

The Focal Point

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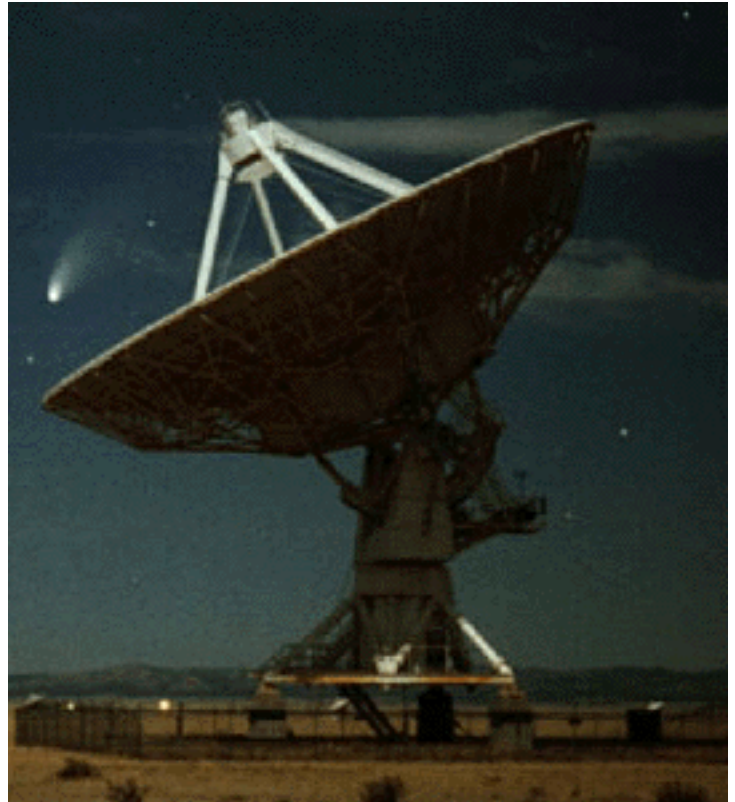
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May General Membership Meeting

Our next meeting of the Atlanta Astronomy Club will be on Friday, May 18, at Emory University's White Hall. Refreshments are at 7:30, meeting and program at 8:00. Don't forget to allow extra time to find a parking space, due to construction of the new science building.

Our program this month will be presented by Dr. Amy Lovell, whose talk is entitled *Millimeter-Wave Imaging of Comets*.

Dr. Lovell started her astronomical career right here in Atlanta, at Agnes Scott College. As a student, she participated in summer programs at Maria Mitchell Observatory, studying variable stars, and at Cornell University, studying Arecibo radar observations of Venus. She received her Ph.D. from the University of Massachusetts Amherst in 1999, with her disserta-



tion on the topic of millimeter-wave observations of comets.

Dr. Lovell recently joined the faculty at Agnes Scott, and continues to pursue her interest in comets, asteroids, and other objects in the solar system.

Of course, we can't forget about the all important elections.

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Here are the candidates running for office. We will also take nominations from the floor the night of May 19th. As it stands now, here are the following candidates for each office. The officer terms run for one year. President Sharon Carruthers and Philip Sacco. Vice President Program Chair is Carol Abernathy. Vice President Observing Chair Richard Blackburn. Recording Secretary Karen Stiles. Treasurer Peter Macumber. Corresponding Secretary Keith Burns. There are three board positions open. Each one has a two year term. Gil Shillcutt. Bear Simmons. Chuck Painter.

Looking ahead, our own Sharon Carruthers will be our speaker in June. And in July, author Michael Covington will talk about *The Wild, Weird New World Of Computerized Telescopes*. We are also working on rescheduling the postponed February talk by James Kaler for this coming autumn.

From the Prez's Desk....

Depending how the election unfolds at our may General Meeting (and whether or not there are any butterflies at Emory), this may be my last message to our membership under the masthead of the President, so....

I would like to take this opportunity to thank all those who helped me during my term. Whether it was giving me advice on how to do something I knew little about, manning a Club event or wielding a hammer, anything I accomplished was due to **YOU**, the AAC membership, who are so generous with your time and talent.

At the Annual Banquet, I singled out three people who deserved extra recognition this year.

The President's Award for 2001 was presented to **John Lentini**, for hooking us up with the Atlanta Area Boy Scout Council and finding us our Dark Sky site at the Woodruff Boy Scout Camp.

Awards of Recognition were also presented to:

Phil Sacco, who has single-handedly created our first AAC chapter, at the Charlie Elliot Wildlife Management Area. This Chapter will be the model for future chapters in other geographic areas.

Joanne Cirincionne for her work to create and manage the Georgia Astronomy in State Parks (GASP) program, which is making a name for the AAC all over Georgia.

I want to thank my fellow Executive and Board Members – you are a great bunch, you were always there for me; and it will always be a highlight of my life that I got to work with you and become a small part of the history of the Atlanta Astronomy Club. Best wishes to my successor and to the future of the AAC.

Sharon Carruthers

Amatuer Telescope Makers Group

Interested in building your own telescope? Want to enhance your current scope with some features or fix problems with it? Do you want to grind your own mirror or learn how it is done? This is the group for you. The ATM group meets every couple of weeks at Skip Cook's house. He has generously offer this location for this purpose. Contact him via phone (404-325-4987) or email (scz9@cdc.gov) for more information and directions. Tracy Wilson runs the group and has much expertise to offer. You can contact him via email (tracywilson@alltel.net). Announcements of meetings will be posted on the AAC listserv. You can also find out about upcoming meetings from Skip. There are other folks that attend these meetings that may have some expertise to offer to help you with construction project you are working on. They are looking for a new place to hold meetings. They need a room that is fairly large and you don't mind it getting dirty. If you know of a place or have one available, please contact either Skip Cook or Tracy Wilson. Thanks.

Corresponding Secretary Commentary

I promise not to make a political speech because I am running for office again. The battle has been brutal so far this year. Running against one's self is a tiring act. After much consideration, I have decided not to oppose my running for a second term as corresponding secretary. Why? Why not?

I will make it simple. Read the Focal Point. If you like it, vote for me. If not, bring someone else in. No long speeches. No political commercials on TV, radio, or print. I like this plan. Simple is good. Complicated is bad.



Now you are probably wondering why there is a picture of Comet Hyakutake included with this article. I am making a commentary but not a cometary. It sure beats looking a nothing but words in a newsletter. Let's face it. Almost everyone likes to see pictures. Here's a picture. BTW: Our May speaker will also be talking about Comet research she has done with this comet. So come and hear her talk. Then vote in the election to follow.

Website Report

The website has proven itself in attracting new members and keeping members informed of club events. This can only happen if we are given the information to post on the website. If you have any suggestions, comments or ideas please send them along to the webmaster@AtlantaAstronomy.org.

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Candidate's Message: Sharon Carruthers

Although my sanity must surely be suspect, I have offered to run for another term as President of the AAC. Our members will get the pleasure of a knockdown, drag-out fight between Mr. Sacco & myself. (Tom Crowley suggested we settle it with a nude mud-wrestling contest; but, as Phil has better look-

ing legs than me, I will forgo that electoral method).

The AAC has gone through a period of rapid growth and development in the last 3 – 4 years, (thanks in a large part to Phil). We have expanded both in the number of members and the kind and quantity of activities we offer to our membership and the general public. My primary goal during my term was to consolidate this growth; to work out the “bugs” and make our programs successful and our members, old & new, happy rather than just to keep growing for growth’s sake.

In some ways, I have accomplished this. We have a new Dark Sky site, for our dedicated Deep Sky observers, while we are working to improve Villa Rica both as a training ground for our newcomers and as a site for public events. I heartily supported Tom Crowley and Art Russell’s idea for the Astronomy Expo, because we need to bring facilities to Atlanta that are sadly lacking in the South East.

However, I have been disappointed that the number of events for the public and for our new members fell off this year. While this was partly due to the weather, I would like to see more of these activities scheduled and fewer “Bad Weather” cancellations.

I have been talking to various people about the need for education programs – such as an “Introduction to Astronomy” course or collimation workshops. Our most active members are stretched thin and shouldn’t be expected to volunteer even more of their time. One solution is to offer classes with a nominal fee for the “teacher” .

I have been pondering a re-vamp of our sidewalk astronomy program to ensure coverage during scheduled events and to spread them more evenly around the city. The AAC could set up sidewalk programs at various locations around Atlanta every month and have groups come to us, rather than us to them (except for special circumstances).

I was also disappointed that our ATM & astrophotography groups never got up to full steam after we lost the use of Bradley (Skip Cook has been doing an great job with the ATM, but his garage is only a temporary stop-gap). I am working to find a new home for these groups and someone to run the astrophotography workshop.

Finally, I want the AAC to begin a Young Astronomers Program (YAP). It will need a few dedicated people to get it up and running, but it is time for us to reach out to the kids, who have a harder time getting started but pay-off with a lifetime of dedication to astronomy.

Presidential Candidacy

by Philip Sacco

Hello All! It is May, and that means AAC elections. There is

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only one thing better than announcing your candidacy for a position of leadership in this club, and that is voting for someone who is willing to take the job.

With that being said, I would like to take this moment to make a formal announcement of my candidacy for the office of President in the upcoming elections.

For those of you that know me, I welcome your support. For those of you that do not know me, I offer you these sentiments and hope that you will show up for the meeting on May 18th hear Doctor Amy Lovell speak, and take part in deciding the leadership of the AAC for the coming year. Whether you vote for me, or Sharon Carruthers will make for a good choice. At the time of this writing Sharon is the only other member of the club that I know of that has voiced an interest in running in addition to myself for President. For those of you new to the club and as yet unacquainted with me, I offer the following:

I was President of the AAC two years ago following my tenure as Observing VP. During my administration many incredible firsts were made for the club. We recognized the Agnes Scott College Astronomy Club as a sister club and reaffirmed our relationship with the college and the Bradley Observatory thru Chris Depree, as well as the Fernbank Science Center and Georgia State University. We purchased our first major piece of astronomical equipment for the club in over 20 years with the purchase of the 24" Techtron complete with onboard digital setting circles as well as some \$1000 worth of new eyepieces specifically for it. The AAC saw the installation of a bathroom at the clubs observatory after 22 years of use with nothing other than the original outhouses installed when the observatory was first constructed. New power was brought into the site to allow more than one hair dryer and a floor heater to run simultaneously. We installed enough power to carry our needs well into the future with five times the power on site than previously available, with devoted circuits to the Observatory, the warmup shed and the observing field where before the entire site was laboring on one circuit. The clubs 8" Maksutov was taken 'out of moth balls', given a home on a devoted pier inside its own rotating dome and brought into service after years of neglect. Wholesale training for the club membership and the public at large was begun for the first time in the history of the AAC. Sidewalk astronomy and public programs made a record number of scheduled activities bringing astronomy to the homebound, youths recovering from surgically, young students, schools, Boy Scouts, and homeowners associations in record numbers. The clubs observing field was cleared and the observatory refurbished with new optics for the telescopes, upgrades on the equipment and beyond a general cosmetic cleaning, major infrastructure was replaced and rebuilt during that time.

The year of my Presidency was undoubtedly the most important year of growth and change in the history of the AAC.

Never before had there been such a swell of energy poured out by the membership, nor had the membership grown so quickly. We reached record numbers of members, and MAINTAINED them.

Never in the 54 year history of the AAC had there been as many observing dates scheduled, and active membership on the road to events. Whereas our participation in the Astronomical League was so questioned that the club almost dropped from their rosters, with my encouragement and the revitalizing efforts of the club membership, before unseen record numbers of AL awards were gleaned by the AAC. While previously only the surprisingly occasional Messier pin was awarded, and only three Herschel pins total had been achieved by our membership, today we boast almost a full 10% of the national number of Lunar Club members, as many more Herschel awards as the previous ten year period had seen awarded our club, as well as many additional first awards to be seen by the AAC including the first National Urban Club pin awarded, several binocular Messier awards before unheard of, several Deep Sky Binocular recipients, at least four Double Star observers, one Planetary observer, two Universe Samplers and your guess as to how many near completed programs have been recorded by our membership. With an ear to new ideas and support for them rather than 'wet towels', creativity and devotedness to a vision encouraged the inception of the 'Ladies of the Night Sky' - again a first for the club, seeing the ladies of our membership take to the field in observing, training, public speaking and FUN-d raising- ALL through the efforts of women new to astronomy and our club. Joanne Cirrincione, one of our newest and most inexperienced members, one who shied away from being put in the limelight in any way at any time, has gone on to become the driving force behind the creation of FoG-spa and G.A.S.P. due to the encouragement and energy which permeated our membership at that time. The ground work was laid for not one, but TWO dark sites for the AAC in addition to the observatory we established in the mid 70's, finally making a reality of the clubs desire to found a new 'dark site'.

The newfound record crowds to our Barber Observatory, in excess of 100@night on several occasions, led to the back-breaking attempts to break ground south of the observatory and establish a new meeting room/club house. While this inertia was created during my tenure, it saw its fruition thru the efforts of Ken Poshedly's administration in the establishment of 'Chrissy's Corner' (it was Chrissy's buzzing energy, creative spirit, gusto and enthusiasm which led to much of the great doings accomplished during that year and since. Her loss has been deeply felt by me and many others who found a 'long lost sister' in her. It is only fitting that this latest addition to our site commemorate her life as those of us that loved her remember her there, and others come to hear stories of her non-

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stop energy, exuberance, and giving- characteristics I hope become a standard for we of the AAC.) Things were getting done, record observing sessions by record numbers of new members were being achieved, and a viable hard working core of new faces had made an appearance.

What this all points to is the simple fact that we had energy under my administration. I did not do it alone. This energy was freely shared by Many willing and enthusiastic members. The lions share of those workhorses were just coming into the AAC, or completing their first year of membership during my term as president. All of them have continued their memberships to this date- ALL of them I count as some of my dearest friends today. Many of them are running for offices this term, and the majority of the current leadership is made up of members that joined during that 'Miracle Year'. I hope they are here to stay. I want to do what it is going to take to keep them as members. One of them is even running along side me for the same leadership position I am here to ask you to elect me to. I encourage her toward her goal, just as I encourage you towards yours, whatever it may be. Win or lose I will be here to support her, just as she will be here to support me. You see, many of us- the most involved in the club- have found more than a hobby or a past time in the AAC. . . We have found a 'new family'.

My goal is to be elected President of this family known as the AAC for the next term.

I want to again feel the surge of energy come from this clubs membership. Two years ago we had unprecedented growth and revitalization under my administration. The fear was we would lose what had been gained. Instead, that growth has since been sustained and then stabilized this year under the Presidency of Sharon. Now it is time to *Strengthen* what we have. That would be the best way to describe my goal should you elect me.

I envision one road to obtain that goal- that being the road of hard work. But not hard work that is not FUN! There was plenty of hard work done under my last presidential term- more so than at any other time in the history of the club short, perhaps, of the time the observatory was built going on 30 years ago. Noone can say we did not have fun. We had fun clearing the site during the 'great chainsaw massacre'. So much in fact, we had another massacre. We dug ditches, and sweat and told jokes and laughed. Several of us suffered from poison ivy, and all of us suffered the onslaught of the famous Swamp 'Sqeeters. We cleared out useless air conditioners, broken space heaters, and a flea infested sofa and replaced them with sealed windows, clean paint, fresh flooring, and insulation. Coffee, cup-a-soup, hot chocolate and microwave popcorn, hotdogs, hamburgers, cold sodas and tv for the kids took their place. We even provided a bin of clean warm cloths- jackets, sweaters, boots, and gloves for those caught ill prepared at the site. We cleaned wasp nests and spider webs and where we saw

the bugs removed, we saw new faces appear. Railings and concrete steps were added to the incline leading to the observatory. New variable intensity lighting was installed as were security/emergency lights for the site. We even had a visit by Elves over Christmas who painted a star map on the east wall of the observatory! We made room and filled it with new members and families out for an evening under the stars. Kids laughed and played were before we had only weeds. All of them new friends just waiting to happen. And happen it did. . . and yet all this is just scratching the surface of what had been accomplished. New life was breathed into the Walter Barber Observatory, and it has had its returns many-fold.

It is time to strengthen what we have. Just as strengthening muscles is work, so will this next phase be. A new approach to training our new members, a continued and concerted effort to bring even better and more regular programs to the public thru sidewalk astronomy, be it informal sidewalk astronomy, scheduled school or community program nights, G.A.S.P, N.A.D.S, Boy Scout training, or new chapter development in areas we have yet to explore membership such as the new AAC/ Charlie Elliott Chapter. I know what is required to make these events happen and become successful. I have participated in them all. I have made the reality of a chapter for the club a mission of mine for the last two years, and it is now alive and well.

What has been accomplished in the past was not done by me or any one person. It has always, and will always require good planning and teamwork to bring worthwhile goals to reality. It starts with someone willing to lead, and continues with those willing to be led. I am willing to lead. Are you willing to follow my lead? If so I ask that you make your appearance at the May 18th meeting, and cast your vote for me as your next President.

I will hope to see you at future meetings and events after that, for as I said- no one can do it alone. I am offering to lead the way, to suggest, to organize, to help and guide in all the ways good leadership can and should.

This is my promise to you. Will you promise to do your part? It starts by your taking an active role and choosing your leadership. You will have two excellent choices before you for president this year (this in itself is something remarkable for this club. There has been a long tradition of 'convincing' people to run for the office. This yields a different sort of leadership than that of one choosing to serve as both Sharon and I do.)

I hope you will.

Sharon and I hope to treat you all to a little good natured 'political folderall' on May 18th. Come prepared to have a good time, as we have braced each other for a little 'roasting' before the elections. All in the name of a good time and fun. And my 'Best of Luck' to all those other individuals seeking election that night as well!



Pictured to the left is Alex Langoussis presenting a plaque to our guest speaker at the Banquet, Leif Robinson. The picture above and right is another way to honor a guest. Have a cake with one of the paintings he talked about in his talk painted on it. Or was that a cover picture from one of the Sky and Telescope Magazines? I don't know. I just take the pictures. Philip Sacco also received his 9th Astronomical League observing Pin with the completion of the Universe Sampler program. That presentation is not pictured. I guess we should start calling Philip "The General" now?

In the picture to the right is our President and the president's award winners for the year 2000-2001. Right to left. First is John Lentini. Second is Joanne Cirincinone. Third is Philip Sacco. Finally is President Sharon Carruthers.



The Limits of Telescopic Performance-Part I

By Lenny Abbey

There can be little doubt that the telescope is the basic tool of astronomy. Practically all our knowledge of the physical nature of the heavenly bodies can be attributed to this instrument, by itself or as the basic component of a system of instruments. The theoretical limits of telescopic performance have been discussed by many authors; however little of this information seems to have filtered down to the amateur. Even though what an observer sees is largely dependent on his ability and experience as an observer, there are certain limits imposed upon his observations by the size and quality of his telescope. To the observer, a knowledge of exactly what his telescope will and will not do is of great importance.

Only the telescope used in conjunction with the human eye will be considered here, since most amateurs are concerned primarily with visual observation.

The performance of the eye as an optical instrument is well understood. Most amateur astronomers are familiar with the gross features of the eye; how incident light is refracted through the cornea, aqueous humor, lens, and vitreous humor in turn, to form a real inverted image on the light-sensitive retina. The structure of the retina is of the utmost importance to the subject of visual telescopic performance, since the formation on its surface of a brighter or enlarged image of the object under view is the primary purpose of the telescope.

The light sensitive elements of the retina are the rods and cones. The information from the image on the retina is transmitted to the brain in the form of impulses from the rods and cones; thus what the brain perceives is a mosaic of signals from individual receptors. The rods are most sensitive to faint illumination, and are concentrated near the edges of the retina. This is why an observer can see faint objects by means of “averted” vision which cannot be seen by direct vision. The cones, on the other hand, are sensitive to brighter illumination and to colors. An object can be sharply seen only when it is focused on the center of the retina, where cones are found exclusively. Both rods and cones are bathed in rhodopsin, or visual purple, which is produced only when comparatively little light falls on the retina. It is believed that the presence of rhodopsin is responsible for the sensitivity of the rods to dim light sources.

The most common defects of the eye are myopia (short sightedness), hypermetropia (far sightedness), and astigmatism. Since both myopia and hypermetropia are defects of focus, the observer can compensate for them by changing the focus of the telescope, and thus need not wear glasses while observing. An observer with a moderate amount of astigmatism can also observe without glasses. When such an observer uses high powers, in which case the astigmatism might be expected to be objectionable – it is not. This is because only a small part of

the eye’s lens is being used by the narrow exit pupil of the high-power eyepiece. If a strong astigmatic condition is present however, glasses are necessary for a clear image.

Other defects which are characteristic of all eyes are spherical and chromatic aberration. Fortunately, these defects are not serious enough to impose meaningful limitations on the quality of the images formed by the eye.

The light-gathering power of a telescope is the instrument’s ability to make faint sources of illumination visible. For a point source, incident light from the object under view which falls on the objective lens is concentrated in the image. A larger lens has a greater area and consequently more light from the source falls on it. This increased amount of light makes the image brighter than it would be in smaller telescopes. Thus, the brightness of the image of a point source is proportional to the area of the objective (or to the square of its diameter). By making faint point sources appear to be brighter, the telescope brings them above the visibility threshold of the eye.

The limiting magnitude – the magnitude of the faintest star that can be seen with a given instrument – is the most convenient and meaningful measure of its light-gathering power. The most widely used formula for finding the limiting magnitude is:

$$(1) \quad M = 6.5 - 5 \log d + 5 \log D$$

where M is the limiting magnitude, d the diameter of the pupil of the observer’s dark adapted eye, D the aperture of the instrument, and 6.5 the assumed limiting magnitude of the unaided eye. This formula takes advantage of the fact that the light-gathering power of the eye-telescope system is greater than that of the eye alone by a factor which is determined by the ratio of the apertures of the two systems. Since it is known that the pupil of the average (young!) eye will open to about 7.5mm (0.3 inches) when fully dark-adapted, the above formula can be simplified to:

$$(2) \quad M = 9.1 + 5 \log D$$

where D is in inches. The factor 9.1 in this formula can be thought of as the limiting magnitude of a one-inch telescope.

As might be expected, the above formulae, which are based on pure theoretical considerations, do not hold true for all observers. This is probably because the pupillary openings and retinal sensitivities vary from individual to individual, resulting in differences of as much as 1.5 magnitudes in the limiting magnitude of a given instrument when used by various observers. An interested observer can determine his personal limiting magnitude with any instrument by determining the faintest star that is visible to him (under optimum conditions) with a one-inch telescope. By substituting this number in place of 9.1 in (2), he can personalize the equation.

Such conditions as bad seeing and atmospheric and instrumental absorption have been neglected in the above considerations.

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Bad seeing blurs and enlarges the stellar images so that all of the light collected by the objective is no longer concentrated into a tiny point. Faint stars appear to be fainter, and the faintest stars that were formerly visible escape detection. Atmospheric absorption is determined by the amount of air through which the light has passed and is therefore inversely proportional (by a complex relationship) to the altitude of the object under view above the horizon. This is easily calculated with the aid of tables in standard reference works. Telescopic absorption depends on the type and condition of the instrument. Small telescopes, both reflectors and refractors, transmit about 80% of the incident light. For sizes over five inches, however, the reflector has an edge on the refractor. As aperture increases, light loss due to absorption in the lens increases as the lens becomes thicker, while the percentage of light reflected by mirrors remains the same. This effect is generally negligible in instruments under about twenty inches in aperture.

Extended sources behave quite differently when viewed with the telescope. Such objects as nebulae and planets actually are fainter, per unit area, in the telescope. They seem to be brighter because they are enlarged to an appreciable size, while the brightness of the sky background is actually decreased by the telescope. This is demonstrated by the surprising fact that the Veil nebula, one of the more difficult gaseous nebulae, is just as easy to see with a six-inch as with a sixteen-inch telescope!

Resolving power is by far the most misunderstood telescopic function. There is much confusion in the literature available to the amateur as to just what the resolving power of a telescope is, and how it limits the amount of detail that can be seen on planets and the separation of double stars that can be resolved. The subject has often been approached from an empirical standpoint (i.e. observers reporting very delicate details they have seen), but before a precise solution of the problem can be formulated (if, indeed, it can be), the underlying optical principles involved must be understood.

The resolving power of a telescope is its ability to form distinguishable images of two objects of small angular separation, and is proportional to the diameter of the telescope's objective. The resolving power of a telescope in relation to double stars will be considered first, as the other cases are merely extensions and reapplications of the principles pertaining to the separation of doubles.

The stars are so far away that they may be considered to be true geometrical points, having no detectable size, but only position and brightness. If the image of a star in a telescope were a true point, there would be no limit to the theoretical resolving power of a given instrument. To resolve any pair, it would only be necessary to apply sufficient magnification to make the two images clearly separate to the eye. Unfortunately this is not the case. Due to the wave nature of light, rays striking different parts of the objective interfere with each other as they are

brought to a focus and a circular image of finite size surrounded by a number of concentric faint rings (alternately light and dark) is formed. This is called a diffraction pattern. The dark rings are areas where the interference is destructive, while light rings are areas where it is constructive. The radius of the inner and most conspicuous dark ring is given by:

$$(3) \quad R = \frac{1.22\lambda}{D}$$

where λ is the wavelength of the light, and D the diameter of the objective. R is in radians. Substituting the value of λ for which the eye is most sensitive (5500 Angstroms), and converting to seconds of arc, (3) becomes:

$$(4) \quad S = \frac{5.45''}{D}$$

where D is in inches and S is in seconds of arc. The central (or Airy) disk is somewhat smaller than the innermost dark ring, and gradually fades into it. It is impossible for a telescope to form an image of a bright object smaller than the Airy disk. If the Airy disk of a faint star appears to be smaller than (4) predicts, it is because the outer edge, where the light is tapering off, becomes imperceptible, even though it is still present. About 85% of the energy from the source collected by the objective is concentrated in the Airy disk. The first bright ring is about 1.7% as bright as the Airy disk, and outer bright rings become successively fainter. For faint stars, the rings may be so dim that they are invisible, and then only the Airy disk is seen.

A double star appears in the telescope as a set of diffraction patterns. As successively closer doubles are viewed, it will be seen that the two patterns approach each other, overlap, and finally merge. The two stars are "resolved" as long as the observer can be sure that two diffraction patterns are present. The standard laboratory definition of resolution is that when the center of the Airy disk of one pattern falls on the first dark ring of the other, the pair can be considered to be resolved. The limit of resolution would then be given by (4). But this is not quite good enough for astronomical purposes. When the conditions for laboratory resolution are satisfied, the two Airy disks overlap and there is about a 20% intensity dip between their centers. This is because the light intensity is greatest at the center of the Airy disk, and diminishes towards its edge. The disks can be brought closer together and still have an intensity dip between them. Well trained observers can detect a dip of only 5%, and when two stars are so close together that this is the case, their separation is given by:

$$(5) \quad S = \frac{4.56''}{D}$$

Somewhat closer pairs can be detected by noting the elongated diffraction pattern, but they are not really "split." Equation (5)

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is the famous Dawes' limit, which was introduced as the result of a long series of observations by W. R. Dawes, one of the nineteenth century's most skilled observers. Strictly speaking, Dawes' limit is valid only for two yellow, sixth-magnitude stars, viewed in a six-inch telescope. However, the equation is accurate except for pairs differing greatly in brightness. Dawes' limit applies to observations of double stars only.

The surface of an extended source, such as the Moon and planets, can be considered to be a mosaic of an infinite number of point sources. Each of these points forms an image, or diffraction pattern, in the focal plane of the telescope, the size of which is approximately given by (3). Dark areas on such surfaces are areas where there are no point sources. Gross dark features are well defined, but when the angular size of a feature approaches that of the individual diffraction patterns, it becomes increasingly difficult to obtain a clear view of it because it is swamped by overlapping neighboring patterns.

Small bright objects appear larger in telescopes than they really are because the diffraction patterns from points near the edges project beyond it. Dark areas surrounded by bright areas appear smaller for the same reason. However, no bright object, however small, can appear to be smaller than the Airy disk for the telescope in which it is viewed.

On the contrary, it is not impossible for a dark marking to appear smaller than the Airy disk. Consider a long thin marking on the surface of a planet. As long as the thickness of the marking is considerably greater than the resolving power of the instrument it can be seen clearly. Now let the marking become narrower until the outer rings of the diffraction patterns from the bright points on either side

of it touch. The marking will still be visible through the rings of the patterns, but will be less distinct because of the network of encroaching bright rings. As the marking becomes yet narrower, the adjacent diffraction patterns overlap more and more until eventually the marking can no longer be seen. As the patterns overlap, the contrast of the marking diminishes, and it appears to get narrower. Because of the eye's remarkable ability to detect linear detail, the marking will be visible even after its width is less than the size of the Airy disks. Even if the intensity dip between opposing disks is less than 5%, the marking will still be visible because there are many of them in a straight line. Therefore in the case of dark markings, if they are linear, the Dawes' limit can be exceeded. Experiments by W. H. Pickering indicate that if such a marking is as thick as one-fifth Dawes' limit it can be seen.

Considerations similar to those above indicate that a dark round object can be seen against a bright background if its diameter is greater than one-third Dawes' limit.

The angular sizes of the four large satellites of Jupiter are very near the angular size of the diffraction patterns for a six-inch telescope. In a telescope of that size the satellites appear to be

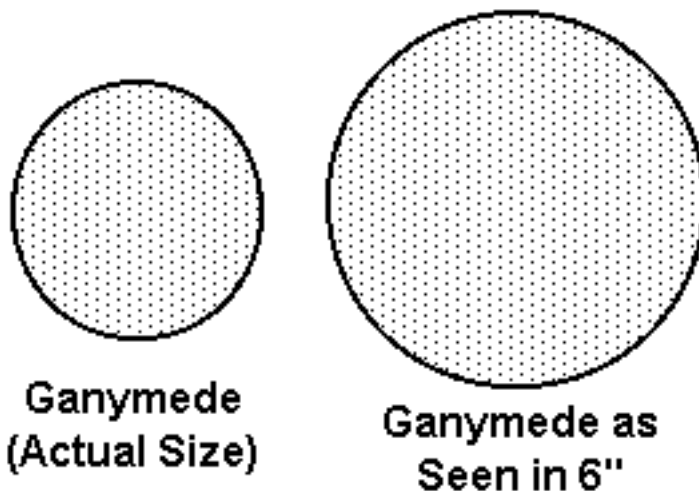
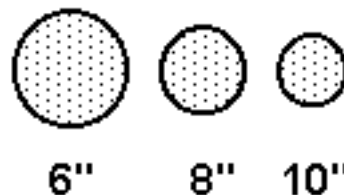
twice as large as they really are. Any detail present would be so much smaller than the diffraction pattern, that it would be clearly impossible to detect it. The details would be completely covered by the Airy disks from the adjacent bright spots.

It would be virtually impossible to give exact limits of resolution for the above types of observations.

Whether or not an object smaller than the limit of resolution of the telescope can be seen depends to a large extent on the observer, but if the limits set by theory are greatly exceeded, such observations must, at best, be suspect.

Illustration titles:

Airy Disks for Small Scopes



Diffraction Pattern for a Circular Aperture (Telescope).
The Effects of Diffraction on the Appearance of Ganymede.

Work Party at VR

Any excuse to have a party is a good one. This one has a special purpose. The plan is to dig ditches, install pipe, install, cable, and bury it. Of course, the ditches won't be dug by hand. We are not that crazy. The club is renting a ditch witch. Help is needed with threading the wire through the pipes and then glueing them together. Then placing the pipe into the ditch. Then the machine will do the rest. Charles Hinely also needs several hands to help him with the wiring of the Chrissy's Corner.

Continued on next page.

Contact Rich Jakiel for more information or watch for it on the AAC listserv. He can be reached in the evenings at 770-577-2330. The date for this event is Saturday May 12th. Start time is 10 AM unless Rich wants to make it earlier.

Elliott Corner- Chapter news

by Philip Sacco

The next meeting of the AAC/Charlie Elliott Chapter will be Saturday, May 19th. Please join us for a covered dish dinner at 5:00 pm at the Visitor Center. The Chapter meeting will follow at 7:30. This will be a historic night with the chapters first election of officers. Any AAC member that would like to vote in the Chapter elections must register as a chapter member to be eligible to decide chapter business. Simply contact the clubs Treasurer and state you would like to be registered as a Chapter member. This in no way changes your AAC membership. All Chapter members must be AAC members. Generally Chapter membership is designed to facilitate membership in our organization in an area which otherwise would be inaccessible for AAC membership due to geographical distance.

The Chapter meetings are free and open to the public as well as any and all AAC members. At this time, the typical format includes a brief talk on some aspect of astronomy, and then a training class for those new to Astronomy. Participants not wishing to attend the class are welcome to set up on the observing field and enjoy a night of observing after the chapter get together. Weather permitting, observing is open to any and all following the chapter meeting. You can expect at least one featured constellation for the month to be singled out and 'toured' as the schedule permits. As the Chapters leadership takes the helm, stay tuned for postings of upcoming meetings planned activities.

Please note that the entrance to the observing field has been moved. The new entrance is a few hundred feet down Elliott Trail towards the Visitor Center, on the right hand side of the road. The new entrance is shorter, better graded and graveled leading into the field. The field is up for being graded smooth soon and has been mowed. There is a new director at the management area, and he has been presented the proposal for the founding of our observing building and pad as was proposed in 1999.

Focal Point Submission Deadline

I'm looking for articles, pictures, and drawings on anything astronomy related. All formats are acceptable. Pictures can be sent as either JPEGs, GIFs, or other formats. I can also scan in hard copy pictures. Articles can either be sent via snail mail at 3740 Burnt Hickory Road Marietta, Georgia 30064 or email at Keith_B@bellsouth.net. You can submit articles anytime up and including the deadline date. The **deadline** for the **June**

issue is **May 30, 2001**. The actual **June issue** will be published and mailed several days after the above date.

Special PSSG 2001 Lapel Pins

By Richard Blackburn

We need your help! We are planning to create lapel pins as a prize for completing the Peach Fuzzies at this years Peach State Star Gaze. If you have an idea, even if you are not artistic, please contact me at rblackburn@mindspring.com, by phone at 770-815-7387, or see me at a meeting. This is your chance to design something special that will be a one of a kind item. We will be making the pins in 1/2" size, so limit the complexity of your ideas & drawings. If you have any ideas at all, please contact me.

Woodruff Qualified

By John Lentini

Several folks have asked what it takes to be "qualified" to use the Woodruff Facility. Here's the deal. To be admitted to the observing field and have access to the warm up shed and cabin you just need to execute a Release & Hold Harmless Agreement, available at <http://www.atlantaastronomy.org>, and mail (preferred) or fax it to me.

833 Countryside Ct.

Marietta, GA 30067

Fax 770-424-6415 make a note to deliver to me.

To have access to the 24 inch scope, you need to take a training course on its use from the Club.

Life without the Herschel 400

By Keith Burns

Okay, now that I have completed the Herschel 400 list what's next? Hmmmm.....I have thought and thought and thought. There is the feeling of being totally lost. Like all good observers, I have several other projects either in the planning stages or actually being executed. The planetary program is a wonderful example. This program has been going on for about 6 months now. The best part is going out in the yard with the trusty 6 inch Schmidt-Newtonian and pulling out my sketch pad. Then putting on paper what I see in the eyepiece. It's amazing how different the view looks each time I look at Saturn, Jupiter, or Venus. Then there is the moon. I have almost finished Phil's Lunatix Challenge. Does this mean I may actually finish ahead of Philip? How about the Art List? Or was that the Arp List? Of course, finally there is the idea of doing a Hubble list. Why not? Sounds like fun either way. It helps to have connections. Do you know of anyone who can get time on the Hubble? If not, the Aurora 13 eager awaits my next command.

Light Pollution Takes Away Untold Beauty

By Bill Wood

As Sharon Guynup points out in her column printed March 7th, light beams pointed needlessly toward the sky rob us of forgotten and unknown beauty. As a lad growing up in Covington, Ga in the 50s, all we had to do was go out in the front yard in the evenings and lay on the grass and look upwards to view thousands of stars spread across a wonderful and awe inspiring canopy overhead. The view was magnificent.

Today, one has to travel at least an hour from a city or large town to view a sky that is still not as full of stars as we knew it just 40 years ago. I enjoy visiting with scouts, either boys, girls, cubs or brownies, at their campouts and helping them learn some of the constellations and identify whatever planets may be visible. The scouts are always appreciative and fascinated to find that there is so much above us that they have never seen before from their homes.

I believe the telling moment came last September. After having spent a couple of hours with a group of girl scouts and their dads identifying at least 25 constellations plus Jupiter and Saturn, one group left to turn in. A dad who was in his mid-thirties stopped to thank me for spending time with them and admitted: "I do not believe that I had ever seen the Milky Way before." It is a simple task before us. Redirect lights toward the ground where they are needed. Turn off lights that are not necessary. Discover or rediscover the beautify that is always above us that we are just too blinded to see.

Joining the AAC

You can join by filling out a membership form and mailing it along with you dues to the address printed on it. These forms are available from our Treasurer or you can download it from the club website (www.atlantaastronomy.org). Download it and print it. Fill out and mail the form in. Fee structure is \$25 for family and single members. Student fee is \$10. If you want to get either Sky & Tel Magazine(\$30)or Astronomy Magazine(\$29), include that with you dues made payable to Atlanta Astronomy Club.

Board Meeting Minutes

Sunday, April 8, 2001-2:30pm-Agnes Scott Observatory

In attendance: **COB** - Bear Simmons, **Board Members:** Tom Crowley, John Lentini **Club Officers:** Sharon Carruthers – President, Peter Macumber – Treasurer, Joanne Cirincione – Recording Secretary **Special Committees:** Phil Sacco – CEWC/Astronomical League **Club Members:** Art Russell, Carol Abernathy, Ken Moss.

President–Sharon Carruthers - opened the meeting starting with Peter Macumber, Treasurer – Atlanta Area Counsel for the Boy Scouts – Received an invoice for \$8,420. Member-

ship dropping off slightly. Office Depot increased the cost of copying the Focal Point by 45%. It went from \$75 to \$104. We also lost our discount. The discount was in effect as long as we had over 400 copies. We have fewer than 300.

Comments made: Focal Point should get out earlier this month so we can get the nominations out before the May meeting. **Joanne Cirincione - GASP** Have some open dates to fill. Tallulah Gorge wants us to do another Women in Astronomy Presentation and they also want us to do a Young Astronomer's Weekend. This will be 5 visits to TG. Still working on another event at Amicalola Falls. **Phil Sacco - Astronomical League** - numbers from the AAC are down on the observing clubs; we need to pump it back up; 2 new programs, Satellite Tracking and the Master Program. Master consists of Binocular Messier, Telescope Messier, Lunar, Double Star and Hershel. Should either get a plaque or pin. **Peter Macumber (sitting in for Matthew Macumber) Webmaster** - Link has been added to the Banquet and Astronomy Expo. Registered 26 people for the banquet. **John Lentini - Woodruff Dark Site** - Insulation has been added to warm up shed. John has cabinets to add. Kendall (from Woodruff) has cleaned the place up for us. Brought up telephone wire and now have electricity. Water soon - about 50 feet away from main area. Fertilized the field and put out seed. Close to being done spending money. John and Sharon made improvements. Charles Hinely will have gone up 4/10 to do internal wiring. Boy Scout volunteers needed for summer camps, both at Woodruff and Bert Adams. This is part of the agreement with Woodruff. Phil will present this to CEWC Chapter to help out at Bert Adams. **Tom Crowley - Nominating Committee** - Went through the nominations; **President** - Sharon Carruthers and Phil Sacco; **Program Chair** - open; **Observing Chair** - open; **Treasurer** - Peter Macumber -; **Recording Secretary**- Karen Stiles - **Board Position** - Bear Simmons; **Board Position** - Gil Shillcutt - **Board Position** - Charles Painter - **Board Position** – James Taylor - **Tom Crowley - Astronomy Expo** – Looking into the capacity of the observatory vs Campbell Hall; Flyers ready and have started leaving them around the schools and other places. Need to leave more around colleges; need help with signs; registration on-site; Art Zorko had Governor proclaim May 5 as Astronomy Day; Prizes slow in coming; still working on state park stuff; Keith, Solar scopes. **Other Business** – Suggested name for the Woodruff Observatory “ William A. Calder Observatory”. Will add AAC as a by-line. Need security for the 24”. Certification still needs to be done on the scope. Scope needs to be locked up and only certified users can have access to it. **Annual Banquet** – Want to present new members a “Chrissy Award”. New comers in the last couple of years who contributed to the club. President's award, working on nominating a member for this. **Main topic of Board Meeting** – Editing of the CEWC by-laws. Suggestions were made and some re-writing has been done. Meeting adjourned.

Calendar

May 12th-Work Party at Villa Rica Observatory. Ditch witch, pipe, and power cable installation. Starts at 10AM.

May 18th-General Membership Meeting, 8PM at White Hall at Emory University. Dr. Amy Lovell of Agnes Scott College. 8PM. Topic: Studies of comets Hale-Bopp and Hyakutake. Elections!!!!

May 19th-Deep Sky observing at Woodruff Boy Scout Camp Bee/Beaver Field.

June 15th-General Membership Meeting at White Hall at Emory. Starts at 8PM. Sharon Carruthers AAC President 2000-2001. Talk on Women in Astronomy.

June 16th or June 24th-Deep Sky Observing at PARI or Brasstown Bald Mtn. Two DSS in one month. Details being worked out.

July 20th-General Membership Meeting at White Hall at Emory. 8PM. Michael Covington on World of Computerized Telescopes. .

July 21st-Deep Sky Observing

July 28th-GASP Storytelling and sidewalk astronomy to follow at Tallulah Gorge State Park. Philip Sacco will do Myths and Legends of the Night Sky. Rain or Shine event.

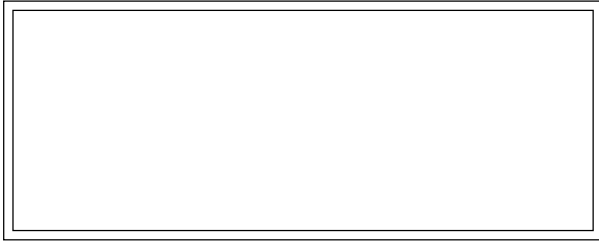


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The Atlanta Astronomy Club Inc., the South's largest and oldest astronomical society, meets at 8:00 p.m. on the third Friday of each month at Emory University's White Hall or occasionally at other locations. Membership is open to all. Atlanta Astronomy Club Hot Line: Timely information on the night sky and astronomy in the Atlanta area. Call **770-621-2661**. Internet Home Page: <http://www.AtlantaAstronomy.Org>

Subscribe to the Atlanta Area Astronomers Mailing List: The name of the new list is: AstroAtlanta. The address for messages is: AstroAtlanta@yahoogroups.com . To add a subscription, send a message to: AstroAtlanta-subscribe@yahoogroups.com . To cancel your membership, send a message to AstroAtlanta-unsubscribe@yahoogroups.com . Messages for the list-owner (me) go to: AstroAtlanta-owner@yahoogroups.com or to (LAbbey@mindspring.com). The "home page" for the list, from which you can change your account defaults is: <http://www.yahoo.com/group/AstroAtlanta>. This list is owned by **Lenny Abbey** who is the **Club Historian**. You can reach him via phone at 404-634-1222.

FIRST CLASS



The Focal Point

Newletter of The Atlanta Astronomy Club, Inc.

FROM:

Keith Burns Email: Keith_b@bellsouth.net
3740 Burnt Hickory Road
Marietta, Georgia 30064

We're here to help! Here's how to reach us:

Atlanta Astronomy Club
PMB 305

3595 Canton Road A9
Marietta, GA 30066