

ward during the past 75 years but none has proved satisfactory, and the question has been considered unanswered.

Drs. Irving I. Shapiro of Massachusetts Institute of Technology and Giuseppe Colombo of the Smithsonian Astrophysical Observatory, both in Cambridge, Mass., now suggest that the latitude variations are not a single motion but have a beat caused by a mechanical interaction between the upper layer and the remainder of earth.

The important interaction, effectively separating the earth into two parts, occurs in the mantle, they believe, somewhere between the depths of about 400 and 1,000 kilometers. The wobble is maintained by a beat—the result of differences in the frequency of motion of the two parts; the beat runs through a complete cycle every 80 to 100 years.

The scientists term the suggestion speculative and, for further evidence, are looking into recent data with the aid of Edward M. Gaposkin, also of the Smithsonian.

SPACE

Successes, tries and problems

Despite the craggiest site ever faced by a U.S. lunar lander, Surveyor 7 settled comfortably on the surface Jan. 9 almost bolt upright, only inches away from a rock that might have flipped the vehicle over if one of its three feet had landed on it.

When scientists at California's Jet Propulsion Laboratory signaled the spacecraft to lower its automatic chemical laboratory to analyze the lunar surface, the device stuck, apparently due to particles of lunar rock kicked up during the landing and lodged in the lowering mechanism. Maneuvering the remote-control scoop that had been included on the spacecraft to dig trenches, scientists pressed the experiment box gently down.

When shut down because of heat last week, the experiment had made some 20 hours of measurements, to compare the rough ground near Tycho crater with that of the smoother lunar, or maria examined by earlier Surveyors.

Not only did the box get its 20 hours, but Surveyor's camera managed to squeeze out some 10,000 pictures. The results are still being evaluated.

Elsewhere on the space front the National Aeronautics and Space Administration was running at full bustle:

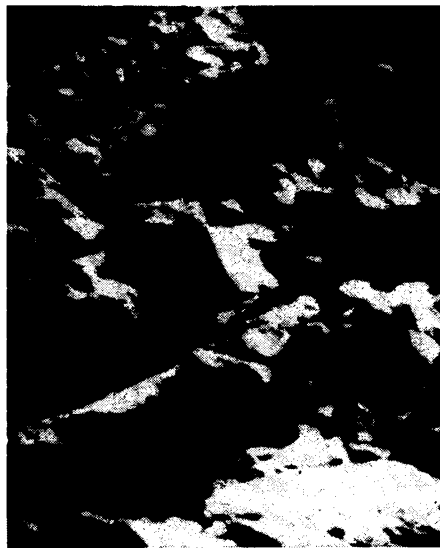
- At Cape Kennedy, preparations were winding up for the first flight of an Apollo lunar module, scheduled, after several postponements, to be launched

Jan. 22. The most important tests will be the firing of its descent and ascent engines, vital to return of the astronauts.

- Continental drift, movement of polar ice caps, impending earthquakes, and the true size and shape of the earth are to be studied with the aid of satellites such as the GEOS-2 probe launched Jan. 11. Equipped with blinking lights, radio transmitters and laser reflectors, the satellite will be used to determine the exact location of the world's land masses, distances between them and their movements.

- A second round of fireproofing tests was begun last week in a redesigned Apollo spacecraft, using a two-gas oxygen-nitrogen mixture instead of pure oxygen as originally planned.

- The most comprehensive study ever made of the northern lights, according to NASA, was to begin Thursday, Jan. 18, including a dozen flights



NASA

Surveyor's eye view of the moon.

in a Convair 990 jet, as well as sounding rocket launches and data from the fourth Orbiting Geophysical Observatory, now in orbit.

- Like most other agencies of the Government, NASA was having its budget troubles. The X-15 rocket plane, whose funding the space agency had taken over from the Defense Department scarcely two weeks before, is probably going to be permanently grounded for lack of money. Also, a two-week three-man flight planned as part of the Apollo Applications program has been cancelled, despite the fact that it had previously been described by the agency as a "fairly important milestone."

And from the Soviet Union, its first satellite of the year, Cosmos 199, was launched last week.

PUBLIC TRANSPORTATION

Proposed: expensive gambles

Ogden Nash once titled a book of verse "You Can't Get There from Here." Sometimes, in America's cities, the phrase seems to hold more truth than poetry.

Swallowing (and often choking on) a heavy breakfast of automobiles each morning, regurgitating them each night, with kinks in the intestines and grief in the tubes, the city has been crying for help.

Transportation doctors have rushed forward with ideas. These tend to be highly imaginative, and, like many prescriptions, immensely expensive, with no guarantee of health to follow.

At the Washington meeting last week of the Highway Research Board, and elsewhere, proposals have been made to provide:

- small buses directed by computer to individual homes;
- one-passenger electric automatics running on exclusive one-way tracks;
- overhead four-passenger automatic cars;
- subway systems with rotating loading platforms so the cars don't have to stop;
- two-passenger overhead downtown carriers combined with suburban high-speed pneumatic-tube trains;
- huge airliners carrying self-contained buses which would collect and distribute passengers on the ground.

All these varied proposals have three things in common: they are aimed at solving the transportation mess, they would be very costly, even on a pilot scale, and nobody knows if they would work.

So many factors enter into public acceptance of a particular type of transportation that choosing one to try out is a form of economic Russian roulette. No private industry is going to finance such experiments without government support and the political consequences of an expensive failure are enough to chill the public blood. The four-passenger overhead system could cost \$700,000 per mile and \$12,000 per car, for example.

The Bureau of Public Roads, trying to reduce the odds, has hired a research firm to build a computer model that would give planners some idea of the kind of transportation needed for different situations, and evaluate the chances that a particular scheme would fill those requirements.

The program, called AFT for "Analysis of the Functions of Transportation," is nearing completion of its first generation form. It is designed to allow planners to feed in data on the amount of cargo, human and otherwise, to be



With artificial satellites already launched and space travel almost a reality, astronomy has become today's fastest growing hobby. Exploring the skies with a telescope is a relaxing diversion for father and son alike. UNITRON's handbook contains full-page illustrated articles on astronomy, observing, telescopes and accessories. It is of interest to both beginners and advanced amateurs.

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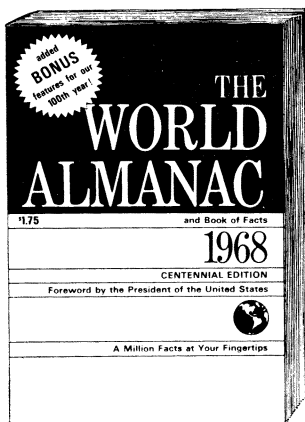
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moved; the constraints—natural, man-made, political and human—involved, and the performance required in terms of comfort, convenience, safety and cost. Out of the model should come information on the kind of system that would meet those requirements.

In another mode, characteristics of a particular transportation system could be fed in, and its safety, cost and convenience determined.

With this tool, says Peter J. Mettam of Booz-Allen Applied Research, Inc., which is developing it, the planner should have some deeper insight into the areas that need technological advancement.

There has been virtual stagnation in innovation in ground transportation, says Mettam, with most technical efforts aimed at marginal improvements in present products. Part of this comes from the expense of trying out ideas; another cause is the big public and private investment in present systems

that, despite the investment, could soon become obsolete.

Another problem planners face lies in designing a transport system for existing conditions, knowing very well that new means of transportation can change those conditions radically. Here AFT should also help, making it possible to predict the effect of changing conditions on system performance.

But AFT, Mettam emphasizes, is only in the first generation stage. "It won't do anything very sophisticated for some time," he says.

Dr. Harry Weingarten, BPR science advisor who is running the AFT program, says he hopes the Bureau will be able to offer planners, by the end of the year, a tool to make rational decisions on alternative solutions to transportation problems.

Until it does, Russian roulette is likely to gain—if not in popularity, at least in frequency—among transportation officials. ◇

SENSORY DEPRIVATION

A new breed of explorer

To volunteers confined alone to a small room in complete darkness and silence for seven days, even a recording of an old stock market report played over and over may provide a grip on sanity.

Two hours into the latest of the Navy's Project Argus isolation experiment, members of the original 40-man experimental team began dropping out. By the end of the week, those who stayed—21 of them—were listening to that record most of the available time.

The 19 dropouts were pretty well shaken when they came out, says Dr. William W. Haythorn, director of the behavioral sciences department at the Naval Medical Research Institute. Their stress, he says, was roughly equivalent to that of soldiers under artillery fire. Those who stayed were more likely to enter a contemplative state of mind.

Actual conditions, of course, will never be this severe. They will, however, last longer, and Project Argus is proceeding on the theory that complete deprivation only accelerates reactions that should occur eventually in the monotonous, confined environment of a research submarine or spacecraft.

Ironically, the men most susceptible to stress seem to be those most likely to volunteer for the experiment. They are the thrill and sensation seekers who value a wide variety of stimuli, notes Dr. Haythorn. Although they readily volunteer, they tend to be quitters.

Men who stick out the deprivation are more down-to-earth and self-reliant, depending less on stimulation from outside sources, he says. This may be

the best type for the next generation of space and ocean explorers.

Dr. John Zubek, director of the sensory deprivation laboratory at the University of Manitoba, adds to this description a biochemical difference between the dropouts and those who stick.

Quitters show an abnormally low level of adrenaline, he says. Successful volunteers normally average an output of nine micrograms of adrenalin a day, while quitters average only five. It could be, says Dr. Zubek, that men with low adrenaline levels are less able to cope with the stress.

The Canadian psychologist has little faith in personality tests and believes that research will produce a biochemical profile of the successful volunteer.

There doesn't seem to be any clear personality difference between the men, he says, except in creativity—those who last score higher on creativity, indicating perhaps inner resources compensate for the loss of sense impressions.

ASTRONOMY

Occultation of Antares

The bright star Antares will pass behind the moon this week, early on the morning of Jan. 25. The occultation will be visible to those in the eastern half of the country, weather permitting.

At 4:49 a.m. EST, as seen from Washington, D.C., the lower bright edge of the moon, which is moving eastward, will hide Antares. The star will reappear from behind the dark lunar edge at 5:12 a.m.