University Lowbrow Astronomers
Ann Arbor, Michigan

REFLECTIONS REFRACTIONS

of the University Lowbrow Astronomers

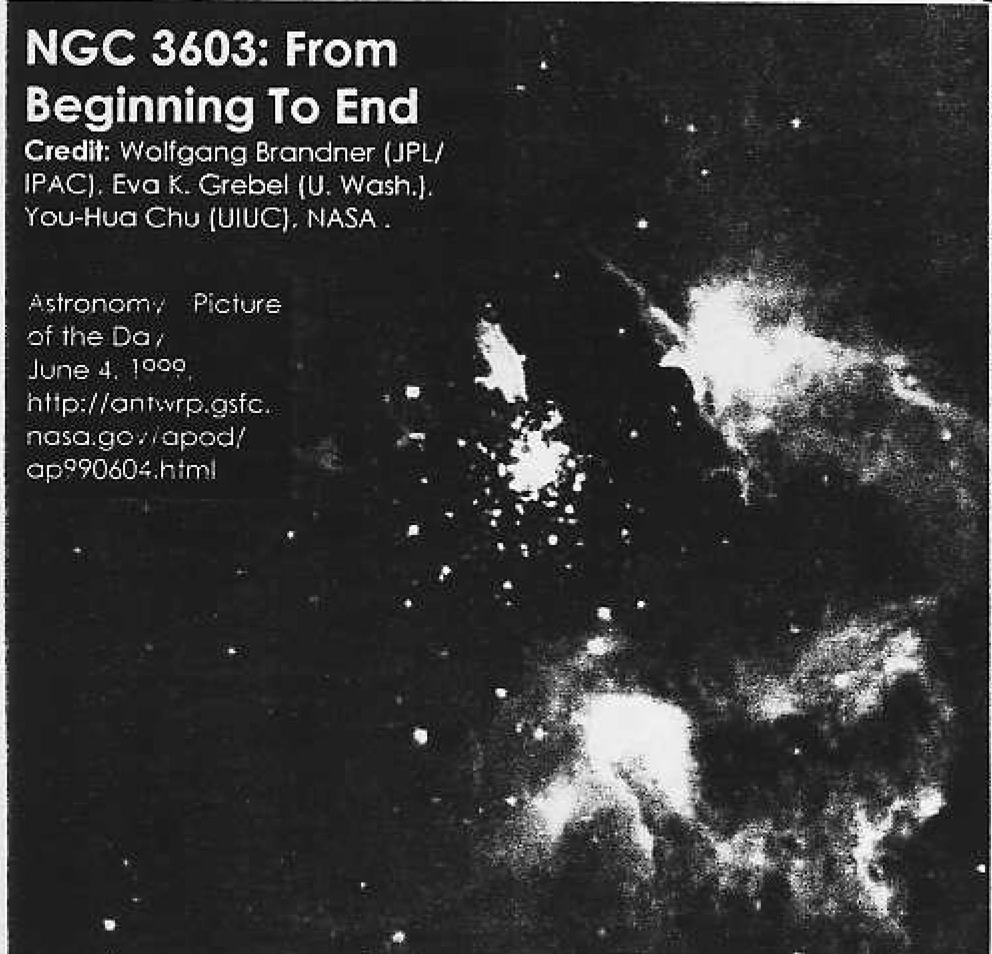
June 1999

The University Lowbrow Astronomers is a club of Astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Physics and Astronomy building (Dennison Hall, Room 807). Meetings begin at 7:30 pm and are open to the public. Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party is canceled if it's cloudy or very cold at sunset. For further information call (734)480-4514.

NGC 3603: From Beginning To End

Credit: Wolfgang Brandner (JPL/IPAC), Eva K. Grebel (U. Wash.), You-Hua Chu (UIUC), NASA.

Astronomy Picture of the Day June 4, 1999, http://antwrp.gsfc.nasa.gov/apod/ap990604.html



This Month:

June 18 - Meeting at 807 Dennison - Mark Cray will make a cool presentation on why we need a CCD camera for the McMath.

June 19 - Public Star Party at Peach Mountain Observatory – It's OK to come late as the twilight will be doing the same two days before the Summer solstice.

June 20 - ATM Mtg – time TBD.

June 25 - Computer Subgroup Meeting 7:30 pm. Contact Dave Snyder for more information.

Next Month:

July 10 - Public Star Party at Peach Mountain Observatory – Mosquitoes will be taking blood samples from unprepared astronomers tonight.

July 16 - Meeting at 807 Dennison - Lorna will speak on parking operations at Peach Mtn.

July 17 - Public Star Party at Peach Mountain Observatory – Welcome all 'scopes' big and small; and observers too.

From beginning to end, different stages of a star's life appear in this exciting Hubble Space Telescope picture of the environs of galactic emission nebula NGC 3603. For the beginning, eye-catching "pillars" of glowing hydrogen at the right signal newborn stars emerging from their dense, gaseous, nurseries. Less noticeable, dark clouds or "Bok globules" at the top right corner are likely part of a still earlier stage, prior to their collapse to form stars. At picture center lies a cluster of bright hot blue stars whose strong winds and ultraviolet radiation have cleared away nearby material. Massive and young, they will soon exhaust their nuclear fuel. Nearing the end of its life, the bright supergiant star Sher 25 is seen above and left of the cluster, surrounded by a glowing ring and flanked by ejected blobs of gas. The ring structure is reminiscent of Supernova 1987a and Sher 25 itself may be only a few thousand years from its own devastating finale. But what about planets? Check out the two teardrop-shaped objects below the cluster toward the bottom of the picture. Although larger, these emission nebulae are similar to

Confessions of a Space Popularizer and How You Can Be One Too

by Jim Loudon
University of Michigan Exhibit Museum
Ann Arbor, Michigan

Jim Loudon, who died several years ago, made his living by giving talks on space and astronomy. They were extremely popular and he acquired a small cult following in and around Michigan. He knew what it takes to reach an audience and hold its attention, something we all aspire to, so in 1987 I asked him to share his secrets with us. This article is adapted from one that appeared in the L5 Society magazine in 1980. Although he specifically addresses non-professionals using the slide/lecture format, his observations are relevant to any astronomy lecturing situation, be it classroom, after-dinner talk, or planetarium show. –JM

[I know many Lowbrows fondly remember Jim Louden. Those lucky enough to have heard his presentations, as I did in the mid 70's, will remember his ability to deliver the cosmos in understandable terms. He would deliver up-to-date news on the latest NASA planetary excursion and hold an audience of hundreds of interested listeners for hours at a time while discussing astronomy and space science. – Ed]

One of the myths of our time is "the public has lost interest in space." I agree the mass media have no interest (or more accurately never had any genuine interest to begin with), but every indication I can see (including the fact that I've found it possible to make a reasonably comfortable living as a professional space lecturer) is that people are fascinated by space, starved for the information of what we're discovering there which the media aren't giving them-and eager to obtain it from, for example, public programs that local L-5 chapters might consider putting on for them, beyond the basic astronomy that planetaria routinely present.

I warn you that doing a good job on such programs-the kind that generates large crowds and keeps them coming back-takes far more time and sheer hard work than you'd probably ever imagine. But the response you can get is fantastically greater than you'd likely expect too. Everywhere I go, lecturing across the United States and Canada, I get crowds of 400, 500, 600 people-if the event has been adequately advertised-and they sit and listen to me talk for three hours or more on Mars or the moons of Jupiter or the prospects for the Shuttle or the great untold story of Apollo, what we discovered on the moon-and they come back the next night for more. It's not me, folks (much though I'd love to believe that); it's the subject. These people are desperate for information on space-if it's presented to them slowly, interestingly, and in terms they can understand.

If you want proof that interest in this magnificent, complex, above all infinitely varied universe we find ourselves in is an intrinsic human characteristic, simply observe any five-year-old. Many are lucky enough to retain it into adulthood, despite years of contact with an educational system that almost seems designed to knock it out of them. The single most popular tourist attraction in Washington, D.C., save only the White House and Capitol, is the National Air and Space Museum; more people go there each year than visit Disneyland. Over a million people went to see each Apollo launch-and the number increased with each one, despite the media's assurances that we were losing interest. Sixty thousand people got up before dawn and committed their cars, their gasoline and their sacred honor to the Mojave Desert just to see the Enterprise fly five minutes-in the lower atmosphere, not even space-the first time it was drop-tested from the 747.

I claim the best way to generate support for space exploration is simply to tell people what it's already discovered. We're talking education, not propaganda, and no hard sell is necessary. In my experience, and contrary to what you might expect, people get bored very quickly with "relevant" or "practical" presentations of space, such as sermons on spinoff. What turns them on is black holes and the volcanoes of Io and how many two-billion-atom-bomb-equivalent explosions it took to cover the moon with overlapping 50-mile craters and why the clouds of Venus are made of concentrated sulfuric acid. In fairness, that may just reflect my own abilities and limitations. I happen to be a good explainer of pure facts and a lousy politician. You may find different interest patterns; in fact, I'd be interested to hear if you do. Meanwhile, I think it's safe advice to say: share your interests; do what you do well; and then give your audience plenty of chance for feedback.

Start out small and simple. You'll inevitably make mistakes, and it's best to make them, and learn from them, when you aren't yet facing half a thousand people. Besides, you can't possibly imagine how many things can go wrong with a seemingly simple public presentation until you've experienced them. For my programs at the University of Michigan (admittedly more complex than most I do) I make my projectionist and myself show up 2 1/2 hours before show time, so we can catch the problems before the audience sees them. Do the projectors work-and are there spare lamps for each one anyway? Find and splice the breaks in the film. What new hums and buzzes has the sound system thought up for us this time? Do all the slides drop into this particular Carousel projector? (By the way, for auditorium use, make it an Ektagraphic, the uprated professional version of the home Carousel, tougher, with more precise focusing, and [depending on model] a brighter lamp. But don't use a supposed equivalent machine with an arc lamp unless you're sure you'll change slides frequently-it can literally melt your [possibly irreplaceable] slide. As your audience watches and laughs. Note also that "Carousel" is a trade name, not a generic term for "circular slide tray," and will take only its own trays!). Find the janitor and get some chalk. Find where the last turkey who used the pointer misplaced it. If it's a new auditorium, where the heck are the light switches? You get the idea.

Start out small and simple, then-but plan on metamorphosing into a Major Event as soon as possible. It's the only way to get the good publicity listings, the best auditorium, the most competent projectionists (and believe me, they'll make or break your show)-and the biggest crowds. I will now tell you free the hardest lesson of my career: to be given status, you have to assume it. Robert Heinlein said it years ago in his classic The Man Who Sold the Moon: "If Columbus had asked for a dime, he'd have been thrown out on his ear. As it was, he got the crown jewels." Or a somewhat earlier wise man: 'To him who hath shall be given." Get everybody thinking of you as a major event, which of course needs a big hall and deserves lots of publicity-and magically you'll find you are one; the crowds will come. (But be darn sure you're ready to deliver when they do.)

A good basic format is one or two films, an intermission to let those with lesser attention spans leave gracefully (be sure to remind them to grab any literature you're handing out as they go!), then a slide lecture for the hard core. Consider co-sponsoring with a planetarium or observatory (or college/ university astronomy department); then you may have additional events such as planetarium shows or telescopic observing (but plan contingencies if the latter is wiped out by clouds, and check sunset time and moon phase before scheduling it-a full moon is uninteresting itself and its light drowns out everything else except the very bright planets). Most planetaria have shows geared for people with relatively little previous space interest, and not much for more serious types; you can help them fill that gap, and their established publicity apparatus can in turn help you draw the crowds. I'll assume a lecture format for the rest of this article, but remember there are other possibilities (e.g. panels, debates, and one I've had a lot of success with but requires experience: totally fee-form Q&A sessions with no restrictions on subject matter, save that it be somehow space-related).

Planning starts many months in advance. Films and auditoria may require six to nine months' lead time to obtain. Many colleges have a policy that "non-academic" auditorium users, like you, can be bumped without notice from a hall they'd been promised if some "academic" user requests it (e.g. a film professor decides the night before your program that the hall you'd been advertising as your site for six months is the best place to show Cries and Whispers to his class of 25-and out you go). I solved that problem at Michigan only by switching to Friday evenings, when there are no classes. If you do get bumped, put up arrows about every five feet to direct your audience to the new site-but expect (based on my experience) a 50% reduction in your crowd anyway.

How to Lecture

I'm convinced it can't be taught; all I can do is give a few hints. You learn how by observing good and bad lecturers, then adapting what you see to your particular style, knowledge, and interests. Hint 1: pick subjects reflecting what you know and care about. Hint 2: let the audience teach you how to lecture; encourage them to ask questions, profound or simple, during the talk, not just after it-why waste your time and theirs talking about something they don't follow you on, when a simple explanation might have given them the key concept needed to understand everything you said from then on? Hint 3: if you're going to let the audience teach you (and they'll do so-the most valuable instruction you could ever have, and absolutely free-if you give them a chance), don't sandbag them by reacting negatively to any question. Credendum, to be engraved on the heart of anyone who would speak in public: there is no such thing as a dumb question. The lecturer's greatest enemy is pluralistic ignorance, a technical term denoting the state where much of the audience doesn't understand something but each individual is afraid to ask for fear he/she is the only one. Psychologists have studied it intensively; it's very common in classes and in lecture audiences, and may be the biggest single factor that kills that wonderful five-year-old's intrinsic interest in science. Fight it: answer every question with the dignity its asker deserves as a human being, a member of (as far as we know) the single intelligent living species. Their questions will teach you what you haven't explained sufficiently, and your refusal to laugh will open them up to ask more "dumb" questions--and thereby teach you more.

If someone asks a question and the audience laughs, you have a crisis. Get across right now that no one need fear to ask any questions, or you've lost them. Technique: use the fact that most "dumb" questions are asked only by five-year-old kids and great philosophers. Respond to the question as if it were so profound that only you and the questioner understood how important it was, while those turkeys who laughed totally missed its significance. Here's your golden chance to tell the audience some major, complicated principle of science that you'd previously shied off from, for fear they wouldn't sit still long enough: make it fit the "dumb" question! No, of course you won't fool anyone-least of all the questioner-into thinking the question was actually that profound-but you'll have established the atmosphere you want, "Don't be afraid to ask any question." And you'll have gotten in that explanation!

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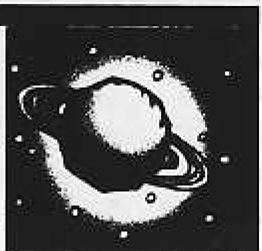
The 20th annual

Astrofest 1999

Sept. 17 – 19th



Camp Shaw-Waw-Nas-See, Kankakee, Ill.
Hosted by the Chicago Astronomical Society
Web: www.chicagoastro.org

I'll have copies of the registration forms at our next meeting – Ed

Ancient Time Keepers

By Lorna Simmons

Do you often wish you could throttle the folks who invented time and time keeping devices? These contraptions cut into your leisure time by making it almost impossible to enjoy "a nice relaxing day"! Well, here are some of the sparse historical facts, and now you can know whom to blame for your lack of leisure - The ancient astronomers! Your very own astronomical kin.

Early on, humans started keeping time in one way or another for a variety of reasons. They must have noticed the regularity of the rising and setting of the sun and needed to have accurate measurements of such events. Notches which were carved on the discovered artifacts of early humans have been interpreted as being tally marks or counters, as a means of keeping track of the seasons and times of the year, and, importantly, as records of the lunar cycle. Early humans were keeping records early on. A marked bone which was probably used as a record of months and lunar phases and which was from approximately 9000 to 8001 BC or as late as 6500 BC was found in Ishango, which is now Zaire. Primitive hunter-gatherers had already detected patterns in the apparent motions of the stars and possibly even in the real motions of the planets through the night sky. These same traditions appeared later in Egypt and in Central America and are thought to have been associated with specific apparent motions of Sirius and Venus.

Of first importance to early people, and upon which all people could agree, with any degree of accuracy, was the measurement of time using fairly large amounts of time. Large amounts of time are easily measured because the "clockwork" is supplied by the universe, itself, as seen in the daily and annual motion of Earth and the Moon. Even so, the more careful measurements of time were not easy to come by. One revolution of Earth constitutes a day and a "moon" is from one new moon to the next; but yearly measurements were not very simple to measure. In addition, a day is not very easy to measure accurately. It took some time before humans learned to measure the day from one noon (when the Sun is at its highest point in the sky) to the next.

A good length for the year was first established by the ancient Egyptians, probably because the Nile floods annually about the same time. This flooding generally occurs when Sirius rises at approximately the same time as the sun (helical rising). A year is approximately 365 days, 5 hours, 48 minutes and 46 seconds, approximately one quarter of a day longer than 365 days. Between 5000 to 4001 BC, the Egyptian calendar appeared, being the first known calendar to be based on 365 days (indicating 12 months of 30 days and 5 days of festival, beginning with the day that Sirius, the Dog Star, rises in line with the Sun in the morning, which coincides with the annual flood of the Nile). From astronomical evidence only, it was possibly instituted as early as 4241 BC or perhaps about 1500 years later. Because the Egyptian calendar is known to have accurately matched the seasons with dates in 139 AD and gradually went into and out of alignment with the seasons with a period of about 1455 years, astronomers have deduced that the year of 365 days began about 4228 BC or 2773 BC.

Hellenic astronomers added the missing 1/4 day to the Egyptian calendar by adding an extra (leap) day every four years, but most people ignored it. The calendar with a leap day was finally adopted by the Romans under Gaius Julius Caesar in 4 BC. Since then, the calendar has had one major modification, when Pope Gregory, in 1582, on the advice of astronomers, dropped the leap day in years that end in two zeros.

Later, sometime between 2600 and 2501 BC, the Chinese used a vertical pole to project the shadow of the sun for the purpose of estimating time. Sometime, between 2200 and 2101 BC, the Sumerians began to use a 360-day year, 12-month solar calendar along with a 354-day lunar calendar. This calendar included an extra month every eight years in order to keep it in step with the seasons. From 1500 to 1451 BC, the gnomon, which is the L-shaped indicator on a sundial, was regularly used by the Egyptians. Thutmose III erected the "Needle of Cleopatra" in Heliopolis. Its shadow was used to calculate the time, the seasons, and the solstices.

The earliest history of humanity has no known dates. After writing began to be used, people started dating events, but these were usually in relation to other events that we can no longer date. The long histories of the Egyptian and the Chinese dynasties, however, provided fairly good year dates for those cultures back to 3000 BC.

The Mayans recorded specific day dates that go back in time tens of thousands of years. Since many of the events dated in this system occurred before the most optimistic early date for humans in North America, it is assumed that these very early dates are for mythical events that were invented much later. Very early Chinese dates also are thought to have been late inventions.

A strong candidate for the first real date in history, that is, the first specific day on which an event can be pinpointed as having occurred, is May 28, 585 BC. The event was a battle between the Medes and the Lydians that was suddenly called off when an eclipse of the Sun frightened both armies. This eclipse, supposed to have been forecast correctly by Thales (although at best he would have had the year right, not the date), could only have been the one observable in the Middle East on May 28, 585. No other solar eclipse would have been visible in that region for many years on either side of 585.

A similar candidate for the first date, September 6, 775 BC, comes from Chinese astronomical records. It is the earliest date that records an astronomical event that we can say occurred at a particular time. However, it is not connected with any other event such as the war of the Medes and Lydians.

Dates were not rigorously kept during the Greek and Hellenistic period, although Chinese dates at this time were more certain. To make matters complicated for us, most dates were given in "Olympiads" which could only be localized to within a four-year period. Approximate dates for the lives of many of the well-known scientists and philosophers in that era have been worked out by historians from bits and pieces of evidence. For instance, if you read in some sources that Thales was born in 624 BC and died in 546 BC you can assume that such dates are indefinite as to source. Instead, historians have been clever and, when only one date in a person's life is known, the historians assumed that the person must have been around 40 when the event occurred. For instance, historians know the year that Thales is said to have predicted an eclipse, which astronomical calculations put at 585 BC. Therefore, it is assumed that Thales may have been born around 623 BC. Because there is a tradition that Thales lived to be about 70, historians think he may have died in 546 BC. Therefore, because of the uncertainty of the dates during this period, consider all dates as occurring within the decade surrounding that date, or even, possibly, in an adjacent decade. Sometimes it had to be assumed that events listed only in the first decade of a century should be considered as having occurred at some date during that century. Often, the century is uncertain, as well.

An early astronomer, Kiddinu, who was born in Babylon between 340 and 331 BC, devised an early version of the precession of the equinoxes which was somewhat inaccurate. The precession of the equinoxes refers to the apparent change over a period of 26,700 years in the position of the fixed stars which is caused by Earth's wobbling in its orbit. Later, from 160 to 141 BC, Hipparchus of Nicea (in Turkey), who was born around 190 BC, listed the fixed stars and more accurately discovered the precession of the equinoxes.

Andronikos of Kyrrhestes, from 50 to 41 BC, built in Athens the Tower of Winds, which was a water clock combined with solar clocks positioned in the eight principal directions. It is the most accurate device that the Greeks had devised by then for keeping time. In 132 Zhang Heng in China combines a water clock with an armillary to produce a device, somewhat like the modern planetarium, to keep track of where stars are expected to be in the sky.

Often misguided writers will believe that there was some coordination between the early peoples and that they corresponded with each other to produce these devices. Wrong! While at rare instances there might have been some correspondence between the members of various civilizations (particularly as one civilization conquered another more scientifically or technically advanced civilization), most of this invention was begun with the single fact of the night sky to lead them. All of these astronomers were able to devise means of keeping time, first generally, but becoming more and more specific as their methods improved, simply because of the improvement of astronomical techniques.

Let us hear a cheer for the ancient astronomers! Where would we have been without them? Next time you visit Peach Mountain (or any dark site); observe a moment of silence, contemplating their brilliance in achievement over the millennia. Your excellent observing powers of today began with their humble first efforts.

What satellite is that?

by Christopher Sarnecki

Years ago I attended a program at Abrams Planetarium on the campus of Michigan State University as they were putting their new *Digistar* planetarium through its paces. After the presentation we were whisked outside to watch the Mir spacecraft fly over our local place on the globe. Right on cue the Mir appeared in the northwestern sky, moved with determination overhead, then quickly disappeared in the Earth's shadow. I thought it was pretty neat how the staff was able to predict exactly were the satellite would appear and move across the sky.

Now you can do the same. Plus, you can predict many more visual satellite sightings with complete confidence. All you have to do is access the DLR/GSOC Satellite Visibility Home Page at **http://www.gsoc.dlr.de/satvis/**. The German Space Operations Centre (GSOC) maintains this site and is part of the *Deutsches Zentrum für Luft- und Raumfahrt* (DLR) in Oberpfaffenhofen, Germany. The GSOC Satellite Visibility Home Page will predict visible satellite passes from any place on the Earth. Some of the significant features of this site are:

- Daily satellite predictions at brighter than mag 4.5.
- Charts identifying the satellite rise/set times (in local daylight times), elevation, and azimuth angles.
- Mir and International Space Station in real time, graphic display.
- Iridium flares, both nighttime and daytime.
- Sun and Moon rise/set data.
- Select from numerous locations or log your lat/long like I did, save it, then bookmark the page for future use (use www.mapblast.com).

All this and more in an easy, user-friendly web site. Click on highlighted rise times and detailed visible pass chart appears. Click on the name of the satellite and a description with a picture of the object appears. It doesn't get any easier than this, folks.

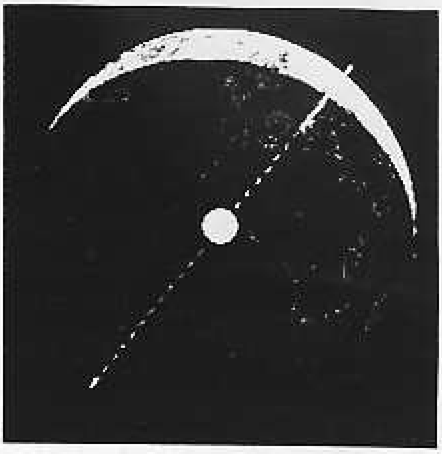
Those of you that know me know I like my astronomy big and chunky. Recently I accessed the GSOC Satellite home page, called up the real time Mir display and noticed Mir would be passing directly overhead in just a few minutes. The Mir, traveling at over 27,000 km/hr, was a couple minutes late. How did I know this? Well, it seems a –7 mag! Iridium flare appeared in the western sky and it was right on time. If you have never seen an Iridium flare, it is a momentary flash of light caused by Sun light reflecting off the reflections of the main mission antennas, which are large, flat and highly polished aluminum surfaces, of one of the numerous Iridium communication satellites that now orbit the Earth. Hope I never see this in the telescope. That would wreck the night vision for hours. Well I would like to stay and chat some more, but right now I have to go outside and observe some more satellites.

[Web page sample and visible pass chart are reprinted with permission of Chris Peat, German Space Operations Centre]

GSOC Satellite Visibility - Home Page

DLR

NEW! Detailed charts showing the satellite's path against star background.
Charts can be resized, zoomed and scrolled.



Current position of ISS

- Edit location (currently Delhi Mills, 42.3300°N, 83.8110° W)
  - select from the database (now over 1 million locations!)
  - edit manually
- Daily predictions for all satellites brighter than magnitude 4.5
- 10 day predictions for special interest satellites
  - Mir
  - ISS / Space Shuttle (STS-96)
- Iridium Flares
  - for the next 7 days
  - for the next 24 hours
  - over the past 48 hours
  - Daytime flares for 7 days - see satellites in broad daylight!
- Sun and Moon data for today
- Select a satellite from the database
- Sky Chart (interactive Java applet, needs IE3 or Netscape 4)
- Real-time Mir orbit display
- Frequently Asked Questions (FAQ)
- Help
- Map showing geographical distribution of visitors
- Daily statistics
- Awards

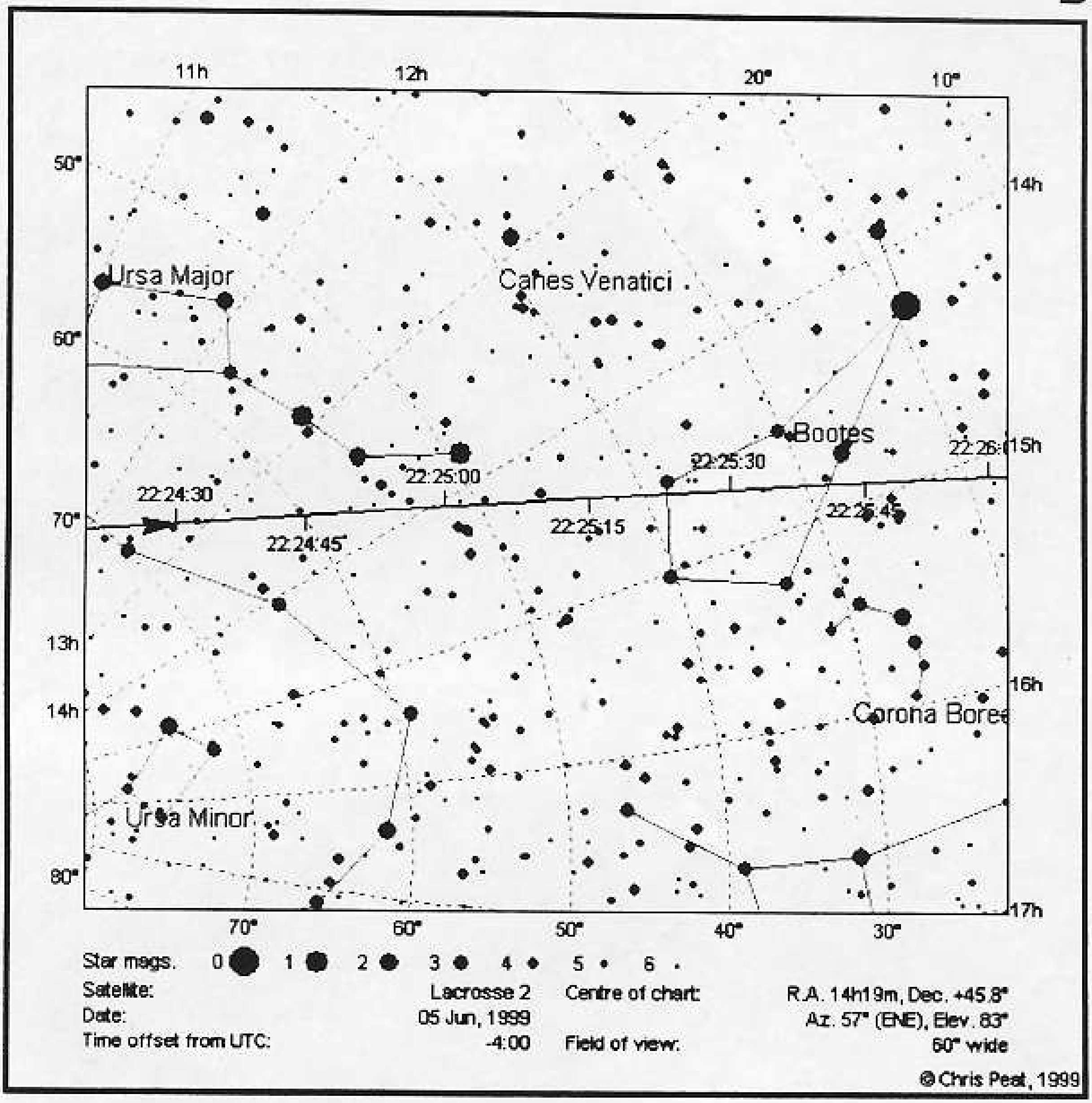
Don't forget to bookmark this page!!!

By bookmarking this page, your coordinates and time zone are saved in the page address, and you can save time on your next visit.

Developed and maintained for DLR GSOC by Chris Peat
Please read the FAQ before sending e-mail.

| Home | Info. | Orbit | Help |

Visible Pass Chart

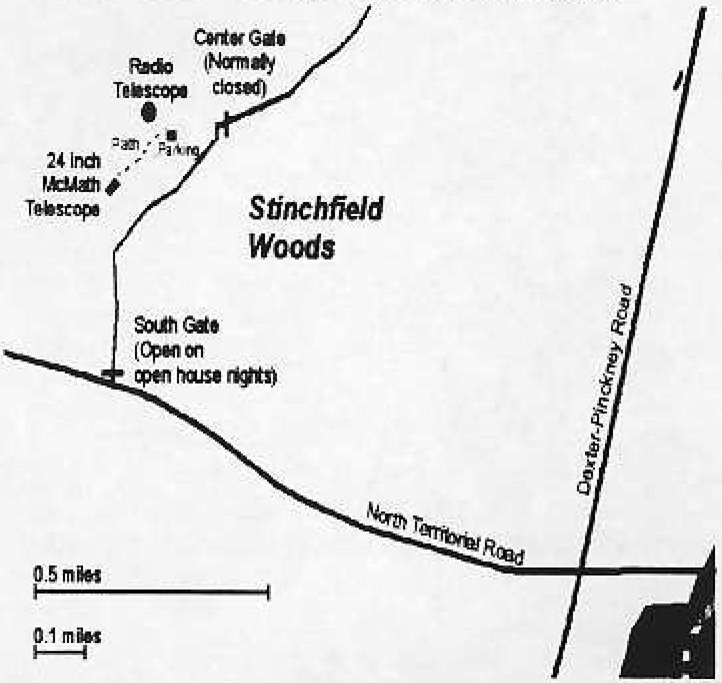


[redacted] 800 (500 to 1600 pixels)

Click anywhere within the inner chart to zoom in on that region.
Click in the border region to get a new chart at the same resolution, but with the centre point moved in that direction.
The chart is oriented such that the local zenith is towards the top.
Click here for more info and help on using the charts.

Places and Times:

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 807. Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.



Peach Mountain Observatory is the home of The University of Michigan's 25 meter radio telescope as well as the University's McMath 24 inch telescope which is maintained by the Lowbrows. The observatory is located northwest of Dexter. The entrance is on North Territorial Road, 1.1 miles west of Dexter-Pickney Road. A small maize-and-blue sign marks the gate. Follow the gravel road one mile to a parking area near the radio telescopes. Walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.

Public Star Parties:

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 480-4514 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitoes - bring insect repellent, and it does get cold at night so dress warmly !

Amateur Telescope Making Group meets monthly, with the location rotating among member's houses. See the calendar on the front cover page for the time and location of next meeting.

Membership:

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training). Dues can be paid to the club treasurer Doug Scobel at the monthly meeting or by mail at this address:

1426 Wedgewood Drive
Saline, MI 48176

Magazines:

Members of the University Lowbrow Astronomers can get a discount on these magazine subscriptions:

Sky and Telescope: $29.95 / year
Astronomy: $27 / year
Odyssey: $16.95 / year

For more information contact the club Treasurer. Members renewing subscriptions are reminded to send your renewal notice along with your check when applying through the club Treasurer. Make the check payable to "University Lowbrow Astronomers".

Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or E-mail to Newsletter Editors at:

Bernard Friberg (743)761-1875 Bfriberg@aol.com
Chris Sarnecki (734)426-5772 chrisandi@aol.com

to discuss length and format. Announcements and articles are due by the first Friday of each month.

Telephone Numbers:

President:	Mark Deprest	(734)662-5719
Vice Presidents:	Lorna Simmons	(734)525-5731
	Dave Snyder	(734)747-6537
	Paul Walkowski	(734)662-0145
Treasurer:	Doug Scobel	(734)429-4954
Observatory Director:	Bernard Friberg	(734)761-1875
Newsletter Editors:	Chris Sarnecki	(734)426-5772
	Bernard Friberg	(734)761-1875
Keyholders:	Fred Schebor	(734)426-2363
	Mark Deprest	(734)662-5719

Lowbrow's Home Page:

http://www.astro.lsa.umich.edu/lowbrows.html

Dave Snyder, webmaster
http://www-personal.umich.edu/~dgs/lowbrows/

Monthly Meeting

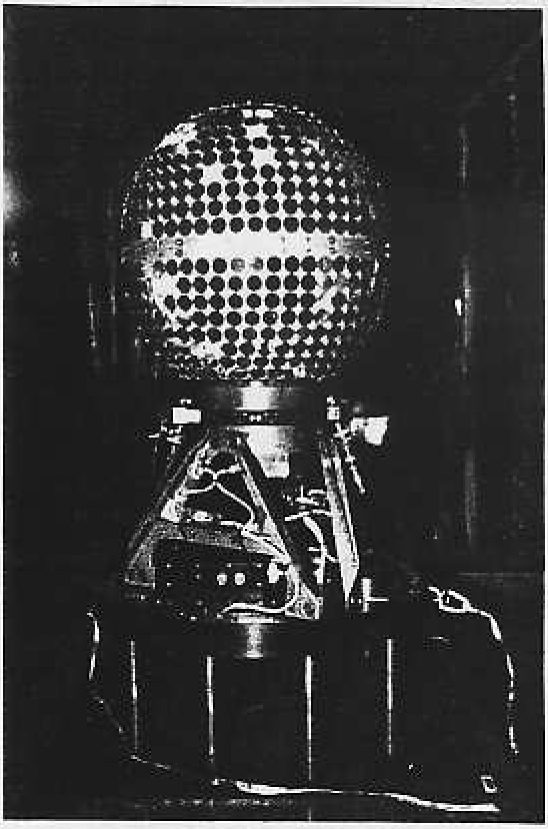
June 18, 1999, 7:30 pm

Room 807 Dennison Hall
Physics & Astronomy Building
The University of Michigan

Mark Cray

Presents

CCD Camera For the McMath



NASA's Project Starshine satellite was placed in to low Earth orbit by Space Shuttle Discovery on June 5, 1999. The mirrors on the satellite were polished by students from around the world. NASA is promoting visual observations and tracking reports from satellite observers of all ages and **between the latitudes of 60 degrees north and 60 degrees south. Visit the Starshine web page at** http://www.azinet.com/starshine/descript.htm. Photo credit: NASA.

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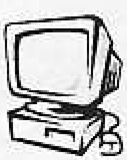

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