R E G U L U S

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TERRY IN REFRACTORLAND

A Brief Account of Observations
With 3 to 7-inch Refractors

by Terence Dickinson

[**EDITOR'S NOTE:** I am extremely pleased to have received an article such as this for our Centre's newsletter. Terry is a recognized writer and observer, and his comments on refractors, at a time when Mars is spectacularly placed for viewing, are most appropriate.]

My misspent youth included two evening activities that can be discussed in a polite publication: snooker on cloudy nights and telescope observing when the sky was clear. I still find both enormously challenging and rewarding pastimes. In my basement, under the snooker table, three telescopes await their turn under the stars.

Over the past 30 years, my observing started with refractors and has come full circle.

The telescope I used most from age 16 to 21 was a Unitron 3-inch f/16 equatorial refractor. In 1960 it cost me $375, a year's savings from part-time and summer work at 55 cents an hour. Though Unitron refractors were standard equipment in the 1950s, today they have priced themselves right out of the market. I haven't even seen a 3-inch Unitron equatorial for almost a decade. A comparable instrument in many respects--and much better value--is the Celestron 80mm f/11.4 Super Polaris equatorial refractor.

The 3-inch was a revelation compared to the flimsy 60mm refractor I had started out with in 1958. It was rock steady with silky slow notion controls and a thick hardwood tripod. It came with six eyepieces as standard equipment, though most of them were of mediocre design compared to eyepieces today. Star images in the 3-inch were tiny pinpoints. I can recall splitting the double double at 48x. Lunar and planetary images were superb as well. One night of excellent seeing (March 28, 1963), Mars was only 9.8 seconds in diameter, but on my drawing of it made at 200x, the north polar cap, Acidalium, Niliacus Lacus, Xanthe, Lunae Palus, Aurorae and Meridiani Sinus are all shown. In retrospect, the optics and contrast efficiency had to be perfect to reveal that kind of detail.

Furthermore, the exceptionally long f/16 focal ratio reduced chromatic aberration almost to zero. Only on Venus did the slightest tinge of purple emerge. This performance is equivalent to what is accepted as apochromatic today. I remember being shocked when I finally got a peek through bigger refractors and saw the violet halo around Jupiter, Saturn and bright stars. But I was even more dismayed by the apparent erratic performance of the Newtonians used by most of my colleagues. They ranged from a 6-inch f/10 that produced pinpoint stars and exellent planetary detail, to pitiful telescopes that could never be properly focussed. At the time, I was unaware of the devastating effects of improper collimation, tube currents and large-aperture seeing limitations that affect Newtonians. I attributed it all to poor optics.

Regardless, that experience led me to seek a larger refractor as my next telescope. It was a 7-inch f/17 refractor built by Harold Brain, a Toronto telescope maker active in the 1940s and early 50s. I bought it for $200 from Archie Ostrander, a prominent observer in the Toronto Centre in the 1950s. He regarded it as a white elephant and was glad to get it out of his garage. It had been used for years on a pier in the open, protected by a boat cover. The mount was, in effect, a rusted piece of yard sculpture.

I could salvage only the counterweight. Likewise the focuser was trash.

However, a few months later (August 1966) I was in action from my own roll-off observatory in suburban Toronto. The Big Eye, as everyone cal led it, was the largest refractor in amateur hands in Canada at the time. But, as we all learn sooner or later in the backyard astronomy game, big isn't necessarily better. Everything moderately bright was prominently adorned with a purple wreath -- chromatic aberration. There was also some astigmatism in the home-built objective. To get rid of most of it I had to diaphragm the scope to 5 1/4-inch f/23 refractor, but it was a comparative disappointment as a 7-inch telescope. In any case, two years later a large shopping centre was built about a mile away, greatly reducing the effectiveness of the observatory. In 1969 I sold everything.

From 1970 to 1983 I owned and sold the following: 4, 6, 8 and 12 1/2-inch Newtonian reflectors, 8 and 10 inch Schmidt-Cassegrains, and 4 and 6-inch Quantum Maksutovs. I enjoyed them all, but always in the back of my mind were those razor sharp images in the old Unitron. The Quantums came close, but there was still a difference. I wasn't about to go back to small aperture, but it kept bothering me that the performance of the 3-inch could not be scaled up to larger apertures.

Theoretically, an unobstructed optical system is the optimum design. In practical amateur instruments, only the refractor is unobstructed. Furthermore, less than perfect lens surfaces introduce far less aberrations into the system than mirror defects. But the refractor nemesis is chromatic aberration which skyrockets as aperture increases. An otherwise fine 6-inch f/10 refractor has more than 30 times as much as a 3-inch f/15. To produce the same essentially colour-free images as the 3-inch, the 6 must have its chromatic affliction reduced by 97 percent.

In the late 70s I heard about Takahashi's new fluorite refractors with exceptional colour correction. More recently, other manufacturers have offered fluorite refractors as well. When used as one of the full-aperture elements in a doublet objective, fluorite eliminates false colour to below visual threshold, even on Venus, but the cost of 5-inch or larger versions remains astronomical.

By 1984 another option had quietly appeared on the scene -- triplet objectives by Illinois-based Astro-Physics. In 1985 I ordered a 5-inch f/12. The first night with that telescope convinced me that, <u>at last</u>, the quest was over. Here was a telescope that acted like a scaled-up version my old 3-inch Unitron. I immediately put my other telescopes up for sale to finance another Astro-Physics refractor. After a few months' observation with the 5 f/12, I couldn't resist. I ordered a family of three shorter focal-ratio Astro-Physics refractors, a 4-inch f/6.5, 5 1/2-inch f/7, and a 7-inch f/9.

The 4-inch and 5 1/2-inch have similar performance to the 5 f/12 (the 4 a bit more residual colour, the 5 1/2 a shade less), and their shorter tubes make them excellent field scopes. I use them for my college astronomy classes and public star parties. (With the telescope collection starting to get out of have, I reluctanlty sold the 5 f/12 to Marty McConnell.

The 7-inch took 20 months for delivery, but it finally arrived in May -- the first one shipped to Canada. It was worth the wait. Roland Christen of Astro-Physics has eliminated all the old refractor problems. The Astro-Physics design so effectively supresses chromatic aberration compared to a traditioanl doublet refractor it is as if the refractor has been reinvented. On some Astro-Physics models there is a touch of false colour still left that can be seen if you look for it in stringent tests, but the new Starfire series are virtually colour-free. In my 7-inch Starfire there is a vague hint of blue tinge around Venus, but it is very faint. I have seen not a trace of chromatic aberration on anything else, even Arcturus and Vega.

Since I am fortunate enough to have the largest apochrcmatic refractor in private hands in Canada, at least for now, I should report some of the observations made with the 7-inch. Saturn was particularly impressive even though it is so low this year. Cassini's division is obvious all the way around, as expected, but I thought I glimpsed Encke's too. The disc of Saturn has at least four belts, and I thought there was some detail on the equatorial belts. Mars at 8.9 seconds in average seeing revealed a huge south polar cap. Syrtis Major and Libya were evident on the gibbous disc.

In deep sky tests the 7-inch was judged by three experienced observers to be about equal to a good 10-inch f/5.6 Newtonian in detecting faint objects, and superior in revealing detail such as galaxy dust lanes and individual stars in the cores of globular clusters. At 180x M13 is amazing. At 40x the 1.6 degree field is stunning. M81-M82 and NGC3077 are beutifully framed. Planetary performance was no contest making the scope's versatility incomparable. Of course, the conparison is partly unfair in that the refractor cost several times as much as the Newtonian reflector. But it does demonstrate the several-inch advantage gained by unobstructed high-contrast optics that transmit about 97 perecent of the light entering the lens.

The Astro-Physics scopes cost between $300 and $800 (Cdn) per inch of aperture (tube assembly only), which is less than some manufacturers charge for traditional refractors. Fluorites start at $600 per inch and some models are well over $1000 per inch. (Tele Vue's Genesis has a fluortie corrector only, and its performance is, I'm told by those who have tested it, a shade below true fluorites and the Starfires.)

The other side of the coin is, why pay $3000 for an equatorially mounted 5-inch apochromatic refractor when you can get a fully loaded 8-inch Schmidt-Cassegrain or a 17-inch Dobsonian for the same outlay? Why indeed? Since this is a blatantly biased personal account, all I can say is why I have been smitten by apochromatic refractors.

To me, telescope viewing is primarily an aesthetic experience -- a private journey in time and space. Stars look like tiny pinpoints of light to the unaided eye, and that's the way I want my telescope to show them. The sky background should be close to black, not grey. The limb of the moon should be perfectly defined, with mountain peaks and crater bowls evident in profile. Likewise the lunar terminator is literally a black-and-white case, not grey in the shadows. Planets should appear as sharp-edged globes that focus to perfect clarity in good seeing. A faint star and a faint galaxy should always look completely different. In wide-field viewing the images should be in focus over the entire field.

Those are my criteria for a pleasurable observing experience. I don't want to see fuzz, flares and waviness caused by the optics or incessant tube currents. I want images as close to the real thing as possible. Now that I am seeing them in my new refractorland, I'm spending more time at the eyepiece than ever. You may not agree with my priorities. I expect that most amateur astronomers won't. Apo refractors aren't as compact as Schmidt-Cassegrains, nor can they compete with the brute aperture of large Newtonians. But they come closest to my idea of a perfect telescope.

I'm not on a crusade. I realize refractors are likely to be equipment of the minority for the forseeable future. But I do want to make people aware that apochromatic refractors do offer a new level of observing experience that has not been available until recently.

Terence Dickinson is author of NightWatch, The Mag 6 Star Atlas and six other astronomy books. He was editor of Astronomy magazine in the mid-1970s and is now a full time astronomy writer. He lives near Kingston, Ontario, Canada. This article is reprinted from the summer 1988 issue of the newsletter of the North York Astronomical Association.

THE SYMBOLS OF THE ASTEROIDS

by Warren Morrison

[**EDITOR'S NOTE:** I am delighted to receive a very interesting article on this topic from Warren whose observing skills are world famous.]

For centuries, astronomers have frequently used symbols to designate each planet. These symbols:

Mercury ☿
Venus ♀

Earth ⊕
Mars ♂
Jupiter ♃
Saturn ♄

are very familiar. With the discoveries of the three outer planets, new symbols were invented:

Uranus ♅
Neptune ♆
Pluto ♇

Thus, it should not be surprising that when Ceres, the first asteroid, was discovered in 1801, it too, received a symbol. In like manner, so did Pallas, Juno and Vesta. After discovery of the 'Big Four', there followed nearly four decades before another asteroid was discovered. Commencing in 1845, serches by the astronomers Hencke, Hind, Graham, and De Gasparis resulted in the discoveries of eleven more asteroids by late 1851.

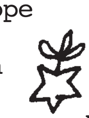
In those days, the discovery of an asteroid was a major event. Perusing old volumes of the Astronomical Journal (which began publication in November 1849, issues of which I examined while working at the Dominion Astrcphysical Observatory in 1977), one regularly sees titles such as 'Discovery of a New Planet', followed by long lists of positional observations made at various observatories. For each new discovery, a name and a symbol were assigned.

As each asteroid was discovered, symbols assumed increasing complexity, and defeated their purpose, for it became quicker to write the name than draw the symbol.

After a total of fifteen asteroids had been discovered, in late 1851, astronomers in Germany, France, England, and the U.S.A. agreed to discontinue the practice (see A.J. # 34, Jan. 1, 1852, p. 80). Instead, each asteroid would be designated by a number within a circle, giving the order of discovery. For example, ① was used for Ceres, ② for Pallas, and so forth.

In modern times, even these symbols have been discontinued, although the numbers themselves are used.

The archaic symbols which were assigned to the first fifteen asteroids are given below. They are taken from an examination of the first 34 issues of the Atronomical Journal. Note that I was unable to locate a symbol for 13 Egeria.

1	Ceres		9	Metis	
2	Pallas		10	Hygiea	
3	Juno		11	Parthenope	
4	Vesta		12	Victoria	
5	Astraea		13	Egeria	Unknown
6	Hebe		14	Irene--A dove carrying olive branch, with a star on its head. (I haven't seen actual symbol.)	
7	Iris		15	Eunomia	
8	Flora				

These symbols are of interest primarily as an historical curiosity. It is however, useful to be aware of their existence should a researcher encounter them while examining astronomical writings from the mid nineteenth century.

Note: In the Astronomical Journal, the editor, B.A. Gould, always referred to asteroid number 12 as Clio, whereas Hind, who discovered it from London on September 13, 1850, named it Victoria, by which it is known today. The name Victoria happened to be that of a minor mythological figire but was also the name of the reigning British monarch at the time. Conscious of their revolution 74 years earlier, American astronomers would not accept this as a name, feeling that the naming of celestial bodies must be free from any suggestion of political overtones. The name, Clio, was therefore assigned to the asteroid. Nowadays, the name Klio (spelled with a K) is given to asteroid nunber 84.

THE VISIBILITY OF MERCURY

by Warren Morrison

[EDITOR'S NOTE: I am almost overwhelmed that a Mercury observer with Warren's accomplishment should submit this significant article on the observation of that planet to our newsletter. Warren has always been very modest about his feat, but I am sure that no one on the face of this planet can approach his achievement of 100 consecutive Mercury observations. Warren, thank you!]

On the morning of February 21, 1988, the writer observed Mercury rising just before the sun. Ony ten days after inferior conjunction, it was still too near the sun to be seen with the unaided eye, but was dimly seen in 7 x 35 binoculars (after first being located in a small telescope) in the bright twilight. This observation would not be of any great interest except for the fact that it marked the one hundredth consecutive apparition of the planet which I have observed. This streak consists of fifty evening and fifty morning appearances, dating back to June 1972. During this period, the planet was viewed on 693 different nights, of which 449 were evening observations, with 244 before dawn.

As is well known, at certain elongations, Mercury is easy to find, whereas at other times it is extremely difficult, some planning being then required to locate it at all. This paper will deal with the numerous factors which affect the visibility of the planet, some of which tend to be overlooked. These factors are Season, Latitude of Observer, Eccentricity of Mercury's orbit, and lastly, inclination of Mercury' s orbit to the ecliptic.

SEASON

This is the well known effect and will not be gone into in detail. The ecliptic's inclination with respect to the horizon near the sunrise and sunset points changes during the course of a year. Mercury, of course, always lies close to the ecliptic. During evenings in winter and spring, and morning in summer and autumn, the ecliptic rises rather steeply from the horizon. Accordingly, for a given angular distance from the sun, the planet at these seasons and times of day is at a higher altitude at sunset or sunrise than it would be in the contrary season. This results in the planet setting about an hour and a half after sunset during springtime evening apparitions, for mid-northern latitudes.

Conversely, when the ecliptic lies close to the horizon (evenings during summer and autumn, mornings in winter and spring) the planet is much lower in the sky and the period of visibility accordingly shorter.

LATITUDE OF OBSERVER

The inclination of the ecliptic with respect to the horizon at any particular time is greatly dependent on latitude. Near the equator, the ecliptic rises fairly steeply from the horizon at all times of the year, and the above described seasonal effect is small. The higher the latitude, the more significant the effect becomes, especially with regards to the unfavourable apparitions. Beyond latitude 50 degrees N, it becomes almost impossible to locate during the most unfavourable ones.

In the southern hemisphere, the ecliptic is in a favourable orientation when it is unfavourable for northern observers and vice versa. Because southern hemisphere seasons are six months out of phase with the north, however, the rule that the best views may be had during spring evening appearances and autumn morning appearances is still valid.

The discussion in most books ends at this point. However, the following factors are also fairly important, and modify the above conclusions.

ECCENTRICITY OF MERCURY'S ORBIT

Because the eccentricity of Mercury’s orbit is 0.206, it is only 0.31 AU fran the sun at perihelion, receding to 0.47 AU at aphelion. When it attains a greatest elongation coinciding with perihelion, its angular distance fran the sun is about 18 degrees, but can be as much as 28 degrees for an aphelic elongation.

The orbit of Mercury is oriented so that its perihelion point is towards heliocentric longitude 77 degrees. That is, on December 9 of each year, its perihelion point lies between us and the sun (Fig. 1). Three months later, the earth having moved a quarter of the way around the sun, we view Mercury’s orbit fran a much different direction. The perihelion point appears to the east of the sun and aphelion to the west.

Hence, when Mercury attains greatest elongation east (evening sky) during the period February - April, it is always near perihelion, and is never much more than eighteen or twenty degrees from the sun. This effect reduces the influence of the favourable ecliptic orientation at that time of year. Conversely, were the planet at greatest elongation west (morning sky) about this time, it could be up to 28 degrees from the sun, being near aphelion. This somewhat counteracts the effect of unfavourable eclitic orientation at that time of year, but such an appearance is still a poor one for viewing.

It is just a coincidence that the most favourable appearances predicted by the seasonal effect coincide with the smallest possible elongations. It is also the case at other times of year. For example, a favourable predawn appearance in September agin placed Mercury near its perihelion point, and again, maximum elongation is only around 18 degrees.

In the southern hemisphere, things are quite differnt, for, rather than counteracting, the two effects reinforce each other. For example, when the planet is in the evening sky during September or October (southen spring), it can be 28 degrees from the sun, ten degrees further than we see in Canada at our best seasons for viewing. The planet can set over two and a half hours after the sun for obervers in New Zealand under these conditions and could still be eight or nine degrees above the horizon when astronomical twilight ends.

Conversely, when the ecliptic is unfavourable (such as in a September morning appearance) it is only 18 degrees from the sun, and is much harder to locate than it would be at an unfavourable apparition in the north.

The eccentricity of the orbit has another effect, for Mercury receives 2.3 times as much sunlight at perihelion as at aphelion. Hence, it then appears as a much brighter object, all other factors being equal.

For example, at superior conjunction (corresponding to full phase and maximum brighthess) coinciding with the perihelion point (such an event must happen about June 8), Mercury is of magnitude -2.3. At an aphelic superior conjunction (around Dec.9) the magnitude is only -1.2. These values are taken from the Astronomical Almanac. (See Fig. 2 for a graph of full phase brightness during the year.) Away from superior conjunction, the planet is somewhat dimmer as it is no longer fully illuminated. Nevertheless, the effect remains. When greatest elongation coincides with perihelion (elongation = 18 degrees) the magnitude is -0.5. When at aphelion (28 degrees) it is only +0.4.

The high eccentricity introduces still another effect. The moment of greatest elongation does not necessarily correspond to half phase as it does in the case of Venus, which moves in a nearly circular orbit. For greatest elongations (either east or west) occurring around June (see Fig. 1), when the aphelion end of the orbit is directed toward earth, the disk may be as little as 38% illuminated. Half phase comes several days earlier (evening sky) or later (morning sky). Conversely, at elongations in December, the planet may be up to 62% illuminated at the moment of greatest elongation. A plot of magnitudes at various possible dates of greatest elongation (Fig. 3) shows magnitudes at both evening and morning apparitions to be somewhat dimmer around May to

July and brighter around November to January, than would be the case if the variation were due solely to the changing intensity of sunlight as seen from the planet.

INCLINATION

The orbit of Mercury is inclined about seven degrees to the ecliptic. The earth is in line with its ascending and descending nodes respectively around November 10 and May 8 each year (at inferior conjunctions around these times, transits may occur). Hence, on the part of its orbit counterclockwise from the point marked ascending node in Figure 1, Mercury is a little north of the ecliptic and somewhat better placed for northern viewers than it would otherwise be. Conversely, in that part of the orbit counterclockwise for the point marked descending node in Figure 1, Mercury is south of the ecliptic. These facts somewhat enhance favourable apparitions from the northern hemisphere, for Mercury is a little north of the ecliptic at these times (November until May). It is however south of the ecliptic during the unfavourable elongations. The reverse is true from the southern hemisphere.

What do all these effects boil down to? The following is a month by month summary for mid-northern latitudes. It is based on the above discussion and also on Figs. 4 and 5, which summarize ny observations over the past one hundred apperitions.

EVENING PLANET (Elongations east of the sun)

Greatest elongation (GE) in Jan.-Feb.

The apperition is favourable, but short, as the planet moves more rapidly at perihelion time. Naked eye observations can commence about two weeks prior to GE and continue until a week after, to within about a week of inferior conjunction.

GE in Mar.- Apr.

The planet can be viewed about two weeks before GE near the time of perihelion, when it is north of the ecliptic. It can be followed with the naked eye during this very favourable appearance for about 7 or 8 days after GE, when it becomes hard to see, as it enters the crescent stage and moving towards aphelion, receives less light from the sun.

GE in May - June

With perihelion falling near the time of superior conjunction, the planet is then very bright, and can be spotted with the naked eye beginning ten days to two weeks afterwards. Then moving towards aphelion, it begins to fade considerably prior to GE, but conditions are still sufficiently favourable to allow it to be seen with the naked eye for a week after GE, and with binoculars for several more days. Using binoculars, the planet can be followed for over four weeks when GE comes at this time of year. In 1973, I followed it from May 31 to July 1, a total of 31 days, although the last observation required a small telescope, binoculars being insufficient.

GE in July - Aug.

The ecliptic is now becoming fairly unfavourable. Apparitions start off fairly bright, since it is shortly past perihelion, but becomes rather dim by the time it reaches GE. Although naked eye observations are possible for July elongations, these usually occur one or two weeks before GE. For August elongations, the planet can be seen with binoculars, but not with the naked eye.

GE in Sept.- Oct.

The ecliptic is unfavourable, the planet is south of the ecliptic, and it is near aphelion and hence rather dim. The only advantage is its large elongation of 28 degrees. Moving more slowly, these apparitions last longer, and binocular observations can occur three or four weeks before GE, bit usually only after first locating it with a telescope. Fading as its phase wanes, it is usually lost to view by the date of GE.

GE in Nov. - Dec.

The planet is very dim in the early part of the apparition, compared to other times of the year, and it is still plagued with an unfavourable ecliptic. Nearer to the date of GE, it comes into view because, approaching perihelion, its tendency to fade as its phase diminishes is counteracted. Also, the ecliptic situation begins to improve late in autumn. Naked eye observations are possible for a few days when GE falls in late November or December.

MORNING PLANET (Elongations west of the sun)
GE in Jan. - Feb.

Fairly near perihelion, it emerges into view fairly rapidly after inferior conjunction, and can be seen with the naked eye for over a week before elongation. Moving toward aphelion, and the ecliptic becoming less favourable, it fades from naked eye view within a week after GE, although binoculars allow it to be followed for some time longer.

GE in Mar. - Apr.

The ecliptic is unfavourable and the planet rather faint. Binoculars or a telescope is needed to locate it. March tends to be a little better than April, for the planet is a little brighter, and the ecliptic not as bad.

GE in May - June

The planet is dim and low in the sky. However, as it approaches superior conjunction after a June elongation, it is approaching perihelion and becomes pretty bright, allowing for possible naked eye observations in early July, following a late June elongation.

GE in July - Aug.

The ecliptic proressively and rapidly improves. It is especially well placed during the two weeks following GE, when nearing perihelion. August apparitions can yield excellent views.

GE in Sept. - Oct.

Excellent! Naked eye observations are possible from about one week before to two weeks after GE.

GE in Nov. - Dec.

Mercury rapidly reappears after inferior conjunciton because it is close to perihelion and north of the ecliptic, which is itself quite favourable. In fact, naked eye observations can come as little as six days after the date of conjunction. The value of GE is somewhat greater than for elongations which come earlier in the autunn. Naked eye observations can be made from ten days before to about two or three weeks after GE. I consider a November morning apparition of Mercury to be the most spectacular of all, providing one is lucky enough to have a fine clear morning in what is normally a very cloudy month.

Mercury Ma[illegible] Ast. Al.
1984 - 1987

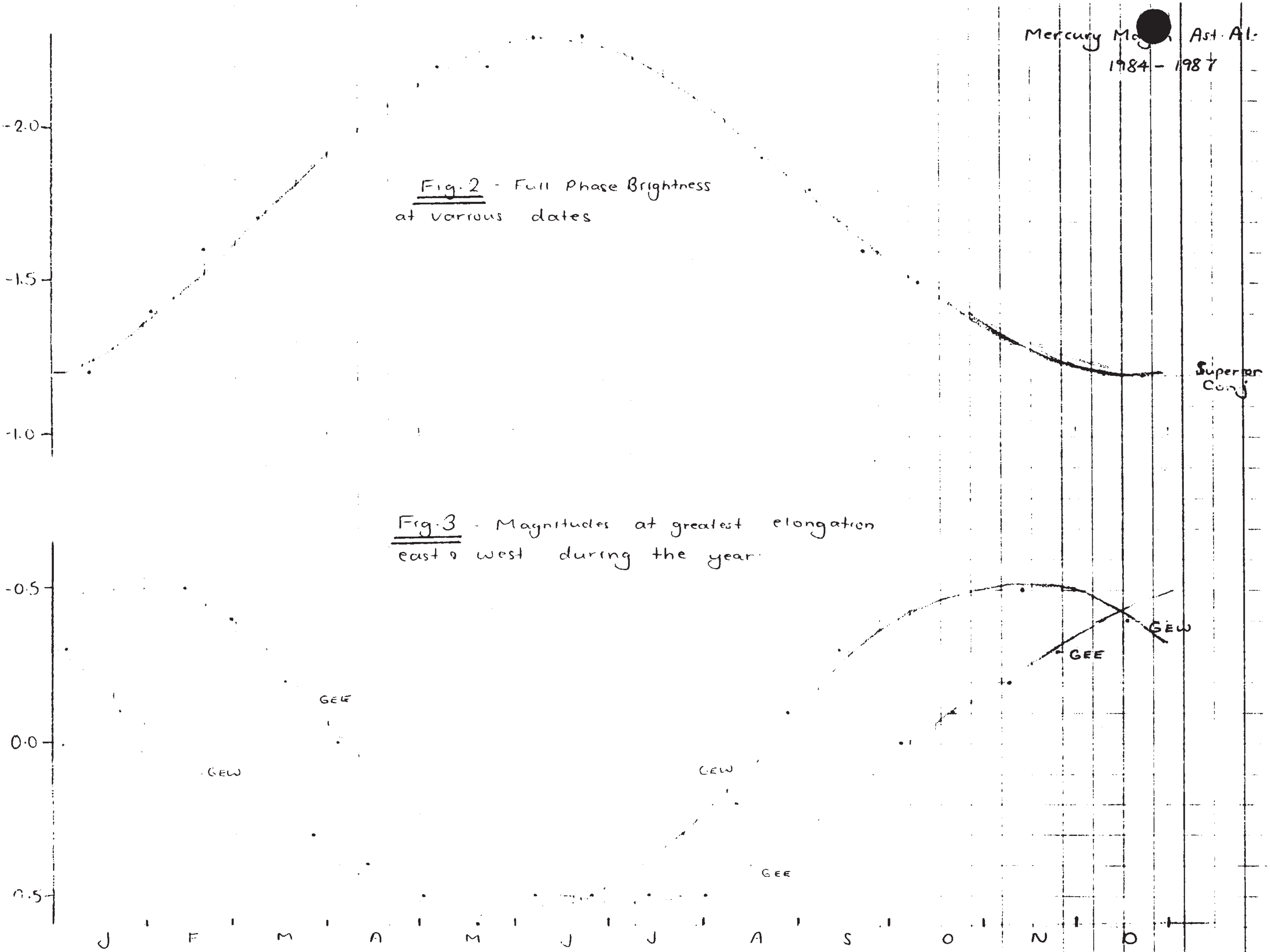


Fig. 2 - Full Phase Brightness at various dates

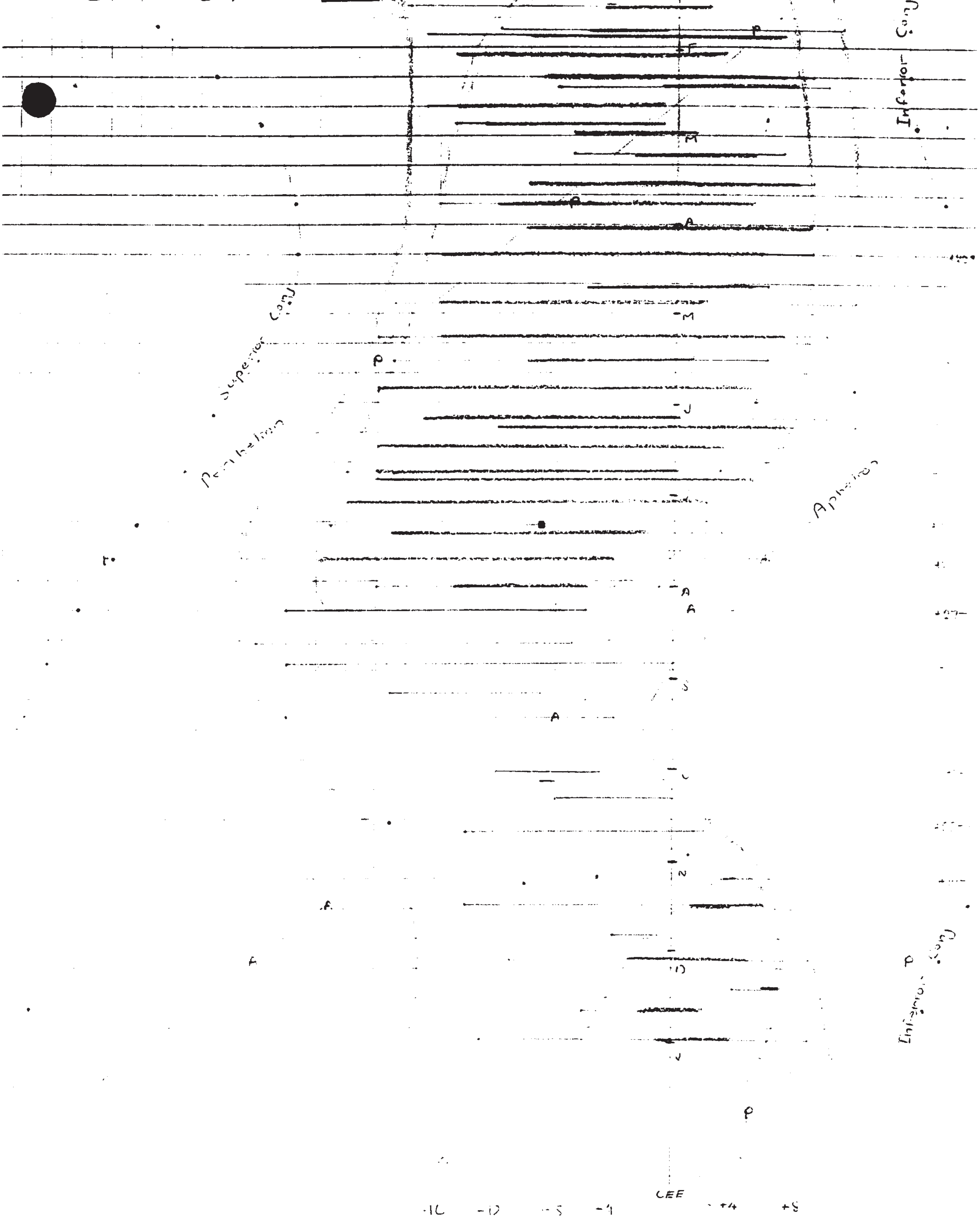
Fig. 3 - Magnitudes at greatest elongation east & west during the year

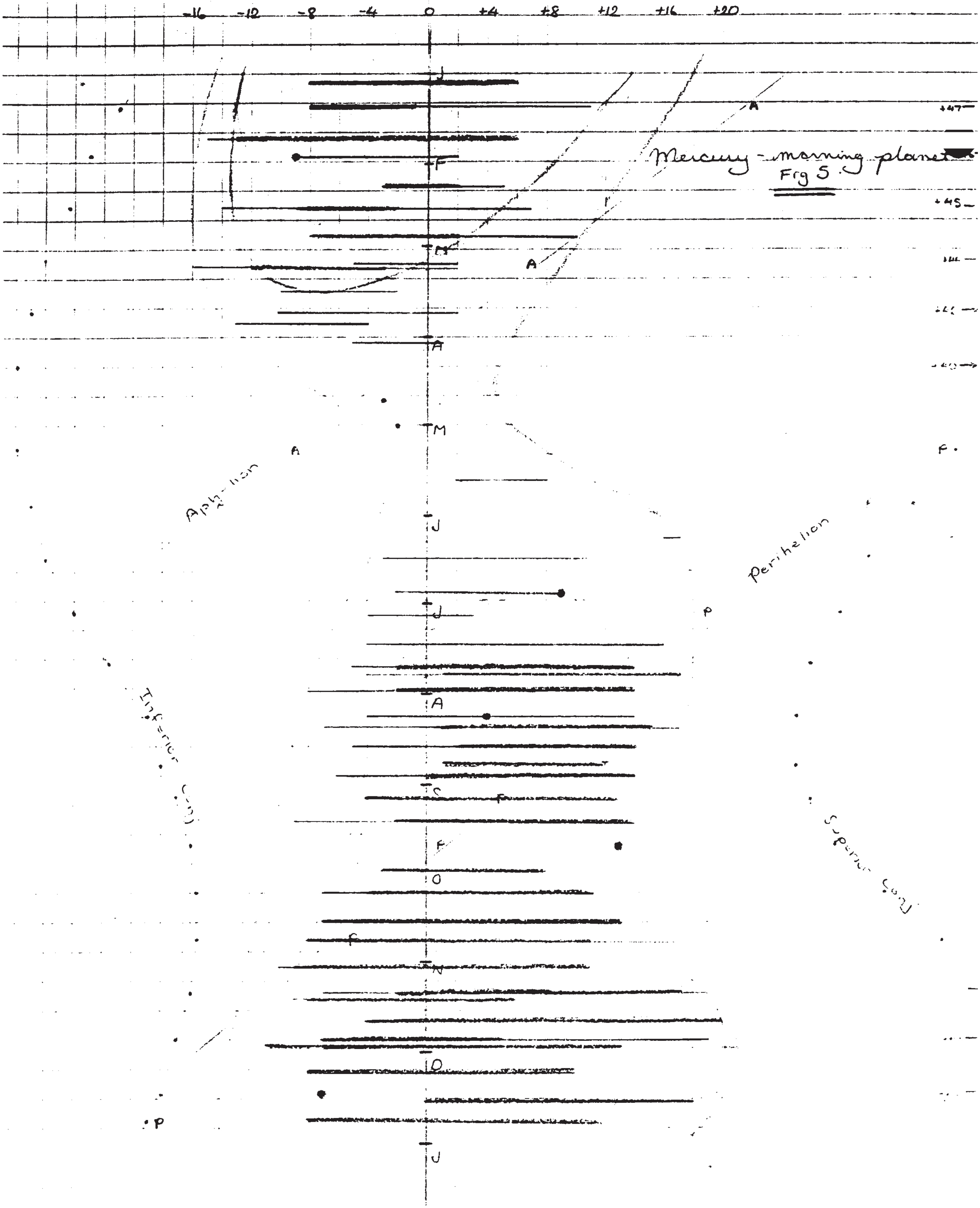
Fig. 1 - Eccentricity of Mercury's Orbit exaggerated for clarity

A - position of Mercury at a greatest elongation point in June

B - position of Mercury at a greatest elongation point in December

Mercury - evening planet Fig 4




Mercury - morning planet
Fig 5
-16
-12
-8
-4
0
+4
+8
+12
+16
+20
J
F
M
A
M
J
J
A
F
O
N
O
J
Aphelion
Perihelion
P
P

EXPLANATION OF FIGURES 4 AND 5

These charts graphically show my observations of those appearances out of the one hundred observed, in which the planet was seen with the naked eye or binoculars. In a few very unfavourable cases, the planet was only seen with a snail telescope, and data for these appearances is not included here. Given proper weather and observing site, it is possible to view the planet in binoculars at least at some time during any elongation, no matter what time of year.

The vertical scale gives the date for a particular GE. The horizontal scale indicates the number of days before (minus sign) or after (plus sign) the date of GE, at which a particular event occurs. The thin horizontal lines indicate the range of dates over which observations were obtained with binoculars. The thicker horizontal lines indicate the range of days over which naked eye observations were made. In a few cases, only a single binocular or naked eye observation was made, indicated by a thin or thick dot, repectively.

In some cases, the period of observation was shortened due to bad weather or other circumstances. Hence the range of dates plotted represents only a minimum range for that particular GE. Hence, I have enveloped the plot of actual observations with blue and orange lines which give a close approximation as to what could be viewed if the weather was perfect every day. (The orange "enclosing lines" are the inner ones; the blue are the outer ones.)

Lines showing inferior and superior conjunction, perihelion and aphelion are also plotted to indicate when each of these events occurs during any apparition.

Take as an example, the GE west (morning sky) which occurs on October 28, 1988. Lay a ruler horizontally across the chart so that it crosses the vertical scale at the October 26 point. Reading fran left to right, we see that inferior conjunction comes about sixteen days earlier, with the first glimpse in binoculars coming five days later. Naked eye observations may be made from eight days before to fifteen days after GE. Perihelion, meanwhile, falls seven days before GE. The final glimpse in binoculars may be obtained about nineteen days after GE, which is still two or three weeks prior to the date of the next superior conjunction.

REPORT OF THE JUNE 1988 NATIONAL COUNCIL MEETING

The National Council of our Society met twice on the occasion of the 1988 General Assembly - the first time on Thursday, June 30, in Room 162 of the Elliott Building on the campus of the University of Victoria, in Victoria, British Columbia. The second time was immediately following the 1988 Annual Meeting of the Society on Saturday, July 2. The National President-elect, Dr. Lloyd Higgs, presided at the first meeting, replacing Mrs. Mary Grey who was recovering from an illness and whose attendance at the meeting was much appreciated. The newly elected officers assumed their positions before the beginning of the second meeting.

Dr. Higgs announced that the first meeting would begin with a special one-hour debate concerning the proposed new constitution for the Society.

Mr. Watson, the chairman of the Constitution Committee, thanked the members of the committee, especially Dr. Bishop who had put the draft issues of the document on his word processor and had received and answered many comments from the Centres of the Society. He also thanked the members of Centres for their comments following the latest draft of Bylaw Number One which had been revised as of Jan 31. The committee had met on that date and through considerable compromise had accomplished a great deal in producing a 32-page document. There would be no attempt in the coming months, he pointed out, to "rush it through" too quickly; on the other hand, there was some concern from some members that approval should come as soon as possible. Through the coming discussions it would be necessary to maintain a spirit of compromise since not everyone would be able to agree on all of the items.

The Constitution Committee had attempted to do a number of things: to codify a number of practices within the Society, to put matters relating to one topic in a single area of the document, to provide cross-references, and to propose some changes.

There was an article-by-article debate on the controversial parts of the proposed bylaw, with a number of members stating their concerns with such topics as surcharges by Centres of the Society.

The regular agenda for the meeting included reports from the officers and standing committees of the Society and a number of other important matters.

Approval by Council was given to the proposal from the Calgary Centre for a national contest to select a poster that could be used by Centres to advertise many kinds of events and attractions.

The Centenary Committee had considered and continued to received a number of suggestions for appropriately marking the one hundredth anniversary of the Society - including a commemorative issue of the Journal and the issuing of a special astronomy stamp by Canada Post.

The postion of International Astronany Day Coordinator was formalized by Council and the nomination of Mr. Steve Dodson, by Mr. Enright, as the latter's successor in that positon, was approved. Mr. Enright announced that in 1989, Astronomy Day would be Saturday, May 13.

Dr. Batten introduced Dr. Jeremy Tatum as the new editor of the Journal.

At the suggestion of Dr. Bishop, the editor of the Observer's Handbook, Council approved maintaining the same price schedule for the 1989 Handbook as was followed in 1988. Dr. Bishop, the chairman of the Honorary Members Committee, invited nominations to fill the one vacancy on the list of Honorary Members of the Society. Also, as the nominating Committee chairman, Dr. Bishop announced the list of incoming officers who would shortly assume their positions - President, Dr. Lloyd Higgs; First Vice-President, M. Damien Lenny; Second Vice-President, Mr. Peter Broughton; Recorder, Mr. Henry Lee; Librarian, Mr. Brian Beattie. It was noted that in the coming year the positions of Treasurer and Honorary President would become vacant and nominations were welcome.

The chairman of the Centennial Fund reported that a draft of a proposed brochure was being prepared - one that would list the aims of the Society and benefits of membership, and invite donations. A special Centennial Fund was instituted by transferring $5000. from the revenues of the Society into this new designation.

Dr. Higgs reported that the first of the Society's new Plaskett Medals had been awarded - to Mr. Richard Grey, a graduate of the University of Toronto.

Council approved the invitation by the Ottawa Centre to hold the 1990 General Assembly in that city on the Canada Day weekend. Approval was also given to a motion for the formation of a committee that would draw up and conduct a survey of the members of the Society, with the hope that the information obtained could lead to improved services to all members.

During the second meeting council appointed the standing committees for 1988-1989.

Complete details of all the items discussed at both meetings may be found in the Minutes of the meetings which have been distributed to our Centre President and our National Council Representative. The Minutes of the 1988 Annual Meeting of the Society, which took place on Saturday, July 2, are being published in the October issue of the Journal.

FOR YOUR COMPENDIUM OF ESOTERIC FACTS

Many amateur astronomer are familiar with the craters and mountains on the Moon, but less so with the mountains on our sister planet Venus. Did you know that the Maxwell Montes on Venus tower as high as 11,800 metres above the so-called "plain level" of that planet? This makes them about 2 kilometres higher than Mount Everest, the highest mountain on Earth. These Maxwell Mountains are amid the roughest terrain on the whole planet, certainly an incredible challenge for mountain climbers or mountain goats, even if they could survive the infernal environment of the planet.

REPORTS AND OTHER ITEMS

1. The Perseids continues to be a remarkable meteor shower. I found this meteor shower this year as in the past few years began very early, about a month and a half before the predicted maximum, that is in June, and during July there was a steady, though low-level, display of members of this ancient order of "shooting stars". Also, as in the past few years, there was disappointment at the time of maximum. Instead of the predicted sixty to a hundred meteors per hour for the nights around August 11 to 13, there seemed to be only twenty to thirty. Of course, the weather was not perfect; there was some haze and scattered cloud. Still the best known of the showers did not live up to expectations at the time of shower maximum, though in total numbers over the entire summer it has been more than satisfying.

2. Congratulations to Mr. Don Macholz of California who has joined a select group of comet discoverers. With his fourth comet discovery on about August 10, he joins Canadians David Levy and Rolf Meier on the list of living North Americans with the most comet discoveries (four) to their credit.

3. Many thanks to Mr. Stanley Hannah and his family who came over to the Outlet Beach on August 9 to assist me with a talk and slide show at the provincial park there. A crowd of about 200 gathered at the amphitheatre at 9:30 and when the clouds did not clear, we had to settle for talking instead of observing.

4. The General Assembly at Victoria from June 27 until July 2 was a memorable gathering of astronomers, the largest convention of its kind that I have ever witnessed with 400 to 500 involved. There were the professionals of every kind, the members of the Astronomical Society of the Pacific, the Western Amateur Astronomers, and the R.A.S.C.. or Centre was also represented by Terry and Ruth Hicks, David Levy, Warren Morrison, and John W. Griese III. The organization required for such a gathering was monumental, but our hosts in Victoria managed to do everything in style.

5. On the weekend of July 16-17, the Syracuse Summer Seminar was another outstanding astronomical event also with our member, David Levy, acting as the special guest speaker. His talk on comets was extremely well received. As usual, the hosts in Syracuse treated us well and everyone who attended certainly enjoyed it. Once again it was great to see our Centre President, Ruth Hicks, there, and Terry as well.

6. An especially warm welcome to both membership in our Society and in our Centre to John W. Griese III of Rocky Hill, Connecticut. Please read about John's recent trip to Hungary in the August issue of **Sky and Telescope** on page 191.

7. My personal appreciation goes to those of you who expressed your good wishes on my marriage to Denise. I am learning that two amateur astronomers are better than one. After many years of solo observing, there is a kindred spirit at the eyepiece.

8. Special congratulations to two of our members, David Levy and Gus Johnson, who were mentioned in an article in the June 6 issue of **U.S. News and World Report.** The article devoted to amateur astronomy was called Backyarders Do What Big Science Can't

9. Remember the dates of our upcoming meetings:
(Maclntosh-Corry Hall, Queen's Univeristy at 8:00 p.m.)
September 9
October 14
November 11
December 9 Annual Meeting
There has been a rumour that our new member, John W. Griese, will put in an appearance at one of these meetings, and just maybe, he will have a special talk for us.

10. Here is our mailing address:
R.A.S.C. - Kingston Centre,
P.O. Box 1793,
Kingston, Ontario
K7L 536

Clear skies! Good observing!

Leo Enright

P.S. Please do not forget that our membership dues are due Oct 1. Please submit your fees to our treasurer, Murray Anderson
adults - $30.00
Youth - $20.00
Life - $500.00