THE FOCAL POINT

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CLUB CALENDAR

Next Meeting: November 18, 8:00 p.m. at Bradley Observatory. **Program:** Dr. Alberto Sadun of Agnes Scott College will present a talk entitled "Jet Setting Across The Universe." An observing session will be held after the meeting on the upstair observing area, weather permitting.

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The Focal Point is published monthly during the academic year by the Atlanta Astronomy Club, Inc. The AAC is a non-profit organization dedicated to the advancement of amateur astronomy. Meetings are held the third Friday of each month (except the second Friday in December) at the Bradley Observatory on the Agnes Scott campus. Dues are $25 annually for a single membership and $30 for a family membership and include a subscription to **Sky & Telescope** magazine and use of club observatory in Villa Rica.

Submissions: Article submissions are welcome, and may be delivered to the editor for consideration. Articles on computer floppy disk are encouraged.

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THE GIFT OF SIGHT

by Steve Gilbreath

Astronomy has always been a fascinating hobby to me. On clear, crisp, dark winter nights I can gaze toward the heavens and am totally in awe. From within the city, I see the brighter stars and a few planets. But once I'm away from the bright city lights, the wondrously minute details of the Milky Way, far-off galaxies, and wispy nebulae begin to appear. But it has not always been that way for me.

A number of years ago when I was in high school I discovered that I had a vision problem. The blackboard and textbooks weren't always in sharp focus for me and eye fatigue was a constant problem. After an eye examination, glasses were prescribed, and for a while everything was clear again and I thought my problem was solved. Unfortunately, that did not prove to be the case. After several years and a number of prescription changes it was clear that there was something more seriously wrong with my eyes. After an examination by an Ophthalmologist, I was diagnosed as having Keratoconus, a rare eye disease in which the cornea abnormally deforms and scars with age. With Keratoconus, vision clarity and contrast can decrease dramatically over a short period of time. Contact lenses were prescribed to retard the disease but for such degenerative diseases as this, there is no real cure.

As the years passed and my vision became progressively worse, my hobbies of astronomy and photography became increasingly difficult to pursue, and I was forced to cut back on many of my activities. As recently as a year or so ago, I could see only the brightest objects--stars, planets, and a few special objects like the Orion Nebula while observing at Villa Rica. Any faint or delicate object completely eluded me. As my Keratoconus grew worse, viewing the world for me seemed like looking through wax paper. For me, the future seemed to hold only extremely limited vision, and perhaps eventually, blindness.

My modern-day miracle came in the form of a cornea transplant, one for each eye, performed about nine months apart. I won't go into the details about the transplants except to say that my doctor has told me that both were completely successful. Eight months after my second transplant my vision is about 20/25 in each eye. I am able to see the world as I used to see it, and trips to Villa Rica are revealing things I've never seen before. I'm learning astronomy all over again and I have a lifetime to observe and enjoy it all again. Needless to say, I'm deeply indebted to Dr. Alan Kozarsky, my Ophthalmologist, and the Georgia Lions Eye Bank. Without them, my life would be much different.

And now I have a request. The next time you are at Villa Rica or another observing site, and you're looking up at the night sky admiring the heavens, keep two things in mind. First, be thankful that you are able to see the wonders of the night sky. Remember that there are others who cannot see what you're seeing. Second, keep in mind that there is a way that you can help them to see. You can share your sight with them by becoming an eye donor. All it takes is a few minutes to fill in a form, so that you might give the gift of sight to others.

THE PRESIDENT'S SOAPBOX

by Leonard Abbey

Last year we passed an important anniversary, our 40th. We did not celebrate this anniversary (an omission which will soon be remedied), but it set me to thinking. Forty years is a long life for an astronomy club, indeed for any social organization. There are a few clubs which have been around for 100 years. Several more are past 50. But when you start counting, you will find that there are only a handful ahead of us. I wonder why?

There have been other astronomy clubs in Atlanta during these of years. I guess I have seen six or seven come and go. What makes our club special, why have we lasted? Why have we never even faltered?

Is it because of our scheduled activities, classes, and observing parties? I don't think so. From time to time we have sponsored classes and activity groups, but when I came on the scene in 1951, it seemed that we took a certain pride in being armchair astronomers. When I wanted to spend seven nights a week observing, I did it alone. Times have changed, haven't they?

How about the Walter Barber Observatory? It has been a real focus of activity. Nope. Our splendid observing facility is only eleven years old. We were a middle-aged club by the time we laid the cornerstone.

Since Steve has told me to keep my soapbox modest, let's go ahead and jump to the answer, because I know what it is, and so do you. Our margin of victory, our advantage, our cornerstone, is Agnes Scott College.

Since Bradley Observatory first opened its doors (also forty-one years ago) we have had the run of the place. We have always had a major telescope to use after our meetings. We have our own closets and can stay as long as we like. This is important. Meeting in an empty classroom, or the "community room" of a local bank just is not the same. It is not "ours." We are always aware that the cleanup crew is anxious for us to leave.

So three cheers to Agnes Scott College! We look forward to another forty years of mutually nourishing partnership. And from what I hear, so do they.

A LOOK BACK

by Dr. Ralph Buice

As the United States begins anew its space efforts with the launch of the newly redesigned shuttle, it is interesting to look back in perspective at the early stirrings of our efforts in space. If the dreams of breaking earth's bonds, from the winged horses and flying carpets of the ancients, to the moon-going train of Jules Verne are set aside, then the beginning in earnest of the exploration of outer space must have surely occurred during the International Geophysical Year.

In July of 1955, President Eisenhower announced that during the IGY of July 1, 1957 to December 31, 1958 (politicians are allowed to redefine intervals of time) the United States would launch a small instrumented earth satellite as part of a forty-five nation effort to participate in a "great international study of the physical environment common to all mankind." The satellite launching effort was to be called Project Vanguard, and was directed by the Naval Research Laboratory under the auspices of the National Academy of Sciences.

From the very beginning the concept of Project Vanguard was one of nobility. Both the launch vehicle and the payload were to be designed from scratch by scientists, rather than military engineers, so that there would be no taint of the ballistic missile. The Vanguard vehicle was a three-stage rocket about 72 feet long, weighing approximately 22,000 pounds and developing almost 27,000 pounds of thrust. In order to reduce drag and weight, there were to be no external fins, and the skin of the rocket's structure was designed to provide walls for the propellant tanks in an effort to save precious weight. It would certainly be needed. In order to carry a small 20 inch aluminum sphere weighing 21.5 pounds into a 300 mile high orbit at a velocity of 18,000 miles per hour, the Vanguard would be launched in an easternly direction to take advantage of the rotational velocity of the earth. At the latitude of the launch site, the earth's rotation would add a quarter of a mile per second, or approximately 900 miles per hour, to the speed of the satellite.

A description of the Vanguard Computing Center in Washington D. C., taken from an issue of *The Junior Astronomer*, published in 1957 under the auspices of the Astronomical League, will surely bring a smile to the owners of today's personal computers. In describing the complex calculations necessary to track an artificial satellite, the publication states:

..."Difficult? A whole regiment of mathematicians frantically pounding desk calculators could not keep ahead of the earth satellite. Only a giant computer could do this. The (IBM) 704 has the terrific speed and capacity to master the floods of figures that have to be handled. Counting pulses flash through its tubes and wires at 186,000 miles a second. Its arithmetic unit can do

41,800 additions and subtractions a second. Multiplications and divisions naturally take a little longer....The 704 has an enormous memory for figures. Its magnetic core storage memory can hold 32,678 'words'. Each word represents a number, or an instruction. If needed, two magnetic drums storing 32,678 words can be attached. The instructions flow into the arithmetic unit at the rate of 2,500 per second...."

In practice, the computer could just about keep up with the motion of a satellite, which typically circled the earth every 90 minutes. The basic equations for the satellite motion were worked out by the Committee on Orbit Calculations at the Naval Research Laboratory, and later, the elegant refinements of the theoritician Yoshihidi Kozai at the Smithsonian Astrophysical Observatory laid the groundwork for the orbital equations of motion that are routinely used today.

The approach to the orbit problem was an interesting one. First, a computer would prepare a preliminary or rough orbit calculation based on the launch information available. Then, observations from tracking stations around the world would be fed into a "differential orbital improvement" program, which would then refine the preliminary orbit and provide precise predictions which would then themselves be improved with new tracking information from the world-wide network of amateur and professional observers.

This prediction process was a never-ending loop, and it had a voracious appetite for data. The Smithsonian Astrophysical Observatory was given the task of coordinating the efforts of all satellite observers from around the world, including the volunteer teams in Project MOONWATCH. Project MOONWATCH was a unique opportunity for an amateur astronomer to make a substantial scientific contribution. Observations from this program supported the early radio tracking, aided in the calculation of the density of the upper atmosphere, and provided the first and last scientifically valuable observations of a satellite. The sophisticated systems of today's orbital mechanics including those which calculate lunar and planetary trajectories have their roots in these early tracking efforts.

The function of a MOONWATCH team was very simple in principle. Operating with only minimal information about a satellite, and using a central mast to mark the meridian, a "picket fence" of observers was set up along a north-south line to watch for the satellite. Each observer's area of the sky overlapped slightly with another observer, but the entire sky was covered in such a way that a satellite would be "trapped" if it appeared over the site during an alert. Most of the telescopes used by the tracking teams were small rich-field telescopes with a little over a 12 degree field and a magnification of about 5.5x. The eyepiece was typically a wide-angle Erfle of 1.25 inch focal length with a field of about 68 degrees. The objective was about 2 inches in diameter with a focal length of around 7 inches. The mounting tube was made of aluminum and was about 8.5 inches long, which provided an arrangement which could be focused from about 10 feet to infinity. For convenience a front-surface mirror was mounted at a 45-degree angle in front of the objective to allow an observer to watch a particular sky area in comfort. Most observing alerts were held either shortly after dark or shortly before sunrise, and lasted for about 90 minutes, the best time for observing low altitude satellites. Many timing devices used by the stations were rather elaborate and allowed all participants to signal a sighting but all were referenced to a WWV time signal. During a practice alert in December, 1956, over 100 stations tracked an airplane trailing a small light along a carefully chosen flightpath across the United States near evening twilight.

In many communities across the United States, MOONWATCH stations had corporate sponsors. In Phoenix, Arizona, the Valley National Bank erected and outfitted a complete satellite observing station on the roof of its skyscraper office building. The Junior Chamber of Commerce in Evansville, Indiana covered the cost of setting up and equipping a station on the roof of the science building at Evansville College. In St. Louis, the president of the Seven-Up Company offered to install a station on the roof of its downtown corporate headquarters, complete with windbreak for the comfort of winter observers. In Walnut Creek, California, the local team was sponsored by the local pipefitters' union, and at the Continental Air Defense Command in Colorado Springs, official permission for the Ground Observers Corps to cooperate with the MOONWATCH program was given by the Secretary of the Air force.

A model of the proposed man-made moon was displayed at the New York Coliseum at the 11th annual conference of the Instrument Society of America, and Congress was briefed on the details of the Vanguard Project. During the briefing, one of the scientists was attempting to explain a point to the congressional audience, and announced that the earth, like a congressman, tends to bulge around the middle, and that satellites will be able to send back data on that bulge. Later, the scientist said, "If you do not mind my using a little equation," and stepped to the blackboard to write: m times v squared over r is equal to m times g times R squared over r squared. It was reported that the silence that greeted this equation was truly bipartisan.

My team, the Chattanooga MOONWATCH team, was one of more than two hundred teams world-wide, and the third team to be accepted into the program. I learned about it first from an issue of *Science Digest* at the local library, and with imagination aflame I wrote the national headquarters in Cambridge for information on the nearest tracking station. As luck would have it, Llewellyn Evans, an engineer for the Tennessee Valley Authority had set in motion the plans to establish a tracking station at the Clarence T. Jones Observatory, about 3 miles from my home, and I promptly joined the team. Those were special years, full of fun, excitement, and adventure, for it was as if we were on the threshold of a new adventure, where indeed, none had gone before. Our team observed hundreds of satellites, and made thousands of sightings, adding our data to the common pool of knowledge from stations around the world.

As with most things, time brought about maturity to the program. Radar tracking reduced the need for visual observations, and computers and their programs became much more complex. Theory merged with empirical results in a way that produced a more elegant framework for satellite prediction and reduced the manpower needs by a factor of 1000. The triaxial Baker-Nunn satellite tracking cameras and later the laser rangers produced routine information of extreme precision and accuracy. But those first years--those early years--were glorious.

A MESSAGE FROM THE EDITOR

In January, a membership list containing the name, address, and phone number of club members will be mailed with the Focal Point. If you do not wish for your address and phone number to be included in the list, please contact the editor at the address listed in the box below.

OBSERVING EGGS

by Liz Matty

The best advice I've ever heard on astronomy tells beginners to start by drawing eggs. At first I though this was the silliest advice I'd ever heard; never the less, I got an egg out of the refrigerator and started drawing. I was amazed. In the imagination an egg is nothing more than an irregular white sphere, but with close examination detailed features appear. The smooth surface of an egg is not at all smooth but is full of bumps and depressions resembling features on the moon and planets.

Drawing eggs teaches one to see. After five years of observing eggs and planets I am convinced that I have finally learned to see. Many times I have looked in my telescope and admired the red spot on Jupiter or the polar cap on Mars then, turning the instrument over to someone else, heard "I don't see any of that!" My response is always the same: "Try drawing an egg."

Beginning astronomers are usually disappointed with their first views in a telescope. When the observation does not live up to the observer's expectations the instrument is usually blamed. Many people catch "aperture fever," thinking a bigger telescope will satisfy their expectations, and some give up on astronomy altogether. I, too, was disappointed with my first look, but I soon realized that what I thought was a deficiency in my instrument was really a bad case of operator malfunction and could be fixed with a carton of eggs.

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