

SCIENCE

29 July 1960

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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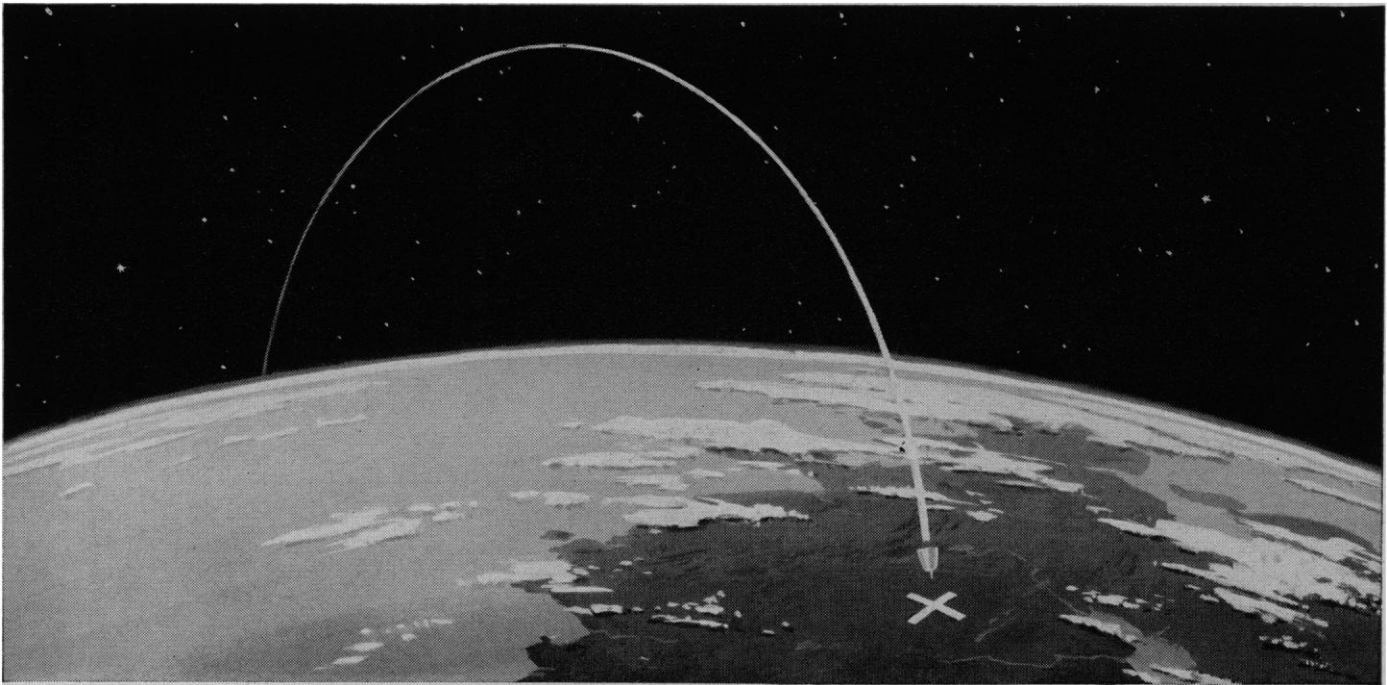
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Cover	The full moon as photographed with the 36-inch telescope of the Lick Observatory on 17 January 1946. The dark <i>maria</i> (almost certainly lava fields) and bright uplands or <i>terrae</i> are plainly visible. Most lunar features, such as craters, 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 <i>mare</i> basins or large impact craters. [Photograph is plate 1 of the <i>Photographic Lunar Atlas</i> , published by the University of Chicago Press; see page 290]	



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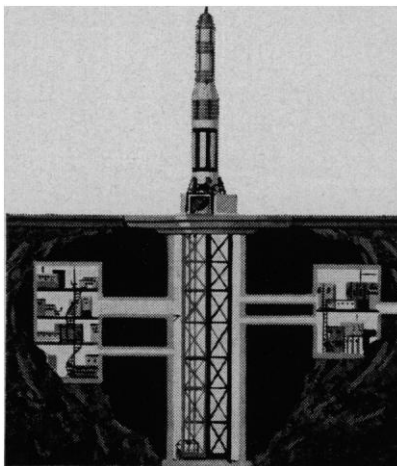
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Science Ambassadors

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.



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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."

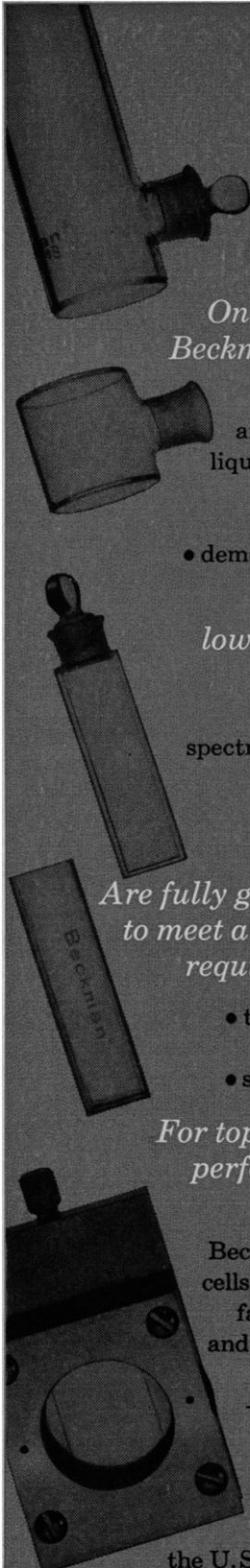
W. LAWRENCE GATES

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



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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. Diegman, 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°, France)

25-27. Chemical Organization of Cells,

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