

## In the wake of the ark

*"... and in the seventh month, on the seventeenth day of the month, the Ark came to rest upon the mountains of Ararat."*

Genesis, Chapter 8.

In 1955, Fernand Navarra, a French industrialist and amateur explorer, found on Mt. Ararat in eastern Turkey an estimated 50 tons of wood buried in the finger of a glacial ice pack. The site of the find is 14,000 feet high, several thousand feet above the tree line and over 300 miles from the nearest trees of any size.

Samples of the wood have been verified as hand-tooled white oak, treated with a pitch-like substance.

**Navarra has claimed** that the artifact is a piece of the Biblical Ark of Noah. But whether it is or not—recent carbon-dating of a sample of the wood indicates it is much younger than the 4,000 years of the Noah legend—how the wood got to such a remote spot is still an archaeological mystery. A relationship to the legend of the ark at least is considered likely, and an archaeological expedition is scheduled to leave next week for Turkey to investigate.

There is a rich history of tales of discovery of Noah's Ark. Marco Polo mentioned existence of the ark near the summit of Ararat in 1300. A Russian physician, Dr. Frederic Parot, claimed to have found wood when he climbed the mountain in 1829. In the aftermath of an earthquake in 1840 Turkish officials sent workers to Ararat to prepare barricades against avalanches. One group of the workers reportedly discovered the prow of a vessel, jutting from an ice pack, exposing three rooms. Airplane pilots flying over Ararat have persistently reported a ship-like shadow in the ice when it is clear of surface snow.

The age of the find is critical, but dates are in dispute.

The Madrid Institute of Forestry in Spain estimated the age of a sample at approximately 5,000 years. The Centre Technique de Bois, in Paris, gave 4,484 years. Their findings, some 15 years ago, were based in part on the degree of lignite formation, gain in density of the wood, cell modification and the degree of fossilization.

**More recently** Dr. Rainer Berger of the University of California at Los Angeles isotope laboratory found that radiocarbon measurement on a wood sample yields later dates. The results are similar to those obtained by the Geochron Laboratories in Cambridge, Mass., and those that resulted from carbon-14 tests conducted at the Uni-



Hand-tooled timber from 14,000 feet.

versity of Pennsylvania. According to these tests, the wood is between 1,300 and 1,700 years old.

Hugo Neuberger, a physicist with the Arctic Institute of North America, suggests that the age discrepancy of the tests may be due to the fact that the wood was soaked in glacial meltwater for many centuries. Thus it may have been contaminated by carbon-14 more recently formed in the upper atmosphere and brought down as carbonic acid in rain and snow. As Mt. Ararat is a volcano emitting sulfuric gases, sulfurous acids and sulfates are formed in the glacial meltwater. In the presence of these acids, the wood fibers are softened and the exchange of carbon molecules between the wood lignins and the carbonic acid is enhanced.

But even if the more recent date is accurate, Dr. Berger suggests that the wood may be related to the ark story, perhaps as a monument to it.

"There is no reason for a building that high in the mountains other than as a hermitage or monument," he says. "Since the ark was a common belief in the heritage of people living in the vicinity of Mt. Ararat, it is quite possible that a hermitage was built to pay homage to the belief."

**The new expedition** hopes to solve some of the controversy over the age of the wood as well as carry out a program of geophysical-glaciological research and archaeological excavation. The expedition is headed by Ralph A. Lenton, a polar ice expert from the Arctic Institute, and Harry Crawford, a veteran of several Mt. Ararat expeditions.

The exploratory effort in 1970 will entail patterned core drilling and excavational pit digging. Infrared photography will be used to develop an outline of the massive artifact. Glacial meltwater samples will be collected for isotope analysis and carbonic acid determination.

In 1971 the investigators will try to



SEARCH

Edge of the ice pack on Mt. Ararat.

remove a sizable portion of the glacial ice. Standard archaeological procedures will be employed in photographing each exposed timber and charting its position on a grid system. □

## RELATIVITY

### Getting within 10 percent

General relativity is the name given to modern theories of gravitational forces. These theories differ from the classical Newtonian theory in that they connect gravity not only to the matter in the universe but to the geometry of space as well. In the relativists' universe, space is curved rather than flat, and this affects gravity.

Albert Einstein put forth the first such theory in 1916. Attempts to vary Einstein's theory so that electromagnetic forces could be covered by it eventually brought about development in the 1960's of a rival theory put forward by Drs. Carl H. Brans of Loyola University and Robert H. Dicke of Princeton (SN: 6/1/68, p. 532).

Both the Einstein and Brans-Dicke theories predict effects that Newton's did not. Many of the effects are qualitatively the same, but quantitatively different. Observers are faced with the task not only of determining the existence of these effects but of measuring them accurately enough to tell the difference between the two theories.

Relativists gathered in New York City this week for the Third Cambridge Conference on Relativity. As they talked, it was clear that observation repeatedly demonstrates the reality of general relativistic effects and the need to replace Newton with a modern theory, but the measurements are not sufficiently accurate to tell which modern theory.

Both theories predict that when a light ray passes near a massive body like the sun, it will be bent and slowed. But the Brans-Dicke theory predicts

about 10 percent less bending than Einstein's does. The bending produces an apparent shift in the star's location. Optical observations have shown the bending exists but have not succeeded in measuring the amount to within the 10 percent accuracy necessary to distinguish between the theories.

The advent of radio and radar astronomy and artificial space probes have provided a number of new possibilities for increasing the accuracy of the measurements, but so far they have not succeeded in doing it.

At the Goldstone station of the Jet Propulsion Laboratory of California Institute of Technology, for example, observations were made of the quasar 3C-279 as the sun passed in front of it. At three centimeters wave length, reports JPL's Dr. Richard Sramek, there was an apparent change in position of 1.77 plus or minus 0.2 seconds, an estimated error slightly more than 10 percent. At 13 centimeters wave length, says Dr. Duane O. Mühleman, the apparent change comes to 1.82 seconds, again with a probable error around 10 percent.

**Results** at better than 10 percent accuracy are hoped for from both quasar observations by very long baseline interferometry, in which signals from widely separated telescopes are combined for high accuracy in determining position (SN: 11/8, p. 437), and from signals sent by Mariners 6 and 7 as they passed behind the sun during April and May (SN: 5/16, p. 481). But results from both of these experiments are still in the preliminary stage, say their respective spokesmen, the quasar group's Dr. I. I. Shapiro of the Massachusetts Institute of Technology and the Mariner group's Dr. J. D. Anderson of JPL.

One place where observation seems to favor Einstein is the so-called advance of perihelion: the gradual changes in the orientations of planetary orbits. For Mercury, Einstein predicts a motion of 43 more seconds per century than Newton did. Dr. Dicke's theory predicts about 10 percent less motion than Einstein's. Observation shows 42.3 seconds.

To make up the discrepancy between this prediction and the observation, Dr. Dicke suggests that the sun is slightly oblate and that the oblateness produces additional forces on Mercury.

Dr. Dicke has done observations in which he claims he sees the requisite oblateness (SN: 3/9, p. 229); others disagree. Dr. Shapiro and some colleagues studied 400,000 past measurements of the sun and came up with a figure for the oblateness that differs from Dr. Dicke's, but with such wide margin for error that, says Dr. Shapiro, "It does not exclude Dicke, but it does not give him much comfort." □

## MINE SAFETY

### Slowness in response

When the 1969 Federal Coal Mine Health and Safety Act was passed late last year (SN: 12/27, p. 592), it was hailed as the country's strongest coal mine legislation and the answer to a historic problem. But there is a difference between the passage of a law and the accomplishment of its purpose.

In the six months since its enactment, the law has become the focus of a rising tide of controversy: In parts of some mines there has been rigorous enforcement, in others none; some mine owners have rushed to comply with its regulation, while others have not, claiming they cannot meet them economically. And the act itself, instead of being hailed as an instrument of good, is being blamed for short coal supplies at a time when the nation faces a possible power crisis (SN: 6/6, p. 550).

The U. S. Bureau of Mines, charged with enforcing the act, contends that its job is rendered impossible by the lack of qualified inspectors. To do an adequate job, the bureau estimates that it needs 1,000 inspectors, five times the number on its rolls. It is training 100 more mine workers as inspectors, but the shortage and spotty enforcement are not expected to end until late 1971 at the earliest.

**Besides manpower**, the industry is citing equipment problems, which the bureau says put it in the position of enforcing the unenforceable. The act, for example, states that by this past March 30 all mine cars had to have automatic brakes. The problem is that automatic brakes have never been built for mine cars, says Henry P. Wheeler Jr., acting bureau director for health and safety, though they are being developed. Similarly, 20,000 to 25,000 methanometers, which detect methane, will be required by December 31. But they are in short supply. It will be March, says the bureau, before that number can be manufactured and distributed.

Similarly, at the end of this month, a limit of 3.0 milligrams of coal dust per cubic meter of air in a mine goes into effect. Many mines cannot now meet that limit, and the problem of getting enough equipment to the mine sites will create further delay. The mine owners contend that the six months they have had has been insufficient.

The bureau must still enforce the law, however. Some coal mine operators are already being cited for violations, and in April about 60 small mine owners from Virginia, Tennessee and Kentucky went into Federal Court and obtained a restraining order. The order prohibits the bureau from enforcing the law where circumstances prevent mine

owners from complying with it. Although the decision originally affected a tristate area, the bureau subsequently extended it to cover all mines.

"A year from now," says Wheeler, "the mines will be healthier and safer, but in this period of time, there is going to be this confusion and uncertainty."

At the same time, the Senate Committee on Interior and Insular Affairs last week delayed confirmation of Dr. J. Richard Lucas, head of the mining engineering department at Virginia Polytechnic Institute, as the replacement for ousted bureau director John F. O'Leary. Lucas is under attack for what critics believe is an unduly sympathetic attitude toward mine owners.

The House Subcommittee on Labor, on the basis of an ongoing investigation, places responsibility for the enforcement problem squarely with the bureau. The subcommittee finds the industry generally reluctant, but cites no specific foot-dragging.

To make sure none develops, Rep. Ken Hechler (D-W. Va.) and others oppose Dr. Lucas' appointment. "Lucas symbolizes the industry point of view, putting a low priority on the health and safety of coal miners as against coal production," charges Hechler. □

## PATENTS

### Signing the treaty

Lack of standardization has created turmoil in the area of international patents. Applications are bogged down by a multitude of forms, differing patent laws, separate filings for each country where a patent is sought and inadequate patent search facilities in many places. The result is massive backlogs, duplication of effort and unnecessary costs.

To overcome these problems, the United International Bureaus for the Protection of Intellectual Property (BIRPI) set out in 1966 to draw up a Patent Cooperation Treaty that would streamline patent application procedures. A year ago a final draft was drawn up (SN: 6/21/69, p. 596), and now delegates of 53 nations are meeting in Washington to put the final touches to the treaty.

**The conference** will end June 19, and what will come out of it will be a draft of a two-phase agreement that would permit an applicant to file one international application through the patent office of his home country. This obviates multiple filings in many different languages with different forms and extra fees. The subsequent search operations will be carried out in one of five centers in the United States, West Germany, Japan, the Soviet Union and The Netherlands.

According to this first phase of the treaty, the applicant then has 20 pro-