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GODDARD NEWS

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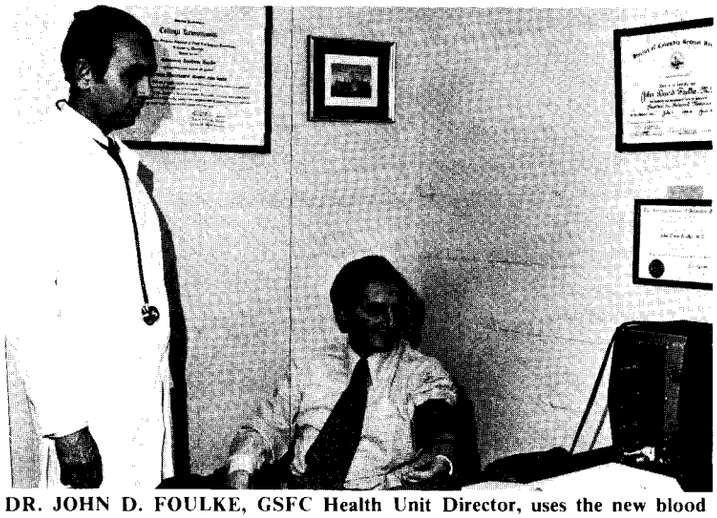
Space Age Technology Applied To Physical Exams

The GSFC Health Unit is now equipped with an Automatic Blood Pressurometer with a digital readout and on-line computer program that provides individual cardiovascular risk analyses based upon individual patient profiles. This system is now being used in connection with Health Unit physical exams. A printout is given to the examinee, listing his/her blood pressure reading and heart rate, followed by a comment estimating the risk of cardiovascular complications based upon age, sex, smoking habits, and systolic blood pressure. The form includes a statement concerning the likelihood of, or odds against, heart or circulatory disease within an eight year period.



DR. JOHN D. FOULKE, GSFC Health Unit Director, uses the new blood pressurometer in checking the blood pressure of William A. Mecca Jr., Director of Administration and Management at Goddard.

GODDARD ASTRONOMY CLUB OFFICERS ELECTED

The new officers for the Goddard Astronomy Club for the year 1976-1977 are:

President: Robert D. Godfrey, Code 805, X6331;
Vice President: George L. Fleming, Code 565, X6346;
Secretary-treasurer: Leslie M. Salter, Code 571, X4966.

The outgoing officers were:

President: Winifred S. Cameron
Vice-President: Robert W. Vostreys
Secretary-treasurer: Ralph P. Pass

For the Bicentennial activities of Goddard, the Astronomy Club conducted Evenings with the Universe, a series of evenings at which the program consisted of a movie on astronomical subjects about which the speaker of the evening elaborated, and an observing session (weather permitting) at several telescopes set up in the Building 8 visitors parking lot which were manned by members of the Astronomy Club. Objects of interest for viewing were the moon, planets, and deep space objects such as star clusters, nebulae, galaxies, and double stars. The programs, attended by several hundred each time, proved to be so popular that the program was extended through December from the original three months of June, July, and August planned.

Four Thousand Year Old Mystery of the Lodestone Solved

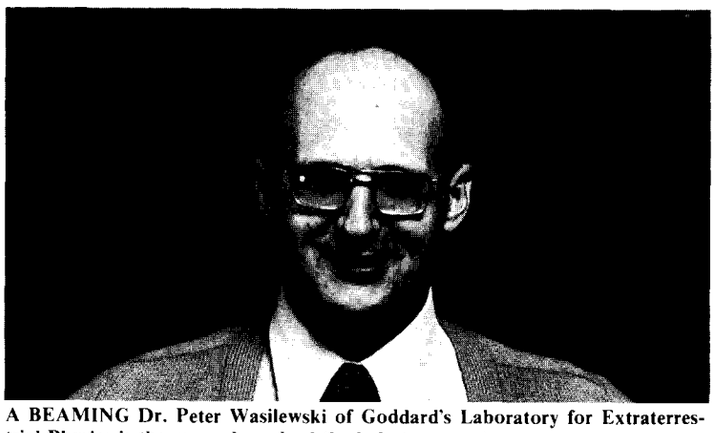
A four-thousand year old puzzle, "What is a lodestone?"—finally has an answer. Dr. Peter Wasilewski, in the Astrochemistry Branch of the Laboratory for Extraterrestrial Physics from NASA's Goddard Space Flight Center in Greenbelt, Maryland has the answer to the question, with a detailed explanation for the existence of nature's only permanent magnet and the natural processes responsible including possible methods for charging the magnet.

Using equipment in his lab which is normally used to study the magnetic properties of meteorites and iron alloys which simulate condensed solar system material and to evaluate processes such as oxidation, reduction, and shock impact, he has clearly documented with microscopic and magnetic studies the differences between lodestones and other iron ores. He has further demonstrated that natural processes such as oxidation and solid state precipitation have been used by Mother Nature to magnetically harden the lodestone iron ore by producing a fine scale microstructure observable only at magnifications greater than 1,000 X. These microstructures are common to all lodestones—iron ores which do not contain them are not lodestones. The detailed magnetic property studies confirm the optical studies and quantitatively explain why the microstructurally hardened iron ores can behave as permanent magnets.

Having for the first time explained why the lodestone behaves as a permanent magnet, Wasilewski approached next the more elusive problem of how the natural magnet is charged as any magnet must. His laboratory tests confirmed that a lightning strike is a sufficient condition. However, to create this phenomenon after careful elimination of many other mechanisms, one other possibility remains; that of magnetization enhancement during the process(es) which magnetically harden the iron ore. Further tests should render discrimination possible as the experimental framework does not presently exist.

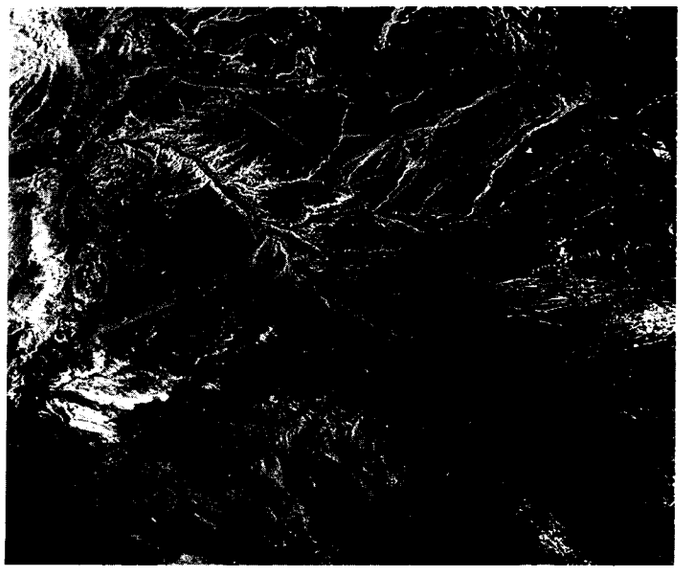
Having been known to civilization for approximately 4,000 years, one might logically ask what are the consequences of the new information? For one, an in depth knowledge of the magnetic properties of iron ores is available, since to ask the question—What is lodestone?—requires an answer to the question—What are the differences between iron ores which are lodestones compared to other iron ores?—all types of iron ores were evaluated.

Further, at all levels of inquiry, one will never be left with the question—What is a lodestone?—unanswered.



A BEAMING Dr. Peter Wasilewski of Goddard's Laboratory for Extraterrestrial Physics is the man who solved the lodestone mystery.

An Application of the NASA Goddard Space Program to Archaeology

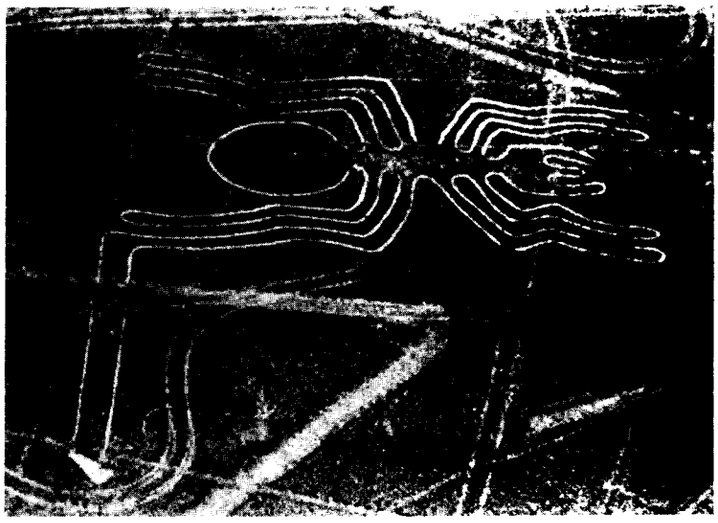


THE HIGH DESERT area between Nazca and Palpa in southern Peru contains unexplained vestiges of an ancient culture. Hundreds of geometric shapes and figures have been etched into the desert floor and have remained, until recently, virtually undisturbed for over 1000 years.

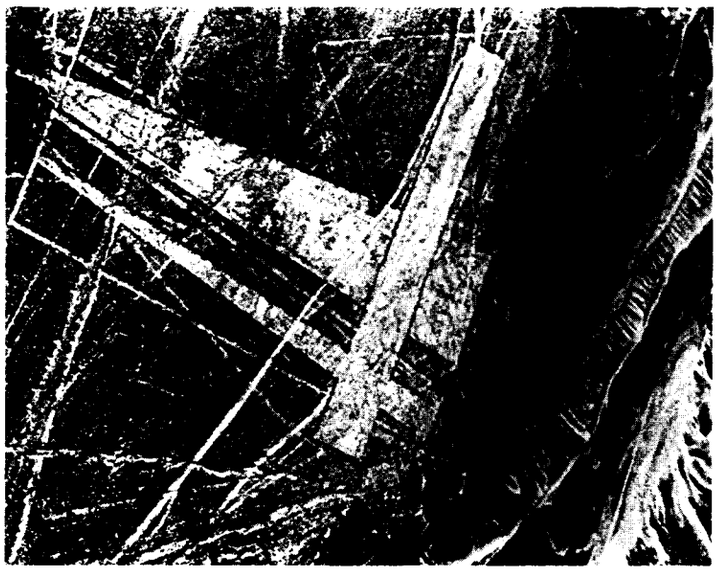
Discovered by Dr. Paul Kosok in 1939 and the subject of thorough analyses by Dr. Maria Reiche for over 30 years, these ground drawings can best be seen and studied from aircraft. To obtain a synoptic view, one must go to altitudes only achievable by spacecraft. Such an overview has been recorded by scanners flown onboard Landsat from a height of almost 600 miles. From this altitude it is not possible to observe the finer structures; only the larger linear features are visible. However, some features have been recorded which have heretofore been unnoticed.

For example, one of the most prominent lines appears to be connected to an early road that had its origin on the Peruvian coast near Bahia San Nicolas more than 50 km distant. In this same area exists a large isosceles triangle, 1750 meters on a side, encompassing an area of 750,000 square meters. This feature lies 52 km southwest of Nazca, well outside the area of known drawings.

This is a singular and very limited use of a new technology, but, as resolution becomes much finer in the future, bears further investigation in its application.



THE HUGE SPIDER was constructed over a thousand years ago for viewing from high altitudes—perhaps for the benefit of Peruvian Gods. From ground level the spider's large size created by the artistic placement of rocks renders it indistinguishable from other rocks in the area. Vacationers from Goddard who recently returned from Peru were fascinated by the area.



THIS ANCIENT man-made design resembles the runways and taxi strips of a modern airport.

Cold-Stunned Sea Turtles Given Warm Refuge At Spaceport

—Cold-stunned sea turtles occupying the shallow waters surrounding the Kennedy Space Center are being given warm refuge in a wildlife laboratory building and recreational swimming pond.

After temperatures in the low 20s swept Florida on the nights of January 19-20-21, 140 cold-paralyzed green, loggerhead and Atlantic Ridley sea turtles surfaced on the waters of Mosquito Lagoon and the Indian and Banana Rivers or were beached on their shores.

The Atlantic Ridley is on the endangered species list and the greens and loggerheads are candidates for the same listing. The size of the turtle population turned up by the freeze far exceeded the expectations of local wildlife authorities.

The giant reptiles are sensitive to water temperatures below about 50 degrees. Temperature readings in Mosquito Lagoon, for example, were plunged to 39 degrees by the succession of below freezing nights.

Robert Yoder, Manager of the Merritt Island National Wildlife Refuge which has been established on NASA lands not in operational use, said the reptiles surfaced after they were "almost anesthetized" by the plunging water temperatures.

For several days after the freezes, fishermen, private citizens, personnel from the U.S. Fish and Wildlife Service and Florida Marine Patrol, and students from Florida Technological University (Orlando) located, reported or brought the reptiles to the FTU field laboratory on the northern end of the Kennedy Space Center.

The largest—a loggerhead—weighed in at 243 pounds. The largest green weighed 130 pounds.

The lethargic turtles were kept in small wading pools or on their backs in the FTU laboratory for several days in hopes that rising water temperatures would permit their return to their natural habitat.

Space Photo Album of the World Prepared With Satellite Imagery

The most comprehensive and detailed "space photo album" of the world's natural and cultural features has been prepared with images from NASA's Landsat Earth Resources Satellite.

Entitled *Mission to Earth: Landsat Views the World* (NASA SP-360), the atlas-size publication contains some 400 Landsat images—most of them in color and near-full page size.

Landsat images are used extensively by scientists around the world as corollary tool in monitoring crop yields, mapping terrain features and detecting urban area growth for census applications. Others use the imagery as an aid in mineral and fuel exploration, water resource monitoring and control, and inventorying strip mining operations as well as flood and pollution damage.

Mission to Earth will be available by early March, 1977, through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, at $14 a copy, The stock number is 033-000-00659-4.

The new book was authored by Drs. Nicholas M. Short, Paul D. Lowman, Jr., and Stanley C. Freden of NASA's Goddard Space Flight Center, Greenbelt, Md., and Dr. William A. Finch, Jr., of the San Diego State University.

They designed the book for wide readership appeal. It is a reference atlas, a teacher's guide, a text book, and a supplemental tool for the resource specialist.

Although the new book covers the world with representative images, preferential coverage is given to the United States. Approximately 40 percent of the images are devoted to the 50 states.

The heart of the book consists of a variety of Landsat mosaics, montages, enlargements, and standard images. In some cases, the standard images have been repeated to reflect seasonal changes. Standard Landsat images cover 185 kilometers (115 statute miles) on a side and encompass about 34,000 square kilometers (13,000 square miles). They are normally printed at a scale of 1:1,000,000.

One special feature of *Mission to Earth* is the use of expanded captions to summarize the basic story present in each of the book's images. Each caption describes many well-known geographic points of interest in a scene, the main urban and cultural features, the major farming and industrial activities of the region, and the characteristic natural vegetation. Various aspects of the geology exposed in each scene have been given considerable attention.

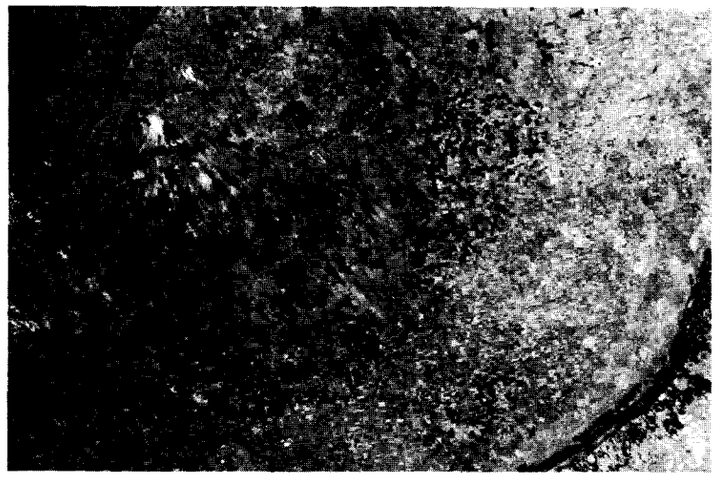
Each image has a letter-number grid system surrounding it for quick location of features referred to in the image caption.

In addition to containing the "main picture gallery" section, *Mission to Earth* includes a comprehensive introduction to the Landsat spacecraft and its systems. Another section provides a broad review of Landsat accomplishments and applications.

Due to the value of the book to educators, an Educators Guide is being prepared by the Goddard Space Flight Center and will be available at no cost upon request to the Center's Office of Public Affairs, Educational Programs, Greenbelt, Md. 20771.

Serving as an educational supplement to *Mission to Earth,* the guide provides a general overview of the Landsat program, how the spacecraft operates, and an explanation of remote sensing and imagery, along with some suggested classroom uses of the imagery.

Contained within the Guide is a "Teacher's Resource Section" which includes classroom activities, exercises, and techniques for using the imagery. This section is organized around several major discipline areas, namely earth science, geography, and social studies. To facilitate the use of *Mission to Earth* by the teacher, the Guide includes a glossary of geological and remote sensing terms which are used in the book.



LANDSAT PICTURE

This is a Landsat picture of southwest Nebraska in band 5 of the spacecraft's multispectral camera showing the numerous center pivot irrigation systems in the state. The irrigated areas show up in striking contrast to the rest of the terrain as perfectly round dots. This picture was taken September 11, 1976. Most of the center pivot irrigation systems are between the two rivers in the scene, the Republican River running southwest in the lower right corner and the South Platte River also running southwest in the upper left corner. Lodge Pole Creek upper left connects to the South Platte near top center.

Marvin P. Carlson, Assistant Director of the Conservation and Survey Division of the University of Nebraska, Lincoln, says that there are some 12,000 center-pivot irrigation systems now being used in the state. With their member growing at the rate of 40 to 60 per cent annually, it is necessary to make yearly inventories.

The reason it is so important to know how much center-pivot irrigation is being installed each year is that state legislators must have an idea of how much water is being expanded from a constantly drought-lowered water table in case there is a need for water allocation.

In addition, the energy crisis has made it important for fuel distributors to know how fuel is being used in the state. With some 1.5 million acres of land irrigated by the center pivot system the diesel fuel or equivalent used is calculated at more than 83 million gallons a year. Water use is estimated at 407 thousand gallons per acre each year.

Even future planning and real estate prices have been affected by the amount of irrigation in the state. As a result, the Landsat imagery is important to highway and transmission lines planners as well as farmers and urban developers.

The Nebraska project is funded by NASA's Office of University Affairs, Washington, D.C. NASA's Goddard Space Flight Center, Greenbelt, Md., is responsible for Landsat project management including data acquisition and distribution.

Ralph Nader Addresses Conference via NASA Satellite

Public Interest Research Groups held a national conference on 29 January 1977 at St. Rose College in Albany, N.Y. A highlight of the conference occurred when Mr. Nader joined other speakers in addressing the gathering from their home states via satellite to a hand held walkie-talkie in Albany. This was accomplished as part of a NASA demonstration coordinated by the experiment's Principal Investigator John J. Woodruff of GSFC.

Futuristic Looking Goddard Facility Active At Night

—Along a lonely country road in Maryland stands a cluster of trailers, equipment, cables, and buildings that look like they belong to a time and place far in the future. The cluster glistens as the sun reflects its rays and silver tones are accented by the snow-covered winter fields. Within the complex brilliant red signs warn of invisible hazards to human beings. In one of the silver buildings, engineers and technicians of Bendix Field Engineering Corporation, dressed in white laboratory smocks, perform maintenance routines and final adjustments on ponderous white equipment.

Later, when the twilight quickly slips into the night of winter, a switch is thrown and the roof of the building slides slowly rearward exposing the cold dark night. The barrel of the device protrudes skyward, and the crew prepares to "sight in" on the target. Computers and displays in the basement hum and silently count off a digital display of the range.

What has been described is the acquisition and tracking of a satellite such as the Lageos Geodetic Satellite (LAGEOS), fitted to receive and return high intensity laser beams by means of retroreflectors. This very accurate methods enables determination of distance to the satellite to within 5 centimeters. The complex described here is headquarters for the NASA Laser Tracking Subnet located at Goddard Space Flight Center, Greenbelt, Maryland, and known as the Goddard Optical Research Facility. The permanent laser tracking facility, known as STALAS, is located here. In addition to its use as a tracking station, the Goddard facility is also the center for research and development for laser tracking tecnology.

Gil Ousley Receives German Medal

Goddard's Helios Project Manager Gil Ousley has been awarded the German Medal "BUNDES-VERDISENST KEREUZ," Germany's highest civilian award, for his work on the cooperative U.S. German Helios Solar Probe Project. The presentation was at a special reception at the German Embassy, in Washington. The medal is comparable to the United States President's Medal of Freedom. The two Helios Solar Probes, launched in 1974 and 1976, have successfully accomplished their mission of traveling several times within 28 million miles of the Sun with all scientific experiments performing flawlessly. Results will help scientists of both countries to better understand the dynamic transfer of solar energy from the Sun to Earth. Gil, who received his BS and MS degrees from the University of Maryland, has also received the Department of Defense Meritorious Civilian Service Award, the NASA Exceptional Service Medal and the French Government Space Medal. Two previous NASA recipients of the German award were Dr. Werner Von Braun (1959) ar

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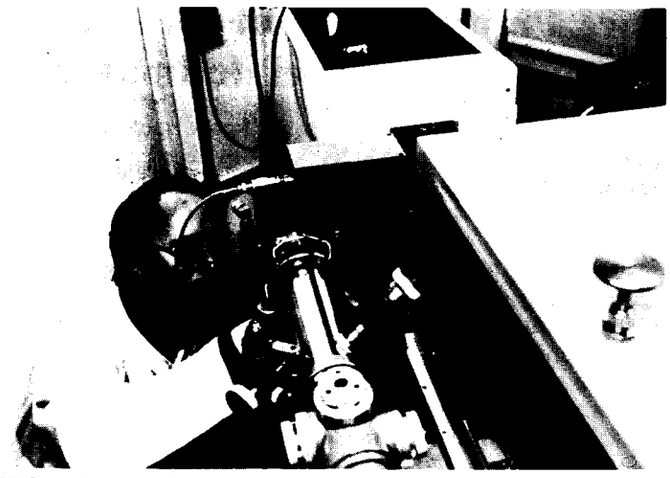

AN ENGINEER at the Optical Tracking Site performs final adjustments prior to operating the Laser Tracking System.

1500 × 1000 MILE DUST STORM

The biggest dust storm since the dust bowl days of the 1930's and certainly the biggest ever seen over the U.S. via satellite is seen in this weather picture received today on a NASA high-resolution ground station at NASA's Goddard Space Flight Center, Greenbelt, Md.

The dust cloud extends east-west about 1500 miles—from about Albuquerque, New Mexico to the eastern Carolinas—and north-south at least 1000 miles—from about Witchita, Kansas to several hundred miles over the Gulf of Mexico.

The cloud comes from top soil of numerous western states that have been parched by the area's long drought. High winds responsible for the enormous dust storm are seen streaming down from the Rocky Mountains into New Mexico and Texas to scoop up the dirt and swirl it 15,000 feet high into the air.

Goddard's Chuck Vermillion, one of the developers of the new Local User Terminal (LUT) station on which the pictures were received said they have been seeing dust storms from time to time since they first started using the LUT last Fall, but "never anything like this." He said, "The average storm seen is about 100 miles long and 20 miles wide."

This two-picture mosaic was received from two passes of the National Oceanic and Atmospheric Administration's NOAA-5 polar-orbiting weather satellite. It has a ground resolution of ½ mile.