

GEOPHYSICS

Scientists Help Test Ban Talks

➤ AS THE STALLED Geneva test ban talks resume again, scientists have given Western negotiators new ammunition to fight the political battle with the Russians at the discussion table.

The recent Nevada underground nuclear tests, condemned by many, may have actually removed one of the biggest stumbling blocks—that of detecting underground nuclear explosions.

Here are some of the reasons for the guarded optimism:

1. Instruments can detect underground nuclear blasts much better than previously supposed. Waves generated by earthquakes and underground explosions can be distinguished probably 75% of the time, an informed source told SCIENCE SERVICE. This nearly reverses the previous assumption whereby if there were about 100 earthquakes a year in Russia, only about 30% could be definitely identified.

2. Special filtering techniques have made seismic instruments more sensitive, eliminating the background noise such as that caused by winds and storms.

3. New instruments such as seismographs resting on the ocean floor were found to be as sensitive as conventional seismographs on land. Perhaps even a wet network of these sentinels could be installed in waters far off the sprawling Russian coastline.

These instruments, coupled with those placed in abandoned oil wells nearly two miles deep, could greatly reduce the 180 stations previously requested by United States negotiators.

As one top earthquake specialist said, "We are in a much better position today than we were two years ago when the U.S. research program on nuclear detection began."

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PHYSIOLOGY

Breathing Regulated By Blood Composition

➤ WHETHER a person breathes fast as in exercise, or quietly as at rest, is determined by the composition of the blood.

Dr. Bruce Armstrong, director of the Cardio-Pulmonary Laboratory, University of Maryland School of Medicine, Baltimore, believes that the respiratory center in the brain acts like a computer. It accepts information about both arterial and mixed venous blood and sends out impulses based on this information to the breathing muscles.

For years, physiologists have agreed about how breathing is regulated at rest, Dr. Armstrong said. The brain's respiratory center is assumed to react to signals from tiny chemical detectors, or chemo-receptors, in the arteries, called carotid and aortic bodies. The receptors appear to react to the carbon dioxide content and acidity of the blood.

But exercise does not change purified arterial blood enough to provide information for the kind of signals obviously sent to the brain during exercise. Dr.

Armstrong said he theorized that similar receptors might be located where they could sample information in venous blood coming directly from working muscles before it was purified by the lungs.

A colleague of Dr. Armstrong's, Dr. Vernon Krahl, professor of anatomy at the University, looked for and found such a structure—the Glomus pulmonale. It is microscopically identical to the carotid and aortic bodies, but located in the wall of the pulmonary artery, where mixed venous blood from all over the body is pumped to the lungs.

Dr. Armstrong has recently studied 25 patients with diseases accompanied by shortness of breath—heart disease, lung disease and various metabolic disorders.

Because in such diseases the mixed venous blood of patients at rest has characteristics that mimic the mixed venous blood of normal persons during exercise, Dr. Armstrong's new theory explains the similar shortness of breath in both conditions.

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SPACE

Proteins Could Give Clue To Unearthly Life on Mars

➤ A LIFE DETECTOR sent to Mars could possibly determine if life there—in case such exists—is like that on earth or of a different sort.

If such a life-detecting device could determine that the proteins, the building blocks of life, on Mars are all alkaline, life there would be certain to have different forms from those on earth, Dr. Robert E. Kay, supervisor of biochemistry at the Aeronutronic Division of Ford Motor Company, Newport Beach, Calif., told SCIENCE SERVICE. Protein molecules in earth life are found in a range of acid, alkaline and neutral.

A life detector for studying the proteins on such planets as Mars is being studied at the present time, Dr. Kay said. The search for the protein on Mars would be made by exposing a dye that turns dark blue when in contact with protein. Protein traces as small as three and a half billionths of an ounce will turn the dye a very dark blue.

The proteins on Mars could be detected by a spectrophotometer in a landed space capsule and the information telemetered back to earth. However, there is no known method which will now communicate over a long distance whether proteins found would be all alkaline or also acid and neutral.

Dr. Kay said a new result shows that the dark-blue reaction can also be used to determine the isoelectric point of proteins when they occur only in very small amounts (trace amounts). This has not been possible before.

Proteins have both positive and negative charges. These charges are equal at the isoelectric point and the protein molecule is then neutral. At this point the molecules will separate from a solution. This new discovery will be useful to protein chemists, Dr. Kay said.

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IN SCIENCE

DENTISTRY

Tests for Chemical Preventing Tooth Decay

➤ TESTS are underway for a chemical solution to prevent tooth decay that will surpass sodium fluoride, now being used.

However, once decay has started, dentists' drills and fillings will still be needed. The tests are being made on extracted human teeth in an artificial mouth at the Evans Research Laboratories, New York.

Scientists have found that natural saliva as well as solutions of calcium phosphate will reharden enamel on teeth softened by sugars. The softening is the opening edge for decay.

Related to the search for a prevention chemical are studies on the softening effects of various kinds of sugar on teeth in the artificial mouth.

In Nature, 195:191, 1962, published in London, three U.S. scientists reported that they tested sucrose, found in cane sugar, lactose, the sugar in milk, glucose, fructose, mannose, galactose, maltose, and soluble starch in the artificial mouth. All sugars tested caused decay, maltose causing the least. Soluble starch, however, did not result in decay.

Dr. Ward Pigman, biochemist of New York Medical College and the University of Alabama Medical Center, Birmingham, and Dr. James Brasher, now in the Armed Services, and Dr. Theodore Koulourides, also of the Medical Center, conducted the studies, part of which were made in Alabama.

They are made by continuously dripping the sugar solution and a mixed culture of microorganisms normally found in the mouth over the teeth. The rate of enamel softening is then measured, indicating the danger the sugars cause.

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MEDICINE

Chemical Gives Male Rats Resistance to Alcohol

➤ A CHEMICAL that combats convulsions can cause resistance to the effects of alcohol, at least in the males. The experiments on rats reported from Finland may possibly apply to human beings.

From the Research Laboratories of the State Alcohol Monopoly, Helsinki, Dr. Lasse Sammalisto communicated to Nature, 195: 185, 1962, about tests upon rats into whose stomachs was placed alcohol, along with the counteracting chemical, glutamine. How intoxicated the rats became was measured by sliding them down a rough surface. An intoxicated rat slides down at a lower angle than a sober rat.

Among rats the females tolerate alcohol well and do not become markedly intoxicated by it even without glutamine.

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E FIELDS

SPACE

Spacecraft Reentry Faces Higher Temperatures

► **WHITE-HOT** temperatures two and a half times greater than previously estimated await space vehicles homeward bound from a junket in outer space.

The new temperatures are expected to prompt the National Aeronautics and Space Administration to have another look-see at previous heat barrier estimations to prevent delays in the lunar space program. The figures are based on studies by Drs. Sinclair Scala and Walter Warren of General Electric's Missile and Space Vehicle Department in Valley Forge, Pa.

A space vehicle returning from the moon would be buffeted by a shock wave with temperatures reaching 10,000 degrees Fahrenheit, the scientists believe. The shock wave is formed by the compression of air in front of the speeding space vehicle.

A newly developed "hypervelocity shock tube" was used in arriving at the new temperature estimates.

An electrically heated helium gas "piston" drives air past a space model at high speeds creating heat similar to that encountered by a space vehicle hurtling back to earth. The split-second testing (lasting 10 to 20 millionths of a second) is long enough to measure the heat transferred from the air to the model.

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MEDICINE

Formula for Artificial Blood Plasma Sought

► **A FAST-ACTION** electronic computer to devise a recipe for artificial blood plasma is being used at the Masonic Medical Research Laboratory, Utica, N. Y., by Dr. Lawrence C. Cerny. Plasma is the fluid portion of blood, minus the blood cells.

The need for plasma substitutes, explained Dr. Cerny, an established investigator of the American Heart Association, is prompted by the widespread use of heart-lung machines in open-heart surgery. Normally the machines, which take over the pumping of blood to the rest of the body so that surgeons can operate on a relatively dry and bloodless heart, are "primed" with fresh blood donated no more than 24 hours before the operation. Blood stored for longer periods is unusable for this purpose. Frequently freshly drawn blood is unavailable. In emergencies, when surgery cannot be postponed, artificial plasmas must be used to prime the machines. In their passage through the body, these liquids serve to keep the blood vessels distended normally.

"Ideally," Dr. Cerny said, "the artificial primers should flow just as real blood does.

"How well the substitutes we now have do their job is open to question.

Dr. Cerny hopes to define the complexities of blood flow in a mathematical equation.

"An exact definition of the flow characteristics of blood could then be applied to developing substitutes for plasma with identical properties," he said, adding:

"We want to fool the blood vessels, in essence, so that they can't tell the differences in flow between the substitutes and the real M'Coy."

He is compiling a massive amount of data on blood flow in long narrow glass tubes with diameters so tiny they compare with those of the capillaries, smallest vessels of the circulatory system.

When he has compiled sufficient data, he will feed this information to an analogue computer. The computer can be programmed to provide an electronic model of a blood flow system based on his experimental findings.

After analyzing the data from the computer, Dr. Cerny plans to examine blood flow within the vessels of living animals and to compare the two systems. Then, by modifying the electronic model to incorporate any differences noted in his "live" experiments, he hopes to have duplicated actual blood flow in the body on the computer. Once this is done, it may be possible to translate the electronic model into an exact mathematical expression which can be applied to the evaluation of substitute plasmas.

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PSYCHIATRY

Problem Youth Workers Helped by New Grants

► **KEEPING UP** with today's bad boys and girls, who get into less innocent delinquency than young offenders did when Dad was young, is putting a strain on the experts who try to handle the problem.

Not only is the supply of workers not keeping up with the fast growing delinquency but workers who are available are not trained to cope with the present crop of juveniles.

The young people who run afoul of the law today are no longer charged mainly with such offenses as pilfering candy counters, moving someone's garden gate down the road, breaking a window with a baseball, tramping in a neighbor's geranium bed, or bending the frame of another kid's bicycle. Now they may be implicated in a gang "rumble." They may be charged with stealing automobiles, beating someone on the street, yoking, dealing in narcotics or gambling.

To bridge the gap between the sophisticated bad boys and the workers who deal with them, the President's Committee on Juvenile Delinquency is devoting \$1,700,000 in grants to establish new training programs.

University courses will be supplemented by on-the-job training or re-training for persons who cannot get away from their jobs, such as court officers, parole workers and probation officers.

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TECHNOLOGY

Transistorized TV Used For Developing Countries

► **A MAJOR** step forward in educational television to be used in developing countries of the world has been announced by the U.S. Agency for International Development.

Dr. Edward Fei, acting director of AID's research, evaluation and planning staff, made public the details of a new educational television receiver employing completely transistorized circuitry, with a 23-inch screen, and requiring only 32 watts of power when operating on a simple 12-volt battery of the automobile type.

He noted that this is the first known television receiver with sufficient capacity to be used in community development educational programs where conventional sources of power are not available.

Need to develop this special type of television receiver results from the lack of any existing self-powered portable model of sufficient size for group viewing for educational purposes. In contrast with the 23-inch screen of this unit, the largest transistorized portable set produced now in the United States has a nine-inch screen.

Largest single problem facing the developing nations is their lack of qualified teachers for schools and instructors for adult education, Dr. Fei said.

To meet the needs of this communications challenge, AID has begun to gather together many of the existing tools of communications and to collaborate in the development of new devices.

The first phase of this project will require approximately 14 months, after which field operations tests will begin in 100 communities in countries of AID activity.

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GEOLOGY

New Zealand's Rivers Of Ice Receding

► **RIVERS OF ICE** in the South Island beautyland of New Zealand are receding.

The famous Franz Joseph Glacier in South Westland has retreated 300 feet in one year (1960-61) and 3,500 feet since 1951, the New Zealand Geological Survey has determined.

About eight and one-half miles long, the Franz Joseph Glacier, and its twin sister, Fox Glacier, 15 miles away, are unequalled in that they reach down into subtropical forest. Nowhere else outside the polar regions are glaciers so close to sea level.

Lighter rainfalls and snowfalls in the area since 1951 are responsible for the retreat. Heavy rainfalls and snowfalls between 1941 and 1946 had allowed the glacier to advance appreciably. Since 1958 the glacier has retreated 1,960 feet. Photographs have been taken weekly since 1951 and scientists have attempted to survey the "snout" of the glacier once a year.

It will take several years of markedly high rainfall and snowfall for the glacier to make any noticeable advance again toward the sea.

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