

normal ion distribution.

The photographs show proton microprobe maps of four different elements in a frozen rat eye. (The eye is facing to the right, so that the retina is on the left, the lens in the center and the cornea on the right.) The variations in shading reflect differences in local concentration of the elements potassium, sulfur, chlorine and calcium.

The researchers also examined kidney specimens with this technique. They showed visually, for the first time, gradients of potassium and chlorine in the concentrating kidney.

Because the technique requires the use of one of about 100 proton accelerators available in this country, the proton microprobe cannot be used in most laboratories. Nevertheless the developers of the technique believe its sensitivity and convenience will allow study of many important biological problems that cannot be approached by other methods. □

Door into space unhinged

On Feb. 20, 1962, John Glenn became the first American to orbit the earth, riding a Mercury spacecraft known as Friendship 7. The most visible landmark of the historic flight has been the 145-foot steel service tower at Launch Complex 14 on Cape Canaveral, from beside which an Atlas rocket carried Glenn's capsule into space. On Dec. 1, 1976, five demolition specialists from the U.S. Army's 27th Engineering Battalion wrapped plastic explosives around the base of the landmark, connected their detonators and blew it down.

The reason was money. The deteriorating tower was deemed "hazardous" for the complex's blockhouse (750 feet away), as well as for some rooms beneath its approach ramps, both of which have been in use as storage facilities. The Air Force, from whom the National Aeronautics and Space Administration borrowed the complex in Mercury days, estimates that to have restored the tower, together with an adjacent one at Launch Complex 12, would have cost \$500,000, plus another \$100,000 a year for maintenance. Complex 12 was "explosively dismantled" on Dec. 3, and the same fate is in store (at a date yet unspecified) for the Project Gemini launch site at complex 19.

All of the orbital Mercury flights—those of Glenn, Scott Carpenter, Walter Schirra and Gordon Cooper—took off from No. 14, whose last launch was that of Applications Technology Satellite C on Nov. 5, 1967. The preceding suborbital flights of Alan Shepard and Virgil Grisom lifted off from a separate pad, number 5, which was dismantled more than a decade ago. A plaque marks the spot. R.I.P. □

A pioneering look 'down' on the sun

While the Pioneer 11 spacecraft was studying Jupiter from close up late in 1974, it was also using the giant planet's gravity to swing around onto a course toward a 1979 rendezvous with Saturn. A fortuitous side-benefit of the Saturn-bound trajectory was that during the trip it would take Pioneer 11 where no other manmade probe had ever been: out of the plane of the ecliptic, far "above" the disk in which the planets orbit the sun, so that it could take an unprecedented look "down" at the solar system.

By February of this year, the spacecraft was about 16° above the ecliptic plane; that is, a line from the center of the sun to Pioneer 11 would have passed through the sun's surface at about 16°N latitude. Measurements from this lofty viewpoint, about 160 million kilometers above the plane, have now given scientists their first direct look at solar outpourings in a region where there used to be nothing but theories. Even with the help of the sun's tilted axis of rotation, spacecraft travelling in or near the ecliptic plane have been limited, by comparison, to heliographic latitudes of 7.25° or less.

Pioneer's results, reported by Edward J. Smith of the Jet Propulsion Laboratory in Pasadena, have now shown that the sun's magnetic field is much more spherical than disklike, extending for billions of miles above and below the solar poles. Within the plane of the ecliptic, Pioneer 11's predecessor, Pioneer 10, has confirmed that the field extends out as far as the orbit of Saturn, and field-strength measurements there combined with Pio-

neer 11's out-of-plane data suggest that it probably reaches all the way to Pluto, more than 4.5 billion kilometers from the sun.

The northern and southern parts of the sun's field are apparently separated, as are those of Jupiter and the earth, by a warped electrical "current sheet," with the magnetic field lines on one side of the sheet flowing outward and those on the other side bringing the circuit back around to the sun. Because the sheet is not flat, and because the sun's axis is tilted relative to the plane, spacecraft flying within the ecliptic plane have encountered field lines oriented sometimes in one direction, sometimes in the other. Pioneer 11 has added strong support to the likelihood of this warped sheet, mitigating against the competing idea that the sun's magnetic field was just cantankerously erratic.

The sun was a major topic this week at the annual autumn meeting of the American Geophysical Union in San Francisco, where Smith presented his Pioneer 11 findings, and the slowly evolving picture of the sun's nonequatorial latitudes was discussed in nearly a dozen presentations. Both the magnetic field and the solar wind have revealed latitude correlations in data from the two German Helios probes, for example, which are so close to the sun—inside even the orbit of Mercury—that a small change in distance from the ecliptic plane represents a relatively large change in heliographic latitude. In March of 1975, Helios 1 provided a particularly rich data harvest when it travelled from 6°S to 6°N in only two weeks. □

Tracking quake data and predictions

Two government agencies have embarked on widely different programs for gathering information on earthquakes, their origin and their prediction. The National Science Foundation has just announced new cooperation with the Soviet Union in an international network of seismic instruments, and the U.S. Geological Survey is starting a file of earthquake predictions to see whose are most reliable.

In the NSF program, an American seismometer, which produces digital data on tape cassettes for analysis in the United States, has been installed in Garm, a remote village in the Soviet Republic of Tadzhikistan. The installation is the seventh in a worldwide network that may eventually include 15 to 20 units. A geophysicist who has helped set up the network, Jonathan Berger of the University of California at San Diego, told SCIENCE NEWS that this marks the first permanent installation of an American seismic instrument in the Soviet Union.

The new network has unusual funding—each country involved pays for

operation of instruments on its land, NSF is paying for setting up the network, and the instruments themselves were donated privately by Cecil Green (a founder of Texas Instruments, Inc.) and his wife Ida. In honor of their gift, the project is called IDA, which can also stand for International Deployment of Accelerometers.

The object of the network is to gather data on the extremely long wavelength vibrations set up in the earth by earthquakes deep below the surface. The data are analyzed by a computer in San Diego. Berger says this analysis should help to develop a model of earth's elastic structure, which in turn can be used to analyze the "source mechanism" of particular quakes. Although the immediate aim is one of fundamental research, the study of such source mechanisms may eventually help scientists predict when more damaging quakes—those nearer the surface—will occur.

The USGS National Earthquake Information Service in Denver has started a computerized file of earthquake predic-

tions, from all possible sources, to help the public separate those of merit from wild claims made by charlatans. Roger N. Hunter, a geophysicist with the Service, says that "because wrong predictions tend to be forgotten, the result of a correct prediction could be instant fame and a great deal of harmful public credulity."

Predictions are given a score based on the amount of information that has been given correctly, and the score is analyzed for its probability based on the usual seismic activity in an area. So far 171 predictions from 32 authors have been recorded, but Hunter says that none achieved a "high enough rating to merit any sort of consideration."

Predictions for the future are being gathered from standard scientific sources as well as from newspapers, reports of psychic visions and private submissions by letter. Predictions can be sent to Roger Hunter, USGS National Earthquake Information Service, Mail Stop 968, Box 25046, Denver Federal Center, Denver, Colo., 80225. "One thing which will not be considered," Hunter says, however, "is a prediction which is only made known after the fact."

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Last week NBC-TV aired a story on its nightly television news in which one Henry C. Minturn claimed to have successfully predicted several earthquakes and said that one will hit Southern California on Dec. 20. As a result of the broadcast residents were flooding government and university offices with anxious telephone calls.

Science writer George Alexander examined Minturn's claims and credentials more carefully for an article in the Dec. 5 Los Angeles Times. He found little cause for alarm:

- The only credentials of expertise that Alexander could establish for Minturn were that he had worked as a technical assistant in the geophysical-oil exploration field more than a decade ago.

- The theory on which his predictions are based—that the moon's motion triggers quakes—is an old one that has been tested extensively and unsuccessfully for years by established scientists.

- The data for his predictions reportedly come from a maintenance mechanic, an amateur astronomer who gathers the data from various magazines.

- Minturn is rather cavalier about the size and exact location of his predicted quakes. Of being off his target by 2,400 miles, he is quoted as saying "we hit it right on the nose." At that rate the "Southern California" quake might hit Alaska. He has also predicted a quake—without specifying the size—for the Solomon Islands on Dec. 19. The Solomons experience quakes of magnitude 3.75 or greater on the average of three per day.

- He hopes to be hired as an earthquake predictor for "a simple living . . . something like \$34,000 per annum." □

Iapetus Ocean: History of opening

In the mobile world of plate tectonics, earth scientists know that before the ancient continental mass split 200 million years ago and the Atlantic began opening to its present width, there was a previous sequence of ocean opening and closing along nearly coincident boundaries. During that time the Appalachian Mountains were born, and in 1970 geologists John F. Dewey and John M. Bird showed how the Appalachians contain traces of all the units of that early ocean's floor (SN: 8/15/70, p. 145).

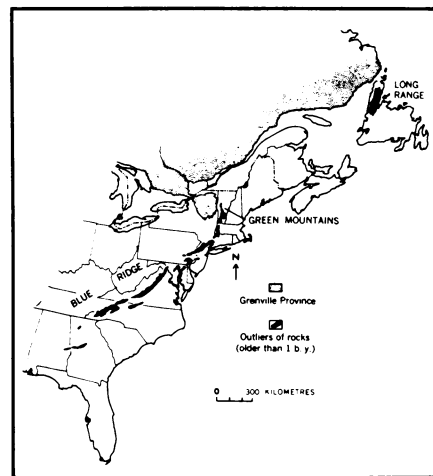
Despite obliteration of much of the evidence by the present cycle of opening, geologists have continued to accumulate a record of the opening and closing of that proto-Atlantic ocean. To avoid confusion with the present Atlantic, it is often termed the Iapetus Ocean.

One of the geologists deciphering that record, Douglas W. Rankin of the U.S. Geological Survey in Reston, Va., last year published in the *AMERICAN JOURNAL OF SCIENCE* (275-A:298) an extensive report outlining evidence from the southern Appalachians of the early episode of rifting. He also showed that the later suturing of the two continental plates left what he termed "some rather startlingly large pieces of the African plate" thrust onto the North American plate. These pieces of Africa, he says, form the modern Piedmont province, along the eastern flank of the Appalachians in Maryland, Virginia and North Carolina.

Now Rankin reports a further unraveling of the mysteries of the late Precambrian continental breakup and opening of the Iapetus Ocean. They concern a series of pronounced bends in the Appalachian structure that have long attracted geologists' attention.

In the Nov. 10 *JOURNAL OF GEOPHYSICAL RESEARCH*, Rankin reports evidence that these bends in the Appalachians are inherited from the initial breakup of a continental mass beginning about 820 million years ago. The evidence indicates, he says, that the breakup occurred at the intersection of rift valleys radiating from what earth scientists call triple junctions—the point at which three crustal plates intersect—at the start of the opening of the Iapetus Ocean.

Rankin suggests that the western margin of a major rift system coincides roughly with the trace of axes of ancient Precambrian rock extending from Tennessee to Newfoundland. He calls this the Blue-Green-Long axis, for the Blue Ridge Mountains, the Green Mountains of Vermont and the Long Range of Newfoundland. The rift system east of this axis, Rankin says, probably did not open far enough to produce significant ocean crust but was an initial stage in the opening of an ocean basin ultimately located still farther east.



Blue-Green-Long axis: Old rift margin.

From composition of the rocks along this axis, Rankin has identified five major bends in Appalachian structural trends that are candidates for former triple junctions generated by hot plumes in the mantle beneath them. Of these five bends, two are in southwestern Virginia (one near Mt. Rogers and one near Roanoke), one in Pennsylvania, one in southeastern New York near New York City, and one in southern Quebec.

These five bends are all potential sites of past triple junctions, Rankin says, and the two convex ones, near Roanoke and near New York City, are triple junctions whose failed arms have been carried away.

Rankin concludes by noting the persistence through time of zones of weakness. Not only are the histories of the opening of the Iapetus and the Atlantic similar; so are the geometries and locations. "The incipient opening of the present Atlantic was essentially parallel to and nearly coincident with the incipient opening of the Iapetus," says Rankin. "In fact some of the same fracture zones may have been involved in both openings." □

Alcoholism: A biochemical marker

Although alcoholism has been defined by many criteria (physiological, clinical, behavioral, psychological, attitudinal), a universally accepted, practical definition has been woefully lacking. Now a team of biomedical researchers at the Bronx (N.Y.) Veterans Administration Hospital has produced a biochemical marker. They believe that it will provide a means of detecting and treating alcoholism early as well as of objectively evaluating the success of different treatments.

A few months ago, two of the researchers, Spencer Shaw and Charles S. Lieber, observed an alteration in the con-