BUFFALO ASTRONOMICAL ASSOCIATION INC.
BUFFALO MUSEUM OF SCIENCE
HUMBOLDT PARKWAY
BUFFALO NEW YORK 14211

the Spectrum

Editor: Ernst E. Both

D E C E M B E R - J A N U A R Y 1974/75

DECEMBER MEETING: The last meeting of 1974 will take place on December 13, at 8:00 p.m. in the Club Room, Buffalo Museum of Science. In compliance with the nostalgia-craze sweeping this country, we are presenting "GOLDEN OLDIES" - several classics of astronomical cinematography. The feature attraction will be the Canadian-produced sound movie "THE UNIVERSE", one of the finest astronomical films produced about 20 years ago. Also on the program will be two time-lapse films made over 40 years ago. A very important report on the Beaver Meadows observatory project will follow the films and the usual refreshments will be served at the conclusion of the meeting. Come all and enjoy some classics!

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JANUARY MEETING: The first meeting of 1975 (January 10, at 8:00 p.m.) will feature Mr. Ernst E. Both in an illustrated lecture entitled "THE NEW FACE OF MARS." A number of excellent slides will be used to summarize our new knowledge concerning the planet Mars, as derived from Mariner 9 studies. As an added attraction, there will be a monster raffle of Sky and Telescope back issues as well as several other items of astronomical interest - proceeds to go to the observatory fund. Refreshments afterward as usual.

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BEAVER MEADOW OBSERVATORY REPORT No. I, by "a concerned friend."

Construction of the Beaver Meadow Observatory is now projected for the summer of 1975. Until completion this newsletter will contain information concerning the progress of this project, both materially as well as financially. Basically, we the Buffalo Astronomical Association must work with Buffalo Audubon in a joint effort to build the observatory. The Board of Managers of Buffalo Audubon has reaffirmed its enthusiastic support of the observatory project and has already taken steps toward raising funds. Over 100 letters have been sent out to local business, asking for financial help. Several Audubon members have given substantial contributions to the observatory fund, in fact the largest single contributors to date have been Audubon members. In addition, they have given us aid in approaching a local foundation, and more help will come as the project gains momentum.

Buffalo Audubon, however, cannot raise money for the observatory without our help. We must do our share as well. Our recent fund raising efforts have been successful, but we are still some distance away from our goal. The Buffalo Astronomical Association must turn to its membership for direct contributions to the observatory fund. The amount is entirely up to the individual - anything will help, no matter how small it might be.

The sky at Beaver Meadow will make the observatory the best in Western New York. When completed, our members will directly benefit, since they will have unlimited use of this facility. We will be able to pursue any kind of astronomical interest, from the visual observation of the Moon and planets to deep space nebulae, clusters, etc. And, with the newly modified mounting, photography of all these subjects will be possible at the new observatory. In short, let us all contribute to an observatory in which all BAA members will have an opportunity to pursue their own personal astronomical interests as well as to provide a unique educational facility for the public.

The Buffalo Audubon Society has given us written assurances that any money donated to the observatory will be used solely for that purpose. In the event the observatory is not constructed, all funds intended for its construction will be returned. Please contribute whatever you can - make all checks payable to: BUFFALO AUDUBON SOCIETY, 190 Stillwell Ave., Kenmore, N.Y. 14217. IMPORTANT: Be sure you specify on the check that the donation is for the ASTRONOMICAL OBSERVATORY.

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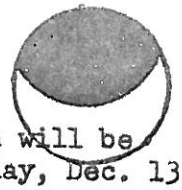
PARTIAL ECLIPSE OF THE SUN



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A partial eclipse of the Sun will be visible in this area on Friday, Dec. 13, 1974. The eclipse will begin shortly after 9:00 a.m. EST and will end soon after 12:00 noon. Mid eclipse occurs around 10:45 a.m. with about 65% of the Sun covered by the Moon. The Museum's observatory will be open for public viewing from 9:30 a.m. to 12:30 p.m. Come and see this interesting event - * in addition to the 8-inch refractor of the Kellogg Observatory, we will have a 3-foot image on the screen of the Solar Observatory where the eclipse may be followed in comfort and warmth. If you plan to observe with your own intrument, be sure you observe the usual precautions. If you wish to observe with the unaided eye, use black-and-white, overexposed, developed film. Do not use color film, since this will transmit infrared which can be damaging to your eyes. Whatever you do, please be careful!

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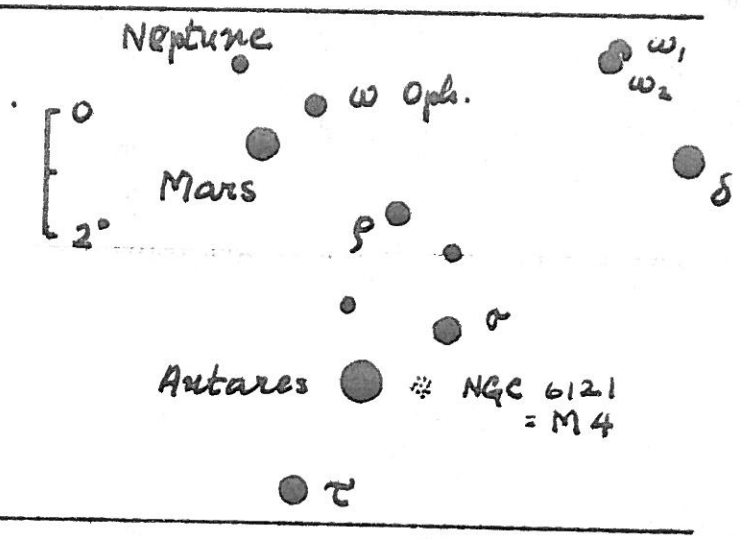
MARS AND NEPTUNE - December 25, 1974. Have you ever seen Neptune in a 'scope? If not, a good chance would be on the morning of December 25, before unwrappg your presents. The two planets will be less than 2° apart, about 5° north of the red star ANTARES. They will rise about 4 hours before the Sun and will be in the SOUTH-WEST. Mars, at m= +1.7 will be nearly 250 times brighter than the near 8m Neptune. By December 25, 1974 Neptune will actually be farther from Earth than Pluto (31.2 astronomical units against 30.8 a.u. for Pluto. One a.u. = about 93 million miles. The adjacent map is from the Becvar Atlas.).



METEORS FOR DECEMBER, by Darwin Christy

We may or may not see any PHOENICIDS on the 5th of December - in the southern hemisphere they are reported to present quite a spectacle at times with as many as 50/hour radiating from R.A. 01h 00m, decl. -55° (the radiant is obviously below the horizon, but some few could possibly be seen here). The GEMINIDS follow on the 13th with short, swift yellow streaks from a radiant at R.A. 07h 32m, decl. +32°. These produce an annual display of 40 to 60/hour, many as bright as second magnitude. Expect to see between 4 or 5 fireballs between the 10th and 15th of December.

A relatively new shower, due to comet Tuttle 1939, are the URSIDS with a radiant at R.A. 14h 30m, decl. +80°, producing between 5 and 15 short-streaked meteors per hour. One shower for January to be mentioned are the QUADRANTIDS on January 3 with a radiant at R.A. 15h 28m, decl. +50°; the average hourly rate is around 40, although as many as 100 might be seen, especially between 2:00 and 4:00 a.m., most of them of about third magnitude.

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HELIOS - A NEW KIND OF SATELLITE * **

A spool-shaped spacecraft named for the SUN GOD of ancient Greece will be launched by NASA on December 8, 1974 - toward the center of the solar system, while its two brothers, PIONEER X and XI are speeding toward the edges of our system. HELIOS-A, a solar probe built by West Germany as part of a joint venture with the U.S., will lift off from Kennedy Space Center, Fla., aboard a Titan Centaur rocket.

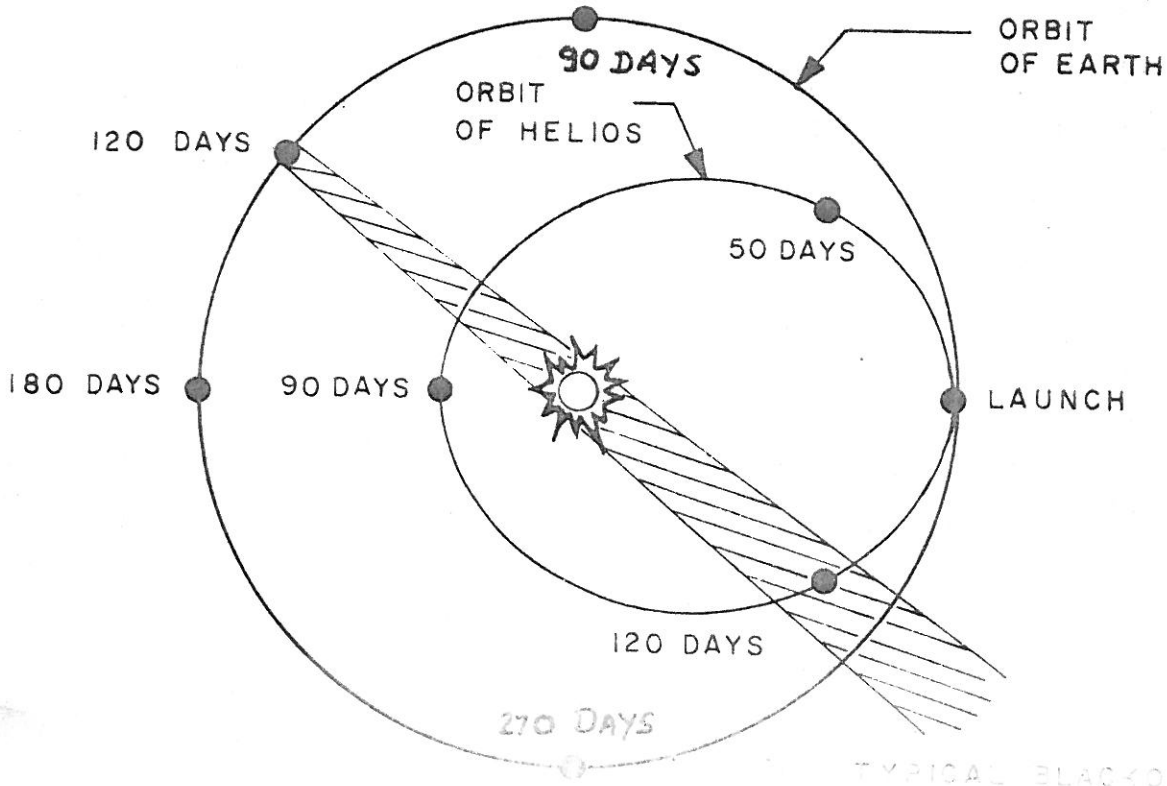
It will fly closer to the Sun than any previous spacecraft - within 45 mill. km, (28 mill. miles) thereby encountering temperatures hot enough to melt lead. The instruments aboard will measure the solar wind (ionized particles given off by the SUN), magnetic fields, solar and galactic cosmic rays, electromagnetic waves, micro-meteoroids, and the zodiacal light. Also, information concerning celestial mechanics, relativity and the Sun's atmosphere will be derived from analysis of spacecraft radio signals and tracking data. Other satellites currently carrying similar instruments are: EXPLORERS 47 and 50 in Earth orbit, PIONEER spacecraft orbiting the Sun, and PIONEERS X and XI. Since these spacecraft measure solar phenomena from various points in the solar system over a long period of time under varying conditions the correlation of all data with that from HELIOS will be a major part of the HELIOS scientific effort.

With the launch of a second HELIOS, a year to 18 months later, information from the two spacecraft will be received at the same time from widely differing locations for comparison with each other and with data taken from the other satellites mentione

The two HELIOS spacecraft are designed for at least an 18-month lifetime, although the missions will be considered successful after the first perihelion pass is completed, ca. 100 days after launch. The second HELIOS may approach the Sun to about 0.28 a.u. or a little over 41 mill. km (26 mill. miles).

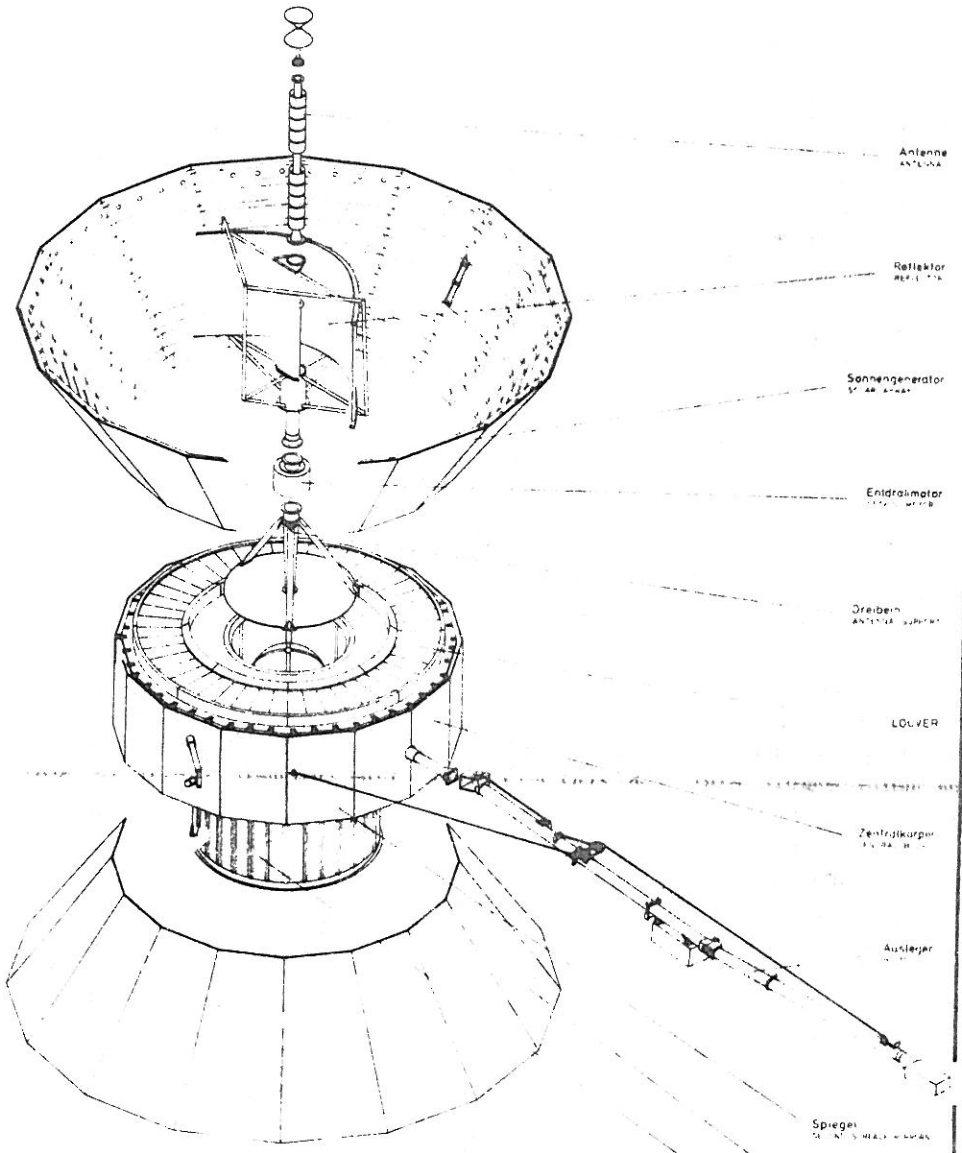
Three of the 10 experiments aboard the German craft are American. The U.S. also supplies the launch vehicle, tracking and acquisition data, and technical support. Overall management responsibility rests with Germany's Bundesministerium für Forschung und Technologie (Ministery for Research and Technology) and the Deutsche Forschungs- und Versuchsanstalt für Luft und Raumfahrt (the German equivalent of NASA) serves as project manager. NASA's Goddard Space Flight Center is responsible for U.S. participation.

The solar magnetic field is being drawn out by solar plasma (the solar wind) in ever widening spirals away from the Sun (much like the water from a rotating lawn-sprinkler) at least beyond Jupiter and possibly beyond Saturn, 5 and 9.5 a.u. from the Sun re-spectively. This magnetic field and plasma eventually establishes a boundary between our solar system and the rest of the Galaxy. Energetic particles from the Galaxy or other



(more on page 5)

HELIOS



Gesamtansicht mit Ausleger, ausgeklappt

HELIOS - THE SPACECRAFT:

The 370 kg (815 pound) craf has a short 16-sided central body with two conical solar arrays attached at both ends. The central body is formed by circular equipment platforms at each end and 8 radial equip ment platforms which join the upper and lower platform. The spacecraft equipment and the experiments are mostly mounted on the radial platform within the central body.

The central body is attached at its lower end to a circular adapter which connects with the launch vehicle.

Above the central body, within and protruding above th upper solar array, is the communications antenna system. It consists of a narrow beam high-gain antenna (23 db) with a mechanically despun reflecto Above the high-gain antenna sits a medium-gain antenna (7 db) and on top of the antenna mast is a third antenn system.

The craft has two deployable booms which carry the three magnetometer experiments. These two rigid booms are diametr. opposite to the central body. Two similar booms also diametr. opposite to one another and perpendicular to the rigid booms are attached to the centr body; they are used as antennas for a radiwave experiment and measure, when deployed, 32 meters (105 ft) from tip to tip

Most of the space craft equipment and the experiments are mounted on the radial platforms within the central compartment. The exceptions to this mounting concept are the rigid magnetometer booms, the flexible experiment antennae and several long telescopes which view out of the lower surface of the central body and are mounted partially within the adapter section. The diameter of the central compartment is 1.75 m (5.7 ft), its height 0.55 m (1.8 ft). The largest diameter of the solar arrays measures 2.77 m (9.1 ft), the height of the probe without antenna mast 2.12 m (7.0 ft) and with antenna mast 4.2 m (13.7 ft).

(HELIOS continued from page 3)
parts of the universe impact against this boundary, but only the relatively high energy particles actually go though it. Dr. James H. Trainor, GSFC HELIOS Project Scientist, comments: "Helios will not only take our instruments in closer to the Sun than man has ever been able to go, it will provide scientific observations of activity on the back side of the Sun as seen from Earth. This hidden activity may well be responsible for interplanetary effects seen near Earth. Additionally Helios will be occulted by the Sun at fairly close distances to the Sun, allowing fine measurements in the fields of relativity, celestial mechanics and densities in the high altitude of the Sun's atmosphere."

With HELIOS behind the Sun or directly in front of it, there will be so much solar noise at times that the craft will not be able to communicate with Earth. However, information on far-side solar activity ordinarily will be transmitted to Earth almost as it happens, with data obtained during the blackout periods stored for later transmission.

Complex problems of system management and thermal control presented significant challenges to the German research team. The craft passed its most important test last Spring when it withstood six days of the highest temperatures ever demanded of a spacecraft at NASA's Jet Propulsion Lab, Pasadena, California. During the tests in a 7.5-meter (25-foot) simulator, temperatures were raised to 370° C. (700° F.) for about 10 days. That's the highest temperature expected at 0.3 a.u. The simulated solar radiation survived was 11 times the solar intensity at the outer edge of Earth's atmosphere. To protect the spacecraft from overheating, the German team designed it so that all payload components in the central body compartment would dissipate heat as independently as possible. The heat from this compartment is radiated into space axially from the radiating areas on the top and bottom via louver systems. Also there are reflectors on the outside of the compartment and several layers of insulation between reflectors and payload. In addition, the spacecraft spins once every second to evenly distribute the heat coming from the Sun.

Experiment area temperatures will be kept between -10° C. (14° F.) and +30° C. (86° F.). However, unique thin wires of 0.2 mm (.009 inches) diameter on the high-gain antenna reflector will withstand temperatures of 500° C. (932° F.), while a bearing system developed for the reflector will use a dry lubricant suitable for the full range of temperatures HELIOS will encounter.

Communication between HELIOS and Earth is possible during the entire mission, except when the spacecraft passes behind or in front of the Sun. Depending on the phase of the mission, the craft will be controlled from NASA's Deep Space Network managed by the Jet Propulsion Lab, or the German Space Operation Center near Munich.

The mission will be the first operational flight of the Titan Centaur rocket, assembled primarily for the coming VIKING expedition to Mars. The new vehicle combines NASA's versatile Centaur upper stage with the Titan III booster. It has an overall height of 48.8 meters (160 feet) and a total liftoff weight of 64,000 kg (1.4 mill. pounds).

Cost of the two HELIOS missions, including spacecraft and launch vehicle, is about $ 260 million; the German share is about $ 180 million. Germany pays for the spacecraft costs which include the price of the two flight units, a prototype, and thermal as well as structural and engineering models. The U.S. pays for the two launch vehicles and their support as well as tracking and data acquisition services, etc. for a total (oops) of about $ 80 million.

HELIOS FACT SHEET: (see p. 4 for a diagram and explanation) WEIGHT: 370 kilograms (815 pounds) including 10 scientific experiments weighing a total of 72 kilograms or 158 pounds. STRUCTURE: Spool-shaped with an experiment compartment 1.75 meters (5.7 ft) in diameter, cylindrical (16 sided), with two conical solar arrays attached to both ends. Height with antenna mast 4.20 meters (13.7 ft) with the diameter at widest point (solar arrays) 2.77 meters (9.1 ft). With booms extended = 32 meters (105 ft) tip to tip. POWER: 240 watts at aphelion (farthest from the Sun from solar cells. ORBIT: Elliptical, from 1 a.u. to 0.3 a.u., 180-day period.

Adapted from NASA RELEASE NO: 74-314

X*SKY EVENTS OF INTEREST*X December 1974: The Moon, two days before first quarter, will be at apogee on the 18th, its distance then being 251,750 miles; at 1:00 a.m., on the 22nd, the Sun will reach the winter solstice and we will mark the beginning of winter (I wonder what we have been doing for the past several weeks?!); on the 25th Mars will be near Neptune (see item on page 2); the Moon, this time two days after full phase, will reach perigee on the 30th, at a distance from Earth of 224,790 miles. * January 1975: Our planet Earth reaches perihelion (point in orbit closest to the Sun) and is then nearer to the Sun by 1.7% (1.5 million miles) than the mean distance of 92,957,000 miles; Venus appears as an evening star (mag. -3.4 on the 15th) low in the south-west after sunset; on the 23rd the planet Mercury reaches greatest elongation east (19° from the Sun) and will then be about 13° above the horizon in the south-west at sunset - so you need a good horizon to observe this planet; watch for a close approach of the asteroid Eros to the star kappa Geminorum on the 24th - there just may be an occultation of that star. Astrophotographers may want to take this opportunity to record the motion of this asteroid with respect to background stars; if an occultation materializes, it might occur around 0.5h universal time (7:30 p.m. EST on January 23rd). The magnitude of Eros will be 7.8, that of kappa Geminorum 3.7; Eros will be about 14 million miles from Earth and about 105 million miles from the Sun - GOOD HUNTING! (the Moon, three days before full phase, will be nearly 45° away and should not present too much interference).

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FROM AN OLD NEWSPAPER: "In the year 2,000 February will have two extra days - a 29 and a 30. This phenomenon will recur once every 1,000 years, because the leap year day we slide in every four years doesn't take up quite enough slack. And if you think it's bad enough for a person to have a birthday only once every four years, consider the poor soul born on Feb. 30, in the year 2,000 ..." TO ALL OUR READERS AND OTHER FRIENDS WE EXTEND OUR WARMEST HOLIDAY GREETINGS AND BEST WISHES FOR GOOD SKIES IN 1975.

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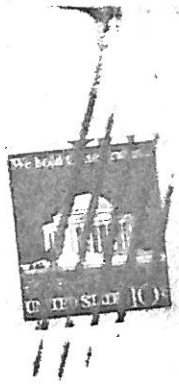

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