

S.C.R.A.P.S.

Society's ChRonological Astronomical PaperS



**From the Chair
By Tom Rimmell**

Be sure to attend this month's club meeting. It is that time of year for our annual club officer elections. We will be taking nominations for key positions and then voting. This is a great opportunity for individuals to get involved and be proactive in planning and conducting the club activities. The direction of the club should always focus on the edification of astronomy with club-sponsored events such as monthly star parties, guest speakers at club meetings, and sharing of our knowledge and telescopic views of our universe.

Personally, being your chairperson has been a wonderful experience. I appreciate the support each of you has given me this year. Also, I would like to take this opportunity to thank those who faithfully serve the club: Bob Arr (co-chairperson), Janice Erickson (treasurer), Lee Erickson (secretary), John "Sparky" Sparks (ALCOR and star party coordinator), Mike Littleton (newsletter editor), and Mike Fleenor (webmaster). Their devoted work has made this club a well-organized team.

**BOOK REVIEW: NIGHT SKY
BY RON DINKINS**

This book is geared more toward beginners and is the one I used to learn the sky a few years ago when I reentered the hobby. I picked it up at a used bookstore and have since worn the cover off the book taking it out with me observing on every session. My primary use of the book is its excellent list of icons associated with each constellation. An icon beside each highlighted feature in the constellation lets you know whether it's a naked eye, binocular, or telescopic object. This has saved me countless frustrated hours looking for something that there was no way I was going to see it with the aperture I had at the time. Even the telescopic objects give a suggested minimum aperture to observe the object. The book is divided up into three major sections: "A Celestial Tour", "The Backyard Astronomer", and "Observing the Nighttime Sky". "A Celestial Tour" is more of a rainy day read of how the universe formed, the life cycle of stars, and how the solar system evolved. It also includes some of the more cutting-edge topics in astronomy such as brief blurbs on the Keck Telescopes, the Hubble Space Telescope, the Chandra X-Ray Observatory, the Laser Interferometer Gravitational Wave Observatory (LIGO), and Sudbury Neutrino Observatory. "The Backyard Astronomer" fills the reader in on how to choose equipment. Not only does it go into the basic operation of different types of binoculars and telescopes, it offers advice on purchasing equipment based on what type of objects you are most interested in observing. Light pollution, eyepiece designs, filters, and even a very brief description of how to collimate a reflector are covered. There is even a brief description of what is involved in astrophotography with the wise disclaimer that is a subject best left to intermediate to advanced amateurs.

Discovery Channel
Night Sky
An Explore Your World™ Handbook
ISBN 1-56331-801-6
Price \$13.95
Pages 192

Finally, the last section and largest is "Observing the Nighttime Sky". Sky coordinates, what eclipses are, what universal time means, and how to star hop are covered briefly before presenting the major portion of the section, the star charts. First, several charts of the entire night sky are presented with month and times when the constellation appears in the sky. Then, each constellation is charted and described with its objects of interest. Each object has an icon next to the name and description, which represents the category of the object. Several objects have nice color photographs as well. Objects included are Messiers, selected NGC's, multiple star systems, variable stars, and bright stars. Each constellation description includes a brief mythology, its size, best months to view, and of course latitudes. The descriptions of all constellations provide fun reading on cloudy days or during observing planning sessions.

The book has a nice index and glossary at the end as well as a plan to build a simple cardboard box sun viewer. I continue to enjoy the book and recommend it wholeheartedly especially for beginning astronomers. The icons for specific objects can really prevent frustration because unsuccessful searching for objects kills interest faster than anything else. I still depend on it especially on those nights when I want to do some quick looking without a prepared observing list.

100-METER TELESCOPE (PART 2)

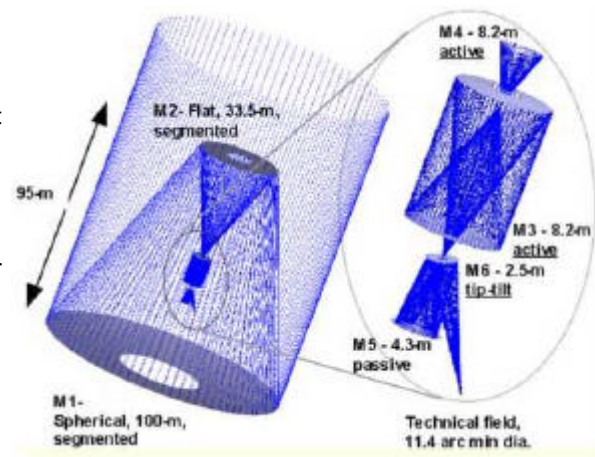
By Michael Littleton

Can it be built?

In the first installment, I explored the scientific need for a 100-meter ground-based telescope. The other big question is “Can it be built?”

The optical design of OWL is dynamic. The original design proposed for OWL was a four-mirror system. A later design evolved into a six-mirror system. The primary mirror consists of about 1600 spherically curved and identical mass-produced segments. Each segment is hexagonal shaped with about 2-m from flat to flat and fits in a hexagonal grid into an approximate circular array. To minimize the telescope's length for structural reasons, the primary is a fast design of about $f/1.3$. The segmented secondary mirror is flat. A flat mirror was chosen to re-image the pupil of the telescope onto smaller mirrors capable of active optics. The size needed for the secondary was considered too large for active surfaces. Because the primary mirror is fast and consists of spherical elements, it suffers from spherical aberration. Mirrors 3 through 6 correct for spherical aberration and stabilize the telescope with active optics. Construction of the required optical surfaces is within the capabilities of existing technology. The optical design is similar to the Hobby-Eberly Telescope. (McDonald Observatory) Segmentation of the primary and secondary mirrors has performed successfully on the Keck Telescopes. Active optics has been successfully used on the VLT.

From “Progress of the OWL 100-M Telescope Conceptual Design”, P. Dierickx, R. Gilmozzi, 2000, SPIE Proc. 4004.



The requirements for the optics for the OWL specify that it will provide diffraction-limited performance in the visible and near IR. To meet this requirement, the telescope must use adaptive optics (AO). Some of the large telescopes built in the 1990s use adaptive optics, which monitor the light from a single star or laser-generated artificial star to map and correct for atmospheric turbulence. This assumes that turbulence “seen” by the monitoring of the single star is the same over the entire cylinder of light imaged by the primary mirror. As the aperture increases, this assumption becomes poorer. In very large telescopes, the turbulence is a result of many atmospheric cells within this cylinder. To correct for all turbulence inside the cylinder, OWL must use a developing technology called multi-conjugate adaptive optics (MCAO). MCAO uses multiple laser guide stars, wavefront sensors, and “rubber” mirrors to make a 3-D model of atmospheric turbulence, which is reminiscent of medical tomography. Using the 3-D model MCAO corrects for turbulence “seen” by the entire primary mirror. MCAO is not a proven technology, but is still in the development phase. A prototype system is scheduled for installation into the Gemini telescopes.

The conceptual mechanical design is for an open-air skeletal framework. The structure is all steel with a moving mass of approximately 13,500 tons. This mass includes the mirrors, which is made of conventional material. The mount moves in azimuth and elevation. Based on the size of the structure and minimization of costs, a traditional observatory building was considered impracticable. OWL will use a roll on/roll off structure. Quadrant-shaped covers protect the mirrors when not in use. A preliminary investigation of the static and dynamic mechanical properties of the structure has been computer modeled. It is believed that the rotating support structure for the 100-m telescope can be built using conventional technology and materials.

OWL appears to be technically feasible and able to perform unique science on basic questions in astronomy. The technology is currently available, except for the MCAO. Other factors will probably decide on the viability of OWL. The first is siting. What site has the atmospheric, geological conditions and usable area sufficient to justify the construction of a 100-m telescope? Mauna Kea is an unlikely choice because of the local opposition to further construction on what some Hawaiians consider a sacred site. Other sites may be as good as Mauna Kea and may not have the local opposition, so siting may not be a major obstacle. The second consideration is the major one, cost. The original cost estimate of \$1B will probably escalate as the design becomes more complete. Other efforts in science are competing for funding. In support for OWL's price tag, other recent projects in astronomy have received this level of funding. The Cassini Spacecraft cost \$1.4B US and has a total projected cost of \$4B US. Perhaps successful funding will be possible through a consortium of nations, like that of the International Space Station.

For more information on the OWL visit the European Southern Observatory web site at <http://www.eso.org/projects/owl/>

CALENDAR

1/06/02 Last Quarter Moon

1/11/02 SMAS Meeting at the Discover Center at 8:00 PM

1/12/02 SMAS Star Party at Gene and Portia Johnson's House

1/13/02 New Moon

1/15/02 Jupiter rises at 4:17 PM and transits at 11:31 PM. Saturn rises at 2:19 PM and transits at 9:22 PM. Mars sets at 10:46 PM

1/19/02 Backup date for SMAS Star Party

1/21/02 First Quarter Moon

1/28/02 Full Moon

Starting 2002 With a Bang and a War by John "Sparky" Sparks

2001 was one of the best years SMAS has had for observing thanks to your participation, fairly good weather and great events in the sky.

There was a time in SMAS, when we did less observing in the winter and that was a shame because the winter skies are the best of all! While it is difficult to get a lot of public out for winter starparties, this is the best time to amaze new and prospective members as well as rejuvenate old-timers of SMAS like myself. Cold fronts clear away the clouds and humidity drops to the lowest levels of the year. This month, Orion dominates the sky and with it, M42, the Great Orion Nebula. Rigel puts out 50,000 times as much light as our sun and if Betelgeuse were to be put in place of our sun, the earth would be in orbit inside Betelgeuse. Don't forget the clusters in Cassiopeia and Perseus, the M31 complex in Andromeda or M33 in Triangulum and many others.

Oh! but there is much more to observing this month, enough that I am setting a observing date and a backup date so we will not miss this glorious sky. Both Jupiter and Saturn are near opposition in January and these are the normal targets in Telescope Wars. So I am declaring Telescope Wars for SMAS at Gene and Portia Johnson's house on January 12th with January 19th as a backup date even if the 12th is clear. Coming out Chapman Highway, Locust Hill is the next left past the traffic light at Stone Road and just before Red Bud Drive. If traffic is heavy, you might want to go to the next traffic light and turn around. The Johnson's house is the 6th house on the right (all the houses are on the right). Call Gene at 406-1136.

I already have a very nice ribbon to present the winner, which will not be myself. I will remove my 6" telescope from this competition because it won Telescope Wars 2001. The public is highly encouraged to come and in fact, I am hoping to bring someone myself. Yes, there is some light pollution, but you might be surprised in what you can see of deep sky. Besides, this Starparty is Telescope Wars 2001 and light pollution doesn't affect planets very much. This spot is in South Knoxville, closer to home than most any Starparty SMAS has had, if you live in Knoxville. Best of all, we have a place to warm up no matter how cold it gets!

Because we are not able to go to Gary Nolan's house, some of you suggested Look Rock. From past experience, I felt it would be too windy and cold and we would get a low turnout. Tell you what, I will try it out in February with the Astrofreaks if clear and see what happens. This is also a chance to spruce up your optics as I am planning on allot more public observing this year compared to 2001 (By the way, anyone know how to best contact the Boy Scouts for their Jamboree?).

The main thing to remember is to dress up with enough clothes to stay warm and bring enough snacks to keep a SMAS mem-

A GUIDE TO GUIDE BY SHAWN GRANT

Astronomy software has revolutionized amateur astronomy. With the advent of charting and prediction software, amateurs have powerful tools at their fingertips. The amateur has access to stars down to 20th magnitude, hundreds of thousands deep sky objects and split second calculations of celestial events. One of the most popular software packages that SMAS members use is Guide. I am going to write a series of articles to help owners of Guide to get the most out of it.

Guide 7.0 CD Star Chart Software
Project Pluto
168 Ridge Road
Bowdoinham, ME 04008
Tel: (207) 666 5750 or (800) 777 5886
FAX to (207) 666 3149
E-mail: pluto@projectpluto.com
\$89

A GUIDE TO GUIDE (CONT.)

In this segment, I will discuss updating Guide. Bill Gray, the creator of Guide, frequently writes new updates for Guide. These updates are not just bug fixes (though some are)-they are feature additions. For example, in the last update the ability was added to download the A2.0 data from the Internet. This is a database of stars down to 20th magnitude. In the past you had to have the many CDs that contained this data to incorporate with Guide. The CDs were expensive and it was a pain to switch CDs whenever you wanted that data. Now you can download this data for free. Other feature additions have been the ability to predict occultations, a detailed lunar map, planetary maps, plotting of all moons in the solar system, artificial satellite tracking and many more. These little updates are free and are small file sizes for quick download.

Here is how to see if your copy of Guide is up-to-date. Go to "Help" and then "About Guide". On the bottom of the info box you will see "you are running the December 6 2001 of Guide" or whichever version you downloaded last. What if you don't have the current version or haven't downloaded any updates since you installed Guide? Open your web browser and go to www.projectpluto.com. Near the top of the page is a menu. Click on "Updated Software". You will see 3 different files to download. One is for Windows 32-bit for Windows 95/98/ME/NT4/2000/XP. The others are for DOS and Windows 3.1. Most of us will need the Windows 32-bit version. Click on it and save it in your Guide folder. After downloading, click open in the download dialog box and it will open your WinZip Program. Extract the files into the Guide folder. During the extraction process, WinZip will say that a file is already there do you want to replace it? Click on "Yes to All". The files that are already in the Guide folder are your old files that you are replacing with the new ones. This single download will upgrade your Guide to the latest version even if your version is several updates old. There is one other thing to do. Guide displays planets the way they really look and plots and labels the features. You need to download the graphic files for the planets which can be found at www.projectpluto.com/planets.zip. Just type the URL into your browser and it will download the file.

Another upgrade is the lunar map that uses the Clementine data. Go to the URL, <http://www.projectpluto.com/lunarmap.htm>, for more details. You can also wait until Guide 8 is released for this feature to be included on CD. There are other things to update. These are artificial satellite elements, comet elements and asteroid elements. Probably the most popular update is the comet elements. Here is how to update them. Go to this web site, <http://cfa-www.harvard.edu/iau/Ephemerides/Comets/SoftwareComets.html>. On the web page, you will see a list of software. Click on "Guide". You will see a list of comets with numbers lined up in several columns. Right click your mouse button and choose "Select All" from the menu. Right click again and choose "Copy". Now open Notepad and paste the data. Save the file and put it in the Guide folder. The file name you choose for it doesn't matter-just anything you will remember. In Guide, click on the "Extras" menu and then "Add MPC Comets/Asteroids". It will open a dialog box asking you to tell it in which file you just saved the comet elements. Choose the file and click the "Open" button. The screen will flicker and the elements will be loaded. You should download this file every time a new comet is discovered.

You won't have to update asteroid data, unless you are working on a project that requires the latest asteroid data. If you need them, go to <ftp://ftp.lowell.edu/pub/elgb/> and select the "astorb.dat.gz" file. You might be asking, "what is gz?" It is a Unix and a Linux-compressed file similar to a zip file. Linux users have to use a console program kind of like the DOS command prompt and type "tar xzvf astorb.tar.gz" and it extracts the file. Fortunately, WinZip is able to unpack the file. Just open the file in WinZip the same as a zip file and extract it into the Guide directory. Next, you do exactly the same as with the comets. Go to "Extras", then "Add MPC Comets/Asteroids".

Next data set is artificial satellites. Guide provides all the features necessary to predict artificial satellite passes including the magnitude of the satellite. In order for Guide to do this, it needs an up-to-date element set no more than a week old. If the file is very old, the accuracy will be way off. The best place to find elements is Mike McCants' homepage at <http://users2.ev1.net/~mmccants/tles/index.html>. At the top of the page, you will see quick links and the first item is "mccants". Click on it and download the file to the Guide folder. Unzip it and then go into Guide. Click on the "Settings" menu and then "TLE" and select the `mccants.tle` file. Next week, just download the file again (it will be updated) and replace the old zip file. Extract it and have it replace the old `mccants.tle` file. You won't have to do anything in Guide just as long as the new file has the same name as the old one.

There is another small update. The Great Red Spot (GRS) on Jupiter is a storm system and like all storm systems it moves across the planet. Guide predicts when you can see the GRS, but it needs to know its longitude. The site, www.projectpluto.com/jeve_grs.htm, lists the current longitude of the GRS. Write down the longitude and go into Guide. Click on the Jupiter symbol and then "Display" and then "Options". You will see GRS longitude. Just type in the number you wrote down and then click "OK".

Keeping Guide up to date is important so you can use the new and innovative features that come along from time to time. It is also important to keep the comet elements up-to-date so you can plot the newly discovered comets. As you may know, some of them can be bright and glorious and you will miss out of the views if you don't keep Guide up to date.