Regulus

Issue 1999-01 **Newsletter of the RASC Kingston Centre** **1999 January/February**

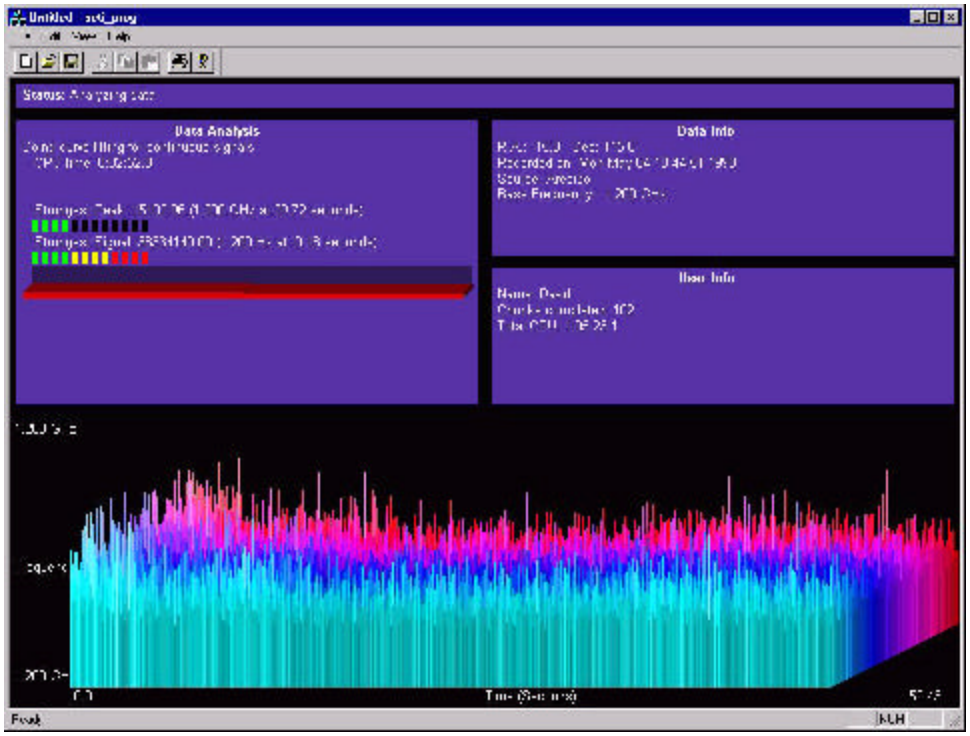
SETI@home

http://setiathome.ssl.berkeley.edu/

SETI@home is a scientific experiment that will harness the power of hundreds of thousands of Internet-connected computers in the Search for Extra-Terrestrial Intelligence (SETI). You can participate by running a screensaver program that downloads and analyses radio telescope data. There's a small but captivating possibility that your computer will detect the faint murmur of a civilization beyond Earth.

SETI@home is scheduled to start in April 1999. Software will then be available for downloading. Versions for the PC, Mac and Unix will be available.

Current SETI research consists primarily of radio astronomers searching for narrow-bandwidth radio signals (radio waves are able to penetrate interstellar dust clouds, and narrow-bandwidth signals are not found in nature). There are a handful of such projects. Some are focusing on particular nearby stars, others are scanning star-dense parts of the sky. The SETI Institute 's Project Phoenix is the best known of these projects.



All existing SETI projects use custom signal processing hardware, listening to the real-time telescope output on millions of frequency channels simultaneously. This analysis, though impressive, only skims the surface of what is possible. Because real-time searches can only check a small number of bandwidths, frequency drift rates and pulse periodicities, it makes sense to consider a new kind of search -- one that analyses a smaller part of the frequency spectrum in a much more thorough way. This is the mission of SETI@home.
(More on page 10)

The Kingston Centre

The Newsletter of the Kingston Centre of the Royal Astronomical Society of Canada
Newsletter Submission Info: The deadline is the Friday before regular meetings in odd numbered months. The preferred method is E-MAIL, then disk, lastly paper.
E-mail: <***kell@cliff.path.queensu.ca***>
Fax: 1-613-533-2907 (with cover page to Kevin Kell)
Post: Box 2033 Kingston Ontario K7L5J8 Canada
ascii or most major word processors (WP6.1 for windows preferred) via E-mail or 3.5" DOS floppy disk
Our Web page can be found at:
http://www1.kingston.net/~rasc

To Send E-mail to all members of the Kingston Executive, address it to: **<*rascexec@cliff.path.queensu.ca*>**
To join the National E-mail List, send a message to:
<***listserver@astrotech.stmarys.ca***>
In the body of the message put:
subscribe rasclist Your Human Name (Center Affiliation)

Centre Location: RASC - Kingston Centre, PO Box 1793, Kingston, Ontario K7L 5J6 Canada
Approx Lat: 44 deg 14 min N Long 76 deg 39 min W

Upcoming Events for 1999

Friday Jan 8th Peter Ceravolo on “"Adventures in Astrophotography: Developing and Using Modern Astrographs."
Friday Feb 12
Friday Mar 12
Friday Apr 9
Friday May 14
Friday Jun 11
Friday Jul 9
Friday Aug 13 Annual BBQ Meeting
Friday Sep 10
* Friday Oct 1 (thanksgiving Mon 11th)
Friday Nov 12
Friday Dec 10
* special meeting dates one week early due to holiday Fridays

Regular Meetings of the Kingston Centre are held on the 2nd Friday of each month (unless noted otherwise) at 20:00 local time in **Room B-201, Mackintosh-Corry Hall** at Queen’s University (parking available off Union Street at Frontenac).

From The Editor

Changes/corrections of address received (I pass any I receive on to the Centre Treasurer who passes them on to UTP) since the master January list was published:
Norm Welbanks
Dick Adduci from

International Space Station

In conjunction with Tom Dean, I have automated a system of predicting overhead passes of the ISS over Kingston, Ontario and have made these available on our Web site. Then we went one step farther and have made daily predictions for every RASC Centre in Canada (that we had accurate locations for). Check out
http://www1.kingston.net/~rasc/isscan.htm

The **A. Vibert Douglas Award** is given each year to a person who has given their time and effort so easily for the advancement, service and achievement in Astronomy.
The winner of this years award
- Joined the Kingston Centre in 1989, and has been a member for 9 years
- Has been the Astronomy Day Co-ordinator
- Has helped various Brownie and Guide groups earn their astronomy badge throughout the years.
- has given many interesting talks to our centre members
- was Chairperson for the very successful 1997 GA
- and has been President for the past 3 years

And I am sure that I have left out many things done behind the scenes Tonight I am proud to present this award to my friend and yours, **Peggy Hurley.**

From The Prez

1998 has been another successful year for the Kingston Center. We have more members, and more activities than any time since I have been here. Youth group, ATM, observing group have all been very successful in the last year. It is, as they say, a hard act to follow.

Never the less, I look forward to what 1999 brings. We have a capable, energetic and experienced executive. (yeah, I know, the Pres. still needs to prove himself, but the rest know what they're doing). I anticipate continued success in our existing programs, along with some consolidation and new programs. Mostly I look forward to a very dark night on December 31, 1999, when the millennium bug takes out the power grid!

I will also be looking for YOUR input as to what we can do to make this a better Center. This especially applies to our out of town members, as we can't always offer the same services to you as our local members. If you have any ideas how we can better service our members, please contact me, or any member of the executive.
Doug Angle

From The Vice-Prez

I would like to take this opportunity to introduce myself as your new centre Vice President. Many of you know me, but I am keenly aware that many of our members live out of town, and do not attend regular monthly meetings. I have been the centre Secretary for the past two years, as well as the Youth Group Coordinator along with Brenda Shaw. I still work with the Youth Group and I also chair the Education Committee. As Vice President, I will be arranging talks by speakers in as many different areas of Astronomy as I possibly can. If you would like to give a talk on your favourite topic in astronomy (or something related), then please let me know. Our first month will feature a talk by Ottawa Centre's Peter Ceravolo, an incredibly gifted man. Not only is he an expert photographer and one of Canada's leading opticians, but he is also a captivating public speaker. I will also seek some professionals at Queen's University to share their passion for the universe with us. For the out-of-town crowd, I would like to improve the services our centre provides to you. I welcome any suggestions you might have. Please do not hesitate to drop me a line or send me an e-mail. My address is RR #1 Joyceville, Ontario K0H 1Y0, and my e-mail address is *<rainbow@adan.kingston.net>*. Our new executive is dedicated to improving service to members, as well as improving our service to our community. Join us, and together we can give others the joy we have found in the night sky.
Laura Gagne

From The Secretary

KINGSTON CENTRE SECRETARY'S REPORT - 1998

January:
Kingston Centre formed a youth group for people between the ages of 13 and 24 years old. A grant was received from the Lennox & Addington, Frontenac, Leeds & Grenville training board to allow us to operate for one year, provided that we focus on careers in space and publish a booklet to be distributed to area high schools. The group was chaired by Laura Gagne and Brenda Shaw and the booklet was written by Laura Gagne and given to our newsletter guru, Kevin

Kell for publishing. It will be released to the schools in early 1999. The centre's regular meeting was cancelled due to Ice Storm '98 which hit the area the Wednesday evening/Thursday morning before the meeting was scheduled. Some of us were without power for 10 days! It was great for fighting the light pollution problem, except that the moon was full and it was cloudy most of the time. Two days after the ice storm, a blizzard struck Kingston so we were also buried in snow. I doubt any of us will ever forget the experience.

February:
The first actual meeting of the new youth group was held this month. Laura Gagne talked about how to buy binoculars and telescopes, Brenda Shaw showed slides of objects that could be found with binoculars or modest telescopes, and the group toured the Queen's University Observatory. The meetings of the youth group were held on the last Saturday of each month. The regular centre meeting was held on the second Friday evening as usual. The speaker was National President Doug George who showed us his CCD imagery techniques. His work is absolutely incredible, and he held the centre members spellbound throughout his presentation.

March:
Centre Life Member Valia Krotkov passed away. I went to a memorial service held for her on the date of the summer Solstice. After hearing testimonials from friends and family members I deeply regret that I had never had the chance to meet this remarkable woman. Astronomy has lost a dear friend. The speaker for the youth meeting was Dr. Judith Irwin, a radio astronomer from Queen's University. The speaker for the regular centre meeting was Ms. Kendra Angle who showed us her newly constructed telescope. She presented a slide show of her work in progress, as well as showing us the telescope she designed and built herself. The design for her mount was adopted by the centre's telescope making group for their most recent 8-inch telescope project. Kendra won the gold medal in the local science fair for her efforts. She then went on to win 2nd place in optics in an international competition in Montreal this summer. You can read more about Kendra's telescope in the November/December Journal.

April:
The speaker for the youth group was Christine Marton from the Students for the Exploration and Development of Space. She talked about the future of Canadians in Space. The speaker for the regular centre meeting was Mark Kaye who showed us his life in astronomy. Mark showed us several of the observatories, telescopes and gadgets he has built over his lifetime in the hobby. He has done an incredible amount of work in such a short time span!

May:
Astronomy day was held on May 2nd, at Cataraqui Town Centre, Kingston's largest mall. As usual, Cathy Hall did a fabulous job in the planning and execution of this major event. She even managed to convince the mall that we were not the Royal Astrological Society (teeth grinding). The regular meeting was a telescope clinic. Tom Dean, Doug Angle and Mark Kaye helped members with the cleaning, operation and collimation of their telescopes. The speaker for the youth group was Terence Dickinson. He spoke about his career as well as his personal journey in astronomy.

June:
The speaker for the youth group was Dr. Martin Duncan; a planetary scientist from Queen's University. The speaker for the regular meeting was Peggy Hurley who talked about Solstice celebrations and other rituals connected with astronomical events. She focussed on Stonehenge and other ancient observatories.

July:
The centre participated in a fundraising event for the Ontario March of Dimes called "The Sky is the Limit Festival". Hundreds of people stopped by to chat and to look at sunspots, the last quarter moon and Venus. We were sunburnt and tired, but happy to have been able to share the sky with the public. The speaker for the youth group was the editor of the Beginner's Observing Guide; Mr. Leo Enright. There was a field trip to the Holleford Crater. The speaker for the regular meeting was Laura Gagne who talked about Black Holes, Wormholes and the possibility of time travel.

August:
The youth group had a "mini starfest" BBQ and fun day with observing in the evening. It was actually clear that night too! The regular meeting was held at the observatory of Mark Kaye and took the form of a very successful BBQ and observing session. He showed us his CCD equipment and gave us a great demonstration until a thunderstorm encouraged us to take the equipment indoors. At the end of the month (August 26th, to be exact) the centre helped Terence Dickinson with his annual public star party held at Charleston Lake. Everything cooperated this year, even the most spectacular aurora ever seen in the area in living memory.

September:
The youth group spoke to Dr. Jill Tarter in Melbourne Australia via teleconference. She was in the middle of an international conference on the Search for Extraterrestrial Intelligence (SETI), presenting recent developments in project Phoenix, the most ambitious search so far. She is the director of the project. The regular meeting was members night, when centre members have a chance to show off their projects. Tom Dean showed us two new barn door designs and Frank Hutchins showed us a barn door device he created from old telescope drive controls (you can see it in the astronomy day write-up in the Nov/Dec Journal). Kim Hay gave us a slide tour of the National Radio Astronomy Observatory in Greenbank West Virginia where she spent a recent holiday. Kevin Kell showed us a series of blackmail slide of centre activities at Grass Greek Park (Sky is the Limit Festival) and Starfest.

October:
The centre held a special public stargazing event on the shores of Lake Ontario. Attendance was poor, but organizers attribute that to the spooky dark shapes that astronomers make in public places. Flashing lights helped alleviate that problem at future sessions. The centre also helped Queen's observatory with their monthly open house (first one held this month). We provided "sidewalk" astronomy which attracted about 100 passersby. The speaker at the youth meeting was Ms. Denise Sabatini who spoke about archaeoastronomy, especially about Mesoamerican astronomers. The speaker for the regular meeting was Mr. Tim Seitz who talked about the role of comets and meteors in shaping the Earth's climate.

November:
The elections were held for the regular meeting. The youth group had a field trip to the National Museum of Science and Technology in Ottawa. The centre held another public star night at the Lake and also helped Queen's Observatory with another open house. Attendance improved at both events, most likely due to public anticipation as well as the keen flashing red lights Kevin set up around the telescopes.

December:
There was no youth group meeting, as it would have been the 26th. The regular meeting was cancelled, being replaced by the first annual banquet and awards night. It was a wonderful evening, with guest speaker Joady Ulrich who spoke about how the Hubble Space Telescope has dramatically increased our view of the Universe in which we live. The A. Vibert Douglas Award for service to the centre (or astronomy in general) was given to the organizer of the 1997 GA; Mrs. Peggy Hurley. The Achievement Award for outstanding work in astronomy was given to Miss Kendra Angle for the construction of her telescope which appeared in the November Journal. Messier Certificates were awarded to Ken Kingdon and David Pianosi. Membership certificates were given to Gerald Schieven (1983), David Stokes and Bill Broderick (1994), and Warren Morrison, Kim Hay, Ruth Hicks, Peggy Hurley, Susan Gagnon, Kevin Kell, Sue Knight-Sorensen, Walter MacDonald, Dieter Brueckner, and Peter Kirk. Honorary President, David Levy, also received an Emmy Award for his recent documentary "Three Minutes to Impact" (Hooray for David!!).
Thus ends a year in the life of Kingston Centre. Laura Gagne

Incoming 1999 Secretary's Hello by Kim Hay

As 1999 rolled over onto the Calendar pages, it brings with it a lot of changes for the Kingston Centre and to the world as a whole. We can look forward to several Blue Moons this year, a Solar Eclipse and many more wonders through our eyepieces on those clear nights or just kicking back and enjoying the meteor showers via naked eye.

I have taken pen in hand this year, and have returned to the Kingston Centre Executive as Secretary. If there is anything that you are having trouble with, or if you have an idea that you would like to see get done, please send me a note via the *<rascexec@cliff.path.queensu.ca>* or *<kimhay@kingston.net>*

The Centre will be updating the new-members packages, so if you have any suggestions on how this can be upgraded or more enhanced for a new member, or if and existing member would like to see or receive a copy let me know.

I am looking forward to working with the new Executive this year, as 1999 promises to be an exciting year for one and all. Our many groups, ATM, Observing, Awards, Light Pollution will be busy this year, hoping to bring the Kingston Centre membership a year that they can be proud of.

May the skies be clearer and darker for 1999 than in 1998, as we all pull together and do our bit for Light Pollution, tell your neighbour to turn off their out door light at night, or give them suggestions on new lighting fixtures. Lets make 1999 a dark and clearer year for Astronomy.
Submitted by Kim Hay, Secretary Kingston Centre

The Awards/Christmas Banquet 1998-12-06
Submitted by Kim Hay

The Kingston's Centre's first Awards and Christmas Banquet was held on December 5,1998 at the Golden Rooster Banquet Hall. We had 28 attendees and the night was enjoyed by all (at least I haven't heard of any complaints).

There were before dinner drinks and mingling with the members before our Hot and Cold Buffet was served. In the break, door prizes were awarded to everyone, along with setting up for our Guest speaker , Jody Ulrich (from the Windsor Centre), who spoke on the Amazing work that the Hubble is doing.

Our Centre President, Peggy Hurley handed out a long awaited award to Kendra Angle, on her Science Fair Project, which was the construction from mirror to base on a 7 inch telescope. Messier Certificates were awarded to Ken Kingdon and David Piannosi (absent). For members who have given their time to help with the Centre's functions for a period of 5 years or more, there were Membership Certificates which are handed out by the Society. Since the Kingston Centre has been lagging behind a few years in awarding these Certificates, we caught up so to speak. The Membership Certificates were handed out to those who were present, and wished for those who were absent that they could have been there. The members present were: Susan Gagnon (5 years), Kevin Kell (8 years) , Peggy (Torney) Hurley (9 years), Kim Hay (9 years) . Absent Warren Morrision (25 years), Peter Kirk (9 years), Deiter Brueckner (5 years), Sue Knight-Sorensen (5 years), Ruth Hicks (11 years) and Walter MacDonald (10 years)

We ended the evening with other round of door prizes (which of course, were all Astronomy related). As Bob Cratchet once said, from the famed A Christmas Carol by Charles Dickins, we had quite the merriment Sir, and that we did.

I want to wish everyone a Very Merry Christmas, and a Clear Sky New Year!!

Youth Group News

Saturday January 30th: Barry Robertson of SNO (Sudbury Neutrino Observatory)
Saturday Feb 27th: Kathy Perrett who is working on her PhD in Astrophysics, studies globular clusters with Prof. Hanes, and is director of the Queen's Observatory.

Observing Group News

1999 Observing Schedule

1999 January: To Be Announced

1998 February: Held at the home of Doug Angle (out Sydenham Road past Railton)

Public Observing Sessions at Murney Tower park (King & Barrie Sts)
Tuesday January 26th 5:30-7:00pm
Tuesday February 23rd 5:00-7:00pm
Queen's Observatory Open House Monday, January 25 from 7-8:30pm The Queen's Observatory is holding a public session at the Observatory in Ellis Hall Room 432. Potential viewing targets include: Jupiter, Saturn and the Moon (weather permitting). All are welcome, and no appointment is necessary. Admission is free! Don't forget to bundle up!

ATM Group News

by Kendra Angle
"We got a 25" mirror blank from a bequest from a will. It is 4 1/4" thick and I think it weighs 1/2 a ton. Dad says it only weighs 175 lb, but I've tried to pick it up, and I think he's wrong. We expect making it into a telescope will take a few years.

Their will be an A.T.M. meeting for Sunday Jan. 24, 2:00 pm at the Angle's house. We will be discussing how to grind the 25" mirror blank and working on the 8" tube etc."

The 8" mirror has returned from Moonward Vacuum Coatings in Sudbury and will become another Centre Loan Program scope upon completion.

A completed 7" scope! By Kevin Kell
I finally did it! After almost 30 years of living with a small Tasco (that got dumped some 20 years ago) and nothing else, I have finally acquired my own 7" f4.5 Dobsonian scope the hard way. I built it! Starting at Grass Creek Park in July of 1988 the project took $310 and 36 hours over the course of 5 months (including grinding the mirror). With a little more motivation this could have been completed in 3 or 4 months, using more weekends and evenings then I did. The finished scope is already going through enhancements, such as bigger altitude bearings, cloth light barriers, adjustments to the secondary mirror mount and more. For a full story, aim your browser at

http://130.15.144.100/atm/

National News

The National Address & contact info:
Royal Astronomical Society of Canada
Bonnie Bird, Executive Secretary
136 Dupont Street Toronto, Ontario, Canada M5R 1V2
(416) 924 - 7973 Fax: (416) 924-2911
<rasc@rasc.ca>

The next council meeting will be Saturday to Sunday, March 6, 1999 in Toronto. Reports to be distributed in advance should be received at National Office by January 31. Electronic copy is preferred.

The General Assembly, and Council and Annual meetings will be in Toronto, July 1 - 4, 1999.

The fall 1999 Council Meeting will be on October 23, 1999, tentatively in Toronto.

Beginner's Observing Guide

Effective immediately, the current 1996 edition of the BOG will be available to Centres for $5 each plus shipping and GST. The retail sale price is still $9.50 ($8.88 + $.62 GST). A new edition will be available in December.

If a Centre sells a BOG to a new member, who presents a pink coupon for $4 off the price of a BOG, the Centres can now return the coupon with the new member's name and address to National Office and receive the $4 refund. The pink coupons are included with the membership welcome package.

1998 Observer's Handbooks and Calendars

As mentioned at the Council meeting, there are about 800 - 1998 Observer's Handbooks and 1000 - 1998 Calendars left over. If your Centre can use any of these for promotional purposes, please contact me. There is no charge for the books, but the Centre would be required to pay the shipping.

BBS News

In addition to the daily satellite photos of the Kingston Area, Starstream has added a daily solar image collection. Finally, an easily accessible online reference to what you see yourself (if you are a solar observer!). Daily images are available from Moonlight Cascade as well, with the Observatory being added soon.

The following Kingston BBS's are RASC support boards:
✶Observatory East (Mark Kaye) 613-353-6495 FidoNet 1:249/109 2400-28800 bps 8N1V.34
✶ StarStream (Kevin Kell) 613-546-6403 FidoNet 1:249/112 14400-28800 bps 8N1V.34
✶ Moonlight Cascade (Kim Hay) 613-353-7369 FidoNet 1:249/133 2400-28800 bps 8N1V.FC

Fireball Group **Submitted by Tom Dean**

Fireball Report Line: 533-6000 ext 77608.
(Note change of number as of 1999 Jan 04
Fireball Web reporting form:
http://www.astro.queensu.ca/~irwin/fireballs/ fbhome.html

Submissions from Members

GEMINIDS OVER INDIANA

Submitted by Ray Berg Crown Point, Indiana
<berg3@netnitco.net>

After being clouded out for the Leonid meteors this year, Mother Nature compensated by teasing me with a partially clear opportunity to view the Geminids on the night of predicted maximum activity, December 14, 1998. Observing was conducted between 8:40 PM (CST) and midnight, so the radiant, located near the bright star Caster, was only half way up the eastern sky for much of the session. About 40 percent cloud cover persisted throughout the evening, with a limiting magnitude of 4.7 in the clear areas. While conditions were not optimum, a number of Geminids were recorded including a brilliant white specimen (magnitude -1.0) within 30 seconds after starting. This provided real encouragement to continue despite the threatening clouds and chilly temperature. It was noted that these meteors were of perhaps a medium velocity, certainly slower than the Perseids I observe every summer. The brighter Geminids exhibited a definite greenish hue, except for the very first one, mentioned above. Adding to the activity were eighteen sporadics and half a dozen meteors from minor showers identified as Chi Orionids and Monocerotids. None of these were bright, being mostly of third and fourth magnitude. Late in the evening, a fast moving Coma Berenicid meteor streaked straight up from the eastern horizon.

Increasing cloud cover brought this chilly session to an end

shortly after midnight As an interesting side note, the December 1998 issue of METEOR TRAILS (The Journal of the American Meteor Society) points out that the Geminids are the only major meteor shower to be identified as being sourced by an asteroid instead of a comet.

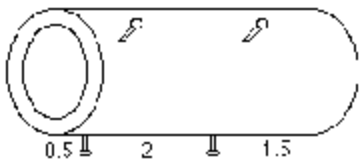
Construction and Use of a Laser Collimator

by Thomas R. Dean

1. Laser Collimation Principles

Collimation refers to the alignment of the optics of a telescope. The general principle is that two light rays originating from the center of view, entering the telescope from opposite sides of the primary objective, travel the same distance to the focal plane. An equivalent description is that the central light ray from the center of the view encounters each refracting or reflecting surface in the center, and perpendicular to the surface (with one slight exception for the Newtonian diagonal). This latter definition provides the principle of the laser collimator. The main use of the laser collimator is for aligning the optics of Newtonian reflecting telescopes. It cannot be used for telescope designs where the central part of a reflecting surface has been removed such as the most of the Cassegrainian family. It can be used for the Schmidt style Newtonian, but does not assist in the adjustment of the corrector plate (which should not be touched by the average telescope owner anyways).

2. Construction Details The laser collimator consists of two parts. A laser emitter with optical focusing elements and a mounting that permits the laser to be mounted in place of an eyepiece. Recent technological advances in laser diode technology as resulted in the availability of inexpensive laser pointers with reasonably accurate optics. They are available from many sources, including Business Depot and Costco. The one I favor retails for about $30 and has flat sides, but almost any laser pointer will perform reasonably well. To test the pointer point it at a flat surface at least twice the focal length of your telescope and check that the spot produced by the laser is still reasonably small. You may notice some defraction effects around the spot. The mounting is made from a short length of aluminum or brass tubing. Since the tubing does vary in size, some care must taken. Ideally, you want a tube that is a few thousandths under 1.25 inches. If it slightly larger, brass tubes can be sanded down to the right size, but be careful of the dust, brass is an alloy of copper and tin. The length of the tube should be approximately 4 inches. Make sure that the tube has walls at least 1/8 inch thick. Thin walls will not hold a precise tap. The cost of the tube will be under $10. The next set of instructions can only be approximate, since they must be done to match the laser pointer used. Six bolts are used to hold the laser in the center of the tube. For those of you that still have finders, or have used a scope with a finder, the suspension mechanism should be familiar. It consists of two sets of three bolt . One set is bout ½ inch in from the end of the tube. The other set is about 1-1/2 inches from the other end of the tube. This section between this set of bolts and the end of the tube is the section that will be inserted into the focus assembly. The bolts should also be aligned pairwise along the length of the tube. A 7th bolt is added above the on/off button Figure 1 shows a diagram of the tube assembly.



3. Alignment Aligning laser pointer in the collimator mount is the first step. I use a small vice mounted on the workbench. The jaws are opened slightly, forming a small gap between them. The collimator is placed on the top of the gap, with one of the pairs of bolts in the gap. The laser is pointing towards the opposite wall, at lest 10 feet away. A small piece of masking tape with an X is used to mark the location of the beam. The laser is then rotated 120 degrees, with the next set of bolts in the gap. The location of the dot relative to the X is noted, and the bolts are adjusted to bring the dot to a point midway between them. The tape is moved, and the collimator is rotated again. This continues until the dot remains in the same point regardless of the rotation of the collimator.

4. Collimation In preparation, the main mirror should be marked giving the exact center of the mirror. Common means of marking are a permanent marker, or a adhesive paper ring. Insert the collimator into the eyepiece and turn it on. Carefully look down the front of the tube. Lasers can be dangerous, especially when at the prime focus of a telescope mirror. The beam should strike the secondary and then the main mirror. Adjust the secondary mirror collimation bolts until the beam strikes the center of the primary. Then adjust the primary mirror collimation bolts until the beam returns to the front of the laser, which is visible in the telescope mirror. This section assumes that the telescope is already reasonably collimated. If the secondary is severely out of place (such as having been removed from the telescope), using the laser collimator alone will only make matters worse. If the telescope is already close, then the laser can be used for fine adjustments (A star alignment is the most precise). After the laser collimation is complete, a visual

inspection of the collimation should be made to ensure that all components are in the right place. The primary mirror should appear centered in the secondary, and the image of the secondary in the primary should appear just slightly off center. If you can only see part of the primary in the secondary, then more extensive collimation is required.

News from the Net

Planning to see a shuttle launch? Here is the 1999 launch schedule.

MISSION STS-93 Target launch date/time -- April 8, 1999 Orbiter -- Columbia (OV-102) -- Shuttle flight #94; Columbia flight #26 Launch window -- 47 minutes Primary payloads -- Chandra X-Ray Observatory

MISSION STS-96 Target launch date/time -- May 13, 1999, 12:33 p.m. Orbiter -- Discovery (OV-103) - Shuttle flight #95; Discovery flight #26 Launch window -- 5 - 10 minutes Primary payloads -- ISS (02-2A.1) second flight, SPACEHAB (DM) MS -- Julie Payette (Canada)

MISSION STS-101 Target launch date/time -- August 5, 1999, 2:15 a.m. EDT Orbiter -- Atlantis (OV-104) Shuttle flight #96; Atlantis flight #21 Launch window -- 10 minutes Primary payloads -- ISS third flight, SPACEHAB (DM)/ICC

MISSION STS-99 Target launch date/time -- September 16, 1999, 8:47 a.m. EDT Orbiter -- Endeavour (OV-105) Shuttle flight #97; Endeavour flight #14 Launch window -- 2 hours, 30 minutes Primary payloads -- Shuttle Radar Topography Mission (SRTM)

MISSION STS-92 Target launch date/time -- October 28, 1999 Orbiter -- Discovery (OV-103) Shuttle flight #98; Discovery flight #27 Launch window -- 10 minutes Primary payloads -- ISS fourth flight (Z-1 truss and PMA-3)

MISSION STS-97 Target launch date/time -- December 2, 1999 Orbiter -- Atlantis (OV-104) Shuttle flight #99; Atlantis flight #22 Launch window -- 10 minutes Primary payloads -- ISS fifth flight, PV module P6 MS -- Marc Garneau (Canada)

RELEASE: 98-225
NASA RENAMES TELESCOPE AND SETS NEW LAUNCH DATE

NASA today set a new launch date for the Advanced X-ray Astrophysics Facility (AXAF), and announced that it will be renamed the Chandra X-ray Observatory in honor of the late Indian-American Nobel Laureate Subrahmanyan Chandrasekhar.

The Chandra X-ray Observatory will be shipped to NASA's Kennedy Space Center, FL, on or before Jan. 28 and launched no earlier than April 8, 1999. The launch date will depend upon the actual shipping date and the results of a mid-February independent review of progress towards preparing the Cambridge, MA, operations center for launch.

RELEASE: 98-221
SOLAR WIND SQUEEZES SOME OF EARTH'S ATMOSPHERE INTO SPACE

Researchers using NASA's Polar spacecraft have found the first direct evidence that bursts of energy from the Sun can cause oxygen and other gases to gush from Earth's upper atmosphere into space. Scientists first saw this effect September 24-25, 1998, when a storm from the Sun smacked into the Earth. Using particle detectors on Polar, they found that the flow of "polar wind" out of Earth's upper atmosphere increased substantially when the storm hit. In effect, pressure from the solar ejection squeezed gas out of the ionosphere.

RELEASE: 98-213
SUBMILLIMETER WAVE ASTRONOMY SATELLITE TO STUDY STAR FORMATION

NASA's Submillimeter Wave Astronomy Satellite (SWAS) mission, scheduled for launch at 8:40 p.m. EST (5:40 p.m. PST) on Dec. 2, 1998, will gather star-formation data, which have remained invisible from beneath the obscuring effects of the Earth's atmosphere

The overall goal of the two-year mission is to gain a greater understanding of star formation by determining the composition of interstellar clouds, and establishing the means by which these clouds cool as they collapse to form stars and
planets.

Mars Polar Lander Mission Status January 3, 1999

Mars Polar Lander -- due to become the first spacecraft to set down near the edge of Mars' southern polar cap -- pierced through a blustery, cloud-covered Florida sky at 3:21 p.m. Eastern Standard Time today atop a Delta II launch vehicle from Cape Canaveral Air Station's Launch Complex 17B. The spacecraft, launched successfully on the first day of the launch period, is equipped with a robotic arm to dig

beneath the layered terrain of the Martian polar region and two microprobes to crash into the planet's surface and conduct two days of soil and water experiments up to 1 meter (3 feet) below the Martian surface.

The third stage fired for 88 seconds at 3:57 p.m. EST to propel the spacecraft out of Earth's gravity and on its way to Mars. At 4:03 p.m. EST, Mars Polar Lander separated from the third stage. A set of solar panels located on the spacecraft's outer cruise stage were deployed shortly thereafter and pointed at the Sun. At 4:19 p.m. EST, the lander's signal was acquired by a 34-meter-diameter (112-foot) antenna of NASA's Deep Space Network in Canberra, Australia.

Mars Polar Lander's interplanetary cruise to Mars will take it more than 180 degrees around the Sun in what is called a Type 2 trajectory, allowing the spacecraft to target a landing zone close to Mars' south pole at 73 to 76 degrees south latitude.

Mars Polar Lander is the second of two spacecraft launched to the red planet during the December 1998-January 1999 Mars launch opportunity. Mars Climate Orbiter was launched December 11, and is scheduled to reach Mars next September 23. Onboard Mars Polar Lander are two microprobes developed as the Deep Space 2 project under NASA's New Millennium Program. The Deep Space 2 probes will smash into the Martian surface as a test of new technologies for future planetary descent probes.

Blue Moon

When the full moon takes its place on Friday night, it will begin an unusual series of full moons not seen in more than eight decades.

There will be two full moons in January, none in February and two in March. That sequence last occurred in 1915, Geoff Chester of the United States Naval Observatory said. January's first full moon becomes full at 9:50 P.M. Eastern time on Friday. The month's second full moon occurs at 11:07 A.M. on Jan. 31.

When a month has two full moons, the second is known as a "blue" moon, though it only rarely has a blue tint that unusual atmospheric conditions can supply. The occasional blue or bluish-green moon can occur when a lot of dust is in the air, like after a volcanic eruption, said Guy Ottewell of Furman University in Greenville, S.C.

SETI@home (continued from page 1)

Each chunk of data delivered to a home or business computer consists of 0.25MB organized as 50 seconds x 20KHz x 2-bits of voltage data. Within this 20KHz 400,000 different frequency and bandwidth combinations are examined. (The bandwidths vary from 0.1Hz to 1.5KHz in 14 binary steps. At the finest bandwidth of 0.1Hz, all 200,000 frequencies in the 20Khz range are examined.)

At least 10 different "chirp"s or frequency drift rates will be examined. This will cover doppler shifts caused by any of the expected orbital speeds (due to the rotation of a planet, a solar system, or an entire galaxy.) Finally, signals that show a strong power at some particular combination of frequency, bandwidth and chirp are subjected to a test for terrestrial interference. Only if the power rises and then falls over a 12 second period (the time it takes the telescope to pass a spot in the sky) can the signal be tentatively considered extra-terrestrial in nature.

1999: From 1/99 through 3/99 we will test and debug the client software, develop the final version of the server software, and prepare the web site for launch. The launch is scheduled for 4/99.

2000-2001: To survey as much of the sky as possible, the experiment will run for two years. The web site will be updated regularly with progress reports, and explanations of the results found so far.