

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

# the Spectrum

Editor: Ernst E. Both

J U N E 1 9 7 2

**JUNE MEETING:** June 9, 1972, 8:00 p.m. EDT, Club Room, Buffalo Museum of Science. Our last indoor meeting is both formal and informal. The formal part will consist of the Annual Report by our President, Richard Zygmunt, followed by the election of officers for 1972 - 1974 (see below). The informal part will feature short reports by several of our members, as well as a raffle of a set of astronomical color slides. Interested members are urged to be prepared to give brief reports on their activities, to bring photographs or slides they have taken, and to be financially equipped to participate in the raffle. Refreshments as usual afterward. This is your chance to let the members know what you have been doing! Be prepared!!

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**ELECTION OF OFFICERS:** The following slate has been proposed and approved at the May meeting:

President: Darwin Christy  
Vice President: Thomas Dessert  
Treasurer: Robert Kartyas  
Secretary: John Riggs

Nominations from the floor were closed at the May meeting. All offices are for a two year term (September 1972 - 1974).

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**2ND ANNUAL APOLLO RENDEZVOUS AND TELESCOPE FAIR:** June 16/17, Dayton, Ohio.

The 2nd Annual Apollo Rendezvous and Telescope Fair will be held on Friday, June 6th and Saturday, June 7th at the Apollo Observatory of the Miami Valley Astronomical Society in Dayton, Ohio. Among other events there will be an exhibit of telescopes and astro-photographs, papers and seminars, and informal star-gazing. The observatory's 19-inch Buchroeder Catadioptric Telescope will be dedicated on June 17th, at 8:00 p.m. Advance registration is \$ 3.00 (\$ 5.00 for a family). If interested, write to: Miami Valley Astronomical Society, Chairman, 2nd Annual Apollo Rendezvous, 2629 Ridge Ave., Dayton, Ohio 45414 (checks to be made payable to: Miami Valley Astronomical Society).

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**PIONEER 10 ENTERS SPACE BEYOND MARS** (Adapted from NASA News-Release No. 72-99)

Pioneer 10, on its way to Jupiter, crossed the orbit of Mars on May 25 and entered space never before visited by a spacecraft. In only 12 weeks the spacecraft covered the same distance previous spacecraft bound for Mars have taken about five months to cross. All of the craft's 11 on-board scientific instruments have

been turned on and are functioning well. Around May 12 Pioneer 10 entered a region nick-named the "Great Galactic Ghoul." In this region, close to the orbit of Mars, several previous Mars-bound spacecraft (including Mariner 9) have encountered difficulties, believed by some to be due to impact by high-velocity meteoroids. Indeed, Pioneer 10's meteoroid instruments continue to encounter unusually large numbers of meteoroids and dust particles.

Pioneer 10 is the fastest man-made object ever flown. Its average speed toward Mars was about 75,000 miles an hour. During the later parts of its 22-month flight to Jupiter (next year) it will slow down to about 25,000 miles an hour, only to speed up again as it nears the giant planet. The craft is scheduled to enter the Asteroid Belt around July 1. It will take about seven months to cross this 175 million-mile wide Belt of rock fragments and cosmic rubble between the orbits of Mars and Jupiter, reaching Jupiter on December 3, 1973. After passing the giant at a distance of 87,000 miles, it will swing out into the far reaches of the solar system, ultimately leaving it completely. If everything goes well, scientists are hopeful that its communications system will return data out past the orbit of Uranus (about 2 billion miles), a point the craft will reach around 1980!

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#### RELATIVITY THEORY TEST - Adapted from NASA News-Release No. 72-105

The National Aeronautics and Space Administration has started the development of a space experiment to test the equivalence principle which is a cornerstone of Albert Einstein's General Theory of Relativity.

The equivalence principle asserts that there is no way to distinguish in a small region of space between the pull of gravity and an oppositely directed mechanical acceleration. A consequence of this principle is that when two identical clocks are in two locations in which the gravitational pull is different, the clock rates will appear to an observer to be different. It should be noted that the clock rates themselves are not changed; it is the geometry of space and time that is warped by gravity. Because a light wave escaping from the strong gravitational field of the Sun or other massive body will have its frequency decreased or shifted toward the red end of the light spectrum as it travels to a weaker gravitational field, this effect is called the "gravitational redshift."

In the planned experiment a clock will be launched in a 3.5-hour elliptical flight trajectory over the Atlantic Ocean. During the flight, this clock will always be in a weaker gravitational field than an identical clock which will remain at a Bermuda Ground Station. Hence, the frequency of the clock in the probe as observed by telemetry, will always appear to be greater than that of the clock on the ground and the observed effect will actually be a "blue shift." Moreover, as the clock rises from the Earth through the increasingly weaker field to its maximum altitude of 11,185 statute miles, it will appear to run increasingly faster. Its rate will then progressively appear to decrease as it returns to the stronger field at lower altitudes. During the flight, the difference between the clock rate in the probe as indicated by the telemetry signal and that on the ground will be compared with the shifts predicted by Einstein's Theory.

The Smithsonian Astrophysical Observatory will develop hydrogen maser clocks for the redshift experiment. These clocks are the most stable ones available for

the period of a few hours in which the experiment will be conducted. They are stable to a few parts in one quadrillion and will provide a measurement accuracy within two thousandths of one percent for the predicted effect.

Called the "Gravitational Redshift Space Probe Experiment," the project is being managed by the NASA Marshall Space Flight Center for the NASA Office of Space Science. It is scheduled to be launched by a Scout-D rocket from Wallops Island, Va. in late 1974.

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SUPERNOVA IN NGC 5253: A fairly bright supernova (mag. 8.5) was discovered by C. T. Kowal, Department of Astrophysics, California Institute of Technology, on May 13, 1972. The supernova is located 56" west and 85" south of the 10.8 ( $m_{\text{phot.}}$ ) magnitude galaxy NGC 5253 (RA= 13h 37.1m, decl.=  $-31^{\circ} 24'$ , equinox 1950.0). Another very bright supernova in the same galaxy was observed in 1895 (= Z Centauri). Although not ideally placed for observation from our latitude, some of our more indefatigable observers may want to follow this object.

According to observations by Dr. G. H. Herbig of Lick Observatory, the spectrum is similar to that of "classical" Type I supernovae. Assuming the supernova was discovered very soon after outburst (this may be a totally wrong assumption), it should be possible to observe it with instruments 6-inches and up until around June 18. After that date it will have become too faint. It would be interesting to see how many members succeed in locating it.

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SOLAR ECLIPSE July 10, 1972: As everyone knows by now, a total solar eclipse will be visible in northern Canada on July 10, 1972. This eclipse will be partial as viewed from Western New York (and much of the rest of North America). The circumstances for Buffalo, N.Y. are:

First Contact=	3h 22m 58.4s	(p.m. EDT)	
Maximum (77%)=	4 34 21.0	"	Altitude= $45^{\circ}$ , Azimuth= $258^{\circ}$
Fourth Contact			
	= 5 39 15.8	"	

The last partial solar eclipse visible from Buffalo occurred on March 7, 1970. The last TOTAL solar eclipse visible from Buffalo took place on January 24, 1925. The next TOTAL solar eclipse visible from Buffalo will take place on April 8, 2024! There will be an annular eclipse visible in Buffalo on May 10, 1994 (a date which some of us may find somewhat easier to meet than 2024). \*\*\*\*\*  
THE KELLOGG OBSERVATORY AND SOLAR LAB WILL BE OPEN FOR THE ECLIPSE 3:15-5:45 p.m.

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PARTIAL ECLIPSE OF THE MOON: A partial lunar eclipse will be visible from Buffalo in the early morning hours of July 26, 1972. The Moon will enter the umbra at 1:55 a.m. EDT. Mid-eclipse occurs at 3:16 a.m. and the Moon leaves the umbra about an hour before it sets, at 4:36 a.m. About 55% of the full moon will be covered by the Earth's shadow. The Kellogg Observatory will be open to the general public.

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A PLANET BEYOND PLUTO? There is all sorts of evidence, circumstantial and other-

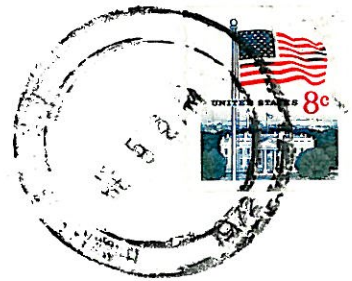
wise, that there may exist a 10th planet far beyond the planet Pluto. In the past several astronomers have attempted to calculate some orbit for such a hypothetical planet. The most recent attempt is that of Joseph L. Brady, of the Lawrence Livermore Laboratory, University of California. Noting that predicted returns of Halley's comet have been consistently off by 4 days in the past, Dr. Brady found that these residuals could be removed almost completely by invoking the gravitational force due to a 10th planet. This "planet X" would have the following characteristics: Distance about twice that of Neptune ( $a=59.9$  A.U.), Mass about three times that of Saturn, Period = 464 years, Inclination =  $120^\circ$ . This inclination would not only make it a retrograde planet (the only one in our solar system) but would also greatly remove it from the common plane of our system. This inclination would locate it outside the area covered by the Lowell Observatory survey (1929-45) which led to the discovery of Pluto. It should be stressed that Dr. Brady's planet X is merely a good solution to an unexplained behavior of Halley's comet and not proof positive that planet X exists.

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\*\*\* W A N T E D \*\*\* Mr. Justin Gray of 33 Eaglewood Ave., Buffalo, N.Y. 14220 (Telephone 822-2228) is interested in buying a 6-inch reflector, second hand or amateur-made, if the price is right. Please call him if you have such an instrument for sale. \*\*\*\*\* REMEMBER TO BRING YOUR RECENT ASTROPHOTOGRAPHS, PRINTS OR SLIDES TO THE JUNE MEETING TO SHOW YOUR FELLOW MEMBERS WHAT YOU HAVE BEEN DOING. ALSO REMEMBER THERE WILL BE A RAFFLE TO BENEFIT OUR RAPIDLY DEPLETING TREASURY. \*\*\*

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Buffalo Astronomical Association, Inc.  
c/o Buffalo Museum of Science  
Humboldt Park  
Buffalo, N.Y. 14211



F I R S T   C L A S S

Mr. Eugene Hazel  
Mr. Larry Hazel  
1234 - 89th St.  
Niagara Falls, N. Y. 14304