SCIENCE

29 July 1960
Vol. 132, No. 3422

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

For engineering, for research, for business data processing in companies both large and small . . . The new, fully-transistorized

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ELECTRONIC COMPUTING SYSTEM

Advanced design: fully transistorized—with important new computer design concepts that provide the largest memory, greatest problem-solving capacity and flexibility in the low- or medium-priced field. Entire system —computer, input-output typewriter and tape punch-read console—have been specially designed as a unit. **High-speed computing ability:** extra large capacity (8008 words) magnetic drum memory, with special fast access features. Computing speeds of up to 230,000 operations per minute. **Ultra high speed input-output:** 500 characters per second photoelectric punched paper tape reader, and 300 characters per second paper tape punch available as optional equipment. **Easy to use:** maximum results can be obtained by non-technical personnel. Users benefit from free training, continuing assistance, an extensive library of programs. Versatile command structure provides programming speed and flexibility. **Low in cost:** priced just above the small-scale computers, the RPC-4000 outperforms computers costing many times more. **Economical to install and operate:** no site preparation, air-conditioning or special maintenance required. Plugs into any standard wall outlet. **Multiple application ability:** designed to perform engineering, scientific and research calculations, as well as business data processing and management control functions.

The RPC-4000 is a product of the Royal Precision Corporation, and is marketed by the Data Processing Division of Royal McBee. It is the latest member of the growing family of electronic computers from the people whose LGP-30 has become the world's leading small-scale computer.

Royal Precision Corporation

Royal Precision is jointly owned by the Royal McBee and General Precision Equipment Corporations. RPC-4000 sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing offices. For full specifications, write **ROYAL McBEE CORPORATION,** data processing division, Port Chester, N.Y.

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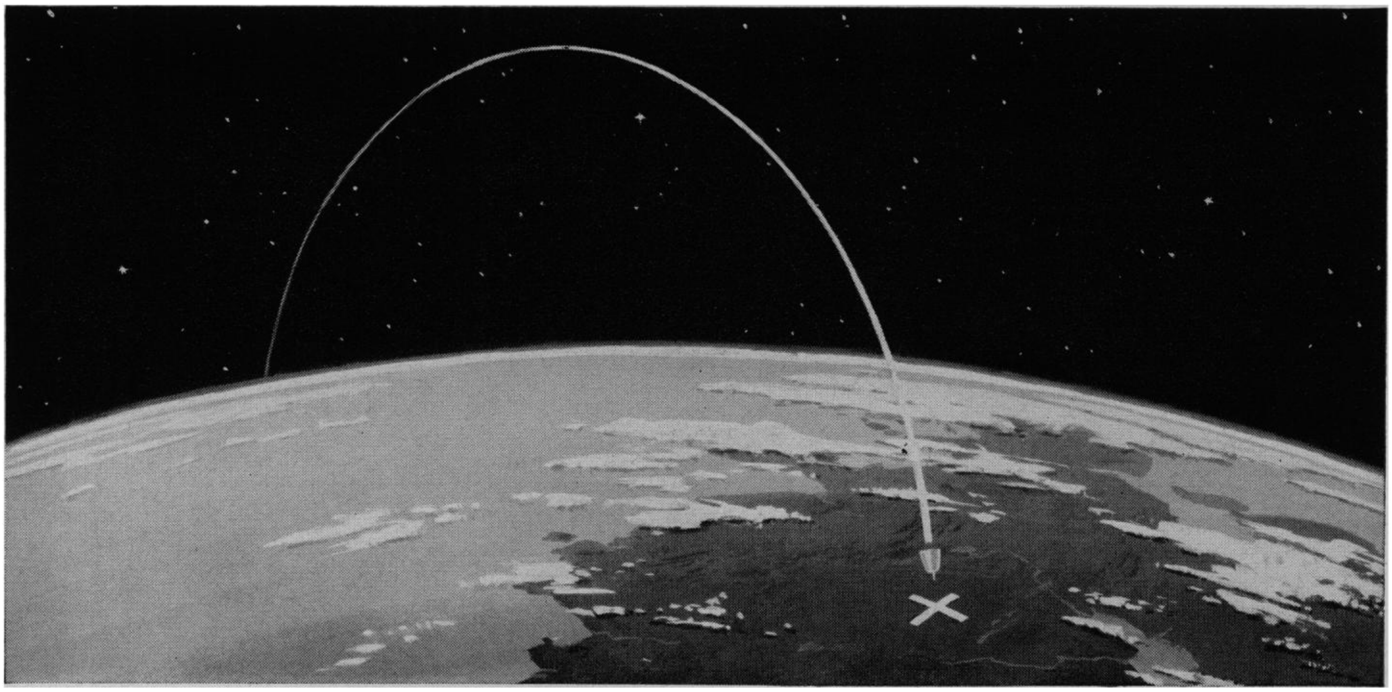
Cover The full moon as photographed with the 36-inch telescope of the Lick Observatory on 17 January 1946. The dark *maria* (almost certainly lava fields) and bright uplands or *terrae* are plainly visible. Most lunar features, such as craters, can be seen only under oblique illumination. Parts of the uplands are apparently the original lunar crust, modified locally by impacts, while other parts are covered with rubble ejected from nearby *mare* basins or large impact craters. [Photograph is plate 1 of the *Photographic Lunar Atlas*, published by the University of Chicago Press; see page 290]

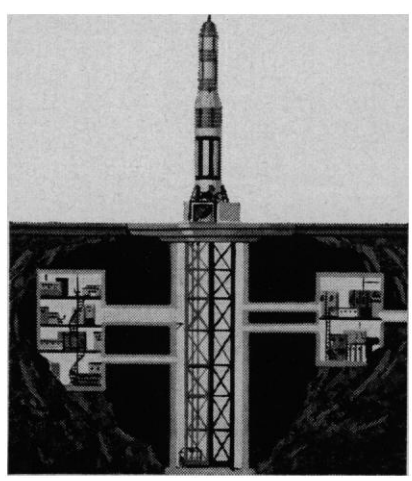


ASSIGNMENT: HIT A TARGET 6000 MILES AWAY

Can you guide a 110-ton Air Force Titan missile far up into the sky, to bring its nuclear warhead down with pinpoint accuracy on a target one-fourth the way around the globe—a target you not only can't see but which continually moves with the spinning earth?

This was the problem in missile guidance the Air Force presented to Bell Telephone Laboratories and its manufacturing partner, Western Electric. The answer was the development of a command guidance system which steers the Titan with high accuracy.

Unlike self-contained systems which demand complex guidance equipment in the missile itself, Bell Laboratories Command Guidance System keeps its master control equipment on the ground where it can be used over and over again. Thus a minimum of equipment is carried in the missile, and the ground station has full control of the missile during its guided flight. Techniques drawn from the communications art render the system immune to radio jamming.



Bell Laboratories scientists and engineers designed the transmission and switching systems for the world's most versatile telephone network, developed much of our nation's radar, and pioneered in missile systems. From their vast storehouse of knowledge and experience comes the guidance system for the Titan.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

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SCIENCE

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Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢. Single copies, 35¢. Cable address: Advancesci, Washington.

Science Ambassadors

Early in 1958 the Department of State reactivated the program of assigning science attachés to U.S. embassies in other countries. Wallace Brode was appointed science adviser to the Secretary of State, and scientific representatives have since been sent to 10 major capitals abroad. We recently had the opportunity to discuss the program with a few science attachés and with several scientists in Europe who have observed the work of our scientific ambassadors.

There have been some initial problems. A new science attaché must demonstrate that he can live and work as a member of the embassy staff and that he can contribute to the working effectiveness of the embassy. In the 18 months since the first attachés reached their posts, much of their time has gone into learning how to work most usefully. Now, the report is, "We are beginning to be truly effective." They facilitate scientific exchanges with the U.S. They interpret American science to scientists, science writers, editors, and others who influence foreign attitudes toward the U.S. and its scientific and technological achievements. And—as a function of prime importance to the Department of State—they help other members of the embassy staffs to give proper consideration to the scientific and technical factors involved in the decisions they must make. The program is well started; the attachés express a feeling of growing accomplishment in what they are doing.

What of the future? The program is, in a sense, on trial. Before it can work at maximum effectiveness, three hurdles must be crossed. First, the Department of State must demonstrate that it gives the program continuing, nonpolitical support. Both the present administration and the administration that takes office on 20 January must be alert to the importance of demonstrating the continuing, nonpolitical character of the program.

The second hurdle is to persuade first-rate men to replace the present attachés, most of whom were appointed for two-year periods while on leave of absence from their permanent positions. If the Department of State passes the first hurdle successfully, the science adviser can recruit good replacements; if the Department fails the first hurdle, the second will also surely be failed.

The third hurdle is to work out long-term staffing policies. The well-selected amateurs in diplomacy we now use have dedication, knowledge of American scientific activities, and considerable acquaintance with the language, customs, and scientific activities of the countries in which they work. Ideally, they should also have a greater understanding of national policy and of Department of State procedures and problems. It is possible to combine the advantages of an amateur with those of a professional, perhaps most effectively by making periodic foreign service a recognized part of the career patterns of appropriate scientists and science administrators, but it will be a waste of time to worry about this third hurdle unless the first one is successfully crossed.

Our emphasis on the first hurdle is because the Department of State failed on this one once before. In 1951 the Department appointed a science adviser and a number of science attachés. When the science adviser resigned, no replacement was appointed; as the attachés came home, their posts were left vacant. Thus the program stumbled to a halt in 1956. The service that the program can render to the nation is too important to allow the first hurdle to be failed again.—D.W.

APPLICATION FOR HOTEL RESERVATIONS

127th AAAS MEETING

New York, 26-31 December 1960

The five hotels for the AAAS New York meeting have established special, **low, flat rates** and have reserved appropriately large blocks of rooms for this meeting. Thus everyone making room reservations for the AAAS meeting is assured substantial savings.

The list of hotels and the reservation coupons below are for your convenience in making your hotel reservation in New York. Please send your application, *not* to any hotel directly, but to the AAAS Housing Bureau in New York and thereby avoid delay and confusion. The experienced Housing Bureau will make assignments promptly; a confirmation will be sent you in two weeks or less.

If requested, the hotels will add a comfortable rollaway bed to any room, at $3.00 per night. Mail your application now to secure your first choice of desired accommodations. All requests for reservations must give a definite date and estimated hour of arrival, and also probable date of departure.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

For a list of the headquarters of each participating society and section, see page 230, *Science*, 22 July. Both the Commodore and the Biltmore are AAAS headquarters hotels.

Flat Rates for Rooms with Bath*

Hotel	Single	Double Bed	Twin Beds	Suites
Commodore	$ 8.50	$14.00	$15.50	$21.00 to $52.50
Biltmore	8.50	14.00	15.50	45.00 and up
Roosevelt	8.50	14.00	15.50	39.00 to 43.00
Belmont Plaza	8.50	14.00	15.50	30.00 and up
Waldorf-Astoria	10.00	16.00	18.00	45.00 and up

* All rates are subject to a 5% New York City tax on hotel room occupancy.

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AAAS Housing Bureau
90 East 42nd Street
New York 17, N.Y.

Date of Application ....

Please reserve the following accommodations for the 127th Meeting of the AAAS in New York, 26–31 December 1960:

TYPE OF ACCOMMODATION DESIRED

Single Room .... Double-Bedded Room .... Twin-Bedded Room ....

Suite .... Desired Rate...................... Maximum Rate ....

(Desired rate and maximum rate apply only to suites)

Number in party .... Sharing this room will be: ....

(Attach list if this space is insufficient. The name and address of each person, including yourself, must be listed.)

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First Choice Hotel .... **Second Choice Hotel** .... **Third Choice Hotel** ....

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(These must be indicated—add approximate hour, A.M. or P.M.)

NAME ....

(Individual requesting reservation) (Please print or type)

ADDRESS ....

(Street) (City and Zone) (State)

Mail this now to the Housing Bureau. **Rooms will be assigned and confirmed in order of receipt of reservation.**

and the comprehension of such content by children in the normal intelligence range is truly surprising, particularly in the light of our current expectations of children.

I have written at greater length elsewhere on this theme [see my article in *The Science Teacher* (March 1960)], and I expect to spend the next several years assessing the feasibility of elementary-school science programs based on content selection by professional scientists.

J. MYRON ATKIN
College of Education,
University of Illinois, Urbana

Weather Forecasting

In his recent article "The atmosphere in motion" [*Science* **131**, 1287 (1960)], Robert R. Long has presented an interesting summary of his well-known work on the channel flow of stratified fluids, and the comparisons between theory and experiment which he presents are impressive. I think most dynamic meteorologists would certainly agree with him in stressing the need for a great deal more basic hydrodynamical research in order to strengthen the foundations of dynamical weather prediction. I also feel that he would find few who would quarrel with the statement that forecasting accuracy has improved little in the past 40 years or so, although more variables are now predicted over greater regions of the atmosphere. Long's introductory remarks on the role of numerical weather forecasting in the past decade, however, may be misleading to the general scientific reader and deserve some comment.

The numerical (or dynamic) forecasts now used subjectively by the forecasting meteorologist differ from his other sources of information in at least two important and fundamental respects. In the first place, the numerical forecasts represent the result of a systematic application of dynamical equations to the problem of large-scale atmospheric flow and are in this sense objective and reproducible. Secondly, the numerical forecasts may be (and have been) systematically improved by the introduction of more realistic models and previously neglected physical effects, as well as by improvement of the numerical procedures employed in the solutions. From a practical viewpoint the test of a forecast is, of course, its accuracy, and in this respect the present numerical predictions are disappointing in some ways. The low-level forecasts issued, for example, by the Joint Numerical Weather Prediction Unit in Suitland, Md., are not superior to those produced by the usual synoptic means; the higher-level (500 millibar) numerical forecasts, on the other hand, are now more accurate for periods up to 3 days than other comparable forecasts. This recent improvement has resulted from the systematic error reduction noted above. In view of the many physical and mathematical approximations incorporated in present operational models, I feel that their performance is more surprising than disappointing; relatively simple dynamical methods are here effectively competing with all of the synoptic calculations and intuitive skill of the forecaster.

From a broader viewpoint, the numerical integrations represent an attempt to verify the same set of basic dynamical equations with which Long is concerned, although for larger-scale phenomena, in which different physical effects are important. While the comparison of theory and observation is here poorer than in the more restricted experiments of Long, I feel there is good reason to entertain more optimism than he suggests is in order. The small but systematic improvement in the prediction of the large-scale flow is here, I believe, a significant improvement. As this scale of motion is progressively better understood, the results of research on small-scale phenomena—of which Long's studies of tornado-like circulations is an excellent example—may then be incorporated into the overall dynamical picture and should result in further systematic forecast improvement, especially for the smaller-scale motions which are closely associated with our subjective impressions of "weather."

W. LAWRENCE GATES
Department of Meteorology,
University of California, Los Angeles

Binocular Fusion of Colors

In an article entitled "Colors of all hues from binocular mixing of two colors" that appeared in *Science* [**131**, 608 (1960)], the following statement was made by Geschwind and Segal. "The problem of binocular fusion of colors has interested investigators since Hecht's demonstration in 1928 that presenting red to one eye and green to the other led to a subjective sensation of yellow. . . . Hurvich and Jameson . . . confirmed these results; it is today generally accepted that such fusion is readily obtainable in most subjects."

A major finding of the article by Hurvich and Jameson cited by Geschwind and Segal was the following: "The fact that does clearly emerge from these results is that, unless there is a yellow further discussion on radiation-produced radicals in living and dead materials. E. L. Powers (Argonne) gave a concluding paper on the role of free radicals in the lethal effect of x-rays on dry bacterial spores.

The symposium was a unique, congenial, and timely meeting, devoted to a subject matter of rapidly growing interest. The proceedings will be published by Academic Press and should appear later this year.

M. S. Blois
Biophysics Laboratory, Stanford University, Stanford, California

Forthcoming Events

August

21–6. Pacific Science Cong., 10th, Honolulu, Hawaii. (Secretary-General, 10th Pacific Science Cong., Bishop Museum, Honolulu 17)

22–25. American Astronomical Soc., Mexico City, Mexico. (J. A. Hynek, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge 38, Mass.)

22–25. American Physiological Soc., San Francisco, Calif. (R. G. Daggs, APS, 9650 Wisconsin Ave., NW, Washington 14)

22–26. Plasma Physics, symp., Gatlinburg, Tenn. (University Relations Div., Oak Ridge, Inst. of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.)

22–26. Western Resources, 2nd annual conf., Boulder, Colo. (M. E. Garnsey, Dept. of Economics, Univ. of Colorado, Boulder)

23–25. Assoc. for Computing Machinery, natl., Milwaukee, Wis. (J. Moshman, ACM, Council for Economic and Industry Research, 1200 Jefferson Davis Highway, Arlington 2, Va.)

23–25. Cryogenic Engineering Conf., Boulder, Colo. (K. D. Timmerhaus, CEC, Dept. of Chemical Engineering, Univ. of Colorado, Boulder)

23–26. American Statistical Assoc., annual, Palo Alto, Calif. (D. C. Riley, ASA, Beacon Bldg., 1757 K St., NW, Washington 6)

23–26. Biological Photographic Assoc., Salt Lake City, Utah. (Miss J. H. Waters, Box 1668, Grand Central Post Office, New York 17)

23–26. Institute of Mathematical Statistics, annual, Stanford, Calif. (W. Kruskal, Dept. of Statistics, Eckhart Hall, Univ. of Chicago, Chicago 37, Ill.)

23–28. American Ornithologists' Union, Ann Arbor, Mich. (H. G. Diegnan, Division of Birds, U.S. National Museum, Washington 25)

24–27. Forest Biology Conf., Seattle, Wash. (Miss E. N. Wark, Technical Assoc. of the Pulp and Paper Industry, 360 Lexington Ave., New York 17)

24–27. Internal Medicine, 6th intern. cong., Basel, Switzerland. (Secretariat, 6th ICIM, 13 Steinentorstre, Basel)

24–2. International Union for the History and Philosophy of Science, Stanford, Calif. (R. Taton, 64, rue Gay-Lussac, Paris 5^e^, France)

25–27. Chemical Organization of Cells,