



VAN FLANDERN MEASURES DECREASE OF GRAVITATION



DR. VAN FLANDERN

Dr. Thomas C. Van Flandern, research astronomer of the U. S. Naval Observatory, will describe his new measurement of the rate of change of the universal gravitational constant at the March 1 meeting of the National Capital Astronomers.

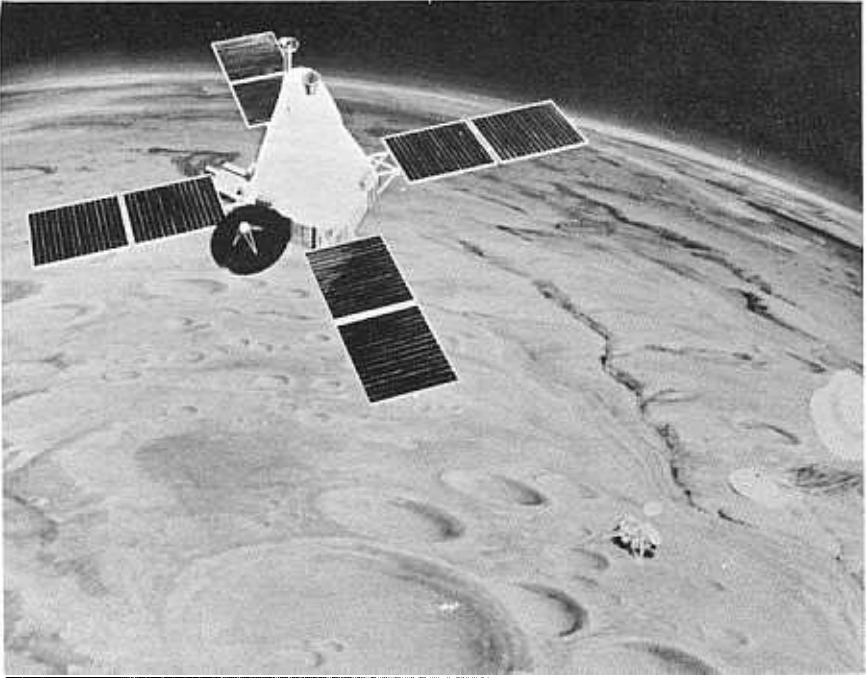
Timings of occultations of stars by the Moon since 1955, when atomic time became available, have shown that the lunar longitude acceleration with respect to the stars is nearly double its acceleration with respect to the Sun's longitude. This observed effect, predicted by Hoyle, implies that the orbits of both the Moon and the Earth are expanding. The simplest plausible explanation is that the universal gravitational constant, G , is decreasing at a rate of $\dot{G}/G = (-7.5 \pm 2.7) \times 10^{-11} \text{ year}^{-1}$, which agrees well with the expectations of cosmological theories such

as those of Hoyle-Narlikar or Dirac, but is larger than anticipated by the Brans-Dicke theory. Virtually all other known interpretations of the excess accelerations can be ruled out; and there is a considerable body of supporting evidence for the \dot{G}/G interpretation. Now, a new determination has become possible from the motion of the ascending node of the lunar orbit on the ecliptic. The discrepancy between the observed and theoretical locations of the lunar node 20 centuries ago, determined from ancient solar eclipse records, would vanish if $\dot{G}/G = (-12 \pm 7) \times 10^{-11} \text{ year}^{-1}$. Both determinations contain the Hubble rate of expansion of the universe, $(-5.6 \pm 0.7) \times 10^{-11} \text{ year}^{-1}$, within their mean errors.

Dr. Thomas C. Van Flandern was born in Cleveland, Ohio. He received his B. S. in mathematics in June 1962 from Xavier University in Cincinnati under a General Motors Scholarship. After a teaching fellowship at Georgetown University in 1962-63, he earned his Ph.D. in astronomy from Yale University in 1969. His dissertation advisor was Professor G. M. Clemence, an earlier Gravity Research Foundation prize winner. Since February 1963 Dr. Van Flandern has been a research astronomer at the U. S. Naval Observatory, where his principal research activity is celestial mechanics, especially lunar motion. He is a member of the International Astronomical Union, American Astronomical Society, American Geophysical Union, American Association for Advancement of Science, Sigma Xi, and National Capital Astronomers.

MARCH CALENDAR

- Saturday, March 1, 6:15 PM — Dinner with the speaker at Bassin's Restaurant, 14th Street and Pennsylvania Avenue, NW. Reservations unnecessary.
- Saturday, March 1, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Van Flandern speaks.
- Monday, March 3, 10, 17, 24, 7:30 PM — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.
- Friday, March 7, 14, 21, 28, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.



This NASA painting shows the unmanned Viking in orbit about Mars with its life-search lander and discarded capsule on the surface of the planet.

FEBRUARY LECTURE

Dr. Richard S. Young, Chief Scientist of the NASA Viking Mars Lander Program, spoke to National Capital Astronomers on February 1 about his organization's programs for detecting life in the Solar System.

Dr. Young emphasized that only a carbon-chemistry, water-solvent basis for life is being seriously considered; no satisfactory model exists for any other biochemical system. Many types of organic molecules (neither necessarily nor even likely of organic *origin*) are found by radio astronomy to be widespread in comets, nebulae, and interstellar space. He pointed to the well-known experiments of Stanley Miller and subsequent workers which demonstrated that amino acids — protein materials — will be generated from the ingredients of the primordial atmosphere of the Earth under conditions such as existed during the early geologic development. Of possible sites of extraterrestrial life in the Solar System, it appears that the likelihood — even if small — is greatest for Mars, Jupiter, and Titan. Laboratory models of Jupiter's atmosphere have demonstrated the capability of supporting certain terrestrial organisms; near-surface conditions on Mars resemble those on the Earth most nearly of any planet. Any Jovian tenants would be expected to be tiny organisms floating high in the atmosphere.

In late summer 1975, two Mars Viking vehicles will be launched from Cape Canaveral to begin the one-year 460 million-mile trip to orbit the planet. Each craft, one of which is depicted in the painting above, will carry, in addition to other experiments and television cameras, a lander capsule containing a sophisticated life-detection laboratory. Powered by nuclear fission, each of the laboratories will be capable of two 40-day periods of operation; Dr. Young

NOTE ON CURRENT RESEARCH

Gamma rays ($\lambda < 1\text{\AA}$) have been observed in the 0.1-1.2 MeV energy range since 1972. They appear randomly distributed in celestial coordinates (18 events) and may be of either galactic or extra-galactic origin. If the latter, supernovae are the likely source, but γ -ray pulses correlate poorly with supernova outbursts.

A galactic source of γ -rays implies energies $> 10^{36}$ ergs. Sofia and Van Horn, of the Joint Institute for Laboratory Astrophysics, hypothesize that the annihilation of asteroid- or comet-sized chunks of antimatter ($> 10^{15}$ grams) by stars is the source of these γ -rays. This hypothesis requires a density of antimatter in our galaxy of $< 10^{-6}$ that of matter.

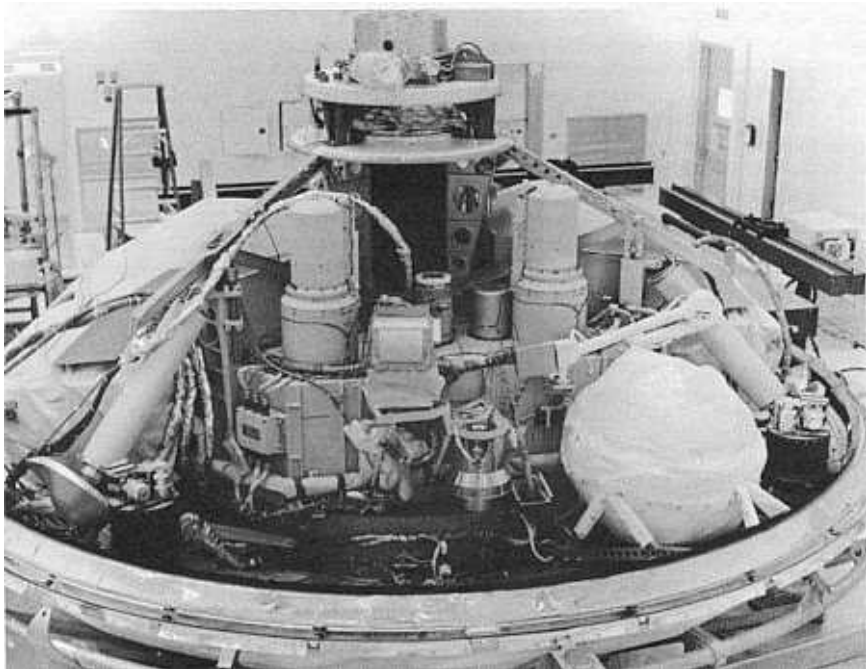
The authors suggest three observational tests of their ideas, all difficult at the present state of the art. (*Astrophysical Journal*, December 15, 1974)

CRAB NEBULA ON TV

As part of their "Nova" science series, WETA TV (channel 26) will present "The Crab Nebula" on Sunday, March 23, at 7:30 PM. The nebula, M1, contains the only known optical pulsar, NP0532, discussed by Dr. William Rose in his November NCA lecture. (*Star Dust*, November and December 1974)

noted that the lander would detect life on Earth within hours of its descent.

One of the laboratory capsules is shown in the photo below. Each laboratory contains instruments to test for photosynthesis and to detect soil organisms. A variety of conditions and nutrients (based, of course, on carbon biochemistry) will be provided to encourage replication within the instruments. A mass spectrometer will record the abundance of elements having atomic weights from 1 to 200. Both craft will be sterilized at 113°C for 40 hours before launch both to prevent contamination of Mars with terrestrial organisms and to preclude erroneous detection of life.



Viking Lander capsule in preparation at Kennedy Space Center (NASA photo)

EXCERPTS FROM THE IAU CIRCULARS

1. Dr. R. M. West, European Southern Observatory Sky Atlas Laboratory, Geneva, discovered a comet on a photograph taken on October 15 by Pizzaro and Ballereau at E. S. O., La Silla. Of 12th magnitude, Comet West was in Phoenix.

2. H. W. van Someren Greve, H. vander Laan, and J. W. M. Baars believe they have detected the binary pulsar at 1415 MHz in a 12-hour measurement with the Westerbork Synthesis Radiotelescope. The flux density was 1.9 ± 0.5 mJy.

3. January 4 — The Reverend Leo Boethin, Abra, The Philippines, discovered a 12th-magnitude comet in Aquarius. Now in Aries, Comet Boethin (1975a) has passed perihelion and is also receding from the Earth.

4. January 16 — D. Gibson, National Radio Astronomy Observatory, observed a radio outburst of β Per (Algol). The flux density increased by a factor of 2.5 at 8085 and 2695 MHz.

5. January 24 — Dr. B. T. O'Leary, Hampshire College, reported positive observations of the occultation of κ Gem by Eros by three teams in western Massachusetts and central Connecticut. Durations ranged from 2.5 to 3.4 seconds.

This listing furnished courtesy R. N. Bolster.

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