SR/Research

SCIENCE & HUMANITY

DEPARTMENTS: Research in America • Letters to the Science Editor • The Research Frontier • *Personality Portrait*—IX • Science in Books

ARTICLES: The Literature Scientist

RESEARCH IN AMERICA

- *PRESIDENTIAL GEOPHYSICS*
- *ATOM REPORT CARD*
- *THE TWILIGHT FLASH*

ARE you a chronic election bettor? Did the events of November 6 leave you wishing for a hole to open and swallow you? If so, there is help for your plight in the next election. Focus your eye on the photograph at our masthead.

We borrowed this picture from *Research for Industry,* the news bulletin of Stanford Research Institute in Menlo Park, California. What you see is a rocket being placed in a firing stand, pointing in the opposite direction from its normal skyward trajectory. The purpose is not to give a Chinese a subway hotfoot, but to dig foxholes for soldiers who may have to drive invaders from the rock-like permafrost of Canada's far north.

You'll find Chapter Two of this picture story on page 64: page 65 shows you the end.

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HAVING made a jocular reference to the Presidential election, we now will give that event the serious attention it deserves from the scientific viewpoint. With a Republican in the White House and the Democrats in control of Congress, it ought to be possible to have bi-partisan recognition of a situation unique in American political history—a campaign in which the biggest domestic issue was geophysics.

Geophysics is the study of natural laws as they operate on the environment of living things. The phenomenon of atomic-bomb fallout is a response to the natural laws governing atmospheric behavior.

On Election Day itself geophysics was elbowed aside momentarily by geopolitics. But on the day after election the Children's Bureau of the U.S. Labor Department announced, at the fifty-fifth annual conference of the Association of State and Territorial Health Officers, that the Bureau was establishing a National Committee to Reduce Hazards to Inheritance and Child Development. The committee's assignment: to "give national leadership to, and help coordinate planning for, research and other activities designed to reduce reproductive wastage and safeguard normal fetal development."

There was no mention of the electioneering that had split atomic scientists into opposing teams debating for and against the proposition that fallout was a health hazard. Instead, Dr. Martha M. Eliot, retiring chief of the Children's Bureau, attributed the new committee's origin to the June 1956 report of the National Academy of Sciences titled "The Biological Effects of Atomic Radiation." That document, she said, has "great significance to child development and to the population as a whole."

Before it can get very far, the National Committee to Reduce Hazards to Inheritance and Child Development will need the answer to a question asked in a letter to the editor of *The New York Times.* The writer was Dr. William G. Cahan, assistant attending surgeon at the Memorial Center for Cancer and Allied Diseases in Manhattan. His query:

"Is there a scientist who knows the exact amount of strontium-90 required to produce bone cancer in any given human being?"

The answer is almost certainly "no." Strontium-90 did not exist on earth until the first A-bomb explosion in 1945. The time since then has been too short to allow accumulation of meaningful case histories.

The implications of this inevitable ignorance are compounded by the fact that only one-fourth of the total amount of strontium-90 which mathematicians say must have been produced by the uranium and plutonium disintegrated so far has been accounted for. The other three-fourths must be assumed to be floating around in the upper sky. Thence, the AEC says, it is falling with "remarkable uniformity" all over the globe. We have the assurance of Merril Eisenbud, AEC's New York operations manager, that when all the strontium-90 has finally fallen on us (assuming there are no more A-bomb blasts to refill the floating reservoir) we will have in our bones only 25 per cent of a safe minimum dose.

If we add that one-quarter of a safe dose to the one-third of a safe dose that the National Academy's June report says we are getting from X-rays, we have only five-twelfths of a safe dose left to absorb cosmic rays, radioactivity from the rocks, and wastes from the atomic-power plants that will begin springing into being next year. In that five-twelfths of a safe dose, we must find room for the fact that while our share of the strontium-90 is getting into our bones, a proportionate share of the "remarkable uniformity" will be falling on the ground, to be ingested by plants and animals, including cows which will secrete the strontium-90 (it kicks out and replaces calcium wherever calcium naturally occurs) in their milk.

In asking whether anyone knows where the danger point for strontium-

induced cancer lies, Dr. Cahan made an observation about this double jeopardy. His letter to the *Times* said:

"Particles of radioactivity which are judged insignificant or permissible when measured in isolation may be significantly augmented by natural processes and thus reach man in highly concentrated form."

He told of a wild muskrat that had eaten water-plants growing beside the river which carries "insignificant" amounts of radioactive wastes from Plant X-10 at Oak Ridge. The plants that grew from the water had fourteen times as much radioactivity in them as the river did, and the bone in the muskrat's right hind leg had more than 150 times the amount of radioactivity in the water. The bone was cancerous.

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IN ITS June report, the National Academy atom panel expressed "something of a surprise, something of a disappointment, something of deep concern" that X-rays were a far greater hazard to health at present than bomb fallout. Atom report cards were recommended for everyone, on the grounds that radiation damage is cumulative and that doctors, by checking individual records, could fit exposure to individual patients. Where circumstances required, the risk of overexposure and its concomitant shortening of life expectancy or altering of genes of unborn children could be weighed against the immediate disease threat to life or well-being.

Officers of the Radiological Society of the State of New York issued such a report card to their members almost immediately. But the members objected and the cards were withdrawn. Now the American College of Radiology in Chicago publishes a special bulletin in which it calls the notion of a record card "premature and inadequately considered, if not totally unfeasible at this time."

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MAYBE *the radiologists ought to* read the November 3 issue of the *Journal of the American Medical Association*. Dr. I. Phillips Frohman, of Washington, D.C., tells a story in it.

It seems that a steel-mill worker needed a piece of string. He picked up the first piece he came upon. This piece, unfortunately, had a radioactive capsule of cobalt on one end. The cobalt was used to expose faults in the steel. He held it in his hand, transferred it to his pocket, and then put it in the glove compartment of his automobile. Three men who rode in the car were innocently exposed with him. The four "faced weeks of uncertainty as to the results of this exposure," Dr. Frohman said, listing the case as "but one example of . . . carelessness and ignorance (which) may very well be repeated many times over in the next decade."

Going!

Wouldn't an atom report card, carried constantly in the pocket and brought out for additional notations periodically, help to educate and jog the memory?

"Another (atomic medical) problem we will undoubtedly face will be the radiophobes—patients obsessed with a probably groundless fear of overexposure," Dr. Frohman warned. "This can be complicated by the known effects of radiation on the reproductive organs, since the relationship between sex and the psyche is a familiar one to us all. Distinguishing a person with *bona fide* radiation poison from the radiophobe will require skilful diagnostic techniques, patience, and understanding."

Wouldn't the diagnosis be a lot simpler if the patient carried a card with all his known exposures recorded on it?

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WHETHER or not there will be a report card, the College of Radiology bulletin underlined the urgent need for vigilance on the atom front. Lauding the Academy's insistence that X-ray exposure be decided by the clinician in each individual case, the radiologists pledged themselves to "cooperate with all efforts to encourage the medical authorities of this country to initiate a vigorous movement to reduce the radiation exposure from X-rays to the lowest limit consistent with medical wisdom, and in particular . . . to assure that proper safeguards always be taken to minimize the radiation dose to the reproductive cells." The bulletin pointed out that radiologists are rigorously trained to this very end, adding: *"Of the estimated 126,000 professional users of X-ray* apparatus today, *only about 4,000* have the comprehensive special training of radiologists." [*Italics mine* —J.L.]

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LAST April SR/RESEARCH reported how man had just made his first star. Geophysicists from the U. S. Air Force Research Center in Cambridge, Massachusetts, had shot a rocket sixty-two miles up into the sky above New Mexico and released nitric-oxide gas. The gas attracted footloose atoms knocked from oxygen molecules by the force of the daylight sun at that height. In combining with the nitric oxide, the oxygen atoms released the energy they had captured from the sunshine and thus generated light.

Because of the faint glow that exists in the sky even on the darkest nights, it long had been supposed that the oxygen atoms were hoboing around up there. But the Cambridge experiment was the first physical confirmation of their presence. Viewed as pure discovery, the event was pleasant to Dr. Murray Zelikoff and his little band of photochemical explorers. But the effects on high-flying aircraft that could be inferred were no cause for enthusiasm. Man cannot breathe free oxygen atoms; they'd disintegrate his lungs. In fact, they cut through toughest rubber like a knife. And in their photochemical interactions with nitrogen and other elements they stir up temperatures exceedingly hotter than any experienced on earth.

It was vital, then, to know just how high up in the sky the breakup of molecules into atoms begins to take place, and where the concentration of atoms is thickest. This could be determined by measuring the intensity of night light observed, since the brightness of the burning is directly related to the amount of fuel in the fire. The nitric oxide was not too good for the purpose, however, because it throws light at many wavelengths and is hence difficult to distinguish from the background of starlight. The Cambridge scientists looked around for something that would act more like a spotlight.

Now sodium is known to exist in the upper sky. It has been thought to be the source of what astronomers know as "the twilight flash"—a sudden brightening of the heavens just as the sun goes down over the horizon. Sodium burns with a clear yellow glow which stands out plainly

against white light and can be detected easily even in the dark by a sharpeyed new electronic watcher built by Dr. Edward Manring, a brilliant young physicist just four years out of Ohio State.

Dr. Manring and a colleague at the Air Force geophysics lab, Dr. John Bedinger, spent many weeks getting ready to duplicate Nature's "twilight flash." To rule out any mistake, they chose to try the experiment at 2 a.m. And at that hour they fired from the southwestern desert a rocket loaded with two stainless steel bottles full of thermite (iron oxide and aluminum powder) and sodium pellets. The bottles were corked by an alarm clock set to go off at an altitude of thirty miles.

The clock uncorked the bottles on the dot. The thermite escaped and ignited at a temperature of 1,000 degrees Fahrenheit. The heat vaporized the sodium pellets and pushed the vapor out into the sky.

The yellow light which sodium emits on contact with oxygen atoms did not appear until the rocket had climbed forty-two miles above the desert. At forty-five miles the light began to brighten. Between forty-five and forty-eight miles the brightness grew and hung in space for ten seconds before dying out. From forty-eight to fifty-seven miles the glow became intense and lasted for a minute and a half, appearing like a rope moving upward of itself. At fifty-seven miles the light dimmed again, and went out entirely at sixty miles. The rocket went on from there in darkness, but when it fell back to a height of sixty miles, the sodium caught fire again, passing through the same period of flareup and gradual extinguishment at the same altitudes where the light had appeared before.

What did the scientists know when the rocket came down that they hadn't known when it went up?

First of all, they were sure that "the twilight flash" is caused by sodium combining with oxygen atoms, which give up energy they receive from the sun.

More important, they knew that they had in sodium an extremely accurate device for measuring the make-up of the atmosphere.

Lastly, they discovered that there is a layer of sky between forty-eight and fifty-seven miles up where the photochemical effects of the sun create more dissociated atoms—and thus a greater hazard to fliers and flying—than anywhere else in the heavens.

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THE invasion of Egypt is a headline-news example of the extravagant price human government is beginning to pay for its failure to harness effectively the revolutionary promise of modern science.

One of the forces cut off by the Suez adventure was a band of salesmen intent on peddling President Nasser a robot that would help Egypt toward a peaceful and prosperous future. Had the Arab chief been able to command the device the frustrated salesmen were bringing to his door, he might have benefited his people greatly. For the wonder-worker the order-seekers had in tow was a plastic-muscled, electric-nerved machine that makes salt or brackish water fit to drink.

Ionics, Inc.—a company formed by two New England professors—markets the device at a price Middle Eastern lands can afford to pay. What fresh water could accomplish in the modernization of Egypt is obvious to anyone who understands the meaning of the word desert. How simply the change might be wrought is only slightly less plain, requiring a hasty glance at a map of the world's underground basins of brackish water. On such a chart the whole of northern Africa appears as a huge, brimming subterranean bowl.

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MOST people who take medicine expect the doctor to predict just how it will act. This isn't a very reasonable prospect. No human is put together exactly like any other human, and drugs are bound to affect one individual differently from his neighbor—or even his brother. Fortunately for the general health of the population the differences usually are too small to be particularly noticeable. Recently, however, so many powerful new drugs have come onto the market that the U. S. Food and Drug Administration has inaugurated a system of reporting unusual or adverse reactions among patients. Eleven hospitals in Connecticut, Pennsylvania, Maryland, Virginia, Ohio, Michigan, and Washington, D.C. are part of the reporting network, and prompt exchange of information is guaranteed by the collaboration of the American Association of Medical Record Librarians, the American Society of Hospital Pharmacists, the American Medical Association, and the American Hospital Association.

Gone!

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ENGINEERS make good husbands. This domestic research finding is reported by M. D. Hooven, president of the American Institute of Electrical Engineers. The divorce rate of engineers is "startlingly low," Hooven says—less than 2 per cent. The national average for all husbands is 25 per cent. "Considering the long hours of work, the extended periods of absent-mindedness when lost in a fog of speculation, and the well-known tendency of the engineer to fix his neighbor's radio while he lets his own go unmended," Hooven philosophizes, "it speaks well for the personality and amiability of the average engineer that, statistically at least, his helpmeet keeps him forever."

It does not seem to occur to the AIEE chief to question whether this idyllic state will change as the shortage of scientists pushes the engineer upward in the social scale, puts rugs on his office floor, snappy secretaries in the outer office. Will the engineer lose his vaunted emotional balance when he no longer has to sit on an orange crate to twiddle his slide rule?

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IF YOU want to know how cool it is in the late days of autumn and don't have a good thermometer handy, go out and find yourself a wood or swamp and listen to Oecanthus Niveus. Oecanthus Niveus is a cricket. To be more exact, he is the temperature cricket. By listening to his song, counting the number of times he chirps in fifteen seconds, and adding that number to the number forty you have the thermometer reading in degrees Fahrenheit.

If you already know it is very cool you can skip the trip to the swamp and listen instead to a Cornell University Record disc called "The Song of Insects." The temperature as measured by the recorded chirps will have no possible bearing on your personal comfort. But the crickets won't mind that.

—JOHN LEAR,
Science Editor.

LETTERS TO THE SCIENCE EDITOR

GEOGRAPHOOEY

YOUR MAPMAKER for the article "North Polar Thaw" by John Lear (*SR* Nov. 3) needs a lesson in geography. Even on your rough outline-map it is evident that Nome has been "misplaced" by several hundred miles.

Incidentally, it is interesting to note that this area should be developing into a point of friendly contact between the United States and Russia. During the Second World War I served with our Air Force as a Weather Liaison Officer with primary responsibilities for coordinating weather forecasting and related activities with a squadron of Russian pilots based at Fairbanks, Alaska. Here we lived in close contact with the Russians, learning much about their ideologies and attitudes.

JOHN X. JAMRICH, *Dean,*
Doane College.
Crete, Neb.

EDITOR'S NOTE: *That's not the worst. Our mapmaker reversed the seventieth and eightieth parallels!*

MISPLACED BRAIN

DR. MAX WOODBURY fits the brainy description you gave him in your RESEARCH IN AMERICA (*SR* Nov. 3) column. But he no longer does his thinking on the University of Pennsylvania payroll. He's moved to NYU.

WILL JONATHAN.
New York, N.Y.

NOT BAD

THANK YOU very much for the excellent summary of my little book (*SR* Nov. 3). You have certainly chosen very well the essential parts of the argument. There is an amusing mistake in the sixth line from the bottom in the middle column of page 56 where "bad" should have been "good." I hope most readers will not notice it.

THEODOSIUS DOBZHANSKY,
Department of Zoology,
Columbia University.
New York, N.Y.

SHOCK TREATMENT

HAVING READ the interesting article about the salt-sodawater treatment for extreme burns (*SR* Sept. 1) I have a question:

Can this treatment be used as effectively on most other kinds of severe shock? Or is this treatment only of value in cases of severe dehydration?

JOHN A. VALENTINE.
Lancaster, Calif.

EDITOR'S NOTE: *The Science Editor has inquired of the National Institutes of Health, and is told (1) the salt-soda treatment has not yet been tried on humans for anything except shock from burns, (2) experiments have been done with animals and in them the salt-soda-water is as effective as blood plasma in treating traumatic shock unrelated to burns, but neither salt-soda nor plasma is as effective in some cases as whole blood, (3) pending experiments on humans, the salt-soda solution might be tried in human emergencies with the reservation that satisfactory results cannot be guaranteed.*

NOT SAFE ENOUGH

FIRST, I SHOULD like to commend you for the three articles on "Food and Cancer" (*SR* Oct. 6). As a nutritionist, I believe that it is very important that the lay public be better informed regarding food supplies, especially those which might come in a classification of being "fads," in that they are used to appeal to the consumer.

On page 62 of the October issue, there is a feature, "Common Sense Precautions." In it, colored margarine has been singled out whereas no mention is made of butter. Butter is colored too. In fact, *Food Technology,* Volume IX, pages 367-72 (1955), carries an article by Barnett Laboratories, Long Beach, California, on the "Detection and Determination of Coloring Materials in Butter and Margarine," and they concluded, among other things, that the analysis of butter indicated that the coal-tar dyes were most commonly used to color butter.

Another thing which I think needs to be brought before the public is that we do not know about the use of antibiotics in the preservation of food. It has been shown that extractives which have been used in the preparation of some foods while no longer remaining in the foods have made a change in the amino acid content which produced poor growth in animals. So far as I have been able to find out, no attempt has been made to determine what effect the antibiotic has on the food constituents. From this standpoint, they have been content to determine the amount, if any, of the antibiotics remaining rather than any possible effect on the food constituents. I thought you might be interested in these last statements, since I was not aware of some of these myself until I attended the American Dietetics Association meeting two weeks ago and heard Dr. (Olaf) Mickelson (Chief of the Nutrition Section, National Institute of Arthritis and Metabolic Diseases) talk on, "Is Toxicology Enough for a Food Protection Program?"

FLORENCE I. SCOULAR, *Dean,*
School of Home Economics,
North Texas State College.
Denton, Texas.

WHAT COLOR DANGER?

A GROUP OF us read the articles on "Food and Cancer" with interest and concern. They provoked a number of questions. Could you, in a coming issue, state whether the following should be included among the products that "bear watching"?

Canned fruits. Are they included in the term "vegetables"? The label on one canned fruit reads "U.S. certified color added." What does this mean?

Artificial sweeteners, such as saccharine and sucaryl. The label on a dietetic soda, sweetened with calcium cyclamate, reads "a non-nutritive artificial sweetener which should be used only by persons who must restrict their intake of ordinary sweets." Just what does this mean—both for the consumer on a special diet and for the average person; both for the person who uses the product occasionally and the one who consumes it regularly?

Chickens, apart from the neck? Is the rest of the chicken possibly also affected by the intake of the growth pellets? What about other poultry?

Bread additives. What are they? Have they been tested?

Colored paper plates and colored candy.

MARTIN WEISS.
New York, N.Y.

EDITOR'S NOTE: *The Rome Symposium of experts belonging to the International Union Against Cancer reported* no dye *has been sufficiently tested to warrant an assumption that it does not provoke cancer. So far as poultry is concerned, the neck alone has a concentration of hormone pellets. The whole problem of food and cancer is so vast that Dr. W. C. Hueper, Chief of the Environmental Cancer Section, U.S. National Cancer Institute, recommends the opening attack on it be centered on dyes, pesticides, hormones, and detergents. A new food and drug law may be presented to the 1957 Congress; in it the vital point for law-enforcement agencies will be whether the burden of proof of safety is placed on the food producers or on the Government. The Rome Symposium said it belongs on the food producers.*

IMAGINARY WEATHER?

WHILE I APPLAUD the introduction of SR/RESEARCH I deplore your dignifying certain *speculations.* In *SR* July 7 ("Can the Atom Change the Weather?") you have missed the point that some of the speculations in atmospheric physics reported there are not supported at all in *fact.* The most charitable that I can be is to say that several elements of your story are nonsense. The implication of my remarks is, of course, that some of the story makes sense.

Dr. Irving Bengelsdorf may be right in his contention (oversimplified) that the Russian A-bomb of November 10 affected the weather in the United States from November 9 to November 18. I assert that the probability of his analysis being basically correct is very small.

There are several wrong statements. For example, "ions are capable of acting as nuclei for the condensation of raindrops." This is just not so. Ions act as nuclei for droplet condensation only at supersaturations of the order of 400 per cent but in the atmosphere the supersaturation seldom reaches as much as 1 per cent. Furthermore, raindrops don't condense—rain occurs by growth of ice crystals (a condensation process—the ice crystals subsequently melt as they fall into the warmer lower atmosphere), or by accretion of smaller cloud droplets that they sweep up in falling. If he had