ATLANTA ASTRONOMY CLUB NEWSLETTER

MEETING: Club President, John Parker 977-2387
The May meeting will be held at 8:00 PM on Friday, May 16, 1986 at hte Bradley Observatory of Agnes Scott College.

PROGRAM: Program Director, Dr. Joe Gibson 255-1621
THE GRAND FINALE SLIDE AND PRINT SHOW. (I shutter to think what might develop so don't attend with a negative attitude; but instead snap it up, stop down, and try to picture the subject that I'm trying to project for you to focus on! Sorry for all the cheap shots!!)

TREASURY NOTES: Acting Treasurer, John Parker 977-2387
Please send all new memberships and old membership renewals to: John Parker
2032 Hastings St.
Marietta, GA 30062

LAST MINUTES: Recording Secretary, Sharone Franklin 934-8796
Dr. Harold A. McAllister, Professor of Astronomy, Georgia State University, gave a lecture on "High Angular Resolution Astronomy." He explained how speckle interferometry works and the future plans at Georgia State for futher advances in Astronomy.

THE UPPER HALF: Upper Halver, George Reight 633-1202
Last IV MOON - Fri May 30th
New MOON - Sat June 7th
Observing Sessions - Both weekends listed above. Be sure to take flying insect spray with you when you go to the Barber Observatory. Those bugs sure like human vistors!

NOTE: This will probably be our last chance to wave goodbye to Mr. Halley's Comet.

This months upper half is written by David Roberts, a member of the AAC Since 1980. He is recognized not only as a dedicated amateur astronomer but also one who is always ready and willing to help.

David received his Bachelors and Masters Degrees from Georgia Tech., the latter in Applied Physics. He is professionally an optical designer and is currently employed by the GA. Tech. Research Institute and by IMAGE SYSTEMS INC.

An interesting sidelight about David. As a youngster he was a successful Kart-Racing driver having won over 25 trophies including the Georgia State Championship along with the U.S. Championship in 1977. He writes:

We all wish we could get greater performance out of our telescopes without moving to a larger, more expensive instrument. A modest outlay for an enhanced silver mirror coating can increase the light gathering power of a Newtonian. High quality eyepieces allow you to see everything the telescope has to deliver and nebula filters help improve contrast between NGC (Not Generally Conspicuous) objects and the sky background. This appears to be everything we can do to boost the performance of our present instruments. Or is it? Could we also improve resolution?

Even if atmospheric turbulence didn't make the star images boil into fuzzy blobs the minimum size of the star images would be determined by diffraction. How diffraction affects the image is determined by the shape and transmission characteristics of the telescope aperture. When a light wave passes through the aperture information on the aperture size, shape, and transmission is encoded into the light wave. When the wave reaches the focal plane of the instrument the aperture information appears in the shape of the diffraction pattern. Almost all of us have seen the familiar Airy disc surrounded by faint rings at high power. This is the diffraction pattern for the average telescope. The diffraction rings broaden star images lowering resolution. Planetary images can be thought of as being made of point sources so planetary detail is also reduced.

It is possible to nearly eliminate the diffraction rings at the expense of widening the central diffraction peak somewhat. If a filter is placed over the telescope aperture with a transmission that varies over the aperture in a specific way the rings will almost disappear. The transmittance of the aperture should follow the formula

$$T = e^{-a(r/r_0)^2} \qquad e \approx 2.718$$

where r_0 is the radius of the objective, r is the radius of a particular zone, and a is a constant that determines how fast the transmission drops for center to edge. This filter is known as a Gaussian filter. Modifying the aperture transmission in this way is known as aperture apodisation (from two Greek words meaning "without feet" so I am told). Unfortunately filters that conform exactly to this formula are difficult to make because of the equipment necessary to produce a variable transmission aluminum coating. Approximations can be made, however.

One method uses layers of window screen to control the transmission over the telescope aperture. The radial drop in transmission is accomplished by cutting successively larger central holes in the screen layers and turning the weave of each layer at a slight angle to the adjacent layers. The more layers of screen the better the approximation. There are some unwanted effects from the wires in the screen but I will keep these secret until someone actually tries one of these things. The window screen approximation to the Gaussian filter is shown below.

Before you build one explore the formula for the screen and plot it for several conditions. Also determine the transmission of a single layer of window screen by finding the area blocked by the wires per square inch of screen. This will vary with the type of screen you buy. Turning each layer of screen relative to others partially covers the little holes in the screen, dropping its transmission. You will have to figure this amount yourself for your screen. I don't want to give specific designs for these filters because there is probably not a best design and I want to encourage experimentation. Try other materials and transmission profiles. Interested observers can call me or ask for help at the club meetings and observing sessions.

Try these filters on double stars and planets (they won't help on galaxies). I have heard people swear by these filters claiming more detail is visible in planetary images and effects of poor seeing are reduced. I have also heard people swear at them saying all they saw was spectacular diffraction and any increase in planetary detail is due to reduced glare from the lower transmission of the filter. Either way the results should be interesting.