

for electromagnetic theory, all the technological consequences that followed the successful generation of radio waves are not likely to have any analogies in the gravitational case. There are no lenses to focus gravitational waves, nor can they be led along waveguides or conductors as electromagnetic waves can.

Laboratory experiments with gravitational waves are in the range of possibility, suggests Dr. Robert L. Forward of Hughes Research Laboratories, a former student of Dr. Weber. But they would be limited to interference studies in which two trains of waves are run into each other to see how they might interact.

Astronomy is likely to be a major beneficiary of the discovery. For astronomers gravitational radiation opens a new observing dimension. Heretofore they have used electromagnetic radiation to tell them about celestial objects and have learned much about the electromagnetic, molecular, atomic and nuclear processes going on in celestial bodies. Gravitational radiation will bring information on the gravitational processes going on, and it will do so especially for those classes of objects for which gravitational processes are especially important: binary stars, collapsing supernovas and, maybe, pulsars.

Shortly after pulsars were discovered, Dr. Weber suggested they might be sources of gravitational radiation (SN: 8/17, p. 154). He now talks of designing detecting equipment for gravitational wave signals from the pulsars CP-1919 and the Crab nebula.

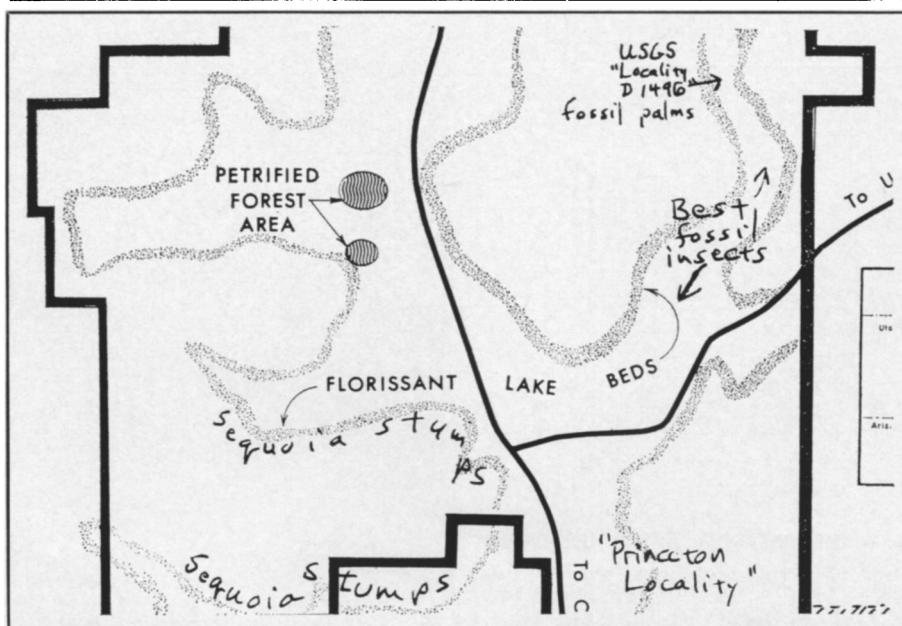
One thing that he suggests is an experiment to watch a pulsar for a year in both radio and gravitational waves. The two records could be compared in detail by a computer to see what their joint behavior could contribute to the physics of pulsars, especially fluctuations in their rates.

Dr. Forward and his group in California have been working on equipment to detect signals from collapsing binary stars, pairs of stars that are spiralling together instead of revolving at a stable distance. Such a pair would produce a chirp signal in gravitational waves, one that slides through a range of frequencies like the chirp of a bird. A wide-band antenna is needed to follow such a signal through its course.

Dr. Weber's present equipment responds to only a single precise frequency. A chirp signal encountering such a detector would produce a sharp spike on the detector's signal recorder as it swept through the detector's response frequency. The signals Dr. Weber has been seeing are spikes of this sort, and he suspects they may come from some similar cataclysm. Collapsing supernovas are a possibility. ◇

FLORISSANT FOSSILS

A treasure in danger



National Park Service

Last chance: Proposed 6,000-acre Florissant National Monument in Colorado.

Fossils are the remains that enable man to decipher the story of the earth's history by unearthing messages trapped in rocks. As such they are treasured and protected by both scientists and government.

Among the fossil sites protected as national monuments in the United States are the Agate Fossil Beds in Nebraska, with remains of extinct large mammals, and the Dinosaur National Monument in northeast Utah. But the most abundant, diverse and unique fossil deposits are the unprotected Florissant fossil beds in Colorado.

Those beds are now being threatened by plans for a housing development, after almost 50 years of Government inactivity.

The Florissant area is in a mountain valley in Teller County, 35 miles west of Colorado Springs, Colo. Florissant fossils date back to the Oligocene epoch of the geologic time scale—34 million to 38 million years ago. Insects, small animals, leaves, flowers, fruits, whole plants, trees and fish fell and settled in the muddy bottom of the Florissant lake. There they were preserved, most of them intact, by tons of volcanic ash that sifted over the entire region.

Florissant's unique conditions for fossil preservation have not been found elsewhere in the world. The total picture of the entire biological community is intact, together with ample evidence of its climate.

So far, says Prof. Estella B. Leopold, of the department of biology of the University of Colorado at Boulder, at least 914 insect species and 114 species

of higher plants have been found on the site.

"Florissant plant fossils are perhaps most noteworthy," says Prof. Leopold, "because they span the interval of 34 million to 38 million years, and represent a tie point in an otherwise huge gap in the plant record of the region—a gap that ranges from 26 million to 47 million years."

The conditions for fossil data-gathering at the 12,000-acre Florissant beds are excellent, Prof. Leopold says. Fossils lie within three to six inches of each other and rock layers exist often only an inch apart.

Scientists have been investigating these fossil remains for over 90 years, and since 1921 there has been a move to establish 6,000 acres of Florissant as a national monument to preserve the beds. Since the monument was proposed, it has taken 48 years for Congress to hold hearings in the field; the first was held last month. The National Park Service has been proposing acquisition formally for 17 years, and despite consideration in four previous Congressional sessions, nothing has been done.

The Senate Subcommittee on Parks and Monuments is currently considering three bills to preserve the site as a Florissant Fossil Beds National Monument. All three bills, which vary only in detail, request acquisition of 6,000 acres. This is the area found to be the most valuable after field investigations under the supervision of Prof. Harry D. MacGinitie of the University of California. But if Congress fails to act, a healthy piece of the site may be lost; 1,800 acres of the

Rubella vaccine ready



Merck Sharp & Dohme

Pekin duck embryos are used to grow live-virus vaccine for German measles.

proposed monument land have already been purchased for subdivision and subsequent land or housing development by a private firm.

K. C. Wofford of the Central Enterprise Realty Company in Colorado Springs says his company has already begun to subdivide the land for private use.

The land was purchased from a private owner, A. W. Gregg of Kyle, Texas, who had kept it off the private market for 17 years waiting for an offer from the Federal Government to purchase the land for the national monument. The sale price to the realty company was \$150 an acre. If the Government were to purchase the 1,800 acres back, Prof. Leopold estimates, it would cost almost double what the Colorado Springs' company paid for it.

Wofford says there are no plans to purchase any more of the land within the area of the fossil beds and he indicates that his company may sell the land back to the Government. But, as yet, the Government has not allocated any funds for that purpose.

According to a recent report from the Bureau of Outdoor Recreation, land prices are soaring. The seven percent projected increase in land value has already raised the estimated cost of acquisition \$126,000 since February 1967, when the last bill was introduced in Congress. The scientists feel that using available funds for purchase is the immediate problem. Both the Department of the Interior and the Colorado Open Space Coordinating Council, Inc., agree that development of the monument itself can be delayed for several years if necessary.

Colorado people, says Prof. Leopold, are anxious about the situation. They are very much in favor of the proposed national monument. It would provide an educational attraction to a little known part of Colorado and preserve a national treasure.

"Destruction of such a site," says Prof. Richard Beidleman of Colorado College, "is comparable to what we might think of as a geological book-burning, especially devastating because there is only one irreplaceable volume on this subject in the universe."

"It is worth mentioning," says Dr. Richard C. Bradley, of Colorado College, "that we have here a most unusual circumstance, perhaps without precedent in recent legislative history: A proposal is being made to put a substantial piece of land under the protection of the National Park Service, and it stands virtually unopposed. . . . If this bill fails to pass, it will not be because powerful lobbies were arrayed against it, but because this Congress, deeply involved as it is with the weightier issues of the day . . . could not seem to find the time to consider it."

If the cycle that began in 1920 prevails, German measles viruses will be around the United States in droves by late 1970 or early 1971. The last time it struck in epidemic proportions, in 1964, the virus killed or deformed the children of 50,000 women who were infected during the first three months of pregnancy.

If it strikes again in 1970 as predicted, scientists will be ready. Health, Education and Welfare Secretary Robert H. Finch last week approved the first vaccine against rubella, urging that it be used widely among school-age children who might otherwise transmit the disease to their mothers, but cautioning against its routine use in women of child-bearing age because its safety in this group is questionable.

The license, expected since April (SN: 4/12, p. 355), was issued to Merck Sharpe & Dohme in West Point, Pa., following a two year study of the vaccine's safety and effectiveness by the

Division of Biologics Standards of the National Institutes of Health. Tested in 18,000 children, the live virus vaccine induced virtually no side effects and is effective for at least three years. Children given the vaccine in initial pilot studies in 1966 still have antibodies to rubella viruses in their blood.

Research for a vaccine has been underway since 1962 when scientists at Harvard and at Walter Reed Army Hospital isolated the rubella virus. More than 650,000 doses of the vaccine, produced in a duck embryo cell culture system developed by Drs. Maurice Hilleman and Eugene Buynak, are immediately available. Merck plans to distribute two million doses by August.

Regulations governing the standards of another vaccine grown in a dog kidney cell culture also have been set. Although a final license has not been issued, the Philips Roxane Laboratories in Columbus, Ohio, is expected to receive one by fall.

\$1.3 BILLION LATER

MOL shot down

The Defense Department's Manned Orbiting Laboratory has been fighting an uphill battle ever since Defense Secretary Robert S. McNamara first proposed it late in 1963. Critics claimed that the military space station, designed to keep two-man crews in orbit for a month at a time, would largely duplicate the functions of the National Aeronautics and Space Administration's Apollo Applications Program, also designed for extended stays aloft. Others feared that the project might put the U.S. in an unpopularly militaristic position in space.

For those reasons, as well as the

competition among projects for funds even within the Defense Department, last week the MOL was killed.

The various activities scheduled for the MOL would have included detailed surveillance and photography, as well as research in materials, biomedicine, remote sensing and other areas. It has often been assumed, however, that plans also included such controversial subjects as testing of weapons systems (even non-nuclear ones) and the inspection of foreign satellites.

Also the increasing sophistication of unmanned military satellites may well have made MOL obsolete.