* thing that seems to keep those blasted Asian Tiger Mosquitos from draining my last drop of blood! Don't forget your flashlight (it doesn't even have to have a red filter if you're not doing any deep sky observing). A copy of the current *Sky and Telescope* is a must if you want to be able to identify Jupiter's Galilean moons or glimpse the Great Red Spot. Finally, a sketchpad, an HB pencil and an eraser are called for if you feel like drawing the planet. I'm not insisting that you do so in order to be a 'real Jupiter observer', but you may, like me, find drawing this planet's many wondrous features to be relaxing. I certainly don't send my drawings to ALPO, and I only rarely worry about being deadly accurate in the placement of details (and I never have gotten the hang of this 'preceding/following' business!). But I do enjoy the process of sketching, and there is an outside (slim) chance that a casual drawing I've made might record an important event on the planet.

A certain amount of single-minded dedication is required to remain active in amateur astronomy. Carrying out and assembling a complex scope after a hard day at work can seem **daunting** (*not to mention the prospect of having to pack it all back up after a weeknight hour or two of observing!*). But this doesn't mean that we can't have fun. If your idea of fun is taking data and keeping careful records, more power to you. But as for me, I'll be more than happy to remain just a casual, fun-loving, celestial tourist.

Skywatch is published bi-monthly as a service at no charge to the membership of the Mobile Astronomical Society by Rod Mollise. Submissions are always welcome. Address correspondence to:

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If possible, submit articles for *Skywatch* in machine-readable form. 3.5" *WordPerfect* disks is the preferred submission format, but a wide variety of word processors can be supported. Out of town/state subscriptions are available for a nominal charge (to cover postage). Also, those club members who are **unable** to pick-up their issues of *Skywatch* at MAS meetings can arrange to receive their issues via mail or in electronic form. Please contact me to make arrangements for this service.

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Astronomy Book Review

Levy, David H.: ***Skywatching***. The Nature Company, Berkeley, CA., 1994. 288 pages. $24.95. Available only from the Nature Company at 800-227-1114.

A while back I wrote about how

surprised I had been at the usefulness of a book I had been given as a gift by non-astronomer friends: *The Audubon Society Field Guide to the Night Sky*. Well, my wife and I recently received David Levy's new *Skywatching* as a wedding gift. I'll admit that I wasn't very excited about this book. While Mr. Levy is a well-known (perhaps *famous* is a better word now--even the general public has heard of Comet Shoemaker-*Levy*!) amateur astronomer, *Skywatching* looked like the typical coffee table astronomy book--long on pictures, short on useful text, and of very little interest to the experienced amateur. I wound up throwing the book in a suitcase before my wife and I left on a recent trip, thinking that it might be fun to look at some of the pretty pictures while riding in the car. In fairly short order I went from skepticism, to the admission that the book might be useful for beginning observers, to the realization that the book is a decent quick-reference for *all* amateurs. But, above all, I realized that I was having a heck of a good time with this book. ***Skywatching* is definitely a fun read.**

I'm not denying, however, that *Skywatching* is aimed at the beginner, it definitely is, and performs the role of being an introduction to astronomy as both science and hobby in an admirable fashion. Following a nice chapter on the history of the astronomy, Mr. levy spends about 30 pages surveying of the universe from our solar system to the Quasars. Initially, I was going to merely skim over this section of the book (Oh, no! Not **another** introductory explanation of the Hertzsprung-Russell Diagram!). But before long I stopped skimming and started reading. Hardly realizing what I was doing, I had finished the entire chapter. This part of the book is written in such a clear, concise and engaging manner that I simply couldn't help myself. It is also liberally peppered with excellent photos and good explanatory diagrams. This chapter is very well organized into a variety of descriptive subtopics such as 'Dwarfs Giants and Supergiants!' and 'Celestial Graveyards'. I can see this part of the book being very useful even for us old hands. I'm *always* looking for a good basic book for looking up elementary facts which I've (temporarily) forgotten (I seem to do this more and more with each passing year!). *Skywatching* would also be a nice 'accessory' to bring to public stargazes to help answer beginners' questions (e.g., Novice: 'How big *is* Betelgeuse, Mister?' Me: 'Gulp!').

The next chapter, Chapter Three, 'Skywatching Tools and Techniques' is, I'm afraid, a *bit* less successful than what has gone before. For example, in a discussion of amateur telescopes, Mr. Levy does not even *mention* that most beginner-friendly of all telescopes, the Dobsonian. Even in his discussion of scope mountings, where one would definitely expect to see the Dob discussed, Levy merely divides mounts into 'equatorial' and 'altazimuth'. While a Dobsonian mount is *technically* an altazimuth, it is a far, far different animal from the small altazimuth-mounted refractor pictured in this book. Further, our author leads us to believe that the altazimuth is **inherently** inferior to the equatorial '...less sophisticated.' A Dob mount may be less 'sophisticated', but that doesn't mean it's less **capable** (pay attention the next time one of your friends with an equatorially mounted scope tries to view objects near the pole--and cover your ears!). I also felt that the author should have more **strongly condemned** 'department store refractors.' There is *no real reason* for *anyone* to have to buy one of these scopes ever again. Exchange rates and other factors have made many of these tiny 60mm, 800 power refractors (those that were *marginally* useful, anyway) almost as expensive as good, U.S. made 6"-8" Dobsonians! *All astronomy writers need to get the word out on this.* The worst of these small telescopes have done more to **harm** amateur astronomy than anything else I can think of! Finally, I felt that Mr. Levy *wasted space* by devoting sections to astrophotography and CCD astronomy. These discussions are **much** too basic to be of use to the experienced amateur and too brief to be of aid to the novice.

In the next chapter of the book (which actually forms the **bulk** of *Skywatching*), David Levy again hits his stride. After an excellent overview of the 'mechanics' of the sky, he presents a selection of well-explained wide-field seasonal star charts. Following these all-sky maps we get *pretty* Tirion charts for each constellation. Every constellation gets its own page (Hydra gets two), and the star charts are accompanied by good discussions of the constellations (which are highlighted on the maps) and the deep sky objects and interesting stars they contain. Each chart is (unsurprisingly) beautifully rendered by master celestial cartographer Wil Tirion (he of *Sky Atlas 2000* and *Uranometria 2000* fame). Although I certainly wouldn't want to use these charts as my **only** sky maps, they *are* detailed enough for beginners' use, and make good quick-desk-reference charts for the rest of us.

The next chapter 'A Tour of the Solar System' has well written sections on the planets, the Moon (with a simple moon map showing a few score of the more prominent features), and the Sun. Also included are discussions of minor planets (asteroids) and comets. Since this book was authored by a **major** comet discoverer (**21** or so the last I heard), I had expected a *little* more than the **brief** section on comets which Levy offers us. I had hoped for Mr. Levy's personal perspective on the whole comet hunting 'game'. But what we have here is a fairly conventional summary of the subject; not much different from anything else in the book, but well done nevertheless.

The final chapter in *Skywatching*, 'Probing the Universe' is something of a catchall for such topics as cosmology, the possibilities for extraterrestrial life, and the space program. All of this will probably be quite engaging for the beginning amateur or the lay person who is just interested in 'space', but I found little here worthy of even the few pages (about 10) which Levy devotes to this chapter.

Perhaps I was wrong in the opening paragraph of this review to compare *Skywatching* to *The Audubon Society Field Guide to the Night Sky*. Despite my few criticisms, the genre that this book belongs to is really that wonderful type of beginner's book (like *Stars* by Zim, the 'Golden Guide' which was my long-ago introduction to astronomy) which is treasured and referred to **long** after one ceases to be a 'beginner.' How *happy* I would have been as a ten-year-old to receive a book like *Skywatching*.

--Rod Mollise

--With this issue, 'From City Lights to Deep Space' goes on Summer hiatus in order to allow me to print the following FAQ (Frequently Asked Questions) from the Internet. I think it will be of interest to all; especially to beginners. Part I follows, with Part II to appear in our July-August issue--Rod...

Purchasing Amateur Telescopes FAQ Part I

Ronnie B. Kon

Last Updated: October 3, 1994

Questions in this FAQ:

In Part I:

1. What is the single most important thing I should know before buying a telescope?

2. What is the single best piece of advice to give to someone thinking about buying a first telescope?

3. What Does All the Jargon Mean?

4. What Are Some Good Introductions To Amateur Astronomy?

5. What Will I Be Able To See?

6. Buying A Telescope:

6.1 What Company Makes the Best Telescopes?

6.2 How do Meade and Celestron Name Their Telescopes?

6.3 Comparison of Schmidt-Cassegrains

6.4 What is the Best Telescope to Buy?

Contributors to this posting include:

Pierre Asselin, Dana Bunner, Doug Caprette, Mike Collins, Kevin Deane, Jay Freeman, Chuck Grant, Dyer Lytle, Christopher Gunn, Doug McDonald, Andy Michael, Dave Nash, Jim Van Nuland, Bill Nelson, Leigh Palmer, Alan Peterman, Tom Randolph, David Smith, Geoff Steer, Mario Wolczko, C. Taylor Sutherland, Paul Zander

1. What is the single most important thing I should know before buying a telescope?

This is the single most important thing you should get out of this FAQ: DO NOT BUY YOUR TELESCOPE FROM A DEPARTMENT STORE. Ignore every-thing any literature tells you about magnification and such. Buy from a telescope store, where you will get a telescope that makes a smaller claim, but will give you FAR better performance.

The reason is that as far as telescopes go, how much you can magnify is a function of the amount of light the telescope receives, which is almost entirely determined by the telescope's aperture (the size of the lens or mirror that points at the sky). As far as magnification goes, you can expect 50x per inch of aperture on a normal night, up to 62.5x on an exceptionally clear night (this is the number Meade uses in calculating their magnifications).

Department stores always show little 2 1/4 inch refractors for up to 300+ dollars and say that the refractor can get up to a whopping 600x or so. Strictly speaking, this is true. However, applying the 50x rule, it is easy to see that 125x would be pushing the optics, and that is assuming that they were high quality ones. With the quality of the parts they usually give you are lucky to get 100x with reason-able resolution.

More details will follow. I put this up at the top so even if you read nothing else, you will read this.

2. What is the single best piece of advice to give to someone thinking about buying a first telescope?

Find a local astronomy club and attend a star party. Find ways to look through telescopes of different quality and prices so you can determine what you want to buy. This FAQ can give you information, but cannot possibly compare to actually going out and looking for yourself. Besides, it's the last chance you'll get to look at the sky for free.

3. What Does All the Jargon Mean?

OK, by popular request, here is a glossary of common astronomy terms encountered in amateur astronomy. Words in bold face (or underlined)can be found defined under their own heading.

altazimuth mount

This is what you think of when you think of a tripod mount. It allows movement in two directions: parallel to the ground (azimuth), and at right angles to the ground (altitude). It is very useful for terrestrial observations, as it is a very natural way of observing. It is significantly less useful for astronomical use, where an equatorial mount is preferred.

aperture

The diameter of the objective.

Barlow

A Barlow lens is a device which has the effect of increasing the magnification. It does this by lengthening the effective focal length of the telescope you are using. Thus a 2x Barlow will double the magnification, a 3x will triple it. Barlows used to have a bad reputation, stemming largely from rather poor quality ones being sold. Modern Barlows are high quality and a good choice for expanding your collection of eyepieces. You should keep the Barlow in mind when buying eyepieces--buying a 3mm, 6mm,12mm, and a 24mm and a 2x Barlow is a very dumb idea. The only use you get from the Barlow is changing the 3mm to a 1.5mm (which is probably going to give you higher than usable magnification anyway). On the other hand, a 6mm, 9mm, 15mm and 24mm would be complemented very well by a 2x Barlow.

catadioptric

Any of a number of compromise telescope designs, using both a lens and mirrors. Examples are the Schmidt-Cassegrain and Maksutov-Cassegrain. Because the light path is folded twice, the telescope is very compact. These are pretty expensive. Pictures can be seen in the ads in any issue of a popular astronomy magazine: the Meade 2080 and the Celestron C-8 are examples of Schmidt-Cassegrain; the Celestron C-90 and Questar are examples of Maksutov-Cassegrain.

chromatic aberration

In refractor telescopes, which use lenses to bend the light, different wavelengths of light bend at different angles. This means that the stars you see will usually have a blue/violet ring around them, as this light is bent more than the rest of the spectrum. It is not present at all in reflectors, nor to any significant degree in catadioptrics. Different glasses and crystals (notably fluorite) are sometimes used to compensate for the aberration. Such telescopes are termed "achromat," or "apochromat" if the correction is nearly perfect.

collimation

This refers to how correctly the optics are pointing towards each other. If a telescope is out of collimation, you will not get as clear an image as you should. Refractors generally have fixed optics, so you don't have to collimate them. Reflectors and catadioptrics usually have screws that you turn to collimate. (This only takes a few minutes to do--it is dead easy).

coma

This refers to the blurring of objects at the edge of the field of view, most common in short focal ratio Newtonian telescopes (at f/10 and longer, Newtonians are very well corrected for coma).

declination

All astronomical objects are located via a pair of coordinates: Right Ascension and Declination. These are easily visualized by imagining that the Earth is in the center of a hollow celestial sphere, which has all the stars, nebulae and galaxies painted on the shell, and the sun, moon and planets move around the shell's inner surface. We can then project the Earth's lines of **Latitude** and Longitude onto the sphere, and have a unique location for each object (obviously, these will change rapidly for quickly moving objects, very slowly for slower objects. See also precession). The Declination is the celestial latitude, the Right Ascension is the celestial longitude. "The Ecliptic" is the path the Sun travels over the course of the year. If it were projected onto the Earth it would form a sine wave bounded by the Tropics of Cancer and Capricorn.

Find a local astronomy club and attend a star party. Find ways to look through telescopes of different quality and prices. . .

Dobsonian

Named for John Dobson of The San Francisco Sidewalk Astronomers (who prefers to call these "Sidewalk Telescopes"), this is a design which allows for very large apertures at very affordable prices. The trade-off is that they are mounted on altazimuth mounts, instead of equatorial ones, which makes them essentially useless for astrophotography, but an inexpensive alternative if you only plan to do visual work. These are light buckets. If you are planning to build your own telescope, you might want to consider a Dobsonian.

double star

A double star is a pair of stars which appear to be very close together. There are two types of double stars: binary stars, where the two stars are actually a part of a system and orbit each other; and optical doubles, where the two stars are not gravitationally bound at all, they just happen to lie on the same line of sight from the Earth.

ephemeris

Plural, ephemerides. A table of the location of a celestial object at regular intervals in time.

equatorial

An equatorial mount is set to the current latitude, and is polar aligned (pointed at the North Pole in the Northern Hemisphere,
the South Pole in the Southern Hemisphere) and then moves only in Right Ascension and in Declination. This take a while to get used to, but offers the wonderful side effect of being able to track the astronomical objects you are looking at as they move across the sky (which is very visible motion at telescopic magnifications) by moving in only one direction (Right Ascension). Most equatorial mounts come with motor drives that take care of this for you.

exit pupil

This refers to how wide the beam of light exiting the eyepiece is, and is equal to the aperture divided by the magnification. If it is bigger than the size of your pupil in the dark (7mm when you are young, 5 or 6mm when you are over 40, as a general rule) you will not be taking in all the light available--effectively, you will be using a smaller aperture telescope than you have.

eyepiece

This is the thing you actually look into. Almost all telescopes separate the Optical Tube (the telescope proper) from the eyepiece. Essentially, the telescope makes a really tiny image of what it's pointed at. The eyepiece acts as a magnifying glass to allow you to see the image bigger than it would otherwise be. The magnification is the focal length of the telescope divided by the focal length of the eyepiece. Eyepieces are described by the diameter of the barrel, always expressed in inches (.965", 1.25" and 2" are the sizes in common use) and the focal length always expressed in millimeters (4mm - 40mm is the usual range). Short focal length eyepieces are also termed high power, long focal length are low power. Also significant with eyepieces is the apparent field of view (expressed in degrees) and eye relief (expressed in millimeters). The apparent field refers to how big the circle of space you see in an eyepiece appears. Bigger is better. Eye relief is a measure of how far from the eyepiece you can have your eye and still see. If you wear glasses to correct astigmatism, you will need fairly long eye relief (the focus knob will correct for almost all vision problems except astigmatism).

There are several types of eyepiece designs. The most popular are Kellner (inexpensive, most popular for cheap telescopes, short eye relief and narrow fields of view. Good to avoid if you can afford better); Orthoscopic (good price/performance compromise); Erfle (wide field of view, expensive); Plossl (perhaps the best all-around eyepiece. Some moderately expensive versions available); and Ultra Wide (very expensive, almost double the number of lenses as other designs makes for more light loss in the eyepiece, large exit pupils. Can cost more than a small telescope. Not a good place to spend your money when you are just starting out). You really don't want to buy many .965" eyepieces--they are generally not as well made as the 1.25" ones, and if you get a bigger telescope it will probably not accept your .965" eyepieces. You can buy an adapter to let you use 1.25" in your .965" focuser. This is probably worth the money.

f/10, f/6.3

See Focal Ratio

finder scope

The finder scope is a low power telescope attached to the telescope you are using. Because most telescopes show such a small portion of the sky, it is virtually impossible to locate anything just by looking through them. So you look through the finder scope to center the object you want (the finder has crosshairs) and then you can use your real telescope on it. Note that you can ignore all the claims about big finder scopes. You almost certainly don't care. All you need is to be able to point your main telescope at something in the sky. Finder scope size only matters when you are starhopping through fairly dim stars (where the larger aperture allows you to see dimmer stars). This will not be an issue for you for quite a while (if ever). Many people use a Telrad sight, which is simply a red LED you can sight on-- you get absolutely no more aperture than your naked eye. The finder scopes are usually advertised as 8x50 (or such). The eight refers to the magnification, the 50 to the aperture in millimeters--just like binoculars.

focal length

This is the length of the light path, from the objective to the focal plane. The magnification is the focal length of the telescope divided by the focal length of the eyepiece. See also focal ratio.

focal plane

The plane that the telescope (or eyepiece) focuses on. When you turn the focus knob on the telescope, you are moving the eyepiece back and forth until you make the two focal planes coincide.

focal ratio

Also referred to as the "speed" of the telescope, is the ratio of focal length to aperture, and is always expressed as an f/number. Thus an 8" telescope with a 2000mm focal length is f/10 (because 8" is 200mm, and 2000 / 200 = 10). An f/10 telescope is "slower" than an f/4.

Fast telescopes give wider, brighter images with a given eyepiece than slower ones (but note that at a given magnification, the images are--assuming identical optics--exactly the same: what you see through a f/6.3 telescope with a 12mm eyepiece is identical in width and brightness to what you would see through a f/10 telescope with a 19mm eyepiece). In general, the slower the telescope the more forgiving it is of optical errors in the objective and eyepiece. A telescope of f/10 is fairly forgiving, f/6.3 much less so.

focuser

This is the thing that holds the eyepiece. It moves in and out so you can focus the telescope. It is always included with the telescope when you buy one. The size, almost always .965", 1.25" or 2" refers to the barrel diameter of the eyepieces it accepts.

fork mount

A fork mount is a type of mount where the telescope is held by two arms, and swings between them. A fork mount can be either alt-azimuth or equatorial (through the use of a wedge). Fork mounts are most commonly used with Schmidt-Cassegrain telescopes, and are almost always equatorial.

German Equatorial Mount

The first equatorial mount devised and still the most common for small to moderate sized reflectors and refractors. Unlike the equatorial fork, the german equatorial is suitable for telescopes with either short or long tubes (although, if poorly designed, a long tube may strike the tripod, preventing viewing at the zenith). They usually are designed with movable counterweights, which make them easy to balance, but heavy and bulky.

The tube of the telescope is joined to a shaft (the Declination shaft or axis) which rotates in a housing that in turn is joined at right angles to another shaft (The polar axis). The polar axis is pointed at the celestial pole (just like any other equatorial mount). A counterweight, which is required for balance, is placed on the other end of the declination shaft.

Tracking an object past the zenith requires that the telescope be turned (both Right Ascension and Declination rotated through 180 degrees), which reverses the field of view. Not so much a problem for visual astronomy, but a limitation on astrophotography.

light bucket

A common slang term for a large aperture. The cure for "Aperture Fever." Well, not really. After a month with the Keck telescope, any amateur worth her salt would be bitching about how much more she could see if only she could double the aperture.

Maksutov-Cassegrain

See catadioptric.

meridian

An imaginary north/south line passing through the zenith.

nebula

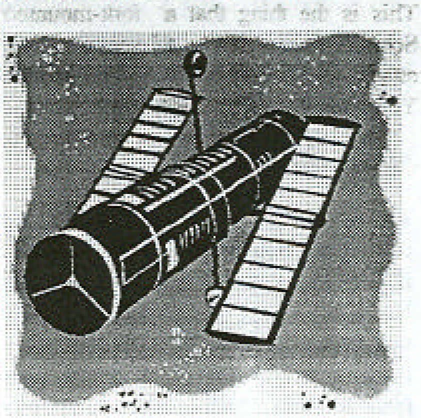
Plural nebulae. An unfortunate term which basically means "something up there which isn't a star or a planet." Until the early years of this century nobody knew what the diffuse light sources in the sky were, so they were all termed nebulae, from the Latin for mist. They encompass galaxies, supernova remnants and space dust. "Emission nebulae" are nebulae that emit light, thus you can see them. "Dark nebulae" are things which don't emit light, and hence can only be seen as a dark foreground against a brighter light. The Horsehead Nebula is probably the most famous dark nebula. Note that most astronomers will grimace loudly if you refer to galaxies as nebulae.

Newtonian

See reflector.

nutation

Like precession, this is a term you really don't want to know about. It turns out that not only does the sun make the Earth wobble in her orbit (see precession), the moon does as well.



This wobble (about 10 arc seconds with a period of about 18 years) is termed nutation. You will never have to worry about it.

objective

This is the thing that gathers light from the sky and folds the light into a cone. In a refractor it is the big lens that points at the sky, in a reflector it is the big mirror at the bottom of the tube. The job of the objective is to create a light cone which comes into tight focus at a single focal point.

optical tube

This is the telescope proper. It is the tube which holds the objective. The rest of the stuff are accessories, such as the mount, tripod, and eyepieces. When reading ads, note that sometimes optical tubes are sold by themselves. You will need to go out and buy (or build) a mount for them before you can use them.

precession

This is a motion which you don't need to think about. It is the drifting of the north pole, and all other celestial coordinates with it, in a rough circle. This occurs over so long a timespan (it is a 26,000 year cycle) that it will not affect you. It is, however, one of the main reasons (proper motion being the other) that star atlases are all prepared as of a specific date (January 1, 2000 is the current standard, the previous was January 1, 1950. Except they are really December 31 of the year before-- which makes a huge difference, as you can well imagine).

proper motion

Everything in the Universe is moving relative to the Earth. It is convenient to divide this motion into two vectors: the motion directly toward or away from the Earth (termed radial motion) and the motion perpendicular to the former, termed proper motion Motion directly towards or away from the Earth has no effect on the body's position as seen from Earth. Proper motion, however, does. This is one reason (along with precession) that star charts are prepared as of a specific date.

reflector

A reflector is any telescope which uses a mirror as its objective. The most common type is the Newtonian reflector, which has a mirror at the bottom of a tube, which focuses the light into a cone which is deflected by a flat "secondary" mirror (which is mounted near the top of the tube in something called a "spider") out a hole in the side. This is where you put the eyepiece. The advantages of the Newtonian design are numerous: there is only one optical surface on a mirror, as opposed to two on a lens, so it is

cheaper to make; part of the light path is at right angles
to the length of the tube, so it can be somewhat shorter than a similar refractor; you can get it in much larger apertures than a refractor, and there is no chromatic aberration . The principle disadvantage is that you do not get as good resolution as with a refractor of equal aperture (all other factors being similar).

refractor

This is what you usually think of as a telescope--it has a lens at one end, and you look straight through the other. This is sometimes referred to as a "Galilean" telescope, as it is of the same design that Galileo used (although strictly speaking, a Galilean telescope is a specific kind of refractor--one with a simple double-convex objective lens and a simple double-concave eye lens. This will not be on the quiz, so you need not memorize it). See reflector for a comparison of the two designs.

right ascension

See declination.

Schmidt-Cassegrain

See catadioptric.

spherical aberration

A problem where a lens or mirror in a telescope is not shaped correctly, so the light from the center is focused at a different location than the light from the edges. You should never have to worry about this. This only shows up in really cheap telescopes, like the Hubble Space Paperweight. [OK, this last comment is no longer appropriate (if it ever was). But I am leaving it in because it emphasizes the similarities between the telescopes available to you, and the very best professional telescopes. The optical laws governing them are identical.]

spotting scope

A small telescope, always a refractor or catadioptric, generally used for terrestrial viewing. Of limited utility for astronomy, though many are marketed as such. Probably the wrong choice unless you want to use it also for birdwatching, or as a powerful telephoto lens on a SLR camera.

The Starry Messenger

The Starry Messenger (or TSM) is a classified advertising monthly for astronomy stuff. Lots of ads, so a must-have for anyone considering buying used. It has started charging the sellers a 4% commission, though, which has prompted a new paper, "The Cosmic Exchange" (TCE), to begin publishing without charging the commission. I expect only one of them to last. Currently TCE is about half the size of TSM, but is growing. Subscriptions are $20/year for TSM, $16/year for TCE.

wedge

This is the thing that a fork-mounted Schmidt-Cassegrain telescope will attach to, to connect it to the tripod. You want it to be sturdy.

worm drive

This is the sort of drive most telescopes come with, if they come with a drive. It is a very accurate and smooth drive. However, due to imperfections in the manufacturing process, there will be periodic errors that occur at the same point in every worm cycle (usually about 8 minutes). To deal with this, higher end telescopes come with drives which compensate for the mechanical defects. Celestron's is the PEC (Periodic Error Correction), Meade's is the Smart Drive.

zenith

The sky directly overhead. An object "transits" when its line of right ascension crosses the zenith.

4. What Are Some Good Introductions To Amateur Astronomy?

In the United States, there are two popular astronomy magazines: Sky and Telescope (S&T), and Astronomy. Of the two, S&T is more technical, while Astronomy has more things like "artist's conception of Jupiter-rise on Ganymede" which are very pretty. I consider S&T a necessity, but getting both is not a bad idea.

In the U.K., there is a magazine called Astronomy Now which you probably want to subscribe to. It is rather like Astronomy in style, but slightly less bulky. Also, fewer pretty pictures. There is also a magazine called Popular Astronomy (which is not sold on newsstands--you have to join the Junior Astronomical Society).

There is also a U.K. monthly periodical The Astronomer (ISSN 0950-138X). This is stapled A4 format with glossy front and back covers. It is the journal of a group of observers of the same name and is devoted to rapid publication of observations. Not for the absolute beginner. Contact John Colls, 177 Thunder Lane, Norwich, NR7 0JF,United Kingdom. (+44 603-36695). Subscriptions are 21 pounds (UK),25 pounds (rest of Europe)>

There are many good introductory books. I can recommend The Light-Hearted Astronomer by Ken Fulton as being an excellent introduction for the complete neophyte. The writing style is a little irritating, but it is full of practical information. It is more about observing than astronomy, though. It has advice like "if you are in bear country, make a lot of noise so the bears don't bother you."

P. Clay Sherrod's A Complete Guide to Amateur Astronomy, available through Sky Publishing Company, is a more technical introduction. Sidgewick's books are absolutely excellent books, probably the very best ever written on amateur astronomy. They are also probably over a beginner's head. Holding off on these for a while would not be a bad idea.

Nightwatch by Terence Dickinson is a good introductory book on Astronomy. Great section on purchasing a telescope. Star charts are so-so.

The Backyard Astronomer's Guide by

Terence Dickinson and Alan Dyer. A comprehensive introduction to astronomy and the equipment amateurs like to use. Written by and for amateur astronomers.

Also see below, the section on Books and Starcharts.

5. What Will I Be Able To See?

The best way to find out is to go observing with someone. Look for a local astronomy club (S&T lists them periodically). This is also a very good way to get a good price on a used telescope of proven quality.

In general, you will be able to see all planets except Pluto as disks. You will be able to see the bands and Red Spot on Jupiter and the rings around Saturn. You may be able to see the ice caps on Mars (although Mars is probably the most disappointing object in the Solar System). Venus and Mercury will show phases but not much else.

You will be able to see four of Jupiter's moons as points. Ditto Saturn's moon Titan. You will be able to see comets.

Do not expect your images to be anywhere as nice as the ones you see from the Voyager spacecraft. If a $2000 telescope could get these, nobody would have spent billions of dollars to send a spacecraft out there.

As far as "deep sky" objects, you will be able to see all the Messier objects in most any modern telescope. Galaxies will tend to look like bright blobs. Look a while longer and you may find some spiral arms or dust lanes (assuming it has them). Galaxies look nothing like their pictures--you will not see the arms anywhere near as clearly.

You will also find that the colors you see are considerably more muted than the pictures you see. This is because our retinas work by having two different types of light sensitive organs, rods and cones. Rods are very sensitive to dim light, but relatively useless for color vision. Cones are the opposite. Thus when looking through a telescope you are using your rods, and you aren't seeing a lot of color.

6. Buying A Telescope

6.1. What Company Makes the Best Telescopes?

Hard to say, actually. The two biggest sellers are Celestron and Meade, both of which turn out good quality optics at fairly affordable prices (Celestron's optics have the reputation of being better than Meade's). Both do, however, occasionally turn out clunkers, which they will repair for free (as long as you are the original buyer).

Televue has a very good reputation, at a somewhat higher price. Questar has an excellent reputation, at an astronomical price.

Coulter makes inexpensive Dobsonians, with acceptable optics. They offer the most aperture for the money, with several drawbacks. First, they are big. Think long and hard about how you are going to transport it before deciding on the 10 inch or bigger. Second, they are basically deep-sky telescopes. All the Odyssey Dobsonians are short focal-ratio, which means they're picky about alignment errors. They all also have more than a trace of coma near the edge of the field
(minor to unimportant nuisance for clusters, nebulae, and galaxies; a more serious one for planets and other small targets). Hence they're not as suited for high power planetary work as your basic, medium-sized refractor. The telescope is very basic; in particular no finderscope and the focuser is a bit on the rudimentary side--a simple friction tube you pull in and out of the telescope's side. Third, they, like all Dobsonians, are altazimuth mounts: very stable but unsuited for astrophotography. Also, you usually have to order directly from Coulter and they're back ordered for six months or more on most of their telescopes. You can look for a dealer who could deliver quicker, for a bit more money (like $100).

Tasco is sold at Toys R Us. Buy some Lego Blocks while you are there, and you can build your own tripod, and have a mount of like quality to your optics.

6.2. How do Meade and Celestron Name Their Telescopes?

Both in rather stupid ways, Celestron being stupider than Meade.

'Look a while longer, and you may find some spiral arms or dust lanes...' M31, The Great Galaxy in Andromeda, is easily visible in small scopes.

Essentially, every Celestron Telescope is C-#, where the # is the size of the aperture in either inches or millimeters. Thus the C-90 is Celestron's 90mm spotting scope (a Maksutov-Cassegrain), the C-8 is their 8" Schmidt-Cassegrain, the C-6 is their 6" Newtonian. They will prefix these with "Super Polaris" to indicate the telescope comes with their Super Polaris tripod and mount (a German Equatorial). Powerstar or PEC (for Periodic Error Correction) means it has their good drive (comparable to Meade's Smart Drive). Ultima means it comes with a heavier wedge and fork.

Meade simply numbers everything. 2080 means an 8" Schmidt-Cassegrain. 2120 means a 10". Premier means sturdier wedge and tripod, and a better drive (but the same optics). All Premiers manufactured in the past couple of years (but not necessarily before) are equipped with "Smart Drive," which is essentially the same as Celestron's PEC. The Premier telescopes come with model numbers: 30 or 36 (no longer sold) means no hand controller, 40 or 46 means you get the hand controller, 50 or 56 means you get a declination drive (so the N/S buttons on the hand controller work) along with a slightly bigger finderscope and a 2" diagonal, 70 or 76 means you get a whole bunch of stuff. If the number ends in a 0 (eg. 40) it is f/10. If the number ends in a 6 (eg. 46) it is f/6.3. If the number has an H postfixed to it (10" models only) it comes with the "superwedge," a heavier wedge that is more stable than the regular wedge, and is useful for astrophotography. The rest of their stuff is pretty obvious, if you stop and think: the DS-16 is a 16" reflector, for example.

Meade has recently introduced the LX100 and LX200 series of telescopes. The LX refers to the drive (Meade has a very strange habit of changing what LX means--it used to refer to the drive, then (apparently) the focal ratio, now it's back to being the drive), which are certainly the most wiz-bang on the market. The LX200 has a computer driven declination drive, as well as the right ascension drive, which permits it to be used without an equatorial wedge. It can slew (move quickly across the sky) at the touch of a button on the hand control, you can hit the GOTO button to go directly to one of the 747 objects in it's library. You cannot do astrophotography on the Schmidt-Cassegrains without the equatorial wedge ($110 for the 8", $395 for the 10"). The LX100 does not have the declination drive, and so comes with a wedge, and doesn't seem to have most of the neat features of the LX200.

6.3. Comparison of Schmidt-Cassegrains

One of the more frequent criticisms I have had on this FAQ is that it is very biased towards Schmidt-Cassegrains. Please bear in mind that the main advantage of a S-C is the smaller length for the aperture. And you pay dearly for that. For a beginner, especially one who will be doing most of her observing from her back yard, it is probably not worth the added expense.

6.4. What Is The Best Telescope To Buy?

Well, Meade has a 16" Schmidt-Cassegrain which is beautiful. It is portable (ie., you and a couple of friends can lug it), reasonably compact, and readily available. You can pick one up for about $10,000. If you are in a position to spend this kind of money on a first telescope (hey Wozniak: this is the one for you. Buy me one while you're at it) it would be a strong candidate. If money is an object, you will have to compromise. My recommendations, by price level, follow. Prices are given as a range, using the price from the cheap New York mail order companies as a low, and Orion or Lumicon as a high, where applicable. Bear in mind that you will need to have some money left over for extra eyepieces if nothing else.

You will also find useful articles in the November 1991 issue of Astronomy (specs on a wide range of telescopes, and answers to a lot of the questions about technical jargon surrounding advertisers and equipment. There is also an article in the November 1991 issue of "Popular Astronomy." Both Astronomy and S&T (especially the former) do review articles on telescopes, accessories, etc. on a fairly regular basis. Also, no FAQ list is going to be truly definitive--we all have our own opinions and interests, and one person's "piece-of-junk optics" might be another person's dream telescope. This does not apply to department store telescope, though. Really.

Note that this information is out of date. I'll revise it eventually. Almost all the 'scopes are still available, the prices are just somewhat different. Also, there is a line of Dobsonians from Orion which should definitely be included (the Deep Space Explorers).

Under $100

Get a pair of binoculars. The only telescopes in the double digit range are pure junk. On the other hand, you can get a good pair of binoculars. Orion sells a pair (the 7x50 or 10x50 Observer (17mm and 14mm eye relief respectively)) for $85 specifically designed for astronomy. The Bushnell "SportView" are a possibility as well. If you can spend a bit more, the Orion 8x56 Mini-Giant binoculars look like real winners ($150), with 18mm of eye relief.

Around $250

Odyssey 8" ($275). An 8" Dobsonian from Coulter Optical. Use less for astrophotography, but far and away the most aperture for the money. The Orion 10x70 binoculars ($300). Personally, I would recommend going with a telescope before an expensive pair of binoculars, but enough people with a lot more observing experience than I have have suggested listing a high end pair. These are good ones.

Under $500

The Orion SpaceProbe 4.5" Reflector ($399). A straight-forward Newtonian on a German Equatorial Mount, with cable controls so tracking right ascension should be easy. Most aperture for the money. Comes with a tripod and a couple of Kellner 1.25" eye pieces (a 25mm and a 9mm).

The Orion Sky Explorer 80 ($533). An 80mm equatorial refractor. Fairly sturdy tripod, and cable controls for right ascension and declination that should make it fairly easy to track star without a drive. It comes with the same eyepieces as the SpaceProbe 4.5" mentioned above.

I don't know if I'd recommend the 60mm version of the above, which sells for $344. An 80mm objective gathers 78% more light-a big difference.

Edmunds Astroscan 2001 ($290 - $340). It is a very portable 4" Newtonian with the distinctive shape of a cylinder thrust into a sphere. The sphere rests in an aluminum base and the telescope can be pointed in any direction. Uses 1.25" diameter eyepieces. Supplied with a 28mm eyepiece giving 16x and a 3-degree field of view, wide enough to do without a finder scope. The drawbacks are that it is not very good for planets; and that it's difficult to track at high power. Also the "permanent collimation" the Astroscan comes with probably isn't. One respondent's seems to have come slightly out of alignment; this is unnoticeable at low power (e.g., the 16x it gives with the eyepiece it comes with), but is noticeable and rather objectionable at about 100x. Since it's permanently sealed up you can't go in and tweak the mirrors the way you can with most reflectors; you have to send it off to Edmund so they can look at it. Even if you could tweak it your self, getting it all aligned would be tricky; short focal-length reflectors (which the Astroscan is an example of) are much more sensitive to minor alignment errors than longer ones. Accordingly, your high power images may be on the fuzzy side.

Odyssey 10.1" ($345). A 10.1" Dobsonian from Coulter Optical Useless for astrophotography, but far and away the most aperture for the money. Also the 13.1 inch ($575). Note that the 13.1 inch appears to be f/4.5, which means that the tube is almost 5 feet long. Think about how you will transport this before you buy it.

The Celestron C-90 Spotting Scope with Multi-Coatings ($370 - $500). This is a catadioptric telescope with a 90mm objective. Note that due to the central obstruction, the C-90 has the equivalent light grasp of an 83mm refractor. The principle advantage is that it is compact and is very easy to carry around. The disadvantage is that it appears to be a telescope almost as an afterthought--the finderscope is pretty feeble, and you have to supply your own tripod. Probably the wrong choice unless you want to use it as a spotting scope in the daytime, or as a camera lens. Note that this last sentence is probably controversial-- many people that have the C-90 rave about it.

Around $1000

The Meade Star Finder ($760), a 10" Newtonian. See review in January 1993 Sky & Telescope. The Celestron C-6 ($720 - $900), a 6" Newtonian. Comes on a solid German Equatorial Mount (the "Super Polaris"), and with an 18mm 1.25" Orthoscopic eyepiece (42x).

The Celestron Super Polaris C-8 with Starbright Coatings ($1150 - $1300). This is an 8" Schmidt-Cassegrain system on the "Super Polaris" mount. It comes with an equatorial mount, and a drive which can track in right ascension. Note that you do not want the "Classic 8," which is the same optics in a fork mount but no tripod for $970 -$1250.

The Meade 2080A ($915 - $1150). An 8" Schmidt-Cassegrain in a fork mount, with a decent tripod. Essentially comparable to the Super Polaris C-8. I'd suggest buying whichever is less expensive.

The Celestron SP-C102 ($1050 - $1250). A 4" f/9.8 refractor (102mm) on the same "Super Polaris" mount as above. Takes 1.25" eyepieces (comes with a 26mm orthoscopic).

Odyssey 17.5" ($1150). A 17.5" Dobsonian from Coulter Optical. Useless for astrophotography, but far and away the most aperture for the money. This appears to be f/4.5, which means that the tube is over 6.5 feet long. This will not fit into many cars. Make sure you will be able to transport this if you don't have a great observing sight at your house.

Around $1500

The Meade 2120B (? - $1600). The cheapest 10" Schmidt-Cassegrain I could find, except for the 2120A, which appears to be the same 'scope, but without the coatings. The 2120A sells for $1500 from the discounters, so the B is almost certainly a better buy. The 2120B appears to be an f/10 scope with a fork mount. It comes with a tripod and a motor drive in right ascension. Presumably, no hand controller. (As you may have guessed, I've never seen one). All in all, a stripped down 'scope, but you get the aperture, which is the most important part of a telescope (after quality of optics, of course).

Around $2000

The Meade 2120 model 40 ($2000 - $2150). A 10" f/10 Schmidt-Cassegrain system with "Smart Drive" and a hand controller. The motor works in the Right Ascension direction but not declination (the declination motor costs extra). Do NOT opt for the super wedge. It costs about $300 extra, and can be bought separately (ie., later when you decide you actually could use it) for about $300. The same logic applies to all the nice things you get with the model 50--it costs as much to buy them packaged as to buy them individually. The issue is that beginning astronomers do not need all the fancy equipment. The big disadvantage, which I did not appreciate until I bought this telescope, is that while the optical tube weighs only 45 pounds, it is unwieldy as hell in the case they give you. I find that I cannot maneuver it around corners in my house, so I either have to get my wife to help me, or I have to carry it by holding the forks, which do not give as good a purchase as one would like, given that one is holding a $2000 piece of very sensitive, and reasonably heavy, junk. It also takes up enough room in the back of the car that it won't fit if we are filling the car for a camping trip.

Around $2500

The TeleVue Genesis (? - $1600) and Systems Mount (? - $900). A 4" Fluorite Refractor, which many people rave about. The Genesis II has been designed to fit into an airline overhead rack.

The Meade 10" LX200. Tons of wiz-bang features (see above), for not a lot more than the Premier 2120s. The finder scope looks like the feeble one that came with my 2120/40, but you can certainly live with that for a while.

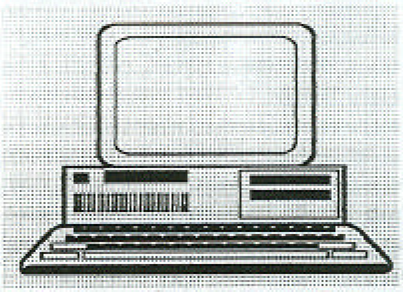
Over $3000

This is well beyond my knowledge. I would recommend avoiding all the fully loaded and computer controlled versions of cheaper telescopes available at this price level. The fact is that you are a beginning astronomer and don't need all the fancy junk (of course, this applies to the Meade LX200 also). If you have the money, you should at least look at a Star Fire refractor, a JMI NGT reflector and a Questar. I have heard very good things about all, but never seen through any.

David Smith contributes the following about the NGT (about $9000---not an inexpensive choice): I have spent a couple of evenings with an acquaintance who has an NGT-18. It is a very good scope. It's comparable in size to a Dobsonian, and I don't need a ladder to see into the eyepiece. I could see dim stars among the Trapezium which I couldn't see in other scopes nearby (4" refractors and 8-10" Newtonians and SC's). The rotating nosepiece works well, although it places increased demands on accuracy of physical and optical axes: the view was sharper from one rotation of the nosepiece than from another. Disadvantages of the NGT-18 are price, time to set up and take down, and lack of fine adjustments for polar alignment.

--Ronnie B. Kon ronnie@cisco.com

Astrobytes



Computers are increasingly important tools for amateur astronomers. Therefore, I'm inaugurating a regular column on astronomical computing. Do you have a favorite astronomy program which I haven't mentioned? If so, why not write a review and share your experiences with us? For example, I'd be really happy to receive a review of The_Sky, a program that I've heard a lot about, but which, unfortunately, I've never had a chance to try.

Shareware Roundup

Following are brief descriptions of shareware astronomy programs that I've used recently. Please note that there may be more current versions of these programs available. The versions listed are those I've actually used . . .

Skymap Version 2.2 (for Windows)

If you're looking for a nice Windows planetarium, it would be hard to beat *Skymap*. In complexity, this program falls somewhere between bare-bones planetariums like *Skyglobe* and more complex offerings like *The_Sky*. There's very little that this program doesn't do (and do well). The registered version can even be configured to use the GSC (Hubble Guide Star Catalog). While this program seems a **little** slow on older 486 computers, it is noted for its accuracy. The charts produced by *Skymap* (on a Cannon Bubblejet) were excellent. Of interest, especially to comet and asteroid fans because of its easy-to-use plotting functions for these objects and its large asteroid database. Look for an in-depth review soon.

NGP Version 2.2

This program is a DOS application that allows the **deep sky fanatic** to edit and save observing notes on the NGC objects, produce observing lists, and generate forms for use at the eyepiece in recording observations. *NGP*'s database includes the entire NGC catalog (of which the Messier list is a subset, natch) and provides minimal (but useful) search functions. One feature that makes this program *very* practical for me is its ability to export notes into David Chandler's *Deep Space Five* (formerly *Deep Space 3D*) program. Now I can use my observing notes in *Deep Space* without having to **start the program, plot maps, select objects, etc., etc.!** Recommended for the active deep sky observer.

The Saguaro Astronomy Club Database Version 6.0

This is the large (10,000+ objects) database produced by the members of the Saguaro Astronomy Club. In addition to the NGC/IC catalog, the *SAC Database* contains a large selection of objects from 'professional' catalogs like the PK, UGC, etc. This database is just that--a *Dbase* (.dbf) file which the user can open with *Dbase* or the database program of his/her choice. Included with the database files is a small *Dbase* application which can be run from DOS, and which has enough search/sort/report functions to get you started. *The SAC Database* contains excellent and useful information that provides the deep sky information for many famous programs--*Deep Space* and *Skymap* among them.

Skyglobe 3.6

I know that I've reviewed this program fairly recently, but this version adds some new functions, and, frankly, I just feel that I need to remind you all just how good this planetarium program is! No, *Skyglobe* doesn't use the GSC, and it doesn't have a database of tens of thousands of obscure deep sky objects, but it does feature stars down to about mag 7, and it does have a good selection of deep sky objects (the Messier catalog, plus a sampling of the 'best of' the NGC). The best feature of *Skyglobe*, though, is its raw speed. This is the fastest full-featured planetarium that I've used. Because it is so blazingly fast, this is the program I turn to when I want to get a quick idea of 'what's up'. Highly recommended based on both its **quality** and its **very reasonable registration fee**.

I'm often asked where shareware programs can be 'bought'. Well, you *can* go out and buy these programs. There *are* dealers who specialize in distributing shareware. One of the best of these is **Andromeda Software** (P.O. Box 605, Amherst, NY 14226-0605), which concentrates on astronomy/scientific programs and images. Most dealers charge somewhere around $5.00 a disk for shareware software (*if* you decide to continue using a program past the trial period, though, you are *morally* obligated to register. Registration fees generally range from about **$20.00 to $100.00**). If you don't want to pay *anything at all* for an unregistered trial copy of a program, though, just about any shareware astronomy program can be found online. Local bulletin board systems often have the popular programs (like *Skyglobe*). More specialized software can be downloaded from the **Internet** (I can provide the ftp addresses of good Internet astronomy sites on request). But if there is a shareware astronomy program you just can't live without, and you can't get a copy by any other means, I'd be glad to make you a copy in return for a blank disk(s). Assuming I *have* said program, of course. I've been looking for a piece of software called *Our Cosmohood*, and can't seem to locate it online. If one of you could provide me with a copy or a location where it can be found on the Internet, I'd be very grateful!

--Rod

Note: When I get around to it, I'm going to publish a list of the astronomy shareware programs I have available. If there's enough interest, I'd be in favor of establishing a club shareware library. Let me know what you have!

Space Calendar

This Space Calendar covers space-related activities and anniversaries. The latest copy of the calendar is available using anonymous ftp at explorer.arc.nasa.gov in pub/SPACE/FAQ/space.calendar. It is also available on the World Wide Web: http://newproducts.jpl.nasa.gov/calendar/calendar.html. Please send any updates or corrections to Ron Baalke (baalke@kelvin.jpl.nasa.gov).

May 1995

May 04 -	STS-69, Endeavour, Wake Shield Facility (WSF-2)
May 21 -	Saturn, Rings Edge-On from Earth's Perspective
May 27 -	Venus/Moon Occultation, Visible from Europe
May 30 -	STS-71, Atlantis, MIR Docking, Space Life Sciences (SL-M)
May 30 -	European Space Agency's 20th Birthday (1975)

June 1995

Jun ?? -	LIFESAT-02 Delta 2 Launch
Jun ?? -	SWAS Pegasus Launch
Jun 03 -	30th Anniversary (1965), Gemini 4 Launch
Jun 08 -	Giovanni Cassini's 370th Birthday (1625)
Jun 11 -	10th Anniversary (1985), Vega 1 Landing on Venus (Russian)
Jun 15 -	10th Anniversary (1985), Vega 2 Landing on Venus (Russian)
Jun 20 -	Ulysses, Begin of 2nd Solar Passage (70.33 Latitude)
Jun 23 -	Galileo, Trajectory Correction Maneuver #24 (TCM-24)
Jun 26 -	Charles Messier's 265th Birthday (1730)
Jun 29 -	STS-72, Endeavour, Space Flyer Unit Retrieval

MINUTES FROM MAS MEETINGS

Following are the minutes from recent MAS meetings as recorded by club Secretary George Byron . . .

Secretary George Byron . . .

Minutes from January Meeting

No formal meeting was held this month. Instead, we all had a good time at our annual dinner at Shoney's in Tillman's Corner! Y'all come next year!

Minutes from February Meeting

Pat brought the meeting to order at 7:15 p.m...

Pat observed that we lost several hard-core members last year. **Mike and Joe!**

Pat also asked, "What happened to the direction the club is going?" He further asked the question to each member, "Why are you coming to the meeting?" A really good discussion followed.

Rick made a motion that volunteers make five minute presentations at each of our meetings. A discussion followed, the conclusion of which was that each member will provide something or someone for a program at each of our meetings. The next few volunteers are:

Leland for March

Judy for April

Ginny for May

We need more members to come forward with interesting topics for discussion or 'programs'. George has a computer program that shows the hydrogen helium cycle of the nuclear "fire" of the Sun. Any meeting will be good for this program, so volunteer for June thru December.

Leland asked who was going to the Mid South Stargaze.

Diane said she needed people for the skywatch set for Thursday, March 16.

The meeting was adjourned at 8:00.

Minutes from March Meeting

Leland brought the meeting to order at 7:15 PM.

Diane requested that the date of the upcoming skywatch be changed from Thursday, March 16th to Tuesday, March 14th at 7:00 PM 'til 8:30 PM.

Loxley said he had not received any thing back from *Astronomy* Magazine.

Leland did a program on "How we measure distance in space." *Good job*, Leland!

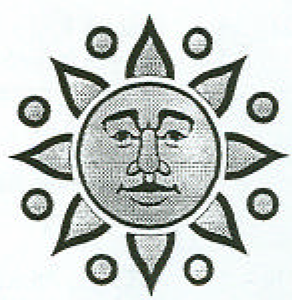
--George

Club Notes

Activities of the Mobile Astronomical Society. . .

Members and guests at April's monthly meeting of the Mobile Astronomical Society were treated to an **informative and enjoyable** lecture on issues concerning the Big Bang theory by The University of South Alabama's Kent Clark. Members listened to Dr. Clark's talk with great interest, and much spirited discussion followed. Thanks, Kent!

The next regularly scheduled meeting of the MAS will be held on June 7, 1995 at the club's usual meeting place at the Mobile Public Schools' Environmental Studies Center on Girby Road. What I'm sure will be an excellent program produced by Ginny Kramer is scheduled, and there will probably be a discussion of the 1995 Mid South Regional Stargaze (scheduled for the last week in April, and which, as of this writing, a number of MAS observers are planning on attending) so make plans to be there! **Your club needs you!**



Conjunctions

'News of Upcoming Astronomy Meetings, Conventions, Star-parties and other Events of Interest...'

This year's **Texas Star Party** will be held (as usual) on the Prude Ranch in Fort Davis, Texas near McDonald Observatory. The TSP, which runs from May 21-29, has become ***the*** event for deep sky observers. For information contact the TSP Registrar at (214)727-8733.