



THE WASP

THE JOURNAL OF THE WARREN ASTRONOMICAL SOCIETY



APRIL 1978



The Warren Astronomical Society
P.O. Box 474
East Detroit, Michigan 48021

Club News

The Warren Astronomical Society (W.A.S.) is a local nonprofit organization of amateur astronomers. Membership is open to all interested persons. Annual dues are as follows; Student- \$11.00, College- \$13.00, Senior Citizen- \$15.50, Individual- \$18.00, Family- 23.00, the membership fees listed here include a one year subscription to Sky & Telescope Magazine.

Meetings are held on the first Thursday of each month at Cranbrook, and the third Thursday of each month at Macomb County Comm. College, in the student union building.

The EDITOR: Roger A. Civic, 26335 Beaconsfield
Roseville Michigan, 48066- 776-8735

OBSERVATORY SCHEDULE

Dennis Joswick..Chairman

Lectures for the coming month are listed below.

April 7/8 Frank McCullough 791-8752
April 14/15 Diane McCullough 791-8752
April 21/22 Don Misson 1-727-9083
April 28/29 Ray Bullock 879-9458

The lecturer may select either the Friday or Saturday, depending on the Weather and their personal schedule.

AMATEUR CONVENTIONS COMING UP THIS SPRING AND SUMMER.

April-8, M.S.U. Astronomy Club- Abrams Planetarium. There will be a Prof. as guest lecturer, a star bowl, a Messier contest. Call Doug Bock.

June-9/11, Great Lakes Regional & Apollo Rendezvous- Dayton Ohio, at the Museum. This one will be Great fun ... Don't miss it.

June-28 to July-1, National League Convention. Madison, Wisconsin. To register for this easy to get to happening, write or call-- Mrs. Arthur L. Koster, Rt.# 2- 5794 Devro Rd., Madison Wisconsin 53711. Phone ...1-608-271-6770. For some price info see Oct. Sky&Tele. page 281, (1977)

•buy – sell – trade•

For sale ... Tasco 60mm telescope (tube only) 2 eye pieces and a 24mm finder..\$25.00. Also, Jagers 4½" reflector (tube only)with a 10X30mm finder. Contact Joe Hunau, 681-2006.

For Sale ... 10" f/6 reflector with Optic Craft mount (pipe), asking \$300.00 Also, Celestron photographic assesories- A.C.-D.C. drive corrector and off axis guiding assembly. F.B. Bruner, 643 Washington, Hope In. 47246

For Sale ... 8" f/6 reflector, with 2.14 diagonal,mounted in 10" tube- 50"long no eyepiece focusing mount. S 125.00. Also 4110. D. -24" long, black iron stand that is ready to accept 3 legs and Equatorial head (Pacific) \$15.00 plus, a 22½ lb. counter weight with 1" hole & screw clamp, \$15.00
Contact Roger Civic, 776-8735.

The february 16th meeting of the Warren Astronomical Society opened at 8:15 p.m. with welcoming new and old members. Dennis Jozwik, observatory chairman, announced to all that a new member for the lecturer's staff has been added, namely Bob Dennington. Mr. Jozwik explained that there are still some problems with the reticle in the finder which he hopes would be fixed in the near future. Further, John Root has volunteered to modify the focusing mount on the 3 inch telescope so it can be used more efficiently in astro-photography. Hope was voiced about finding someone who will grind and polish or donate a 6 inch f/4 or f/5 mirror for the Observatory. Sometime in April or May, a meeting of all lecturers will take place, said Mr. Jozwik.

Membership rate for the Warren Astro Society has been raised from \$6 or \$8 a year.

As part of a money making venture, tickets were sold for a raffle on the Norton Star Atlas donated by Jim Paulausky.

Frank McCullough, program chairman, disclosed that the March 2nd Cranbrook meeting will feature Bill Whitney who will speak on aerial phononena or UFO's. A representative from Dr. Hynek's staff will be present to answer questions. Also, a book on Flying Saucers will be raffled.

The National Convention date has been changed to the last week in June and the first week of July. The site will be in Madison, Wisconsin and more detailed information will follow.

Roger Civic, editor of "The Wasp" and our Martian expert, has generously supplied us with old copies of our periodicals. It was suggested that by editing the last three or four years of the Wasp and offering the materials for sale in a Special Issue, this group could then use the profits to augment the treasury.

Members were invited to view exhibits by Dr. Paul Strong on photo electric analyzation in connection with Eclipse 1977. John Searles showed enlargements which all enjoyed during the break. Pete Kwentus will be compiling eclipse photos to sell as another money making venture for our Society. Brad Vincent, a student at Macomb Community College, offered his book, "1978 American Ephembris and Nautical Almanac", for sale to members.

Mr. McCullough then disclosed that Doug Smith will give a talk on Comets in March and that the March 16th meeting would feature "Amateur's Night". All were requested to submit a sample of their endeavors.

Mr. Faix noted that members whose pictures were published in Sky & Telescope Magazine were: Dave Harrington, Dr. Strong, Pete Kwentus and Perry Persha. In April, Mr. Persha will give a talk on Photometry (the Measure of Light). The 1978 Observer's Handbook is being made available by Ray Bullock.

The meeting was then turned over to the speakers. Loretta D. Caulley gave a book review of Carl Sagan's "Dragons of Eden." She was assisted by visual aids prepared by Mr. Faix. After intermission, Ken Kelly announced the appearance of Comet 1978C in the Southern Hemisphere. It would be brightest on March 13 with a Magnitude of 3.9.

Dennis Jozwik then narrated and showed beautiful professional shots from space made by Mariner Voyages and Sky Lab. Informal group participation enhanced the presentation.

The meeting was closed at 10a45 p.m., by President Faix.

Respectfully submitted,



Loretta D. CaUlley, Secretary

HERCULES

Rich Carter

The ancient Greeks studied the stars, grouped them into constellations, and wove many myths around them. One of their most elaborate myths concerns the constellation Hercules, for he was their greatest mortal hero.

Hercules was the son of Zeus (Jupiter), king of the gods, and Alcmena, a mortal woman. For this reason, Zeus' wife, Hera (Juno) was jealous and constantly tried to kill Hercules.

Hercules was the strongest man in the world. No mortal person or beast could defeat him. He killed many creatures in his time and, as a baby, he killed two snakes sent by Hera to kill him. When he was eighteen, he killed a ferocious lion and afterward wore its skin as a cloak. Later, he conquered the Minoans, enemies of his native Thebes, and for this he was married to the Princess Megara.

For all his physical greatness, Hercules was very weak mentally, his intelligence limited to devising a way to kill an enemy who was about to kill him. On a very hot day, he once tried to shoot the sun out of the sky. He was also highly emotional, and his blows of anger were often fatal. As a child, he killed his music teacher in a fit of rage, and such things happened many more times during the rest of his life.

Even with these faults, the Greeks idolized Hercules above all men because of his greatness of soul. He would consent to even the most outrageous, punishments for his accidental killings and other faults, real and imagined. When others would exonerate him, Hercules punished himself by exile or other means. Once, when Hercules had become drunk at the house of a friend whose wife had just died, Hercules went to the Underworld and recovered her.

One day, Hera possessed Hercules with a madness which caused him to murder his wife and children. When he recovered himself and found what had happened, he could not be convinced that the murders were not his fault. An oracle told him that, in order to purify himself, he must submit to the commands of King Eurystheus of Mycenae. He did so, and was ordered to perform the famous Twelve Labors.

He had to kill the Lion of Nemea, and then the Hydra. Then he had to capture alive a sacred stag with golden horns, which took him a year, and a great boar. After this, he had to clean the Augean stables. This he did by diverting two rivers through them. With the aid of the goddess Athena (Minerva), he drove away a huge flock of birds from a neighboring country. He captured a savage Cretan bull, and the man-eating mares of King Diomedes. He obtained the girdle of Hippolyta, Queen of the Amazons, and cattle from the island of Geryon. He had to get the Golden Apples of the Hesperides, daughters of Atlas, next. He went to ask Atlas, who held the world up, for help, and Atlas went to get them, leaving Hercules to hold the world temporarily. On Atlas' return, he would not take the world back from Hercules. Hercules tricked Atlas into taking the world back on the pretense of making a pad for his shoulders to better bear the load. When Atlas 'momentarily' took it, Hercules took the apples and went on his way. Finally, Hercules had to go to the Underworld to get the three headed dog, Cerberus. After this, the most difficult task of all, he was freed.

Hercules later remarried. He lived happily, but his new wife was suspicious that he was unfaithful. She sent him a shirt with what she had been told was a powerful love-potion on it. When Hercules put it on, it burned him terribly. His terrible agony was so great, he built a funeral pyre, climbed on top, and lit it. In heaven, the gods took pity on him and put him in the sky as a constellation.

SATURN'S SATELLITES IN 1978

During 1978, the earth is in the unusual position of being north of the orbital plane of Iapetus, but south of the orbital plane of the other six bright satellites of Saturn. Consequently, as viewed from the earth, Iapetus appears to orbit Saturn in the opposite direction from the other satellites. Iapetus orbits counter-clockwise, while the other ones orbit clockwise.

The reason is because the plane of the orbit of Iapetus is inclined at an angle of 14.7 degrees to the planes of the orbits of the other satellites. The earth passed through Iapetus' plane last January, but will not pass through the other planes until 1980.

After this happens, the other satellites will appear to move around Saturn in the opposite direction and will then orbit the planet in the counter-clockwise direction as viewed from earth. In the meantime, the apparent orbits of the six inner satellites will become more and more elongated, while the apparent orbit of Iapetus will become less elongated.

Be sure to watch the movements of these interesting satellites in the coming months. Saturn will be an evening object until it is lost in the Sun's glare in July.

The following table can be used to locate the five brightest satellites during the next month. The apparent distances are in seconds of arc, measured from the center of Saturn. The position angles are in degrees, measured from true North around to the east. Remember that in an inverting telescope North is at the bottom and East is to the right. Also, the rings are at an angle of 26.7° north of east. Note that the position angle of Titan keeps decreasing, while the PA of Iapetus increases (except where they cross 360°).

Ken Kelly

APPARENT DISTANCE (") AND POSITION ANGLES (°)
OF SATURN'S SATELLITES FOR 9 P.M. E.S.T.

DATE	TETHYS		DIONE		RHEA		TITAN		IAPETUS	
	AD	PA	AD	PA	AD	PA	AD	PA	AD	PA
Mar. 16	44	268	42	251	30	230	202	263	464	273
17	47	86	62	84	78	90	191	260	434	273
18	48	263	43	276	54	69	154	254	403	273
19	48	81	14	203	60	276	98	242	368	273
20	46	260	51	76	74	257	45	197	332	273
21	43	76	60	266	36	110	81	111	293	273
22	38	253	31	104	85	82	130	98	253	274
23	32	69	24	54	18	16	176	90	211	274
24	26	243	58	259	85	266	198	85	168	274
25	18	52	55	89	32	234	190	81	125	275
26	12	208	19	345	75	90	153	75	81	279
27	10	344	36	247	56	70	94	62	36	287
28	14	124	61	82	57	277	40	8	23	328
29	21	288	47	273	74	257	77	291	52	52
30	28	99	13	172	33	113	139	275	93	64
31	35	274	46	73	84	82	182	269	139	75
Apr. 1	40	91	61	265	17	357	198	262	185	90
2	44	268	37	99	84	266	185	259	226	90
3	46	85	18	42	35	237	146	253	266	91
4	47	263	54	257	73	91	91	240	304	91
5	47	81	57	88	58	71	41	189	341	91
6	45	258	25	290	54	278	82	110	375	91
7	41	76	29	242	75	258	132	97	407	91
8	36	252	58	81	29	116	175	90	436	91
9	30	68	51	271	83	83	193	85	463	91
10	24	241	14	140	18	10	183	80	488	92
11	17	48	40	70	82	267	145	74	509	92
12	11	200	60	263	37	239	86	61	527	92
13	10	332	42	96	70	92	37	359	542	92
14	15	120	14	19	60	72	80	288	555	92
15	22	285	49	255	50	280	140	274	563	92
16	29	98	58	86	76	259	180	268	569	92

The Apprentice Astronomer's Notebook

Louis Faix

When asked the distance to, and name of, the nearest star, many amateur astronomers will promptly reply Proxima or Alpha Centauri, four light years away. Such a response typifies that rather ho-hum attitude most of us have about our Sun, a class G2 star just eight light minutes away. An interest in this celestial beauty truly doubles the viewing hours available to us. Perfect seeing and transparency aren't required for observing, light pollution is of no consequence, photography doesn't require agonizingly long periods of precise tracking and changes occur on an hourly and daily basis.

Our minds may swirl with the exotic mysteries of black holes, super luminous quasars and violence of novas. But how about the unsolved mystery in our own backyard – Sunspots. What are they? Why are they cyclic? Why are the cycles cyclic? Why do sunspots start at high latitudes and drift towards the equator? How do sunspots affect life on earth and the weather for next weekend's picnic? The observing, drawing, photographing, plotting and charting of sunspots can be a fascinating hobby. It is extremely hazardous to view the Sun unless proper precautions are taken. Blindness may be the penalty of rashness or ignorance. There are many useful texts describing safe techniques and all amateurs are encouraged to seek the counsel and help of a more experienced observer before using any technique or new equipment for the first time. Projection of the solar image onto a viewing screen is the only totally safe method. Full aperture filters, used ahead of the telescope objective lens, are also safe when properly selected and installed. Eyepiece filters should never be used alone. They may shatter without warning. The risk of using eyepiece filters can be reduced when a Herschel optic wedge is added.

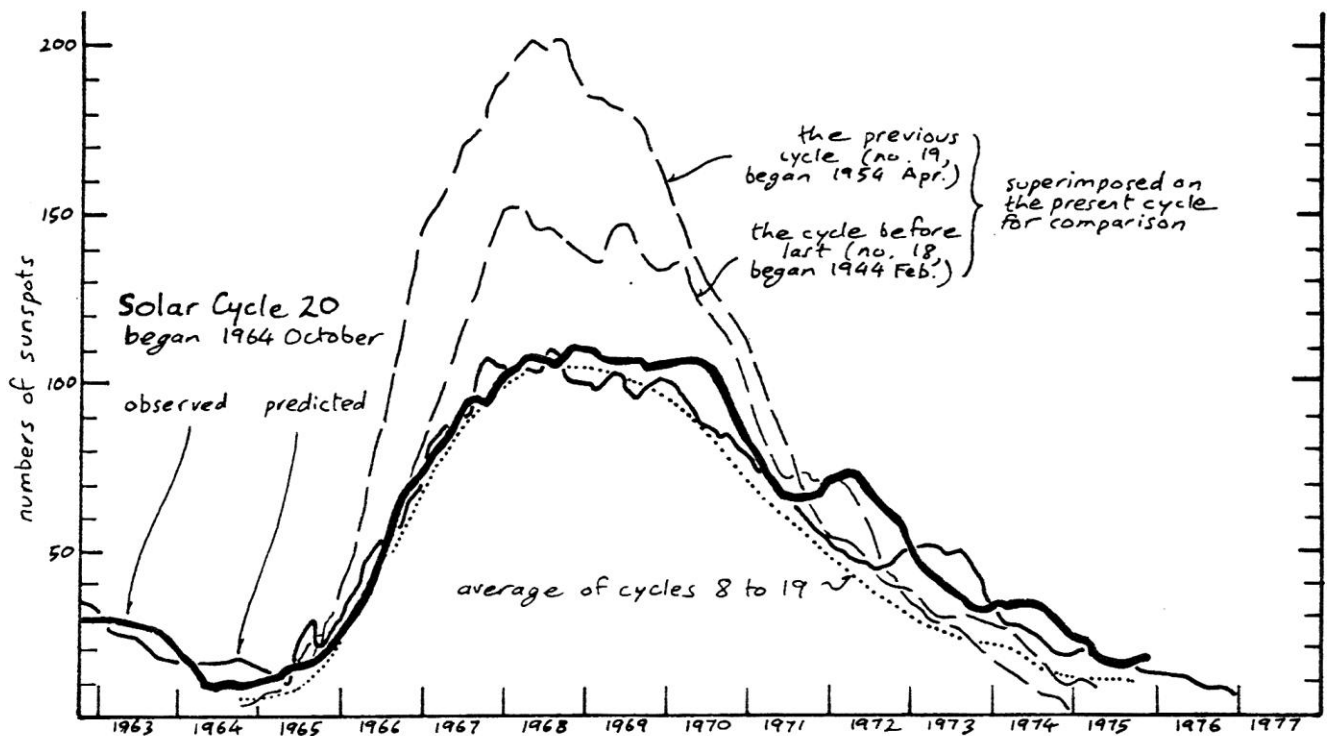
Deep orange or red filters are preferred for sunspot view. The lower cost aluminum coated Mylar screens are usable but reduce the observer's ability to detect small spots and the delicate penumbra shading around large spots. The human eye is more sensitive to orange and red than to blue. Also the earth's atmosphere bends and scatters blue light rays the most leading to softer, fuzzier images. Conversely, red rays penetrate the air with the least distortion. Ideal observing times are from 11 a.m. to 3 p.m. local mean time.

Since we are now at the start of a new solar cycle, this is an ideal time to start observing sunspots. The table on the following page itemizes the nine classifications (A thru J) of spots. It is interesting to note the daily progression and change in the spot structure. All spots start as an "A" type and eventually fade and end at the same point.

Typical progressions might be an ABA or ABCDCBA. The date, number and location of spots should also be carefully noted. The frequency of spots waxes and wanes over a period averaging eleven years but may vary from 7-1/2 to 16-1/2 years for any cycle. The eleven year pattern is really a half cycle since the magnetic polarity reverses after each minimum period. The rise from minimum to maximum activity is usually more rapid than the decline, taking about 4-1/2 years.

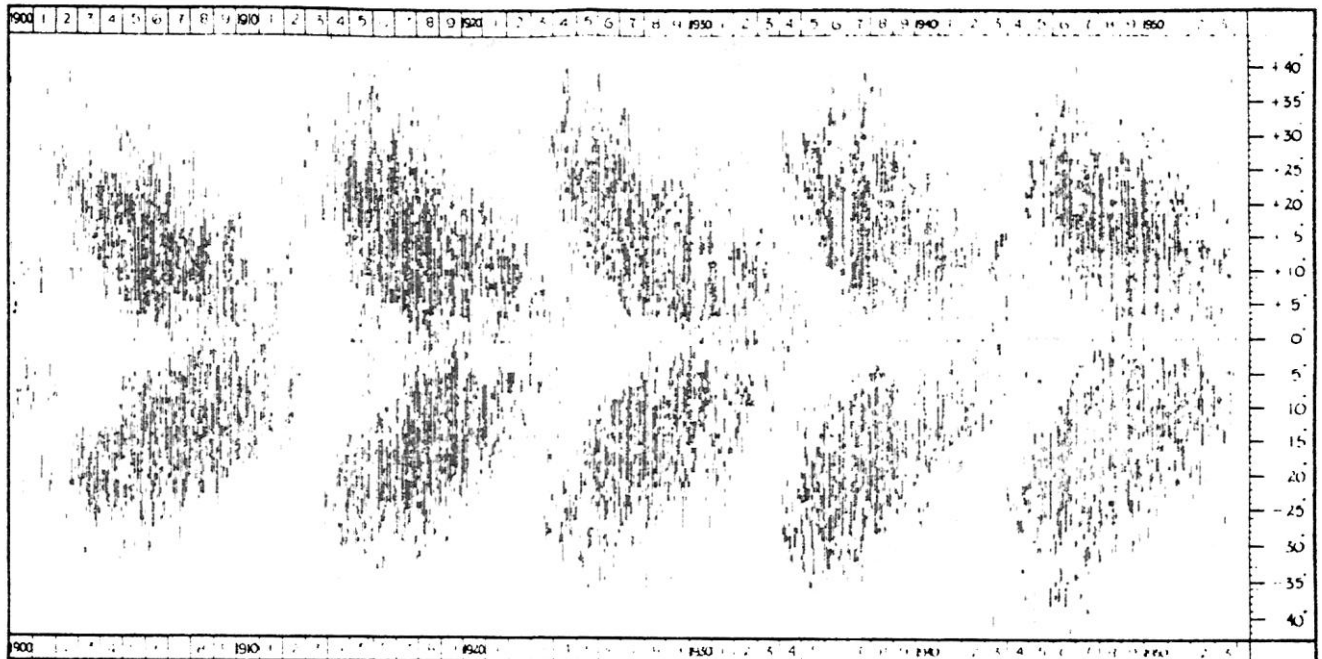
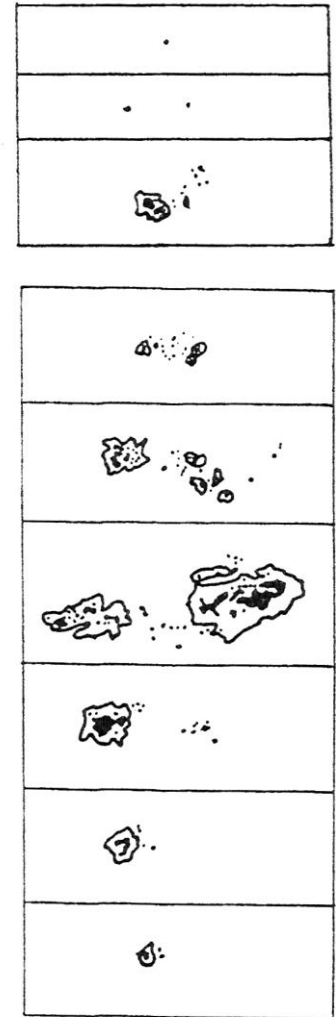
Spörer's Law is the name given to the fact that two spot zones simultaneously drift from high latitudes towards the solar equator as the cycle progresses. At minimum the spot zones are only a few degrees north and south of the equator. The variation in latitude and number of spots is shown in a striking manner by plotting them by date and latitude to produce a data whose symmetry resembles butterfly wings. (See example on following page.)

Next month we'll discuss the Sun's rotation and use of Stonyhurst Charts to measure the exact latitude and motion of sunspots.



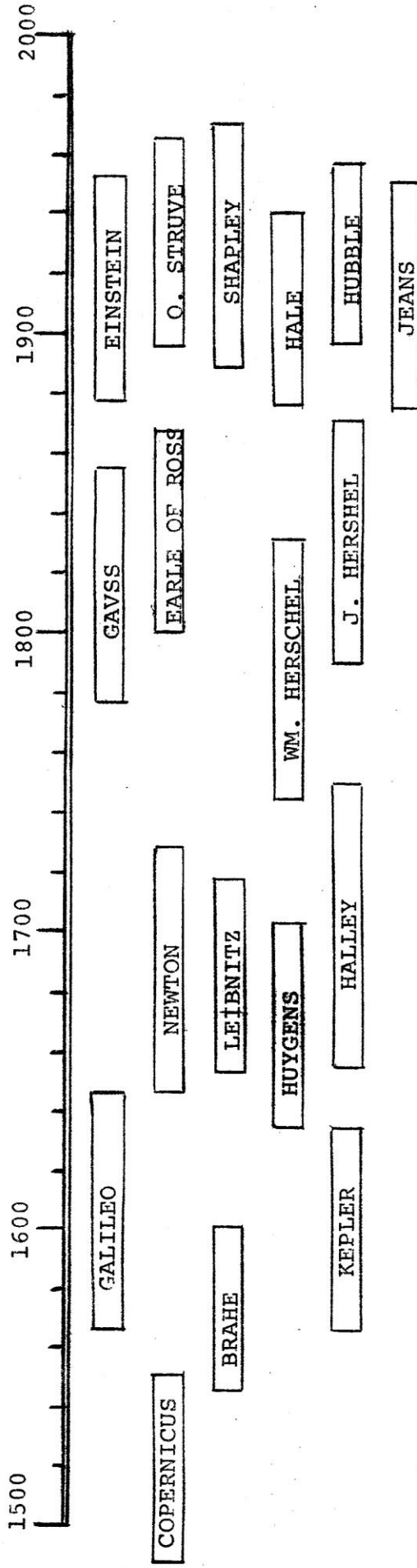
SUN SPOT CLASSIFICATION

- A. An isolated spot or group of spots without penumbra or bi-polar structure
- B. A group or groups of sunspots in configuration, with penumbra lacking.
- c. Spot-group, only one of the principal spots, be it a preceding (leading) or following spot and surrounded by a penumbra.
- D. Spot-group, both spots showing penumbras; at least one of the spots possessing a simple structure and having a length greater than 10° of the total visible solar structure.
- E. Large sunspot-group, both principal spots having penumbras and usually having a complicated structure. Immediate region occupied by small sunspots. Total length of the group at least 10° .
- F. Very large or complex sunspot-group having a length of at least 15° .
- G. Large group without immediate spots and a length of at least 10° .
- H. Sunspot surrounded by penumbra and a diameter greater than 2.5° .
- J. Sunspot surrounded by Penumbra and having a diameter of less than 2.5° .



The 'Butterfly Diagram' for five complete solar cycles, 1900-1953

FIVE CENTURIES OF ASTRONOMERS



THE POSTING PARADE OF HISTORY IS RESPLENDED WITH MEN OF IMAGINATION, DEDICATION AND FORESIGHT WHO TURNED ASTRONOMY FROM THE FOLKLORE OF ANCIENT MYTHS AND SUPERSTITIONS INTO A MODERN SCIENCE. WHILE THEIR CONTRIBUTIONS WERE NOT ALWAYS RECOGNIZED OR ACCLAIMED IN THEIR TIME, EACH IS A GOINT ON WHO'S SHOULDERS CONTEMPORARY ASTRONOMERS STAND. IN THE COMING MONTH'S THE WASP WILL FEATURE A BIOGRAPHICAL SKETCH OF THOSE MEN WHO GAVE US OUR UNDERSTANDING OF THE UNIVERSE.

From the Realm of Known Space

By Gary M. Morin

Editors Note: This is the first in a series of articles which will feature the lives and times of important figures in the history of astronomy and astronomical thought. A time line is provided in this issue to help place all of these articles in the proper time frame.

Christiaan Huygens

Christiaan Huygens was born at the Hague, April 14, 1629. Early in his life he showed talents in mechanics and mathematics fine enough to impress visitors to his parent's home. One of these visitors was the great Rene Descartes who encouraged the boy and helped to get him into the best Schools in Holland...Huygens excelled in his studies. He went to Paris in 1655. Paris was then the "intellectual capital" of the world and Huygens fit right in. He became friends with Blaise Pascal and was one of the founding members of the French Academy of Sciences.

It was during this period of his life that he invented a new method of grinding and polishing lenses. With these improved lenses he discovered the true shape of the rings of Saturn and the stellar components of the Orion nebula.

In the period from 1666 to 1681 Huygens resided in France and became friends with Gottfried Wilhelm Leibniz the German mathematician and philosopher. His work became more and more mathematical. He did pioneer work in the mathematics of curvature oscillation of pendulums, the theory of centrifugal force and uniform circular motion.

Like many of the scientists of his time Huygens was interested in the nature of light and gravitation. When in 1685 Louis the fourteenth revoked the edict of Nantes, which granted liberties to Protestants in France, Huygens went to England where he met with Sir Isaac Newton and lectured on his own theories of gravity. Huygens was troubled by the lack of mechanical explanation in Newton's work although he admired the Mathematics. Huygens own theory was based on Cartesian vortices had never found much favor in the light of Newton's brilliant work. He did however do work in optics that far surpassed Newton's. Huygens was the first person to put forth a wave theory of light and the results yielded a beautiful description of reflection and refraction, far superior to Newton's.

The last five years of Huygens life were marred with illness. and he died in 1695. Much of Huygens work was lost until the 19th century when they were recognized as the great works that they are.

1978 ELECTIONS

At the May general meeting, balloting will take place to select new officers for the Warren Astronomical Society.

The following positions will be filled:

President

First Vice President (Activities and Program Chairman)

Second Vice President (Observatory Chairman)

Secretary

Treasurer

Candidates for all offices are being sought. Our past President, Mr. Peter Kwentus has agreed to be the chairman for the nominations and election. If you'd like to place someone's name in nomination, just inform Pete. He will confirm that individual's willingness to serve before the name is entered on the ballot. You are invited to enter your own candidacy if you are willing to serve your Society. Since all current officers are serving their first term, none are restricted from reelection by our bylaw limiting officers to two consecutive terms.

Please remember that the Warren Astronomical Society, like all volunteer organizations, is sustained only by the efforts of its members and their willingness to serve. It's the easiest thing in the world to sit at the semimonthly meetings and allow yourself to be entertained by the labors of others. Little dedication is required to use an observatory that others maintain. Remember that these programs, the publications and the facilities would not be there were it not for the labors of a few. Join the "doers" - be a part of the "inside group" - enter your name as a candidate and agree to serve the Warren Society as it has served you.

THE OUTER PLANETS

By: Jeff Stanek

Uranus The Seventh Planet

Uranus was discovered to be a planet by William Herschel in England in 1781, but it had been plotted on sky maps for about a hundred years prior to that with the thought that it was just another star. It revolves around the Sun in 84 years, at an average distance of more than 19 A.U. from the Sun. Even at the most favorable possible place in its orbit, which has an eccentricity of almost 5 per cent, it is never closer than 17 A.U. to the Earth. Thus Uranus never gets any larger in the sky than 3.6 seconds of arc, and studying its surface structure from the surface of the Earth is very difficult.

In 1972, the balloon Stratoscope II carried a 36-inch telescope up to an altitude of 24 km, above most of the Earth's atmosphere. Photographs were taken of Uranus, as well as of other objects. The 17 photographs of Uranus had resolutions of 1/6 second of arc, and give us our most accurate measurements of Uranus's diameter, but even with this resolution- no detail on the surface can be seen. Thus we know that Uranus does not have belts of clouds as do Jupiter and Saturn. The Stratoscope observations suggest that Uranus is surrounded by a thick layer of methane clouds, with a semi-transparent atmosphere of molecular hydrogen above the methane. Both Uranus and Neptune have greenish casts when observed from the Earth, which led in times past to many diffuse Objects in the sky (some of which also appear green but which are not planets at all) being named "planetary nebulae".

Even though the photography does not reveal structure on Uranus, there is strong evidence from visual observations that there may be structure after all. Direct observations with the eye at the telescope is certainly out of favor at the present, but nonetheless the eye and brain can take advantage of especially fine moments of observing, when the Earth's atmosphere is particularly still, and can use color differences to differentiate one region from the next. Over the years, many visual observers have reported seeing structure on the surface of Uranus, and even though they do not agree about the exact form of that structure they may well be correct that structure does exist.

The other planets rotate such that their axes of rotation are roughly parallel to their axes of revolution around the Sun;

Uranus is different, for its axis of rotation is roughly perpendicular to the other planetary axes.

Uranus's axis of rotation lies in the plane of its orbit. Sometimes, one of Uranus's poles faces the Earth 21 years later its equator crosses our field of view, and then another 21 years later we face the other pole. So there are strange seasonal effects on Uranus, and the differences in the heating pattern from year to year may be the reason that there are no cloud bands. When we understand just how the heating affects the clouds, we will be closer to understanding our own Earth's weather systems. Of course, even though there is an effect because the angle at which sunlight hits different parts of the surface of Uranus varies with the season, we must recall that Uranus is very distant from the Sun, so the intensity of sunlight is never very great. Uranus is always very cold, probably 90 K (-185 c).

It is said that Uranus rotates in the retrograde direction, and so it does-but barely. Mainly, from our point of view, we see it rotating sometimes as do the hands of a clock and sometimes from top to bottom, while the other planets always appear to rotate from side to side. In 1975 it was discovered from studies of how the Doppler effect broadens a sharp spectral absorption line that Uranus rotates in 12.3 hours. The correction from the previously accepted value was over 10 per cent, which indicates how inaccurate our knowledge is of the other members of our solar system.

Uranus has five moons-(going from innermost to outermost) Miranda, with a diameter of 200 km, is the smallest moon of Uranus. Ariel, has a radius of 700 km. Umbriel, has a radius of 500 km. Titania, with a radius of 900 km, is the largest of Uranus' moons. And Oberon has a radius of 800 km.

A very important discovery has just been made about Uranus recently. At a 1977 occultation by a star which was unknown, observers were surprised to find that the star winked out briefly 5 times before the main occultation and a symmetric 5 times afterward. This means that Uranus is surrounded by rings, as is the giant planet Saturn.

At the present time it is planned for the second of the Voyagers to pass not only Jupiter and Saturn, but also Uranus, arriving there in 1985 or 1986. The definite decision need not to be made until we see in 1980 how well the first of the Voyagers has succeeded in studying Saturn.

Uranus has a diameter of about 50,000 km. (about 29,000 miles) Being so big, it is the 3rd largest planet in the solar system being smaller than Jupiter and Saturn. Also Uranus is about 15 times as massive as the Earth. Uranus also has the 2nd lowest density in the solar system (1.2 g/cm^3).

Observing wise, Uranus is located in the constellation Libra being located near the star Alpha Librae. Uranus is only 1.1 degrees east of Alpha Librae. Through a small telescope Uranus looks like a very faint greenish disc. Although Uranus is very faint, it is well worth locating on a clear night.

SKY CALENDAR APRIL 1978

Information for helping teachers and students observe the sky

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>4 BRIGHT PLANETS shine in the evening sky during all of April. A fifth, Mercury, may be seen April 1-3, and dim Uranus appears later in evening. These planets are discussed in order of position from W to E.</p> <p>45 min after sunset: Mercury 6° lower right of Venus. Can you still find Mercury?</p> <p>Venus ★</p> <p>★ Mercury</p>	<p>Venus is the brilliant "star" very low in W at dusk. On Apr 1 it sets nearly 1 1/2 hrs after sun; by Apr 30 it sets after sky has completely darkened, 2 hrs after sunset. Watch Venus' setting place move farther north until May 24.</p> <p>45 min after sunset: Mercury 7° lower right of Venus. Binoculars & very clear skies are needed to see Mercury tonight.</p> <p>Venus ★</p> <p>★ Mercury</p>	<p>Jupiter is next brightest "star" after Venus. On Apr 1 it is 60° upper left of Venus; on Apr 30 it is 29° upper left of Venus. One hr after sunset on Apr 1 it is nearly 60° up in WSW; by Apr 30 it is 35° up in W. Gets lower due to motion of earth.</p> <p>Moon rises 10° S of east 1 3/4 hrs before sunrise. 45 min before sunup moon is 10° up in ESE. Note tilt of crescent: Moon ☾ this morning</p> <p>One hour after sunset: Moon ☾</p> <p>★ Hyades</p> <p>★ Pleiades</p>	<p>Positions of <i>Jupiter</i>, <i>Mars</i>, and <i>Saturn</i> among the zodiac constellations are shown on Apr star map. <i>Mars</i> on Apr 1 is 6° from Pollux and passes just S of overhead within 1 hr after sunset. On Apr 30 1 hr after sunset, it is high in SW. See 20, 27.</p> <p>Last chance to see waning crescent moon. It rises 5° south of due east just over an hour before sunrise. Best 45 min before sunup. New Moon will occur on April 7th. Compare orientation of crescent Apr 4-5 & 8-9.</p> <p>One hour after sunset: Jupiter ★</p> <p>★ Moon</p> <p>★ Pleiades</p>	<p><i>Saturn</i> passes due south about 2 1/2 hrs after sunset Apr 1, and very shortly after sunset Apr 30. Saturn is 5 1/2° to 6° west of Regulus. The planet is yellowish in color and about twice as bright as nearby bluish Regulus.</p> <p>mag star Alpha Librae is only 3° up in ESE and very difficult to see. Another 3rd mag star, Beta Librae, has about the same altitude but is 9° to the left of Alpha. In the next 1-2 hrs, as the two stars rise above horizon haze, binoculars will show Alpha has a 5th magnitude companion 4' (minutes of arc) above it. For most of April, Alpha will also have a 6th magnitude companion to its lower left: Uranus! Watch Uranus approach Alpha. On Apr. 5, 3 3/4° apart; 12th, 1 1/2°; 19th, 1 1/4°.</p> <p>One hour after sunset: Mars ★</p> <p>★ Jupiter</p> <p>★ Betelgeuse</p>	<p><i>Uranus</i> is easy to locate with binoculars, once the star Alpha Librae has been found. This month's map shows the sky 3 hrs after sunset on Apr 1, 2 hrs after around the 12th, and 1 hr after around the 24th. At the time of this map, the 3rd</p> <p>45 min after sunset: Mercury 5° lower right of Venus. Mercury is of mag +1.4 tonight and 0.2 magnitude fainter each night.</p> <p>Venus ★</p> <p>★ Mercury</p>	<p>45 min after sunset: Moon, only 1.4 to 1.5 days old in continental U.S., sets before twilight ends.</p> <p>★ Venus</p> <p>★ Moon</p>
<p>45 min after sunset: Excellent view of earthshine Apr 9-12.</p> <p>★ Moon</p> <p>★ Venus</p>	<p>One hour after sunset: Aldebaran ★</p> <p>★ Hyades</p> <p>★ Moon</p> <p>★ Pleiades</p>	<p>One hour after sunset: Moon ☾</p> <p>★ Hyades</p> <p>★ Regulus</p> <p>★ Moon</p>	<p>One hour after sunset: Hyades ★</p> <p>★ Pleiades</p> <p>★ Venus</p>	<p>Using binoculars, look for the Beehive 3° east of Mars. In late April 1978, light from Mars takes 11 minutes to reach us; light from Beehive cluster, 500 years!</p> <p>One hour after sunset: Moon ☾</p> <p>★ Spica</p>	<p>One hour after sunset: Procyon ★</p> <p>★ Spica</p> <p>★ Full Moon</p>	<p>One hour after sunset: Castor ★</p> <p>★ Pollux</p> <p>★ Moon</p>
<p>One hour after sunset: ★ Saturn</p> <p>★ Moon</p> <p>★ Jupiter</p> <p>★ Venus</p> <p>★ Pleiades</p>	<p>One hour after sunset: ★ Saturn</p> <p>★ Moon</p> <p>★ Regulus</p> <p>★ Moon</p>	<p>One hour after sunset: ★ Saturn</p> <p>★ Regulus</p> <p>★ Moon</p>	<p>One hour after sunset: ★ Hyades</p> <p>★ Pleiades</p> <p>★ Venus</p>	<p>One hour after sunset: ★ Beehive</p> <p>★ Spica</p>	<p>One hour after sunset: ★ Procyon</p> <p>★ Spica</p> <p>★ Full Moon</p>	<p>One hour after sunset: ★ Castor</p> <p>★ Pollux</p> <p>★ Moon</p>
<p>One hour after sunset: ★ Jupiter</p> <p>★ Venus</p> <p>★ Pleiades</p>	<p>One hour after sunset: ★ Regulus</p> <p>★ Moon</p> <p>★ Venus</p>	<p>One hour after sunset: ★ Regulus</p> <p>★ Moon</p>	<p>One hour after sunset: ★ Hyades</p> <p>★ Pleiades</p> <p>★ Venus</p>	<p>One hour after sunset: ★ Beehive</p> <p>★ Spica</p>	<p>One hour after sunset: ★ Procyon</p> <p>★ Spica</p> <p>★ Full Moon</p>	<p>One hour after sunset: ★ Castor</p> <p>★ Pollux</p> <p>★ Moon</p>

Magnitudes of the Planets: Venus -3.3; Jupiter -1.7 to -1.6; Saturn +0.5 to +0.6; Mars +0.5 to +1.0; Mercury: See Apr 1. **Motions during April:** Venus is visible against a dark background beginning in mid-April. It moves eastward 1.2° per day, passing 3.6° S of the Pleiades Apr 26. Mars, shifting 11° eastward in 30 days, enters Cancer on Apr 1 and passes Beehive (see Apr 27). Jupiter, moving 4.5° eastward, crosses from Taurus into Gemini Apr 10. On night of Apr 15 Jupiter passes 11' (nearly 0.2°) N of 4th mag 1 Geminorum. Jupiter's motion, then 9' per day, should be easy to detect for a few days as it passes that star. Jupiter closes month 0.9° N of Eta, Castor's Toe. Saturn, in Leo, retrogrades only 0.5° Apr 1-25, then is stationary 6.0° west of Regulus. Uranus retrogrades 1.1° and passes just north of the double star Alpha Librae (see Apr 25).