NOVA NOTES

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NOVA NOTES are printed bi-monthly (Jan., March etc.) through the courtesy of the Nova Scotia Museum. Contributions on any aspect of astronomy and related topics are welcomed. Contributions for the next issue should reach the Editor by Monday 23 August. Articles should be typed in the format of this issue on one side of each sheet.

UP COMING EVENTS:

July and August: No meetings

17 Sept.: 7:00 pm at the N.S. Museum. Dr. Bishop will give a talk entitled 'Universal Illusions'. Following this at apx. 8:30, we will be holding a public star party in the Museum parking lot. We will need everyone with a telescope to turn out for this. More information will be forth coming.

15 October: An informal seminar type gathering to discuss any and all aspects of mirror making with which you might be having trouble as you make your first (or tenth) telescope. Likewise if you have had success, let us know your secrets and tricks of the trade. Mounting of the finished product may also be covered and demonstrations will be encouraged.

Minutes of the April Meeting

Our regular meeting this month was set back two weeks to April 30 and was held at 8:00 pm in Room AC 147, Saint Mary's Univ. After opening the meeting, Dr. Bishop spent a few minutes setting up final arrangements for the upcoming Museum Societies' Show.

The general theme on this occasion was the Solar System, a grand tour of the planets conducted by several of our members. With our benevolent Sun, President Bishop in the chair, promising to keep a tight rein on his planet-speakers, Chris Purcell started us off on our journey by taking us to the inner most planet Mercury. This object, characteristically very difficult to observe from Earth, was recently photographed by Mariner 10. It apparently has a small magnetic field, probably a large iron core and (for those who are relativity-inclined) is the one of perihelion-shift fame. Peter Reynolds continued outward to Venus, the cloud-shrouded 'twin' of the Earth. This planet rotates very slowly in the retrograde sense, has corrosive acids in its atmosphere and its surface (from what little we know) is very hot (500° C) and relatively smooth. Dr. Bishop then directed us to pass Earth to Mars where Bill Calnen took over. He described the Mars revealed by Mariner 9—dust storms, volcanoes, various landforms and a thin atmosphere. Also mentioned here was the Viking Lander mission and the possibility of finding primitive life forms. Randall Brooks described the giant planet Jupiter—its overall H-He solar-like composition, the rapid rotation rate, the banded structure and composition of the atmosphere, and of course, the Giant Red Spot. Randall pointed out that although Jupiter emits more energy than it receives from the Sun, it is not a star since nucleur reactions do not play a role. Sherman Williams then took us to Saturn, the planet famous for its ring system. He described the structure of the ring system, the nature of the ring particles and some general features of the planet itself, finally leaving us with the thought that the large satellite Titan might harbour some forms of life. Last but not least, Murry Cunningham

was left with Uranus, Neptune and Pluto. Murry chose the historical route describing the discovery of Uranus by Herschel in1781, followed by the discovery of Neptune by Galle at the Berlin Observatory in1846. The latter was made possible by the Leverrier-Adams predictions of Neptunds position. These predictions in turn had been based on the observed perturbations of Uranus' orbit. Finally, Pluto, small and distant, was discovered in 1930.

Following this very comprehensive report on the Solar System, some of the speakers gave a brief slide show and we all enjoyed refreshments.

P.H. Reynolds
Secretary

MINUTES OF THE MAY MEETING

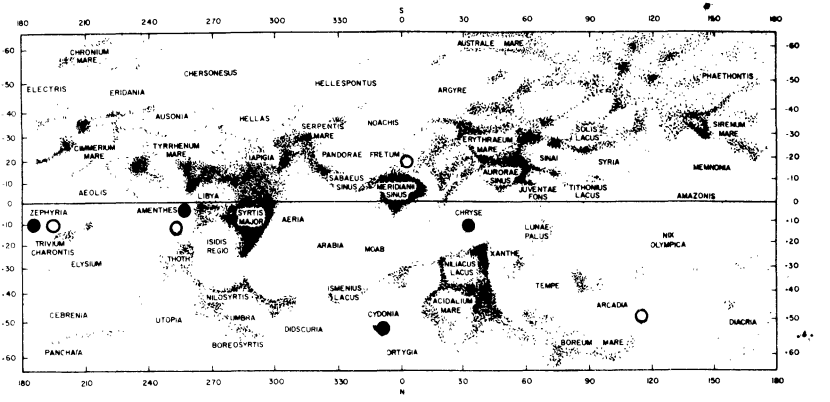
As part of the Centre's participation in the Museum's Annual Societies' Show, the May meeting concentrated on observing for the beginning astronomer. Randall Brooks opened the meeting with a few general announcements, he filling in for our President and Vice-President who were in Calgary for the General Assembly. The speaker for occasion was Miss Mary King. As most of the audience were being initiated into astronomy, her talk centred on basic aspects of observing using the unaided eye. With the use of slides showing the summer sky she pointed out the more familiar sign posts of the celestial sphere giving some of the mythology and personal reminiscences of each constellation. After covering the 'fixed' stars of the summer skies she described when and where to look for the wandering stars—the planets—this spring and summer. Miss King then pointed out with the use of more slides, the major constellations of fall and winter indicating where to locate such objects as the Orion Nebula, Andromeda galaxy etc. The younger setof the 30 plus audience, were intriguedwith the stories of the Hunter, the Lion, Bear and the royal family of the heavens. A number of questions were raised, answerd and followed by refreshments.

BK

THE VIKING PERSPECTIVE

R.C. Brooks

11 months and 460 million miles later and the Vikings are about to land on the Red Planet--Mars. Viking A is already in orbit and B will undergo orbital insertion about the time you receive NOVA NOTES. About 9 days before going into their 24.6 hour synchronous orbits about Mars, the Vikings will begin long range photography searching and checking possible landing sites. As this is being written, the landing date for Viking A has been set back from July 4th to July 8th because the initially chosen site in Chryse was found to be too hazardous. The second site to be scrutinized will be Cydonia, an area at the edge of the North polar hood. Besides considering the geology (surface slope, bearing strength, roughness--the ground clearance of the Vikings is only 22 cm), scientists will be looking for areas with the highest probability of water, low elevations (hence maximum air pressure) and interesting atmospheric structure and winds.



● Primary Landing Sites

o Secondary Landing Sites

Map of Mars from the Observer's Handbook

The scientific duties of the landers will begin about 10 min. before the landing by collecting data on the structure and molecular composition of the atmosphere using a mass spectrometer. The gravitational and wind effects on the descending craft will be measured by a variety of instruments. Data on the ion and electron concentrations, their energies and temperatures will be relayed to the orbiting section for later transmission to Earth. Shortly after hitting the surface--softly--at 10 kmh^{-1}, several of the experiments will go into operation and will operate for the 90 day life expectancy of the probe. The basic experiments are: meteorology and seismic packages; X-ray floresence and gas chromatographic-mass spectrometers; cameras; and biological test packages--the ones that everyone is expectantly holding their breath for. If life exists on Mars will only be confirmed with positive results from the biology group. Negative results will be inconclusive and will imply four possibilities: 1) that the craft landed in a biologically barren area; 2) that life is dissimilar to what we know on Earth; 3) that life is dormant in this period of Mars' history or 4) that life has not and does not exist on the planet. One cubic foot of the environmentally sterile interior is devoted to the three biological experiments: label and pyrolitic release experiments and gas exchange experiment.

A 0.5 cm^3 soil sample will be scraped from the surface, placed in a test tube and feed a solution containing radioactive carbon-14. Any activity by microorganisms will cause them to process the food and in the process of maintaining and reproducing cells, they will release waste gases containing the C-14. After 2 weeks in an oven at 49°c, sensers in the label release package will test for the radioactive carbon products which, if yielding positive results, will mean carbon based organisms are present. The pyrolitic release experiment will hold 0.25 cm^3 samples of soil in a Martian atmoshere (CO_2, CO plus C-14 tracer) for periods of up to five days at which time they will be baked at 625°c. If photosynthesis has occured during the incubation period, the radioactive tracer will be detected in the products of the burnt organisms. On route to Mars, tests of the gas exchange appartus on Viking B have shown a malfunction

but complete loss of the experiment can not be confirmed until the probe has landed and the ovens turned on. A similar problem may well exist in the A lander. If it functions, this package would incubate a soil sample in a water-rich nutrient bath. An atmosphere of H, CO_2 and Krypton will be flushed through the system periodically and this tested by means of a chromatographic-mass spectrometer. Any organically produced molecular compounds would then be detected in the gases. The mass spectrometer part of the experiment will also be used for atmospheric analysis and a second stage of soil study. The former will remove the CO and CO_2, which comprise 95% of the Martian atmosphere, thus making analysis of the remaining gases easier. Results may give some indication of past life on the planet.

The two television cameras on each Viking, stereoscopically scan the lander vicinity yielding information on the geology and environment and using their two data collecting rates (2 or 20 min. per scan) to look for signs of macroscopic life. These will also determine where the samples should be obtained for the previously mentioned experiments. You will also receive live TV pictures from these cameras. The photographic study of the geology will be supplemented by an inorganic chemical analysis which will identify minerals in the rocks by use of the X-ray fluorescence spectrometer. The rocks will be subjected to X-rays to create fluorescence in certain of the elements believed to be present. The detection device is a gas-filled proportion counter and the results will tell us something of the geological processes that have shaped the Martian surface. Subterranian properties will be investigated by the seismometer. It will monitor volcanic and meteoritic activity and in case of a seismic event, the apparatus will jump into a fast data collection mode thus revealing the secrets of the interior structure including possible differentiation of the mineral components into layers. Magnetic properties of the soil and the reaction of the soil to the atmosphere will also be investigated. The meteorology package will during the 90 day life expectancy of the probe, periodically test for daily, seasonal and non-periodic climatic variations.

During the next few weeks, Man will learn millions of times his previous knowledge of the Red Planet and all from a 567 kg marvel of science and engineering.. The liklihood of finding signs of life existing at present are slim to say the least. Signs of life in the past may not be so difficult to find but again I suspect they are slim as well. This venture will, however, go a very long way to satisfy Man's curiosity about our 'canali' crossed neighbor.

SOME RECENT BOOKS ON MARS

1) THE NEW MARS: THE DISCOVERIES OF MARINER 9
by; W. Hartmann and O. Raper (1974); available from the U.S. Government Printing Office, Washington, D.C., 20402 for $8.95 (US) as NASA publication SP-337.

2) Scientific American, Sept. 1975 has a good review on Mars. This journal has been republished in its entirity by Freeman (1975) under the title THE SOLAR SYSTEM.

3) THE VIKING MISSION TO MARS
by; W.Corliss; NASA publication SP-334 available from adress given in 1). No price available.

4) VIKING AND THE SEARCH FOR LIFE ON MARS
by; D. Bane; available from TRW Systems, One Space Park, Redondo Beach, CA 90278

CALCULATING THE MASS OF THE GALAXY

Doug Somers

Ask almost any physics teacher "what is the mass of the Milky Way galaxy?", and if they are busy enough they will tell you:

a) "It is far too large for our best electronic* calculator to even begin to imagine, let alone a mind of your size." or

b) "The galaxy has infinite mass." or

c) "I used to know, but the mathematics are so incredibly involved and complex that I don't have the time to show you how it can be found (and I don't remember)."

Well friends, these people are WRONG. Finding the mass of the galaxy only requires high school physics.

We will make an assumption in our calculations, namely that all stars are within the orbit which the sun traces around the nucleus of our galaxy. This of course is not true, as our sun is about 10 kiloparsecs (1pc equals 3.26ly) from the center of the galaxy, and the outer reaches of the spiral arms are said to be 15 kiloparsecs from the nucleus.

If we consider, however, that the stellar density is greater near the nucleus of the galaxy, then the number of stars outside the sun's orbit becomes less crucial, and we may expect less error in our answer. See figure 1 below for the exagerated diagram depicting star density and the solar orbit.

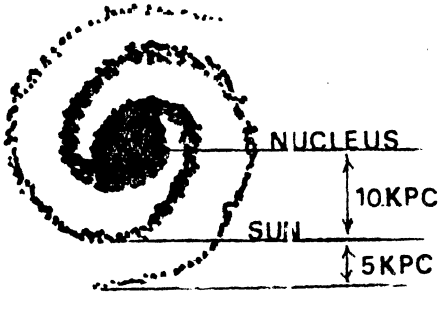


FIG. 1

To begin with, we will use the Newtonian equations involving force and acceleration. Equation 2.0 represents the acceleration of a body towards the center of its orbit, while 1.0 and 3.0 are more general in nature.

$$F = M_1 A \qquad 1.0$$

Doug Somers

$$A = \frac{V^2}{R} \qquad 2.0$$

$$F = G\frac{M_1 M_2}{R^2} \qquad 3.0$$

(Note: F - Force; M_1- Mass of the sun; M_2 - mass of the galaxy; A- accelleration; V - velocity of the sun around the galaxy; R - the distance from the sun to the center of the galaxy; G - the gravitational constant)

It may also be pointed out that all of the mass in the galaxy can be considered to exist at a point at the center of the nucleus. Thus R attains a definite value.

First, we substitute equation 2.0 into 1.0:

$$F = \frac{M_1 V^2}{R} \qquad 4.0$$

Then, since 3.0 and the newly-formed 4.0 both represent force, they may be equated:

$$M_2 = \frac{M_1 R^2 V^2}{M_1 R G} = \frac{R V^2}{G} \qquad 5.0$$

Finally, since we're interested in the mass of the galaxy, we solve the equation for M_2. Notice that M_1 cancels out, so that we do not need to know the mass of the sun.

$$G\frac{M_1 M_2}{R^2} = \frac{M_1 V^2}{R}$$

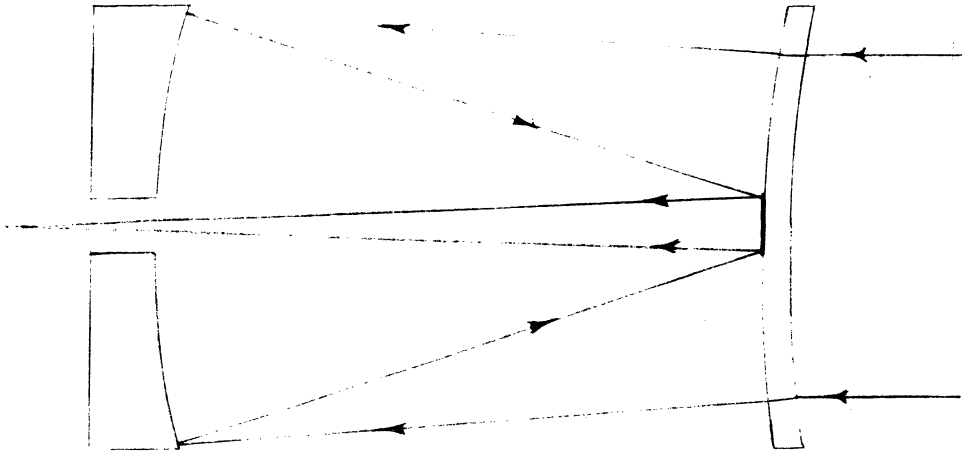
*as opposed to manual

THE STORY OF THE CATADIOPTIC TELESCOPE

Bill Calnen

During the second World War, a Russian astronomer and optical designer named D.D. Maksutov made what is possibly the greatest advance in telescope design since Newton invented the first reflector. The parabolic mirror used in most reflecting telescopes have several basic defects. These cause the image to deteriorate very rapidly away from the central axis, a fault that is very noticable with short f/ratio mirrors.

Maksutov made the primary mirror spherical and then corrected the aberations produced by the mirror by placing a correcting lens, also having spherical surfaces, in front of the mirror. The correcting lens had exactly the opposite faults of the mirror; the mirror and lens together resulted in an almost error free system. A combination lens and mirror system is known as catadioptric system and Maksutov's type of catadioptric design now is named after him.



OBSERVATION PLANNING AID

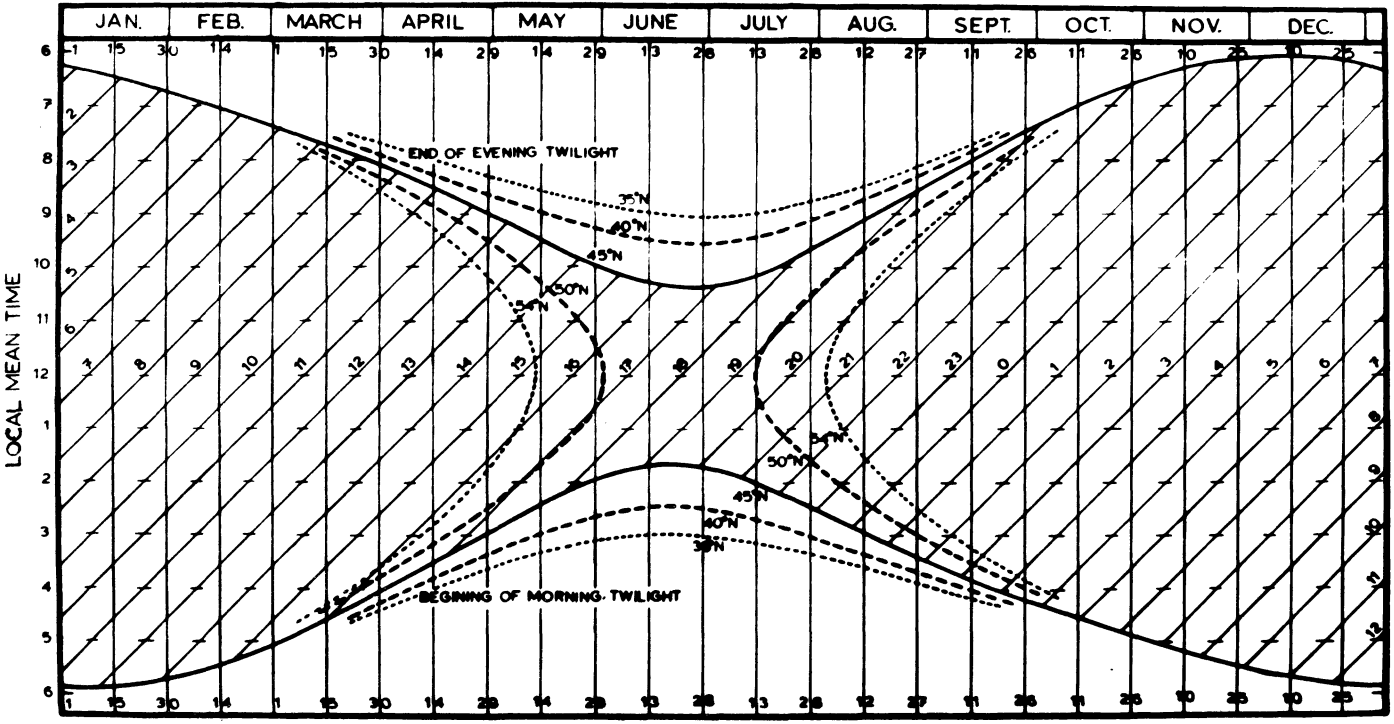
R.C. Brooks

The chart on the following page has been drawn to show for various latitudes, times when the Sun is 108° from the meridian, ie. the end of astronomical twilight in the evening and the beginning of astronomical twilight in the morning. The time is local mean time, therefore a correction is required for standard time as described on p. 14 of the '76 Observer's Handbook. For Halifax the correction is 414 m. which results in a downward shift of the entire chart by about 3 mm.

The chart may also be used to determine the Right Ascension of objects on the meridian (ie. the sidereal time) for any day and for any time of the night simply by use of the diagonal lines. Ex. You are planning to go out at 3:00 a.m. (LMT) on Feb. 14, what is the sidereal time? 12:25 apx. Therefore M61 (RA 12 h 20 m, Dec = 4°04' 39') will be very close to the meridian and will be suitably placed for observation.

The reverse procedure can also be used. If you want to know what time of year you will be able to see some object, first look up the RA. Let's take M 42, the Orion Nebula, as an example. Its RA is 5 h 34 m. Locate the diagonal lines for 5 and 6 h and estimate the 34 m line. Then on any date on which this line appears between the twilight lines, the Orion Nebula will appear on the meridian and hence favorable for observation (Oct 5 - Feb 24). But it may be seen for almost 6 h before and after meridian passage since its Dec is near the celestial equator (-05° 24'). Thus it will rise when the ST is apx. 23 h 30 m and will set at ST 11 h 33 m. From apx. Aug 6 to April 29, M 42 will technically be visable from Halifax.

Note that the days on which ST 0, 6, 12, & 18 h cross the meridian at midnight coincide with the equinoxes.


JAN.
FEB.
MARCH
APRIL
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
LOCAL MEAN TIME
END OF EVENING TWILIGHT
35°N
40°N
45°N
50°N
55°N
BEGINNING OF MORNING TWILIGHT

With the values R = 3.084×10^{20} meters, V = 2.62×10^{5} meters per second, and G = 6.67 meters^3/kilogram-seconds^2, we substitute them into the final equation 5.0:

$$M_2 = \frac{(3.048 \times 10^{20})(2.62 \times 10^{5})^2}{6.67 \times 10^{-11}}$$

and thus:

$$M_2 = 3.17 \times 10^{41} \text{ kg}$$

A quick check in the Observer's Handbook states that th mass of the galaxy is about 2×10^{11} solar masses. If we divide the mass of the galaxy by 1.98×10^{30} kg, which is the mass of the sun, we obtain:

$$M_g = \frac{3.17 \times 10^{41} \text{ kg}}{1.98 \times 10^{30} \text{ kg}} = 1.60 \times 10^{11} \text{ solar masses}$$

This is surprisingly close to the astronomers' accepted value. Maybe they did it the same way.

NATIONAL OFFICE ADDRESS CHANGE

Effective 15 July 1976 the address for the National Office of the RASC will be:

RASC,
124 Merton St.
Toronto, ONT
M4S 2Z2

In case you haven't heard, the old 252 was sold for the outrageous sum of 185,000 dollars.

After passing through the correcting lens, the light rays of the incoming beam are reflected by the primary mirror to the secondary mirror which is located on the back surface of the spherical lens. Then the secondary mirror reflects the light to an eyepiece which is located behind the primary mirror in Cassegrain style. The Cassegrainian-Maksutov combines the principles of both refractors and Cassegrain reflectors but none of their defects. The spherical-shaped optical mirrors are simpler to make than the paraboloized surfaces of reflectors, thus they can be made more accurately with less effort and at less expense. The lens in a Maksutov is very thin and the optical system acts essentially as a reflector and does not have the severe chromatic and spherical aberrations inherent in a refractor (which are corrected at great expense and effort)

By having the correcting lens at one end of the telescope and the mirror at the other, the tube can be sealed as in a refractor. This method stops air currents in the tube that could interfere with the resolution and prevents the entrance of dust and pollutants that could reduce the mirror's efficiency. The doubled path length reduces tube length and keeps the observer at the back end of the telescope as in a refractor. Maksutov-designs have become very popular with telescope and camera makers--the well known Questar is a Maksutov design and Nikon now makes a 1000mm telephoto lens for their 35mm camera which is of the same optical design. The Questar has an f/12 focal ratio using a 3.5" mirror but the tube is only a foot in length! And as everyone knows, this is an excellent instrument and highly recommended if you can afford the $900 (US) price tag. The Nikon 1000mm Maksutov telephoto sells for $1200 in Halifax but when compared to the $1500 or more for a standard lens of the same focal length and when compared for size and weight it is the obvious choice assuming one is in the market for such anitem.

(Ed. note: If anyone is interested in finding out more about Maksutov telescopes consult the following;
Gregory, p. 440, July 1957, Sky and Telescope.
Louth, p.40, July 1966, Sky and Telescope.
Bulletin C from Sky Publishing, 49-51 Bay State Rd., Cambridge, Mass. 02138. $1.00.

GUIDE TO METEORS AND METEORITES

Photography of Meteors

Michael Boschat

Amateur astronomers who become interested in meteor observations will want to photograph them to better determine their height and speed. What type of camera to use? A single lens reflex (SLR) 35mm camera will be the most easily accessable for most people and it should be equipped with an f/1.2 to f/2.8 lens. Having thro-the-lens focusing, you will be able to compare the view in the camera to your star charts so as to centre on the desired field. You will, by following this procedure, be able to tell if a meteor has passed in view of the camera. The camera must be mounted on a tripod or on the ground facing the desired direction but when on a tripod should be kept as close to the ground as possible to avoid wind vibration. A simple mounting for the camera could be constructed from 2 x 4's but again keep the height down.

In choosing the film remember that the majority of objects will be fast moving and faint, hence choose a fast film. Most easily availabe is Tri-X (ASA 400)but types such as 2475 Recording (ASA 1000) and Royal-X pan (ASA 1250) are easily obtained from the larger photo shops. Colour film can be used but for serious work,they should be avoided.

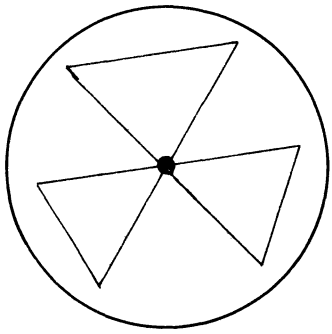
Spectrographic Infrared photography :
Again a 35mm camera can be used to capture the bright line (emission) spectrum of the incandesent meteor fragment. This may be achieved by use of a dispersive element such as a prism or grating. The main problem here is to balance the required dispersion with an adequate field of view in order to get an effective number of results. Unless a large film size is used, short focal length lenses are required. This means that the prism or grating MUST have maximum dispersion. In the case of a prism the angle should be large, however this leads to excessive absorption at the thick end. It is thus best to compromise with a

refracting angle of 30° and the prism made of dense flint glass.

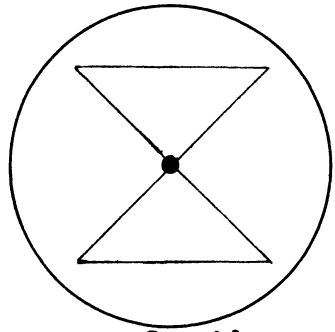
If a grating is used, it should have at least 5,000 lines per inch and be blazed to throw most of the light into the first order spectrum and the blue end of the second order. The diffraction grating or prism must now be mounted in front of the camera lens. However, in lining up the camera remember that the light will be bent perhaps as much as 30° in the dispersive element and the camera will then have to be offset by this angle in order to photograph the desired area of the sky. Most of the bright sporadic meteors descend steeply through the atmosphere. Therefore, align the grating with the lines running vertically (do the same with the refracting angle of the prism).

Meteor spectrographs are always used on stationary mountings--the trailed stellar spectra being of little trouble and are actually useful in reduction of the photos. Best results are obtained with the brightest meteors and when the stream is 40° to the side of the field of view and the camera pointed to an altitude of 50°. The use of infrared and UV sensitive films have been successfully employed in the US by amateur astronomers, they being abl to record meteors unseen by the naked eye.

Other experiments one could attempt are: 1) use a fast rotating shutter in front of the camera lens. Such a shutter could be made of cardboard with three triangular holes cut in it as shown below. It is mounted on a small battery driven motor and results in a meteor trail broken into small dashes. These can then be measured and the velocity of the meteor determined using certain assumptions. The same effect can be obtained using the glass from an old pair of polaroid sun glasses. 2) If you can find friends interested in meteor observing you may be able to find the height and trajectory of some of the brighter objects. Two cameras placed about 20 miles apart and aimed at the same part of the sky will, if you are fortunate, record the meteor trail. The trail can then be compared to the background stars and the path computed by triangulation. With extreme luck you might be able to find the landing place of a bolide.



simple



polaroid

Rotating Shutters

To set up a rotating shutter, you will require a disc about 2½ times the diameter of the camera lens. A pattern of holes as shown above (right) will give the required slashed light streak. This disc is then placed on the shaft of a small DC motor whose rotation rate is known or can be found and which should be 10 or 15 per second. This rotation rate should be determined as accurately as possible. The disc and motor (with its power supply) should be mounted on a small platform on which the camera can be placed and aimed at the sky. You are now ready to take the apparatus outside and photograph meteor trails. Exposures of 1 or 2 hours can be achieved with low fog levels in a dark area with the lens wide open. The chances of recording a 'shooting star' are very good during a shower, so good luck.

To set up a polaroid shutter device, you will need 2 pieces of polaroid material, another disc and the same motor as used above. The polaroid glass must be aligned so that one piece will have the polarization verticle when in front of the camera lens and the other horizontal when in front. To find the polarization orientation, hold the polaroid material facing light reflecting off glass or water--maximum glare will indicate one orientation and minimum glare the other orientation. Fix the two pieces permanently to the disc. You are now ready to attempt some observations. One last word of precaution. When mounting the camera and motor to the base, use some foam rubber to dampen out vibrations from the motor as these will severly affect your results. What type of film should you use? Tri-X or Recording Film 2475 (ASA 1000) are best. Remember persistance is required for sucessful meteor observations.

TELESCOPE RAMBLINGS

The Sagittarian Teapot

As twilight fades on a transparent, moonless, summer night in the country, one of the most beautiful portions of the celestial sphere slowly emerges out of the gathering gloom to cast its spell across the southern sky. This apparition is not formally recognized by a name. It is not a constellation, nor a Messier object, but it is a blend of several features of the summer sky. To me it is the "Sagittarian Teapot", complete with its ascending clouds of water vapor and a small butterfly flitting near its spout. Being best observed during warm clear nights from the wilderness areas of our province, this is perhaps why this pattern evokes such pleasant, mystical feelings in those who are familiar with it.

The teapot is, of course, the pattern made by the brighter stars in Sagittarius. Complete with handle on the east, cover on top, and spout to the west, it is unmistakable. Immediately off its spout is a large puff of "steam". This puff is an incredibly rich portion of the Milky Way and lies in the direction of the center of our Galaxy. Above this, separated from one another by intervals of about five degrees, are three smaller puffs. The lowest contains the bright, naked-eye Lagoon nebula, M8. The next contains the spangled small cloud of the Milky Way, M24. The upper puff is in the vicinity of the Omega or Horseshoe nebula, M17. Above these is a second large cloud of steam, a bright portion of the Milky Way at the tail of the eagle, Aquila. In it is the rich open cluster M11.

And the butterfly?? With binoculars look a few degrees due west of the spout of the teapot. There you will find the misty twinkle of the open cluster M6. With binoculars on a dark, clear night it requires little effort to see in this asterism a small butterfly with wings spread, flitting southeastward as if to avoid the clouds puffing out of the teapot, or perhaps to alight on the flower-like sprinkle of stars just ahead of it, the cluster M7.

An excellent photograph containing the butterfly and the surrounding stars appears on page 226 of the October 1974 issue of Sky and Telescope. However, to fully appreciate the spell of this portion of the night sky, take your binoculars and find a dark, clear night this summer remote from the haunts of men.

Roy L. Bishop
Maktomkus Observatory

NOTE OF THANKS

As co-chairman of the recent Societies' Show, I would like to take this space to thank those who assisted by donating display material; time for setting up, mirror grinding and star nights. In particular Mike and Pete Edwards should be singled out for assisting on several occasions with their usual good humour and friendliness.

If anyone has not had their display material returned please call me at 422-7361 ext 255 and I shall look into it for you. I have a chart showing a round trip flight plan for Apollo. Would the owner of this also please give me a yell so I can deliver it.

R. Brooks

A couple of years ago, I had a call from a reporter of a local paper concerning a rather odd phenomon which he said had occured in 1913. The event was the Cyrillid shower of Feb. 9 or sometimes refered to as the Canadian Fireball Procession. The reporter was trying to find some way to put forth arguments in favor of extraterrest life being the responsible force. His main points hinged on the odd nature of the orbit of these strange bodies. No less an observer than C.A. Chant of the Univ. of Toronto witnessed this procession and he followed up with an article in the Journal of the RASC (June, 1913) which included descriptions by several observers in the Toronto area. The procession consisted of groupings of 'sparks' which moved horizontally across the sky in a fiery red display which lasted over 3 min. Chant gathered reports of sightings from papers and was able to construct the path of the meteors from northern Wisconsin, across the Great Lakes and southern Ontario and out over the Atlantic near New York. Later reports extended the 'Chant Trace' as far south as Cape San Roque, Brazil, these reports coming from sailors and Bermuda.

J.A. O'Keefe of the Goddard Space Flight Centre wrote an article for Sky & Tel (Jan 1961) which analysed the orbit after a lengthy search of papers from over North America. The shower he concluded was observed on only one pass which thus allowed him to draw certain conclusions about the orbit. He showed how a normal parabolic solution could not give the horizontal path observed. A circular orbit similar to that of an Earth orbiting satellite was proposed by O'Keefe. The bodies were Earth satellites which had been in orbit for several passages but the perigee decreased gradually and on the final pass, they heated to luminesence. He also attempted to conclude that the origin of tektites is in showers similiar to the Cyrillids and that they have a common source—perhaps the Moon as a result of meteor impacts.

The reports of this unique display are quite interesting and worth the effort to look up—the Journal for 1913 can be found in the Dal Science Library. The reporter never did write his article as far as I know, which in the long run is just as well for the well being of astronomy.

NEWEST DISCOVERED NEIGHBOUR?

You are all familiar with the list of Nearest Galaxies on p. 109 of the Handbook. Well a new member may belong in this list of the Local Group of galaxies. S.C. Simonson, in a letter to the Astrophysical Journal Letters (1 Nov), has reported what just may be a satellite of low mass (less than 1 billion solar masses) and at a distance of 17 kpc (56,000 ly). You are all also familiar with M51 which is another galaxy with a very close companion, the companion distorting the spiral arms of the larger. The Milky Way's arms in the vacinity of the constellations Orion and Gemini, have been noticed to be distorted in the 21 cm surveys. The arm rises above the recognized plane of the galaxy by several degrees. Such a distortion could be due to a small neighbouring galaxy, but no condensations which could be the stars of theis galaxy can be seen on the Palomar Sky Survey prints. This led Simonson to the conclusions that the object must be near and hence of wide angular extent and low surface density, that it lacks the usual characteristic nocular bulge and that it lacks nonstellar objects such as star clusters and ionized hydrogen regions.

Using the 21 cm hydrogen data, Simonson shows what he suspects is the centre of the companion and the bulge may be the tail produced by tidal forces. The velocity measures of the region support the contention that something abnormal is acting on the stars of our galaxy. Using computer simulation, Simonson has been able to mimic the distortion using a galaxy of 100 million solar masses at 17 kpc. Such a mass is only 1% of the Milky Way's.

If this theory is confirmed, it will join the 8 known Milky Way satellites—6 dwarf ellipticles and the Large and Small Magellanic Clouds. What to call it? Simonson says (sic): "I call it 'Snickers", because it's like a Milky Way, only peanuts."

OBSERVING REMINDERS

Wed July 14 — Alpha Cygnids. Meteors radiate from RA 20^h56^m Dec +47°. Full moon will be bothersome.

Sat July 24 — Mercury 0°.4 north of Venus in the early AM

July-Aug — Periodic Comet d'Arrest passing perihelian. See Observer's Handbook p.80. It will reach magnitude 6.4 about Aug. 10. This comet was discovered in 1851 and this passage will be the most favorable since then. It will only be 0.15 AU's from Earth.

26-31 July — Delta Aquarids reach max. activity on Wed the 28th. Radiant point is far from the New Moon at RA 22^h36^m Dec -11°. With a radiant that far south a camera pointed to the zenith may have a good chance of capturing an image.

Sun Aug 1 — If you happen to be in Saint John's, NFLD. just after dusk, you may have a chance to see Alpha Virgo undergo a grazing occultation by the Moon. Come to think of it that's about the time I'll be flying towards Europe, so if you hear about some kook hi-jacking a plane....

10-14 Aug — Perseids reach max at Midnight Aug 11 (to 12) Moon 2 days past full. Oh well!

21-31 Aug — Zeta Draconids. RA 17^h28^m Dec +63°

Thur Aug 26 — Greatest Eastern Elongation of Mercury, ie. look to the West after sunset. Even though it is 27° from Sun along ecliptic, it is only 6° above the horizon at sunset. Very unfavorable.

Sat Aug 28 — Occultation of Alpha Virgo (mag. 1.2). Spica will disappear after 8 pm ADT behind the bright limb of the Moon which is 3 days from New phase. With Spica being this bright, a series of photos showing its disappearance is a possibility.

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