The SPECTROGRAM

Newsletter for the Society of Telescopy, Astronomy, and Radio

October, 2002

October's Meeting

The next meeting of S*T*A*R will be Thursday, October 3rd . The meeting will begin promptly at 8:00 PM at the King of Kings Lutheran Church, 250 Harmony Street, Middletown.

Our featured speakers will be two S*T*A*R Astronomy's most accomplished astrophotographers, David Segelstein and Gordon Waite, who will compare and contrast astrophotography techniques using film and CCD.

In this Issue

From the Editor

Thank you to this month's contributors. The Spectrogram is your newsletter and appreciates your support. Articles may be submitted to Greg Cantrell at monthly meetings or electronically at cantrell@optonline.net .

DUES are DUE!

Membership dues of $25 per individual or $35 per family are due now. You may pay dues directly to Paul Nadolny at the meeting, or through the mail to:
STAR Astronomy Club
P.O. Box 863
Red Bank, NJ 07701

Calendar

September 5, 2002
Ernie Rossie
STAR Astronomy Club

October 3, 2002
David Segelstein & Gordon Waite
STAR Astronomy Club

November 7, 2002
Dr. Haimin Wang
NJIT

December 5, 2002
Dr. Jerry Sellwood
Rutgers University

January 2, 2003
Dr. Eddie Guerra
Rowan University

February 6, 2003
Bob Sal
ASTRA Astronomy Club

March 6, 2003
Dr. Dale Gary
NJIT

April 3, 2003
TBA

May 1, 2003
TBA

June 5, 2003
Annual Business Meeting

September Meeting Minutes

STAR held its first meeting of the 2002/2003 year at the King of Kings Lutheran Church. The meeting was well attended by about 40 people.

Short announcements and discussions:

1. Greg Cantrell brought the meeting to order more-or-less promptly at 8:05 PM. He made several requests of the members:
   a) To please be on time, so that we can start our meetings promptly at 8. This is a courtesy not only to all our members, but also to our speakers.
   b) To please have extraneous conversations outside the meeting room. The room we use for our meeting has excellent acoustics, and conversations in the back of the room can be heard all over the room.
   c) To please pay our dues.
2. The meeting agenda for the year has about 5 professional astronomers on it, and about 5 club members. This is a mix that has been good for the club in the past couple years. Potential speakers for the year include Eddie Guerra from Rowan University, and possibly Freeman Dyson (!!!).
3. There are several committees formed to look into specific interests of the club:
   a) An observatory committee chaired by Andy Zangle and Joe Cascella. Joe has a very well-thought-out plan for the club to acquire a portable planetarium, and anybody else interested should talk to Andy.
   b) A bylaws committee, chaired by Mike Lindner and Greg, to suggest revisions of our bylaws to the board, and then to the club with the board's suggestions. Anybody interested should talk to Mike or Greg.
   c) A new-member packet is being put together by Steve Fedor. Anybody wishing to help on this, talk to Steve.
4. Mike Lindner got a request from a teacher in Howell, who's teaching two astronomy/space units, for some help from our club. She said that she'd like one on telescopes, and another on "whatever's current or cool" in astronomy. Interested volunteers should talk to Greg Cantrell.
5. Andy Zangle agreed (on the club's behalf) to present a star party (with activities) and an evening of observation to the Sunday-school children (6^{th} grade +) at King of Kings church. Since they are such an accommodating host for our meetings, we believe that we can't ignore this request. The date for this day/night activity is Sunday October 20, 2002, at King of Kings (any rain date?). Interested members should please talk to Andy.
6. Greg Cantrell will be interviewed on the morning of Saturday, October 12, on a talk show on WADB (1310 AM) about amateur astronomy (~9 AM). Of course, he'll also mention STAR. Spread the word!

Main Program:

The main program of the evening was a very entertaining description by Ernie Rossi and Steve Fedor about their trip to New Mexico for some dark-sky observing. Their talk was illustrated by some pictures that they took along the way, and by pictures of some of the objects that they observed (their observing was strictly visual, but they wanted to show us some of the objects they saw, and say how well they were able to see them).

Their trip was "nearly" free, since Steve's sister is a travel agent. This past April, they flew into El Paso, and then drove out into the desolate parts of New Mexico to Alamorgordo and then to New Mexico Skies (in Cloudcroft, NM). Along the way, they passed through the Lincoln National Forest, and took a picture of its tree. Cloudcroft was a town out of the Wild West.

They have several scopes at New Mexico Skies, and they can be rented on a per-evening basis, with the larger scopes costing more. Ernie and Steve were there for three nights of observation, but one night (the third) was overcast. Ernie allowed that although they saved the rental money that night, he'd rather have seen the sky.

Ernie said that the accommodations were immaculate. However, the eyepieces were not up to his standards, so he brought his own. One goal of this trip was to see omega Centauri, which they did. Ernie also said that although the skies were dark, his place in the Catskills is even darker.

While they were in the area, Steve and Ernie traveled around to a couple other astronomy observatories. They went to Apache Point, and saw a solar observatory at about 9800' altitude. Walking up slopes at that altitude can be unusually draining.

They also stopped in on the Sloan Digital Sky Survey, and got an impromptu tour of the telescope. They were also well received at another 20" observatory, and found the inhabitants to be friendly.

They also dropped in on Roswell, to see if they could talk to anybody (really, any being) having a closer view of any of the objects they were looking at. They found one at the UFO museum there.

The meeting ended about 9:30 PM, or thereabouts.

Next STAR Meeting:
The next STAR meeting will be held in on October 3, at King of Kings Church.

Respectfully submitted,

Chris Olszewski

What's Mike Been Up To?
By Michael Lindner

As some of you know, I *always* have at least one ATM project going on, and usually several. One of the projects I'm currently working on is the Lurie Anastigmat, a telescope of unusual design.

I've often considered getting into astrophotography. My biggest obstacle has been lack of time. With three young boys at home a full time job and a working spouse, it's often hard just to find time to sleep, let alone observe; and as David Segelstein (and the other astrophoto nuts) will tell you, astrophotography is all consuming.

When I first got into telescope making, I purchased a number of books on the subject. One of them (and still one of my favorites) is *Telescope Optics: Evaluation and Design* by Harrie Rutten and Martin van Venrooij. This book (which will likely be the subject of a book review in a future issue of *The Spectrogram*), explains how a telescope works, and goes through many different designs of telescopes, with examples and performance data.

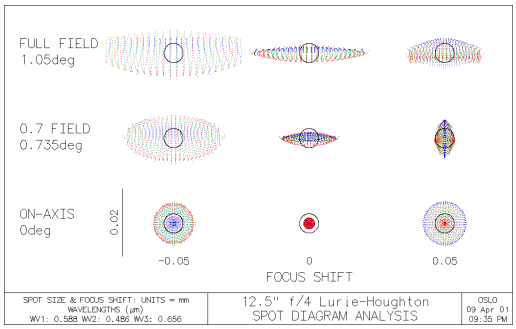
One of the scope designs that immediately caught my eye was the Lurie-Houghton. As R&V say:

> "We conclude that designs derived from the Houghton have favorable characteristics and deserve more attention from amateurs."

The Houghton consists of a 2 element full aperture corrector in front of a primary mirror, with a diagonal to bring the image to a conventional Newtonian focus.

The Lurie-Houghton has a wide, well corrected field with no coma, negligible color and only slight curvature. It can be made as fast as f/4 and still retain these features. In addition, unlike many specially de-

signed astrographs, it still retains a diffraction limited field, suitable for use as a visual scope as well as for photography.



If you look at the spot diagram (above), you'll see that the performance is quite good. Each row represents the image of a star at a particular place on the focal plane (the bottommost row is at the center, the topmost row is at the corner of a 35mm frame). Going across the columns shows how the image changes as the focus is changed slightly. The colors represent the different colors of light.

For reference, the black circles are airy disk sizes, and the vertical line labeled "0.02" is 20 microns long (about the size of a grain on a 35mm negative or slide). At focus, the performance is "diffraction limited" and exceeds that of a newtonian. At a point 0.05mm outside of focus, the star images all fit in 20 micron circles. This means the scope works (in theory) well as either a visual or astrophoto instrument.

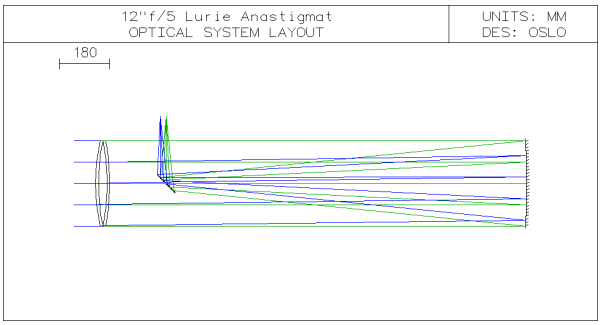
To a telescope maker, the Lurie-Houghton is very attractive in that the type of glass used for the corrector elements doesn't matter, as long as they are both the same. All the surfaces (primary and correctors) are spherical (which is much easier for an amateur to make than a parabolic surface). In addition, two of the corrector surfaces match the other two exactly, so they can be tested by interference against each other (see my testing articles in last year's *Spectrogram*).

Unfortunately, filling a 35mm frame and getting all the mechanical aspects doable, as well as keeping the scope at f/4, required a reasonably sized primary. I kept juggling the numbers and saying "yamightaswell" until I had a 12" clear aperture corrector, with a 14" primary and a 4" diagonal.

This would have been a killer scope, exept it became clear after a while that it was too ambitious as a first non-newtonian scope project, at least for me. I gathered some materials, and worked on the primary for a while, but never really got anywhere. The design was shelved.

This spring, the last issue of ATMJ (the Amateur Telescope Maker's Journal) was published, and it had a very interesting article in it, about Lurie's work. According to the author, the Lurie-Houghton was just one example of a broad class of scopes that Lurie derived general design formulae for. The generic name for the designs in Lurie anastigmats.

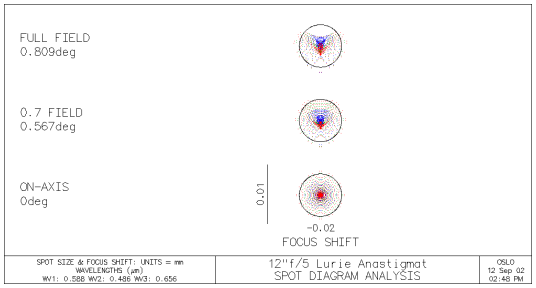
The interesting part is that Lurie presented a generalized equation that could derive the shapes needed for a two element single glass corrector for any shape primary (the Lurie-Houghton has a spherical primary), and at any distance from the primary.



That meant one could, in theory, design a two element corrector that could simple be placed in front of an existing Newtonian's tube to make an astrograph! To me, that's a much more attractive option than having to make an entire scope dedicated to astrophotography, even if it *can* also be used visually.

In addition, since the corrector for a parabolic primary doesn't have to correct for

spherical aberration, only for coma and astigmatism, the performance is even better!



In the above diagram, you can see that at focus, the instrument is essentially diffraction limited across an entire 35mm frame! In fact, a 12" instrument will effectively cover a 4x5 inch negative. Of course, I did slow it down to f/5, as the curves get rather steep and hard to produce at f/4.

In my determination not to make this a project I couldn't finish, I decided to start small. Instead of building a scope from scratch, I decided to make a corrector for my existing 6" scope. That would give me a 6" f/7 newtonian which, when the corrector was attached, would take 35mm images. If that turned out satisfactory, step two is to make an 8" f5/2 primary, which can be used with the same corrector, but will give me shorter exposures. Step three is to build a larger instrument.

One of the problems I had encountered on the Houghton project was finding glass. Optical glass typically doesn't come in large blanks, and the expense of having one custom poured seemed ludicrous for a project that is an experimental whim. I might as well buy a Takahashi! On the other hand, since the glass type didn't matter, I could design the scope using plate glass, which I did. Plate is much easier to find and less expensive by far, but it has to be tested for stress and other defects which typically don't matter for a window but do for a lens.

Optical glass companies will do this, but typically only stock ¼" thick plate glass, as this is the thickness used for Schmidt correctors. Again, finding the ½" to ¾" thick pieces I needed would be harder. Fortunately, I came across Dan Cassaro, an ATM who sells plate glass blanks. After talking to him, he agreed to check through his stock and find me suitable blanks (which he presumably did).

I ordered my glass in mid-May and it arrived in July. I already had all the grit and other materials. Since then I have been slowly but surely working on the two ¾" thick corrector blanks (which are getting thinner each day). All the curves are roughed in with 80 grit, and I am up to 320 grit on surfaces 1 and 2. I am grinding the blanks one at a time, but alternating grinding both sides of the same blank, to avoid scratching an already finished side while working on the other side.

I have built a wedge tester to keep the blanks from getting wedge (where one side is thicker than the other – something that doesn't matter for a mirror, but is deadly to a lens), and a spherometer (since one of the curves is convex, it is difficult to measure any other way).

I hope to be finished with this project before the last STAR meeting in the spring, but we'll see. I'll be sure to keep you posted from time to time. How well will it work? If practice matches theory, very well, however, you know the difference between theory and practice…in theory, there is none!

The Lure of Luna Domes

by Ernie Rossi

I have looked at the moon for decades with excellent planetary scopes under very favorable conditions and had seen these humps, or domes for a long time and wasn't sure what they were until I did some research. Many amateur astronomers over the years

have reported phenomena on the Luna surface such as flashes, smoke, brightening, and color anomalies. An international effort has been made to accumulate active luna activity. For the owner of a small telescope, observation of the luna surface feature called "domes" is intriguing and challenging. Many observers never knowingly saw them like myself, yet luna domes are evidence of past and possible present activity on the moon. Lunar domes are low mound-like swellings ranging from 1/3 mile, to over 20 miles in size. They often have a central crater and thought to be of volcanic origin. Many resemble just mounds that were pushed up like a half bubble by internal forces that push up the moon's crust without being able to break it.

Robert Barker, an English amateur astronomer, drew attention to domes in the early 1930s, and others were soon found by other amateur astronomers. Domes are not spread about at random, but occur in clusters. Groups of domes can be found inside the crater Capuanus, near Arago, near Prinz, and on various parts of the Oceanus Procellarum, they also have been found in the luna highlands and in the crater Darwin. The distribution of domes lends credence that they are volcanic in origin, being located where late stage volcanic activity on the moon is thought to have occurred (and they may still be active).

In observing luna domes, their very gentle slope renders them invisible unless under low sun-that is, near the luna terminator. Even then they are not obvious or striking objects, but many can be seen with modest size telescopes. I have seen them with a 6" reflector at around 150x, and made them out well at 300x on nights of good seeing. You are the ultimate the main factor in astronomical observing, and much can be accomplished with very modest means. What you need to do dome research is:

1. A good moon map.
2. Careful planning, and observing near terminator.
3. Pencil and sketch pad.
4. Patience, persistence, and a trained eye.

Making drawings at the telescope is not only a fine economical way to record what is observed, but trains the eye and mind to "see more" as well. If you record some domes, or would like to write about your observations please let me know.

Mirror-Making, Part One

by Dave Nelson

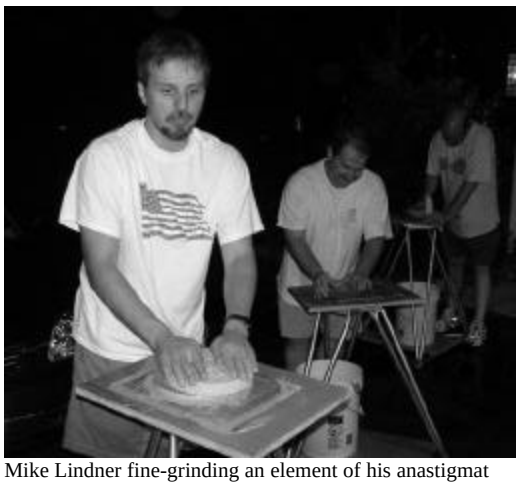
I always considered myself a quasi-Amateur Telescope Maker (ATM). Sure I had done woodworking, electronics and even collimated a time or two. However I'd never made a telescope mirror. Mirror-making was the realm of expert opticians, serious amateurs and magicians and I doubted my ability. Then the November 2000 Sky & Telescope magazine ran an article by Alan Adler on flexing a spherical mirror by mechanically deforming the mirror into a highly-corrected paraboloid. Adler wrote of spectacular optical results using simple methods. I was intrigued and felt the first pangs to grind a mirror.

Rough grinding. Glass disk below, plumbing parts above, grit and water in between. The cast-iron pipe flange serves as the tool for rough grinding.

Mirror Making 101:
Simple. A, start with a disk of glass, a grinding tool and abrasive. B, create a rough approximation of the desired curve by "rough grinding": pushing and pulling the tool across the future mirror, with abrasive & water in-between.

C, progressively smooth out and finally polish the desired spherical curve using finer and finer grinding compounds (fine grinding). D, gently deepen the curve's center ever-so-slightly (parabolizing, the touchy final phase). Within each of these steps one must measure the glass to ensure staying on course to the desired curve.

Last May Steve Fedor advised me that STAR (Society for Telescopy, Astronomy and Radio; in Monmouth County; www.starastronomy.org) was forming a group to make mirrors. I posted a note on STAR's very active Discussion Board, followed-up with a phone call to Mike Lindner, the group organizer, and was accepted (even though I was not a member of STAR; I subsequently joined this great club). I offered to bring some of the long-unused grinding compounds the NJAA had from the 26" mirror project.



Mike Lindner fine-grinding an element of his anastigmat corrector. STAR President Greg Cantrell and Steve Fedor in background

Mike Lindner, an experienced ATM, was making an 8" Lurie anastigmat, a two-element corrector that could turn a regular Newtonian into a powerhouse photographic telescope with a wide, well-corrected, flat field. Mike had ordered his two glass blanks from Dan Cassaro and I followed suit, ordering an 8" disk. As a bonus, Cassaro was providing glass with pregenerated curves, which would eliminate the rough grinding stages for both of us. Several other group members ordered from Cassaro as well. My disk cost $25 plus $5 S&H.

Gordon Waite, STAR's recent president, hosts the sessions at his house. Our first session was 24 June. Gordon was putting the finishing touches on his grinding machine, about to begin work on a 14" mirror. We assembled the grinding stands, got acquainted with each other over beer and sandwiches, learned the basics of mirror-making from Mike and later did some rough grinding. The Cassaro mirror blanks had not yet arrived, those without glass took turns with those who were grinding.

The sessions are lots of fun, grinding occupies about half the time. The gatherings typically start with talk & beer, then set-up and grind, break for sandwiches/pizza (courtesy Gordon), more talk, beer and grind. Besides the roughly eight mirror-makers, at least half a dozen other STAR members drop by to chat and see how things are going.

When my glass disk finally arrived from Cassaro late July, Gordon and I discovered some distressing things. The disk wasn't quite circular (it was cut from a larger piece of plate glass with a water saw and had a "belly button"), the pregenerated curve was off-center, and the disk had thickness varia tions.

Steve Fedor fine-grinding with a mustard-bottle

I was crestfallen- these conditions could severely affect my final flexed-mirror. "Let's see what Mike says about this" Gordon commented. We set the mirror aside and made my fine-grinding tool, using bathroom tiles and dental plaster.

Mike made some recommendations at the 12 August session. With a diamond hone I was able to make the disk circular. On 2 September, following Mike's advice on what strokes to use, I began grinding and within 45 minutes had ground the rough curve back to center and reduced the thickness variation to 0.002". I was feeling pretty good! After the dinner break, I ground a bit more and graduated to the next–finer grit – things were looking very promising.

By this time (early September) Gordon, with his grinding machine, had rough ground, fine ground and was beginning to polish his 14". Steve Fedor was working with #500 grit, one step away from polishing. The other mirror-makers were in various stages as well. Both Gordon's and Steve's mirrors were in the smooth-as-ice phase. Mike was about three grits into fine grinding his Lurie anastigmat, which has four surfaces to put curves into.

To be continued….

Observing the Messier Objects - October

by Greg Cantrell

We say good-bye to the summer constellations, as they slip over the western horizon with the arrival of autumn. The nights are longer and a bit cooler now, but still warm enough for enjoyable observing sessions. October nights tend to be among the most cloud free of the year, and offer the opportunity for excellent views of the Messier objects, grand and small alike. This month's selection includes galaxies, open and globular clusters, and an asterism.

M 29 (NGC 6913) –This small magnitude 6.6 open cluster is found in Cygnus the Swan. Binoculars reveal a small fuzzy patch in a rich field of stars, while a small telescope resolves the cluster into about 20 magnitude 8 stars. Right Ascension (RA) 20 23.9, Declination (Dec) +38 32

M 39 (NGC 7092) – At magnitude 4.6, this large bright open cluster in Cygnus may be observed naked eye under dark sky conditions. Easily observed with binoculars, this cluster easily resolves into bright widely spaced members when observed telescopically. RA 21 32.2, Dec +48 26

M 71 (NGC 6838) – A magnitude 8.3 globular cluster residing in Sagitta, this object is easy to find and nicely observable even in binoculars. A medium sized scope is required to begin to resolve this compressed, V-shaped mass of stars. RA 19 53.8, Dec +18 47

M 31 (NGC 224) – The famous Andromeda Galaxy, easily naked eye visible at magnitude 3.4, is a spectacular object to observe, even in the smallest telescope. RA 00 42.7, Dec +41 16

M 32 (NGC 221) – An 8.1 magnitude elliptical galaxy, companion to the Andromeda Galaxy, is an easy binocular object. Telescopically, M32 appears slightly oval and slightly brighter than M110. RA 00 42.7, Dec +40 52

M 110 (NGC 205) – Like M 32, M 110 is a magnitude 8.1 elliptical galaxy and companion to Andromeda Galaxy. However, M 110 is larger and appears less bright when observed through binoculars or telescopically. RA 00 40.4, Dec +41 41

M 72 (NGC 6981) – Found in Aquarius, this small magnitude 9.4 globular cluster is a very difficult binocular object. In small telescopes, this object appears as a faint patch of light that gradually brightens toward its core. RA 20 53.5, Dec –12 32

M 73 (NGC 6994) – This magnitude 8.9 asterism in Aquarius, comprised of 3 or 4 stars, is located about 1.5 degrees west of M 72. RA 20 59.0, Dec –12 38

M 2 (NGC 7089) – Small and bright, this magnitude 6.5 globular cluster in Aquarius appears as a small fuzzy patch of light at low telescopic powers. In binoculars, M 2 looks like a small, fuzzy star. RA 21 33.5, Dec –00 49

M 30 (NGC 7099) – A magnitude 7.5 globular cluster in the constellation Capricornus, this object is difficult to find in binoculars, appearing as small fuzzy star. Small telescopes show a faint patch of light, gradually brightening toward its core. RA 21 40.4, Dec –23 11

M 27 (NGC 6853) – Known as the Dumbbell Nebula, this magnitude 7.3 planetary nebula can be found in the constellation Vulpecula. While this object can be glimpse in binoculars, a small telescope begins to show the rectangular shape of this nebula. RA 19 59.6, Dec +22 43

Upcoming Events

Star parties are an important part of the amateur astronomy experience. Listed below are several events offering dark skies and astronomical fellowship.

October 2 – 6, No Frills VII Star Party will be hosted by the Delmarva Stargazers. Visit http://www.delmarvastargazers.org/archive/nofrills2002/index.html for more information.

October 4 – 6, South Jersey Star Party will be held by the South Jersey Astronomy Club at Belleplain State Forest in Cape May County, New Jersey. For more information, visit http://hometown.aol.com/sjastroc/sjacsplb.html

October 4 – 6, Stella Della Valley XVI will be held by Bucks-Mont Astronomical Society. Visit http://bmaa.freeyellow.com/Sdv.html for more information.

October 12, The **12th annual NOVAC Star Gaze** will be held at Franklin Park, 45 miles west of Washington, DC. Information at http://novac.com/gaze.

October 28 – November 4, The **8th annual Mid-Atlantic Star Party** will be held at a central North Carolina site that boasts mag 6.5 skies and southern sky objects that cannot be viewed from New Jersey. For more information, visit http://www.masp.org/maspindex.htm.

November 3 – 10, The **Chiefland Star Party 2002** will be hosted by the Chiefland Astronomy Village, Florida. For more information, visit http://www.c-av.com/.

Oct 6 Oct 13 Oct 21 Oct 29

Are You a S*T*A*R Member?

Memberships: ( )Individual....$25
( ) Family...$35 ( ) Institutional $25

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Make checks payable to: STAR Astronomy Society, Inc and send to P.O. Box 863, Red Bank, NJ 07701