

-G. Rodney Crowther, III.

SR/Research



DEPARTMENTS: Research in America • Letters to the Science Editor • Personality Portrait-XLIII • Science in Books • The Research Frontier **ARTICLES:** The Unimaginary Equator

RESEARCH IN AMERICA

NO TOLL ROUTES TO THE STARS!

والمراقع والمراجع والمراجع المرومين والمرور

F YOU have an ordinary pair of eves, you will need to peer closely at the masthcad photograph above before you are able to see the stars of the Big Dipper and the very fine line of light that marks the passage through the Dipper of man's first home-made Moon: the Soviet Sputnik of 1957. But if you look hard enough you will be able to see the stars and Sputnik's route-because a meticulous and patient photographer made the event a matter of record.

No people can decide a great public issue unless the facts about the issue are set plainly before them. The report that follows is an attempt to gather into the open literature all the available information on what up to now has been a secret struggle by astronomers to prevent communications routes through the heavens from being sold to the highest bidder like privately owned real estate.

At stake is nothing less than the people's right of free access to present and future knowledge of the universe.

What the astronomers are trying to protect is man's oldest and most precious dream: that he may someday somehow at last understand what he is and whence he came.

The answer is hidden somewhere between us and the farthest stars, and no one now knows how far man will have to travel to hear the ultimate message or how much farther than that the news will have to come to reach him or what strange, yet unimagined hearing aids must be fitted to his ears to make whatever the word is intelligible.

All that the finest mind can tell us today is that we must listen intently and constantly, with no irrevocably fixed notion of what we are listening for, and above all to keep the channels open not only for ourselves and for our contemporaries but for future men who may possess keener perceptions. As long as man simply looked at the sky, there was no real problem of an obstructed view. A handful of people who were curious enough to want to explore the mysteries overhead by distant observation, inference, and deduction, merely climbed to the mountaintops and gazed through progressively stronger magnifying glasses. But after young Karl Jansky, of Bell Laboratories, discovered in 1931 that it was possible to hear as well as to see the happenings of heaven, the situation changed rapidly and drastically. It was a revolutionary explosion in the realm of human perception. In common with most revolutions, it is not easy to explain.

It begins with electromagnetism. Electromagnetic waves are created when atoms give off energy through the electrons in their shells. Some of these waves can be seen as light. Others can be felt as heat. Still others can be discerned as sound. That part of the electromagnetic spectrum which is susceptible to detection by radio receivers attached to man's ears is 100 times as broad as the spectrum that informs man's eyes even when their vision is sharpened by the most powerful auxiliary lenses. The window through which the universe can be surveyed has been expanded enormously, and radio-telescopes that now point through that aperture from a dozen lands around the globe have already sketched in many details of cosmic environment to which we have heretofore been oblivious.

The image of the Sun, for instance, has been altered from a blazing round ball to a shape more akin to that of a nicely poached egg. Jupiter, the giant planet of the solar family, gives evidence of being surrounded by magnetically trapped belts of radiation patterned on a grand scale after the newly discovered Van Allen radiation belts girdling Earth. And just as these enlarged models of our own space travel barriers afford us an opportunity to learn by comparison, so far-off galaxies of spiraling stars provide us a mirror in which to study the spiral design that the radiotelescopes have found in the Milky Way-All this is only preliminary to the truly spectacular promise of the radio-astronomers: a decision on the age-old question of whether creation began at a fixed point of time or is a timeless process that has always been going on.

It may be too much to say that if the science of radio-astronomy had not been born when it was, the Russian rocket that reached the Moon last month would not have got there. But it is certainly true that radio-astronomers were first to listen for very faint signals from the sky and to use those signals as guides in following the paths of heavenly objects invisible to the eye. And it is also true that without tracking facilities the launching of any Earth satellite would have been impractical. Finally, experience with satellites had to precede attempts to reach the Moon or the neighbor planets of Earth.

As often happens in science (and elsewhere), the satellites and the Moon rockets turned on the very men who pioneered their creation. The only legitimate purpose of these space vehicles at the present primitive stage of extraatmospheric exploration is to substitute for man's senses and report back what they experience. The reporting must be done over various wave-lengths of the same electromagnetic spectrum that man uses to see and hear the sights and sounds normal to his daily life, including the TV pictures and radio broadcasts recent years have added to his entertainment fare.

Events followed each other so swiftly after the 1957 Russian jump into space

... NEWS IS HAPPENING AT NORTHROP

Norman V. Petersen Chief of the Astro Systems and Research Group, Norair Division of Northrop Corporation



How the Outer Edge of the Earth's Atmosphere Can Be the Training Ground for Man's First Landing on the Moon

by Norman V. Petersen

One of our current studies at Norair shows that a manned capsule can be rocket-launched from the earth in a ballistic trajectory approximating an approach to the moon. A braking rocket blast fired from the capsule would push the vehicle into an earthward turn and place it in landing position – the same way a space ship would maneuver for a moon landing. Such a maneuver would be made above the earth's atmosphere in order to approximate the moon's lack of atmosphere and its low gravity.

We base these particular studies on the use of conventional manned satellite capsules modified by the addition of a braking rocket as the lunar landing trainer and a ballistic rocket booster as the launching vehicle.

The capsule would be ejected at 50 miles altitude after traveling 100 miles from the launch site. Trajectory prior to ejection could be made to simulate either a close orbit approach to the moon, an intersecting elliptic trajectory approach or a vertical approach from a direct earth-moon trajectory. The guidance system would perform automatically during the initial approach, but would be fitted with an "override" feature allowing the pilot to take over the controls during the braking maneuver.

This simulated moon landing study is only one of our many current missile and space projects at Norair. Our range of activity allows the scientist and the engineer to work in research, design and development. He is active in the fields of close orbit, lunar and interplanetary flight regimes as well as research in many fields of space technology. Encouraged by the outstanding facilities of the entire Northrop Corporation, the Norair scientist and the engineer has a continuing chance to broaden his activities in space age developments. He is one of those important men who are making the news happen at Northrop.

Current papers by Northrop scientists and engineers include: A Simulator for LunarLandings, NormanV.Petersen; The Influence of Launch Conditions on the Friendly Rendezvous of Astrovehicles, Robert S. Swanson, Norman V.Petersen.

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that the radio-astronomers were caught off balance. When their science was young, and almost every scrap of noise their instruments picked up held some sort of excitement, these men had been content to audit the sky on any quiet, narrow lane they came across. Radiotelescopes then were too few and far between, and the sky was too vast, to permit apprehension that anyone might be crowded out. And it is probably fair to sav that even now, with perhaps ten radio-astronomical observatories dotting the breadth of the United States, there is plenty of room for easy, dependable flow of information.

The struggle the astronomers are engaged in today is the sort of struggle that should always occupy science. It is not a rearguard action to save the flank of yesterday but a preliminary skirmish to make tomorrow worth living in.

There has been in session at Geneva in Switzerland since August 15 the 1959 Radio Conference of the International Telecommunications Union. The ITU was formed in 1912. Upon organization of the United Nations in 1945, the ITU became associated with it as a specialized agency. Operating thus by world agreement, the ITU has the responsibility of allocating wave-lengths of the electromagnetic spectrum for broadcasting purposes. Its regulations amount to treaties, which usually are in force for the ten year periods between meetings of the ITU administrative assembly.

HE decade now beginning-the ten years that this session of the ITU will legislate for-almost certainly will encompass an explosive multiplication of communications channels for telemetering (space telegraphing) purposes. The military services will be receiving information from more and more rockets and space probes, and the commercial telegraph and radio companies will be bouncing trans-atlantic messages off the Moon and whatever other dependable vehicles rise. Unless science, as an advance agent of the public welfare, can protect itself, radio-astronomy is in real danger of extinction.

The radio waves that come in from outer space are extraordinarily weak. They possess only about one 10,000th of the strength of the messages received by radar sets. Because of their delicacy, the star-waves are exceedingly vulnerable to man-made interference of all kinds--surface radio and TV, long distance radar, plane and missile communications, even reflections from the Moon and the planets.

It has been demonstrated mathematically that if the space-telegrapher's dream—a satellite hanging 22,000 miles above the Earth and operating as a radio post office – comes true and is assigned to any wavelength now used by radio-astronomers, it will effectively cut off radio-astronomical observations on that wavelength from all points in the hemisphere above which the satellite orbits.

THE boom in activity beyond Earth's atmosphere was not foreseeable five years ago. So when the State Department (as the American voice on ITU's International Frequency Board) began to prepare papers outlining this country's position on problems likely to come before the 1959 ITU meeting, the astronomers felt no sense of need for a united front. At the request of the Federal Trade Commission, the Naval Research Laboratory's Dr. John Hagen polled the star-watchers on the wavelengths they would want. Each responder to the poll said he'd like to stay on the wavelength he was using at that time. The FCC could not reasonably support such a disparity of petitions, and the State Department was annoved by the scientists' lack of appreciation of the practical side of negotiation.

Result: The official United States recommendation to the ITU at Geneva offered only one world-wide listening path to the radio-astronomers. This covered that slice of the spectrum from 1400 to 1427 megacycles, and included "the hydrogen line" of 1420 megacycles on which the presence of the element hydrogen is detected. Space on both sides of the line is desirable in order to detect Doppler shifts, a phenomenon similar to the rise and fall of a train whistle when the train approaches and then recedes from an observer.

then recedes from an observer. "The hydrogen line" is important to all studies of the universe because, in contrast to its scarcity on Earth, hydrogen accounts for more than threefourths of the makeup of the stars. But there are many objects in the heavens that radiate on a number of wavelengths across the electromagnetic spectrum, and a detailed picture of these objects is impossible without matching up all the varying impressions.

The necessity of protecting much more than "the hydrogen line" for radio-astronomical observation became apparent to the scientists with the appearance of the first Sputnik in the autumn of 1957. At the general assembly of the International Scientific Radio Union in Boulder, Colo., that year, recommendations were drawn up for presentation to the International Radio Consultative Commission, the technical advisory body of ITU. Delegates from Great Britain, Holland, France, Belgium, Australia, Finland, India, Sweden and the United States took the proposals to their respective governments to line up support. All succeeded except the Americans. By April of 1959 the international nature of the backing for the proposals was established and CCIR okayed their transmission as "scientific advice" to the ITU assembly.

The CCIR resolution conveying this endorsement guaranteed that the proposals would be introduced at Geneva and made it appropriate for American radio-astronomers to approach the State Department again and ask for a broader American position in defense of radioastronomy. This petition traveled through Dr. Detlev Bronk, president of the National Academy of Sciences, to Dr. James R. Killian, Jr., who then was Special Assistant to President Eisenhower for Science and Technology. Dr. Killian passed on to the Science Advisor to the State Department, Dr. Wallace Brode, what amounted to a Presidential directive. The directive did not positively support the position of the radio-astronomers but it did instruct the American delegation to ITU not to oppose protection of broadcast wavelengths for astronomical use.

THE ITU meeting will last until December 17. Discussions preliminary to the fixing of an agenda for action still have a month or so to go. After that the roads to distant knowledge will be allocated for ten years.

The United States delegation is, by its negative instruction from the White House, in the position of seeming to drag its feet on a proposal which practically every other country, including Russia, favors.

The Russian delegates at Geneva have, in fact, formally advanced the argument that radio-astronomy must have exclusive right, everywhere in the world, to the use of the following wavelengths: 322-329 megacycles (the so-called "deuterium line" where the Russians claim to have seen heavy hydrogen); 1400-1427 megacycles ("the hydrogen line"); 1645-1675 mcgacycles ("the OH line" on which molecular fragments of oxygen and hydrogen are thought to be detectable); 3165-3195 megacycles; 4800-4810 megacycles; 5800-5815 megacycles; 8680-9700 megacycles.

If American astronomers could hold open all those lanes across the universe, they would be overjoyed. They would be happy with the somewhat less generous Dutch proposal to set aside 39-40.5 megacycles, 80-82.5 megacycles, 152-156 megacycles, 328.6-335.4 megacycles, 610-615 megacycles and 1400-1427 megacycles for astronomy's exclusive use, with some sort of sharing arrangement on 2555-2565 megacycles, 5110-5130 megacycles, and 10230-10250 megacycles. But they would be happiest of all if the ITU representatives of their own country would come forward with a positive expression of interest in the future of knowledge for the sake of knowing.

S. B. Starten and M.

Isn't a window overlooking the universe worth \$100,000,000 to the people? (That's what the requested radioastronomy channels might be worth in a TV auction.) Shouldn't the advancement of science merit one-tenth of the attention gladly given to radio "hams"? (That's the relative extent of the radioastronomers' requests when compared to the spectrum now set aside to maintain amateur radio operators in their hobby.)

One thing is certain. If science doesn't get the right to use these radio channels for the future benefit of all the people, the channels will be grabbed up in time if not immediately by the military and by whichever of the fiercely competing commercial interest prove able to pay the highest price.

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A^S this issue of SR/Research was put on press, a letter came from Dr. Austin Smith of the Pharmaceutical Manufacturers Association. The letter contained the following paragraph:

"You may be interested in knowing that in pursuance of paragraph 7 of our Statement of Principles of Ethical Drug Promotion, which provides as follows: 'Any violation of these principles brought to the attention of the President of the Pharmaceutical Manufacturers Association shall be referred by him to the Board of Directors.' I am referring your letter and your Saturday Review article entitled 'The Case of the Substituted Drug' [SR/Rescarch, Sept. 5] to the Board of Directors at their next meeting."

Among the letters to the Science Editor this month (see page 51) is one expressing regret that SR's study of drug marketing has not revealed the awkward position of the druggist who must stock new drugs ad infinitum in order to remain in business. This point was touched on, but perhaps not sufficiently, and it may later be appropriate to present the full picture from the druggist's point of view.

This same letter labors Madison Avenue in defense of Main Street. It may be comforting to believe that Madison Avenue alone is responsible for present circumstances of the drug market. But such a belief is a delusion. Main Street is at fault, too, and, in the Science Editor's opinion, perhaps more gravely at fault because a man in a small town is intimately known to his fellow townsmen and must be on constant guard of his good name. In the city, anonymity is easier.

The physician on Main Street has an influence far out of proportion to his



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• In addition to its current major projects-the Navy POLARIS FBM; DISCOVERER Satellite Air Force Q-5 and X-7 and Army KINGFISHER, Lockheed Missiles and Space Division has been assigned additional responsibility as systems manager for PROJECT MIDAS and PROJECT SENTRY -programs of the Advanced Research Projects Agency under the direction of the Air Force Ballistic Missile Division.

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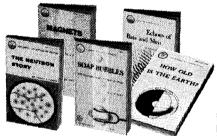
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medical practice-if he chooses to exert it. Unfortunately, the Main Street doctor is so busy taking care of larger numbers of patients than ever before crowded his waiting room that he hasn't even time to read his professional journals carefully and thus must rely more and more on the advice of the "detail men" sent to him by the drug houses.

UST as patients have to trust the doctor, so the doctor has to trust someone to tell him about research he can't do himself. The drug manufacturers are aware of his dilemma, and have increased the number of confidantes ready to fill his ears. A recent study has shown that there is now one "detail man" from the drug sellers for every ten physicians in this country. The drug houses are currently spending \$1,400 a year on "free" advice to each member of the medical profession. They are even beginning to make up digest magazines for him-drugmakers' selections of what his patients are reading in lav publications. Why? So the doctor may give his patients the answers the drug houses want him to give in answer to questions about drugs.

The total effect of the process just described has been gradual substitution of the drug house for the medical school in the postgraduate education of phvsicians. Fortunately, the deeper implications of this for society have been discerned by professors of medicine. The California Medical Association Postgraduate Activities Committee, for instance, is concerning itself with postgraduate courses being sponsored by drug houses without the cooperation of the medical schools.

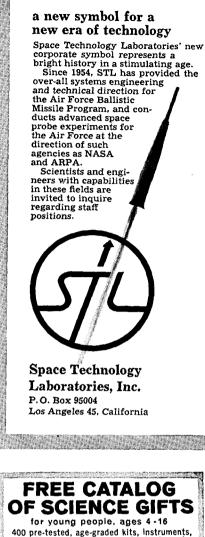
Doctors themselves are wakening to the dangers of high pressure drug salesmanship and are subscribing by scores to the independently edited Medical Letter mentioned earlier in these columns; since SR's first drug report was published, the Letter has pushed its list of subscribers to 10,000.

L HE spreading practice of using trade names of drugs in professional journal reports will come under fire at this month's meeting of the advisory board of the Federation of American Societies for Experimental Biology.

There is rising pressure in Congress for a sweeping inquiry into drug prices.

And Arthur Flemming, Secretary of the U.S. Department of Health, Education and Welfare, has advised federal legislators that new departmental regulations are being written to govern conflicts of interest like the one SR reported in the case of Dr. Henry Welch, director of the antibiotics division of the U.S. Food and Drug Administration.

-JOHN LEAR, Science Editor





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LETTERS TO THE SCIENCE EDITOR

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SEE YOUR 9/5/59 issue, page 53, column 2, line 14, word 1: "Hypothecated"!!!

J. T. MCNAUGHTON. Professor of Law Harvard Law School

Cambridge, Mass.

EDITOR'S NOTE: Fowler's English Usage would not sanction the substitution of hypothecated for hypothesized. As an exercise in language, however, it would be interesting to explore the extent to which a scientific theory is a pledge of future performance. Many scientists have mortgaged their careers in such fashion.

USE OF AN ART

CHEERS FOR JOHN LEAR'S research into medications . . . this is the finest use of the journalistic art. The hard work and regard for accurate reporting these articles reflect is appreciated by your readers. GEORGE E. TEMP.

Spring Valley, Calif.

A DOCTOR'S THANKS

You ARE to be commended for the accuracy and forthright exhibition of facts many of which are unknown even to most doctors.

G. W. ERICKSON, M.D. South Bend, Ind.

THANKS AGAIN

MAY I COMMEND you again upon your astute observation and penetrating analysis, this time in connection with the Roerig Enarax advertising?

A. BENEDICT SCHNEIDER, M.D. Cleveland, Ohio

MOUNTAINS OF SKEPTICISM

I WISH TO congratulate you on your work and article on Enarax in the Sept. 5 issue of SR.

I hope enough publicity will be given to it so that the greatest number of physicians may be reminded once more of the necessity of maintaining strong skepticism about the mountains of drug advertisements that clutter our mailboxes.

JEAN FEYS, M.D. Washington, D. C.

DETAIL MAN

I MUST SAY that I have enjoyed the articles by John Lear on the sharp practices of the drug-manufacturing industry. But I am still unable to see the point. What is Mr. Lear driving at? That business has its unethical practices; we all know that. That the prevalent motto in many cases is that the public be damned; but we all know that. What Mr. Lear has done, and well, is to fill in the details of what we all already know in general.

Astoria, N. Y.

PHILIP SIEKEVITZ.

HILIP SIEKEVITZ.

SPASM, ULCERS AND CANCER

IT IS ALL very well for you to rise as a champion of scientific integrity in drug advertising ("The Case of the Substituted Drug"), but you must avoid such pit-falls yourself. The statement on page 45, "Intestinal spasm can lead to ulcers and cancer." is, to my knowledge, unsupported by any evidence whatsoever. If there is any, I would be glad to hear of it. As far as I am concerned, the edge is taken off your article by this unfounded and irresponsible statement.

J. ERIC HOLMES, M.D. Los Angeles, Calif.

EDITOR'S NOTE: Qualified authorities in the American Cancer Society assure the Science Editor that about 18 per cent of all cases of ulcerative colitis terminate in cancer and that appearance of the ulcerous condition in such cases is usually preceded by intestinal spasm. SR's reports did not pretend to resolve the puzzle of causation.

MADISON AND MAIN

OF VITAL importance in the treatment of mental and physical diseases is a strong chain-like bond of understanding trust between physician and patient. I wonder how many such chains have been snapped by Science Editor John Lear's recent Research in America article?

Many of us have always detested the "blitz" campaigns of the Chas. Pfizer Co. But we can now also detest *The Saturday Review's* flying bannered "Case of the Substituted Drug" cover as a good way to sell a magazine to a pill conscious nation.

Mr. Lear's article was excellent and it is correct on most all points save one. It should not have been presented so onesidedly to the layman. There are thousands of men and women doing courageous and worthy work in pharmaceuticals. How about them? Your article should have been entitled "Madison Avenue Ad Man versus Main Street U.S.A. Medicine" or something more appropriate. Also Mr. Lear's article forgets to mention the "dupe" for the whole mess, the pharmacist at the corner drugstore who must stock twentyfive trade names of the same drug in order to be able to fill his prescriptions which by law, by business, and by God cannot be substituted for in the pharmacy.

JOHN D. BOLAND. Registered Pharmacist

POUNDING IT IN

Alton, Illinois

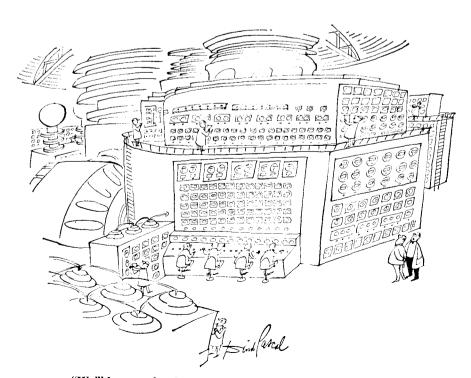
Is JOHN LEAR so insecure that he had to pound your faithful readers with the fact that he was *The* Science Editor? I'm not not sure but I think he more or less proved a case of bad advertising practices in his yarn about the substituted drug (SR/Research, Sept. 5, 1959). However, after being told *16 times* that he was *The* Science Editor, methinks he protests too much and I wonder—is he?

MARTIN ALLYN. Washington, D.C.

FIRST TIME

FOR THE FIRST time in my medical career I was conned [SR/Research, Sept. 5] into looking at a drug ad. It is paradoxical that medical journals are largely financed by drug ads which are systematically ignored by the medical profession. Certainly none of us would put an ounce of credence in the statistics used or claims made. Your Science Editor would do better to expose quack remedies that appear in the daily newspapers for less discerning readers.

ROBERT D. JACKSON, M.D. Lancaster, Wis.



"We'll have to abandon it. It's been blabbing confidential data."

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