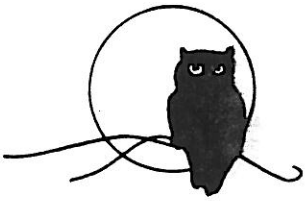
THE SPECTRUM



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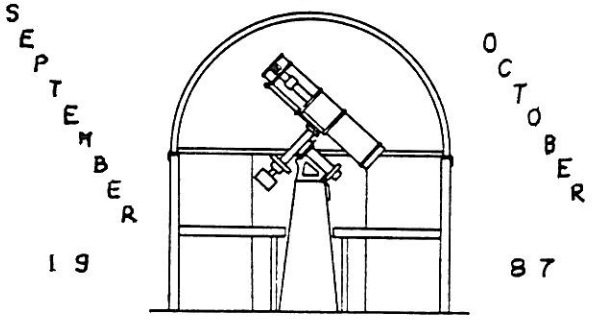

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MEETING NOTICES

FRIDAY, SEPTEMBER 11, 1987 - 7:30 PM in the New Science Building Auditorium, State University College off Elmwood Avenue.

Our first meeting of the 87/88 year will feature Mr. Raymond Rusk, a Phd. candidate at the University of Toronto, as our main speaker. His talk will revolve around some new clues about the so called mysterious "jets" associated with Quasars and "BL" Lacertae type objects, especially one near Cygnus. This should be an extremely interesting presentation since Quasars, Black Holes and other associated phenomena are subjects which we all get excited about.

FRIDAY, OCTOBER 9, 1987 - 7:30 PM will also be in the New Science Building Auditorium.

Our October meeting speaker has not been confirmed as of the publication deadline. However, we are attempting to contact a Mr. Andrieas Gada from North York Astronomcial Association in Ontario, who will speak about an unusual Meteor Telescope. We are also trying to confirm a Professor Malcolm Saveroff from Rochester, who would speak on Cosmology, Pulsars or Bursters. We should know by the September meeting, so if interested ask then.

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OBITUARY

Robert S. Mayer

It is with a deep sense of loss that the Buffalo Astronomical Association records the passing of Robert Mayer. He was a very talented and sincere craftsman, known to many for the skill, resourcefulness and knowledge he brought to each task.

His willingness to always be of service to others is well-known, even at times when fatigue pressed hard upon him.

We will remember him as we use the many things to which he laid his hands to create or improve the instruments which have brought so much joy to our many members as they study the heavens.

Bob was a remarkable human being with a pervading nobility of spirit. Our lives have been made richer because we have had the privilege of knowing this very fine gentleman.

We extend to Verna our heartfelt sympathy during these difficult days and hope she will find solace in beautiful memories.

Edith L. Geiger

Buffalo Astronomical Association

Dear Members,

Many thanks for all the expressions of sympathy I have received.

Bob found his association with the Astronomy group a very meaningful part of his life.

He was never happier than when he felt he was helping someone to solve a problem.

Sincerely,
Verna Mayer

ANCIENT EGYPTIAN ASTRONOMY

From the newsletter of the Hamilton Centre RASC, "ORBIT".

Consider, if you will, the Egypt of days past. It was a time of tropical breezes, barges on the Nile, astrology and Pharaohs. A much simpler way of life, but they had much to offer their contemporaries and even to us in the 20th century. The Egyptians of this era are best remembered for what they have left behind - the monuments to their dead kings, golden treasures and mummies. These objects are marvelous, but probably their greatest and

ar calendar.

To backtrack for just a moment, the Egyptians were very interested in astronomy. Imagine the clear skies they would have had and the bright stars they would have seen. The Egyptians of this time regarded the heavens as the home of pious souls. For example, Sirius was believed to be the soul of Isis and Orion as that of Horus, The night ske itself was divided into 3 categories. The first group was made up of the planets-known as the Unwearied. The second group-the Imperishable-was made up of the circumpolar stars. Apparently it was believed that the Heavenly Fields where kings passed eternity was found in this region of the sky. The third group-the Indestructible- was where the fixed stars were found. 36 of these stars were chosen to preside over the 36 decans (10 day periods) found in the Egyptian year.

They also made up tables and charts which detailed the position of the stars. The Egyptians believed that in the centre of the sky sat a human figure and the top of his head was placed below the zenith. The stars which were approaching the zenith fell over a portion of the figure's body and their position was then listed on their star tables.

As early as 3000 BC the Egyptians realized that an agrigultural society, such as theirs, needed a practical tool to predict major events such as the flooding of the Nile. Their studies of the stars made tis a much simpler task. Their calendar consisted of 360 days, 12 months containing 30 days each and 5 days left over at the end of the year. (This division of time was quite arbitrary, and the moon and it's phases was totally ignored.) The 12 months were then divided into 3 seasons each of 120 days, which were named after the 3 main periods of Egyptian agriculture, the Innundation, the Growing of the Seed, and the Harvest. The beginning of the year, the Innundation, coincided with the heliacal rising of the star Sirius. (Just to remind you, the heliacal rising is the first day on which a star can be seen to rise briefly before the sun does in the morning twilight.) During the early years Sirius first appeared in tho sky around the time of the summer solstice which also happened to be about the same time as the Nile flooded. The Egyptian year was therefore the time between the heliacal rising of Sirius. This calendar had one disadvantage though. It's year of 365 day was still too short and lost one day every four years and one month every 120 years. For example, If in 2782 BC the start of the year fell at the beginning of the Innundation, in 2542 BC it would fall 2 months before the Innundation and in 2302 BC the difference would have become so great that the Innundation would fall during the time of the Harvest. The Egyptians had a "wandering solar year" whose months dod not generally coincide with the periods and seasons of nature. Even so the solar year was generally accepted and the natural year, the phases of the moon and the seasons, was primarily used by priests to establish dates for festivals and other events. By extrapolation, it was discovered that the wandering solar year and the fixed year would once again match after 1,460 years of heliacal risings of Sirius. This period became known as the Great Year of the Sothic Cycle. (Sothis= Sirius)

Not only did the Egyptians develop the calendar but they also gave us our divided 24 hour day. This, of course, is 12 hours of daylight and 12 hours of night. During the night the stars were observed by dividing the sky into 36 decans each rising for 10 days. For them, much the same as today, the 24 hours in 1 day were not equal, but rather varied in length depending on the season; with more hours of daylight in the summer and less in the winter.

So, it can be seen that the Egyptians laid the foundations for our calendar, and 24 hour days. It must have been quite a sight to see the billions of brilliant stars shining against a totally black sky along side of the Nile. We can envy them for more than their magnificent architec-

Karyn Bennett

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SPY & TELL

Spy and Tell

Congratulations are again in order for Patty Rupp ar another young lady who, on June 29th, swam from New Haver Connecticut, to Long Island in 3½ hours.

We are very happy to announce that Dave Williams, wh was born in Welland, Canada, is now a citizen of the Unit States. He received his naturalization papers at the cer mony held at Melody Fair.

Ernst Both was elected president of the North Collin Board of Education for the year 1987-88. He has served o the board, off and on, over a period of many years, both a member and president.

A very fine review of John Yerger's paintings appear in the June 26th issue of Gusto. Congratulations.

As of June 8th, Scott Williams was hired as full tim Naturalist-teacher at Beaver Meadow. He now resides in the Naturalist's Residence. Scott is a graduate of Commu nity College of the Finger Lakes, and Plattsburg State Un versity. He is a wildlife photographer and is developing an interest in astronomy since living at Beaver Meadow.

The Junkins have moved to their own home 7 miles fro Beaver Meadow on land they call "The Junco Nest." They happily say they "are living in Bliss (N.Y.)." Dave continues as Director of Beaver Meadow.

Shaun Hardy is now head librarian at the Buffalo Museum of Science.

Terry Farrell takes great pride in the 25" Mississipp River boat model which he finished. He has it mounted in a plexiglas case.

In late June, Al Kolodziejczak, Tristan and Debbie DiLapo went sailing in Al's boat in the Allegheny Reservoi in Pennsylvania. They stopped at an island in the reservoir and found it to be totally covered with a layer of fossils.

Esther Goetz,who was seriously ill this past winter, has bounced back, making a remarkable recovery. She is filled with her usual wit and feeling of well-being.

Peter Michael Goetz will be seen again this fall on TV's "The Cavanaughs." He is also making another movie.

Dave Williams is taking courses at Bryant and Stratton four nights a week in travel and tourism management. He will finish in two years.

Bill Kirst is a fine photographer and is a member of both the Buffalo Museum of Science Camera Club and the Southtowns Camera Club. Bill has amassed numerous award winning ribbons for his excellent work in competitions within both of the clubs.

During the week of July 19th, former member, Pat Loebel, visited her family and also visited with Doris Koestler in her trailer. Pat is very happy in New York where she works in a photo lab on black and white negatives and also does some color work. The lab is engaged in advertising, and Pat has done several magazine covers. While here, Pat went to Beaver Meadow with Doris to do some star gazing.

Tristan DiLapo hopes to find a job teaching physics in a high school.

The following members went to Stellafane this year: Ed Czapla, Brian Fallon and Carl Millazo. The keynote speaker was John Dobson, inventor of the Dobsonian telescope.

At the end of June, Terry Farrell, Dave Williams, and Bill Kirst left their wives and a girlfriend and went with an astronomy group from Buff State,led by Art Gielow, to Franklinville for a weekend of fun, enjoying marshmallow

wars and squirt gun fights.

It has been reported that at Bill Kirst's Star Party Ken Biggie put the pump on backwards on the keg of beer, and poured for himself a glass of foam and guzzled it down.

In November, Marilou Bebak will be going to the Mid-Atlantic Museum Conference held in Saratoga Springs, at which time she will be speaking on "The Magnet School and Team Programs."

Edith L. Geiger

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MATCHING A BINOCULAR TO YOUR EYES

A binocular consists of two telescopes, rigidly mounted parallel to each other, and provides a closer view of distant objects to an observer's two eyes. Each telescope has four important optical elements:

1 - Objective Lens (Entrance Pupil)
2 - Eyepiece
3 - Prism Erecting System
4 - Exit Pupil

The objective lens has a diameter larger than that of the observer's eye to collect more light and to form an image of the distant object (Inverted).

The eyepiece is essentially a magnifier, used to examine the detail in the image formed by the objective.

The prism erecting system shortens the optical system and rotates the image of the distant object so that it is no longer inverted but is correct up-and-down and left-and right.

The exit pupil is the image of the objective lens aperature (entrance pupil) formed behind the eyepiece. To locate and look at the Exit Pupil, hold a piece of ground glass, a thin piece of paper or other diffusing material behind the eyepiece while the objective is aimed at the sky or any uniformly illuminated light source. As the ground glass is moved toward and away from the eyepiece, a sharp round circle of light will be seen. This is the Exit Pupil, and is where the eye must be placed to see the entire field of the binocular.

All binoculars are designated by numbers such as 7 x 35 The first number is the power of the binocular, how many times closer the distant object appears through the instrument. Some people call it magnification. The second number is the diameter of the objective lens aperature in millimeters (35mm in this example). The diameter of the Exit Pupil can be calculated by dividing the objective diameter by the power.

A few common binocular numbers are given below with the Exit Pupil diameter in brackets:

6 x 30 (5.0)	10 x 50 (5.0)
7 x 35 (5.0)	11 x 80 (7.27)
7 x 50 (7.14)	20 x 80 (4.0)

The size of the pupil in the eye changes with the ambient light level. For someone 20 years of age or younger, the pupil can be as small as 2mm under bright light conditions and as large as 8mm under fully-dark-adapted light conditions. Remember that the Exit Pupil is reversible. If the observer's pupil is closed down to 2mm in bright light only a 14mm diameter at the objective end is being used with a 7 power binocular.

For use at very low light levels such as the military, sailing at night and observing the night sky, a large diameter Exit Pupil binocular such as the 7 x 50 has always been recommended. Wars are fought by the young men in every country, most of them about 20 years old. The 7 x 50 binocular was designed for their hand-held use. The Germans manufactured a large number of 10 x 80 (8.0) binoculars for WW II.

Not many are aware that as we get older the iris (pupil) in our eye does not become as large under fully-dark-adapted conditions. It also takes longer to become dark-adapted.

The following table gives the average maximum diameter of the pupil of the fully-dark-adapted eye at different ages:

Age	Pupil Diameter (mm)
20	8.0
30	7.0
40	6.0
50	5.0
60	4.1
70	3.2
80	2.5
90	1.2

The writer, obviously in the higher age brackets, hsa compared 7 x 35 and 7 x 50 binoculars on star fields and can see as many stars with the 35mm as with the 50mm objective.

The commonly available 11 x 80 binoculars are excellent for young amateurs, but older observers should seriously consider the 20 x 80 models.

Ralph K. Dakin

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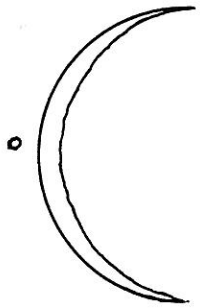
OCCULTATION OF VENUS BY THE MOON, APRIL 25th, 1987.

There was an occultation of the planet Venus by the waning Moon in the early morning of April 15th 1987 and I had the good fortune to observe it under perfect clear sky conditions.

I was awake at 05:20 am EST and looking due east from the top floor of the house saw the thin crescent of the waning Moon quite low in the sky. Venus shone brilliantly a little more than one apparent Moon diameter to the left (north) of the Moon's limb. The dawn sky was still quite dark.



Naked eye view..
The waning moon and planet Venus about 06:20am EST April 25th 1987.

An hour later the sky was much lighter but the Moon and Venus, which showed a tiny disc now quite close to the moon's limb, were clearly visible with low power on a 2.4 inch refractor. Joe Provato was also observing with me with 7 x 50 binoculars. Occultation occured about 06:34 am EST. Although I didn't consciously measure the time interval from first to second contact I later estimated it to be somewhere between five to fifteen seconds.

Fred W. Price

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** OBSERVATIONS **

I observed the planetary nebula known as the 'Bug' nebula, NGC 6302 in Scorpius on the meridian only 9 degrees above the horizon with my jointly owned 26 inch Dobsonian, using an UHC nebula filter. On June 17th, it appeared vividly green and oval shaped, 1 x 2 arc minutes in size. It is of medium surface brightness and has a total magnitude of 10. It is slightly brighter towards the center and in the middle is a blue star. It's minor axis is slightly brighter, and the southern one is sharper, also the perimeter is of a very low surface brightness with an irregular shape.

At 3:52 AM on July 23rd, a minus 6 magnitude meteor was seen from Boston, N.Y. It was orange, and traveled 15 degrees southwesterly on the border of Aquila and Serpens. It lasted 1 second and its flash was seen on the ground. It left a glowing train in the sky visible to the naked eye for 3 seconds.

An aurora was seen from the Beaver Meadow Observatory on July 28th on the northern horizon. Most of the time it was a pale green arch, 20 degrees above the horizon with

rays were pale violet and at one time extended 60 degrees upwards.

On August 4th with the 26 inch scope, a galaxy was seen 3 arc minutes N.W. of the famous ring nebula, M-57 in Lyra. It is I.C. 1296, with the 13mm Nagler eyepiece and deep sky filter and averted vision, it was at the limit of detection as a 10 arc second fuzzy spot of 16th magnitude.

Carl Milazzo

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OBSERVATORY REPORT

The telescope at Beaver Meadow Observatory now has an Off-Axis Guider, thanks to a generous donation by Eugene Witkowski. If you have an interest in astro-photography, a workshop is being formed at the observatory once a month. Dan Marcus will instruct basic and advanced photography. See Dan or myself for more information, as to time and date.

June & July public nights have been well attended, between 15 & 30 people have been observing each Saturday evening. Some of our new members have been coming out and are learning astronomy as well as how to use the telescope. Again I ask the members of our club to give a public night. I feel if you use the observatory, you should give one night during the short season for public nights, so that the same few do not have to do public nights all the time. If you would like to do a public night and feel you need more experience, call Hugh Pettit at 852-3163 or myself at 833-8498. We will show you on any Saturday night.

John Yerger, Obs.Director

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INSTRUMENT REPORT

The passing of Bob Mayer dealt a cruel blow to the Instrument Section. Not only did Bob attend every section meeting but he also went out of his way to lend his valuable assistance to any member having problems.

The club was probably unaware how rare it is that a club has available the services of a skilled craftsman. Bob was an expert pattern maker. This occupation encompasses the combined talents of an advanced wood-worker and the skills of an expert took-maker. He was a very fine tool-maker, capable of a wide range of operations in metals.

Best of all, Bob would give freely of his talents. This does not imply that he neglected to build things for himself. He simply lengthened his work day. At his death he was building another fine telescope for himself. This, as with his other ingenious designs, he would have brought to our meetings to give us more ideas. He was a very ingenious worker and always added an original touch to any project he carried out.

We will miss the skills ho so freely shared as well as his always cheerful way of tackling difficult problems and making them look easy. Many members have features on their scopes that were either suggested by Bob or frequently crafted by his own hands.

The Instrument Section has been meeting for nearly 30 years. At first, the members exchanged ideas and showed examples of telescopes or gadgets that they had built. Members would bring partially completed projects. This was a combined showing of their original ideas and asking for suggestions on particular problems. It was this problem solving phase which dominated the meetings in later years. Much attention was given to testing mirrors newly ground by members or acquired from commercial firms.

Telescope making has changed since our first meetings. The early members came over from telescope making classes. They were making their own instruments, including the grinding of the mirrors. Later, when mirrors became available at affordable prices, these were purchased. In fact, it became possible to buy completely built telescopes. They ed, believing that commercial mirrors must be perfect. And for those who wish to do any part of the project themselves, there are good books and articles and even a fine magazine devoted entirely to the subject expressed in its title, "Telescope Making". Our many wonderful meetings are now memories and none of us regret the time spent in exchanging ideas and helping new builders with their problems.

Ed Lindberg

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SUNSHINE - WHERE DOES IT COME FROM?

One of nature's greatest mysteries was solved just before the start of World War II. In 1938 Hans Bethe and C.F. von Weizacher proposed that the source of the sun's enormous energy was thermonuclear reactions. Today we know that deep in the core of the sun four hydrogen nuclei, or protons, fuse into one helium nucleus. In the process, roughly 0.7% of the original mass is converted into energy according to Einstein's famous equation, $E=mc$. The sun loses four million tons of mass every second, and has been doing so for nearly five billion years. How was the sun's heat and light accounted for before we understood atomic reactions?

For ancient astronomers the problem was not as acute as it would become for later ones, because without a comprehension of the sun's huge size and distance from us they had no way to assess its energy output. Without laboratory standards to quantify heat and energy they were unable to draw comparisons between the feeble energy produced here on Earth to the incredible energy produced by the sun. Early societies often associated the sun with their gods; in some instances they believed a new sun was created each day. Those who thought more deeply into the matter imagined the sun to be clouds set on fire, or a red-hot stone glowing in the sky. Various Greek astronomers speculated about the size of the sun. Some placed it at about the size of a large dinner plate, others thought it was larger than the Earth.

By the end of the 18th century a variety of ideas abounded that explained the sun's energy source. Laplace believed that the sun was in combustion, but even if the sun were a solid lump of coal it would be reduced to ashes in only a couple of thousand years. Clearly the sun had been shining for a long time compared to a thousand years. And further, no reduction in its size had been seen in historical times.

Another theory of the late 18th century maintained that the real body of the sun was dark and cool. The part we see, the photosphere, was a luminous layer in a complex atmosphere of strata with different properties. The existence of sunspots helped support this conclusion. At first sunspots were thought to be mountain tops that penetrated into the photosphere. Later, sunspots were seen as gaps in the photosphere that enabled us to see the dark solar surface below it. The Scottish astronomer, Wilson, and the famous William Herschel were proponents of the cold sun. The latter further speculated that the sun's solid surface was ideal for habitation because opaque layers of the atmosphere shielded the surface from the hot photosphere and produced a comfortable climate for the sun's residents. Authors of astronomy books written a century later still mentioned this structure, although by then some of them expressed varying degrees of reservation about its validity.

Two new sources of solar energy were proposed during the middle of the 19th century.

One contended that meteors crashing into the sun converted potential energy into heat. The problem of where this gigantic quantity of meteoric material came from quickly discredited this idea. By now, scientists had advanced to where they could measure energy, and the sun's stupendous output was fully appreciated. The sun would have to acquire annually a mass of meteors equal to approximately 1/10 of the Earth's mass to maintain its energy output if this were its source. A storehouse of material of this quantity near the sun would perturb the orbits of the planets; and besides, meteoric impact on Earth was many, many orders of magnitude below this intensity. How could the sun be bombarded by so many objects, and the planets by so few?

The second theory, this one forwarded by Helmholtz, was much more satisfactory. He suggested that the sun was gravitationly contracting and was releasing potential energy, not from meteors, but from its own mass. A modest reduction of 200 feet in diameter each year sufficed to account for the sun's energy output. In the last 10,000 years the sun's apparent diameter would have decreased by only one second of arc, a quantity that would have entirely escaped detection during man's history. Calculations showed that if the sun's size started out as large as the orbit of Neptune, the most distant planet then known, it could have been shining for 15 or 20 million years. That was a great improvement over the couple of thousand years provided by chemical combustion proposed earlier. Unfortunately for Helmholtz's theory, paleontology and geology had progressed enormously in the preceding century, and a few million years for the existence of life on Earth was no longer adequate.

Simon Newcomb, writing in the early part of our century, suggested the newly discovered phenomenon of radioactivity might provide the sun's energy. He noted, however, that the decay of radium, the element best known for its radioactive properties, was far too slow to solve the problem. He commented that super radioactive elements, as yet undiscovered, might someday yield the final solution.

As late as 1940 Fisher and Lockwood explained the source of the sun's light and heat as the result of high pressure and temperature in its core breaking atoms into their constituents, protons and electrons. They cited mass loss to account for the production of energy. Einstein had made his impact, but the mechanism was wrong. They naively concluded that the sun would last about 15 trillion years, more than a thousand times the current estimate. The error probably arises from two mistakes. A star's life ends when only approximately 1/10 of its hydrogen is converted into helium; the outer volume of a star never enters into the fusion process. Secondly, slightly less than 1% of the mass involved is converted to energy, the remaining 99% becomes helium.

To the rescue came Bethe and von Weizacker. At last, after several centuries, we had the answer to the energy source of the sun--we hope. Imagine the frustration astronomers must have felt until then, trying to explain an incredibly important phenomenon without the scientific tools to do it. I suppose other issues in astronomy await new concepts from the next century, but I doubt that any will be more significant to us than what makes the sun shine.

Leslie Martin

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ASTRONOMICAL HAPPENINGS

SOLAR:- The Sun will cross the celestial equator at about 09:45 AMEDT on September 23rd. It is the time to again tr the 'egg trick' by placing an egg on your kitchen table c its end and disprove those who believe in it. On Septembe 22nd an annular eclipse of the sun will occur throughout Asia, New Guinea, parts of Australia and New Zealand.

LUNAR:- The phases of the moon are as follows:- New Moon will occur on September 22nd & October 22nd; first quarte will be on September 30th & October 29th; full moons will be on September 7th (corn) & October 6th (harvest); and last quarter will fall on September 14th & October 14th.

An eclipse of the moon will be seen on October 6th-7th throughout Canada and the United States. The 'penumbral' eclipse will begin at about 08:53 PMEST, October 6th and lasting to about 01:10 AMEST, October 7th.

OCCULTATIONS:- none are scheduled to occur during September & October.

CONJUNCTIONS:- Saturn - September 1st & 28th & October 26
Uranus - September 2nd & 29th & October 26th
Neptune - September 2nd & 30th & October 27th
Jupiter - September 10th & October 8th
Mars - October 20th
Venus - October 23rd.

PLANETARY EVENTS:-

CONJUNCTIONS:- Mercury & Venus - October 19th

Uranus Stationary - September 1st
Neptune stationary - September 17th
Mercury stationary - October 16th
Mercury @ greatest elongation 26° east - Oct 16t
Mercury @ inferior conjunction - October 28th
Jupiter @ opposition - October 28th

METEOR SHOWERS:-

for September, the Beta Lacertids on the 1st appear from radiant R.A. 22h 25m - Dec. +53°, a new type yet unknown as is the trajectory. Some information records it as having as many as 10 per hour appearing white at about 4th magnitude. The duration is approximately 10 days with the maximum on September 1st. Other showers are:- Aurigids, Epsilon Perseids, Southern Piscids, Kappa Aquarids, Alpha Aurigids & Sextandids.

for October, the Quadrantids of the 2nd will be seen for the second time, the first on January 3rd. This shower radiates from R.A. 15h 20m, Dec. +52°, it is an annual show of long-slow 3rd magnitude meteors. They appear to be white in color lasting only for a period of about 6 hours. It appears in another plane of the earth's orbit on January 3rd each year. Other showers are:- Andromedes, Draconids, Northern Piscids, Epsilon Arietids, Epsilon Geminids, Orionids & Leo Minorids.

Darwin Christy

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PRESIDENT'S CORNER

Well! Another summer of star parties is over and we will be back to our regular monthly meetings thru next June. Remember, the September 1987 to December 1987 meetings will be held at the State University College's New Science Building Auditorium.

Then in Januray 1988, we move to the Museum of Science where we stay thru June 1988, with the exception of our annual May Dinner Meeting.

All meetings are at 7:30 PM on the 2nd Friday of each month with detailed information published in each "SPECTRUM".

I want to thank all those who sponsored star parties this summe as well sa those few who attended.

I want to thank all those who sponsored star parties this summer as well as those few who attended. For all

those who skipped the star parties, shame on you. The sponsors put a lot of time and preparation into those parties and in a few instances the turnout was very poor. Lets all try to resolve to improve our attendance at next year's star parties - as well as this years general meetings.

Ken Biggie, President

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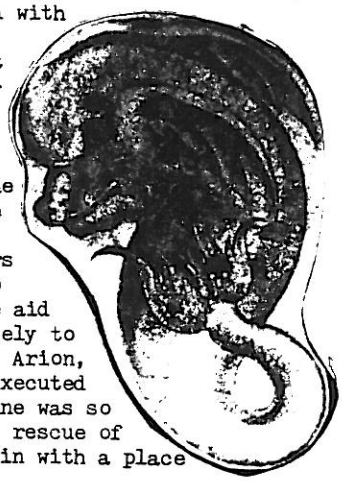
SEPT-OCT CONSTELLATIONS

DELPHINUS, the Dolphin also refered to as Job's Coffin is one of the smallest constellations. It had originally included the stars which Hipparchus took to form another constellation, that of Equuleus. In most of the astronomical literature it has been borne its present title and shape. Varied stories have regarded its namesake as the most remarkable of all the marine creatures.

---The Dolphin small of sight floats
O'er the Goat-----

Aratos



The Dolphin being associated with 'Arion', who was a native of 'Lesbos', and was a famous poet and musician. Arion was threatened with death by a crew of sailors on a ship which he was traveling. After begging his captors to allow him to sing one last song and they agreeing, he attracted a dolphin. Upon completion of his song, the sailors threw him overboard and left to drown but the dolphin, with the aid of other dolphins, bore him safely to shore. Having been denounced by Arion, the sailors were captured and executed on their arrival to port. Neptune was so very pleased with the dolphin's rescue of Arion that he honored the dolphin with a place among the stars.

As for the name 'Job's Coffin', there seems to be very little information as to its existance. No author has come forward admitting the name. The only information I have found is the shape was near to that of a coffin.

Delphinus is bordered by Vulpecula on the north; on the south by Aquarius; Equuleus & Pegasus on the east; and by Sagitta & Aquila on the west. Objects of interest are as follows:- Globular Clusters - NGC 6934 & 7006; Planetary Nebulae - NGC 6891 & 6905; Variable Stars - CT, CZ, EU, HR, R, RS, S, TZ, U, V & Z; Double Stars - Alpha, Beta, Gamma 1 & 2, Kappa, 1, 13 & S.

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EQUULEUS, the Foal or Colt, is another small constellation borne out of a part of the Dolphin by Hipparchus. It is said that it was named of almost no writer, although in 1590, Hood wrote of it. It is an 'ancient' constellation going back to the Babylonians, but still on the charts and maps and recognized as one of the 8u modern constellations.

Equuleus is bordered by Pegasus and Delphinus on the north; Aquarius on the south; on the east by Pegasus; and on the west by Delphinus. Objects of interest are few but the following are there; Variable Stars - S & R. Double stars - Beta, Gamma, Delta, Epsilon, Lambda & 6.

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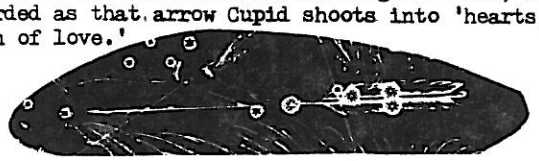
SAGITTA, the Arrow by a general appearance asterism is an instrument which was supposed to have slain the 'Cyclops' from Apollo's bow. It is also supposed to be the arrow Hercules use to kill the 'Hideous Vulture' that was gnawing at Prometheus' vitals while chained to the rocks on the summit of Mt. Caucasus. On the brighter side, Sagitta is regarded as that arrow Cupid shoots into 'hearts ---- 'A token of love.'



Sagitta is bordered by Vulpecula on the north; Aquila on the south; on the east by Delphinus; and by Hercules on the west. Many interesting observational objects enhance this constellation. The Globular Cluster NGC 6838 (M-71) as well as the Open Cluster H-20 with Planetary Nebulae NGC's 6879, 6886 and I,4997 are easily found. Diffuse Nebula - R.A. 19h 30m, Dec. +18.2° is a nice object. Variable Stars include HS, S, T, U, VZ, W, WY, WZ (NREC) & X. Doubles stars are Alpha & Theta. Novae N-1783 and N-1977 are also included.

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VULPECULA, the Little Fox was introduced by Hevelius about 1690. It was first called "Vulpecula cum Anser" (the Little Fox & Goose). The Goose (Anser) is now dropped and only refered to as being an ancient constellation.

Vulpecula is bordered by Cygnus & Lyra on the north; Sagitta on the south; Pegasus on the east; and on the west by Hercules. Interesting objects include Open Clusters NGC's 6800, 6802, 6823, 6830, 6885 & 6940. Planetary Nebulae NGC's 6842 & 6853 (M-27 - the Dumbbell Nebula). Diffuse Nebulae NGC 6820, I,1305, I,4954, & R.A. 19h 27m, Dec. +23°. Variable Stars are - BW, CK, DY, ER, ES, FI, LVMW, R, RS, RT, RU, SV, T, U, W & X. Double Stars are - 1, 2 (ES), 4, 5, 7, 9, 13 & 16. Novae include N-1968, N-1970 & N-1976.

ANCIENT CONSTELLATION

ANSER, the Goose, a creation in Hevelius' atlas was placed there within the 'Barnyard' region of the sky, with the fox, swan, eagle, dolphin, horse, colt etc. Flamsteed's atlas shows both 'Vulpecula' & 'Anser' although separating their titles, 'The Little Fox & the Goose'. One small star represents the whole constellation of Ansew which lies just west of the Fox's head. It is a 4.4 magnitude star, as described in the 'standard dictionary' and holds true in the 'century dictionary'. Anser is now omitted from the charts by modern astronomers which (by my idea) was probably eaten by the fox.

Darwin Christy

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ACTIVE GALACTIC NUCLEI

There are four main types of AGN's, Quasars being the most luminous, followed by BL Lacertiae Galaxies, N-Galaxies and the least energetic being Seyfert Galaxies. All these related objects have in common the following characteristics: they all very in magnitude and irregularity over a fairly short period. No other type of object in the universe is more energetic than these galaxies. They have a small power source which is located in the very center of the host galaxy. All are rare and fairly distant with an extremely massive and dense engine which is tidally stripping matter from a companion galaxy.

The most likely object capable of producing such a tremendous amount of energy in AGN's is a super massive black hole. It, too, is surrounded by a dense cluster of smaller black holes, neutron stars and white dwarfs. The gravity of the cluster sucks in the dust and gas towards

[illegible] black hole.

When an orbiting companion galaxy is disturbed and passes too close, it is tidally stripped of dust and gas along with stars which fuel the black holes. This is like pouring gasoline onto a fire, flaring the AGN to as much as 30 trillion times more luminous than the sun, which is equal to -31 in absolute magnitude. Without fuel for their massive black hole, they remain dormant like M-81, M-31, M-87 or even our own Milky Way Galaxy which has such an object hibernating in it's very center. Sometimes two galaxies collide head-on and merge to form an elliptical or SO galaxy, resulting in strong radio emissions orignating from it's center. Some giant ellipticals have as many as 7 undigested nulceus near it's center.

Matter falling towards the black hole first goes in orbit around the black hole and forms an accretion disk which is like a whirlpool. Friction and pressure in the d disk causes it to heat up and emit infrared from its outer radius and gradually get hotter towards the inner radius, emitting energy as short as the Gamma Ray wavelengths. In 1986 the spectrum of an AGN was seen to change as it devoured a star as its fuel. The massive and rapidly spinning disk acts as an excellent gyroscope, constantly for millions of years, not even precessing. The inner part of the disk acts as a nozzle as it resists the intense light pressure and wind generated just outside the black hole as matter falls into it.

If matter falls in at too high of a rate for it to be swallowed up by the black hole, the remaining is heated super hot to form one or two jets of plasma that is moving outwards at nearly the speed of light. They are collimated by strong magnetic fields generated by the spinning black hole. The jets are very narrow and straight and the radio jets are always aligned with its optical jets. The jets themselves produce some of the nergy in the jets from particales moving at relativistic velocity colliding with blobs of hot gas. This causes shock and turbulance which forces the gas to collapse and form a new star; some into supernova which help to form another blob. A jet is a very violent reagion with strong magnetic fields, surface charges, tourque and radiation.

Quasars are the most luminous because they house the most massive black hole, and vary on the average of about ½ of a magnitude in about a month. They have broad emission lines from hot gas moving rapidly within the hoast galaxy, and most quasars are blue in color. The rare red and infrared ones result from dust scattering from a very recent collision with a companion galaxy. Today about 4000 quasars have been discovered and yet to be discovered, an additional 10 million, perhaps. They are housed only in spiral galaxies and have weaker continuum and absorption lines. One quasar in 1957 almost became the first to be discovered, which was thought to be an old nova or white dwarf, because of its peculiar spectra. In 1960 two quasars were thoguth to be radio stars with a totally baffling spectra lines. Then finally the big breakthough came in 1963 when it was realized that the lines were highly redshifted by the Doppler effect from the expansion of the universe.

It was the quasar in Virgo named 3C273 which is redshifted by 16%, the previous record holder was only 2% and that was for a normal galaxy. Today, quasars range from 4% (800 million light years) to 93% of the spped of light (17.9 billion light years) which is also equaled to a 401% shift of visible light. The brighttest quasar is 3C273 at +12.5 magnitude and is 2.8 billion light years away. At the distance of the farthest and faintest (+27m) yet deteced, galaxies no longer appear smaller, instead they are larger because of the curvature of space. They are bluer and more luminous, and 75% of what is imaged are distant galaxies' the remaining 25% are foreground stars. Due to the observing technique originally used, all quasars were strong radio sources, unitl the first radio quiet one was found in 1965, now 95% are quiet. The blue continuum spectra is mainly from synchrotron energy process which also emits radio. Gas in a quasar moves as rapidly [illegible] because of its black hole being millions to billions of solar masses. The now extinct original stars called population 3, may have been consumed by the massive blackholes. Quasars were 500 times more common when the universe was young because galaxies were packed together and contained much more gas and dust for fuel. Galaxy clusters have been found to contain a quasar and whole clusters of quasars have been found in recent years. Linear groupings of some quasars may be because of cosmic strings which is a wrinkle like defect in the formation of the universe. Some quasars vary in brightness in as short as 30 seconds in time and the faintest is +22.5 magnitude. In 1987 the first binary quasar was discovered 12 billion light years distant. They are 4.2 arc seconds apart, but can't be because of gravitational lensing ; because of the different spectra. Also because of both the optical and radio positions are the same.

BL Lacertae objects in the 1920's, when first monitored were thought to be some type of irregular variable star. It was realized in 1968 that they were an AGN that varied much more so (3 magnitudes on average) than quasars. They are the next in line of luminosity after quasars and exist only in giant elliptical and SO galaxies, usually one or two billion light years distant. All are strong at radio wavelengths and all are orientated face on as host galaxies, with their jet pointed directly towards Earth. They are also strong in the infrared and X-ray, having bright contuum spectra, produced by synchrotron energy reacting with the plasma. At minimum light level, weak emission and absorption are barely detectable. It is because of the glaring aligned jects and because dust and gas is sparce in ellipticals and SO galaxy's hub. All BL Lacertaes are highly polarized because of its jet alignment which is also why we nenver see twin jets. Also because of this, they are rare objects (130 known) because of the unlikely chance alignment of a narrow jet with Earth. The relativistic beaming of the jet greatly enhances its brightness, like a beacon from a lighthouse. As with quasar jets, so do BL Lacertae jets have blobs with geometric illusion of matter moving faster that the speed of light.

N-Galaxies were discovered in 1964, which are extremely rare, with about 50 presently known. They are spiral galaxies with an intense starlike nucleus and broad emission lines, indicating gas moving 3500 mps and varies 1½ magnitudes.

Type 1 Seyfert galaxies were discovered in 1943 with about 500 known and with internal velocities of 3000mps. They are almost identical to the N-Galaxies except for the nucleus being slightly extended and slightly less luminous. They are strong emitters at most wavelengths and the hub of the host galaxy has strong hydrogen-alpha emissions. Seyferts have an absolute magnitude of -24 which is the lowest of the four main AGN's. They are the nearest with most being less than a billion light years. Seyferts were ignored for 20 years until quasars came along. In the 40's & 50's, astronomers were having enough problems trying to explain normal galaxies without attempting to solve the riddle of these pecular galaxies called Seyferts.

Two subgroups of AGN's are: type 2 Seyferts which are the very lowest in energy output; one example is M-77 in Cetus. They have internal velocities around 500 mps. This id from expanding filaments of hot hydrogen gas. The other is the Blazars which is the combining of optically violent variable quasars with some BL Lacertae which are both SO galaxies. Both are the most luminous, all are radio loud, polarized and powerful X-ray emitters. When gas is ultra thin and hot, it is unsuitable to produce strong emission lines, but is the right environment for X-rays. In 1987 a clue was revealed about the nature of the jets of AGN's. Blazar jects point more directly towards us than the jets of other types of AGN's. Also, blazars have magnetic fields that are parallel to the flow within the jet. With the other AGN's, the magnetic field is perpendicular.

Some near by objects aren't AGN's, but have a few of their qualities. For example: on March 5, 1979, a mysterious object in the Large Magellanic Galaxy burst out in

but fortunately for only 0.0002 seconds. In our galaxy, a massive binary star catalogued SS 433 has twin jets; with material moving outwards at a $\frac{1}{4}$ of the speed of light.

Today, no other type of object is being researched more than AGN's by professional astronomers and they have stood the test of time quite well. In the early years of the study of quasars, a small number of astronomers thought that they were nearby objects. Because if they were very distant, they would be producing energy at a rate that was physically impossible. But the evidence accumulated over the years is now overwhelming. The sheer existance of other AGN's, which are nearer, clearly show that they are galaxies. Other evidence, is that no proper motion, proves that they are over 60,000 light years away. Not a single example of a blue shifted AGN; all are red shifted, and very much so. The first quasar with a multiple image, form by a galaxy about half the distance to Earth. This is true with all 8 cases known to exist, the first was found in 1979. Fuzz discovered around the nearest quasar happened in 1978 which is the resolved image of the host galaxy, and now dozens are known. The fuzz has the correct size of a galaxy at the distance indicated by it's red shift. The spectra of the fuzz is the same as that of stars in a galaxy's disk. The fuzz has an intensity profile and surface brightness, including internal shape. In 1983 a super nova went off in the fuzz of the host galaxy of a quasar. It was 3 arc seconds from the center and had the correct brightness as that of an object at the indicated redshift. Intergalactic absorption lines have redshift always less than AGN's, and usually about half the shift.

These particular variable galaxies are not all beyond the reach of an amateur telescope, a 6 inch 'scope can show you the quasar sC 273 in Virgo. Larger amateur 'scopes can spot over 20 AGN's of all types, and one is 13 billion light years distant in Cepheus. Some list, of AGN's for amateurs to see with their very own eyes, includ-

dinates can be found in the following sources. The Observers Handbook for 1978, pg. 191; Sky & Telescope magazine, July 1984, pg 15; and April 1983 pg 348; also May 1978 pg 372.

Carl Milazzo

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