Table 1. Intensity of organic band in different regions of Mars.

Region	Relative intensity	No. of spectra
Amazonis	0.3	2
Arabia	0.5	13
Mare Cimmerium	2	1
Mare Sirenum	2	2
Pandorae Fretum	2	7
Syrtis Major	2.5	11

previously reported by Kuiper (*4*, p. 358). These are shown quite well here, particularly the ones at 2 μ, which were in a region of low detector sensitivity in Kuiper's spectra.

No new absorptions, other than the organic bands, were found on Mars. The N_2O bands at 3.90 and 4.13 μ were no stronger in Mars spectra than in sun spectra. The CH_4 band at 3.3 μ was likewise equally strong in Mars and in solar spectra. The effective path length of CH_4 on Mars is four times a vertical path (two paths through the atmosphere each with a factor of 2 coming from the average over slant heights). For N_2O the effective path length is less than this because an appreciable fraction of the energy is emitted by the surface. However the ability to detect these gases is reduced by nearly tenfold relative to detection in the earth's atmosphere because of the low pressure on Mars. The amounts of CH_4 and N_2O, if present, are probably less than the amounts in the earth's atmosphere.

The presence or absence of these gases, and of oxygen too, is important to the question of biological life on Mars, for on the earth these gases are formed chiefly by biological activity. Oxygen results from photosynthesis, methane is formed by the decay of organic matter, and nitrous oxide is produced by bacteria in the soil (*7*).

Conclusions

The presence of the bands near 3.5 μ is confirmed. These bands are most probably produced by organic molecules, but carbonates also possess bands in this region (*8*). Their absorption is strongest at 3.4 and 3.9 μ with practically no absorption at 3.7 μ. Though carbonates are eliminated because of the disagreement in the details of the absorptions, it probably cannot be assumed that no inorganic molecule can explain the observed bands. The observed spectrum fits very closely, however, that of organic compounds and particularly that of plants (see Fig. 4).

It is tempting to assume, though this has not been demonstrated, that the dark regions that have appeared during the history of planetary observing also contain organic molecules. If this is true, then organic molecules are produced in localized regions in relatively short spans of time. Growth of vegetation certainly seems to be the most logical explanation for the appearance of organic molecules.

At first the band at 3.67 μ seemed to be an enigma, for it had not been found in any terrestrial plants. However it has now been found in the alga *Cladophora* (Fig. 4). It is apparently produced by carbohydrate molecules present in the plant. The attachment of an oxygen atom to one of the carbon atoms shifts the resonance of a hydrogen atom attached to the same carbon to a longer wavelength. Thus the evidence points not only to organic molecules but to carbohydrates as well. The strength of the band at 3.67 μ compared to its weakness or absence in plants may indicate a significant difference in plants that may be present on Mars and perhaps indicates a larger storage of food.

References and Notes

1. E. C. Slipher, *Proc. Am. Phil. Soc.* **79**, 441, (1938) (see plate III).
2. W. M. Sinton, *Sky and Telescope* **14**, 360 (1955).
3. V. M. Slipher, *Publ. Astron. Soc. Pacific* **36**, 261 (1924); P. M. Millman, *Sky* **3**, No. 10, 10 (1939); G. A. Tikhov, *Bull. Astron. and Geodet. Soc. U.S.S.R.*, No. 1 (8), 8 (1947).
4. G. P. Kuiper, in *The Atmospheres of the Earth and Planets*, G. P. Kuiper, Ed. (Univ. of Chicago Press, Chicago, Ill., 1952).
5. W. M. Sinton, *Astrophys. J.* **126**, 231 (1957).
6. This work was substantially aided by grant G3949 from the National Science Foundation.
7. G. E. Hutchinson, in *The Earth as a Planet*, G. P. Kuiper, Ed. (Univ. of Chicago Press, Chicago, Ill., 1954), pp. 392–405.
8. G. Schaefer, C. Bormuth, F. Matossi, *Z. Physik* **39**, 648 (1926).

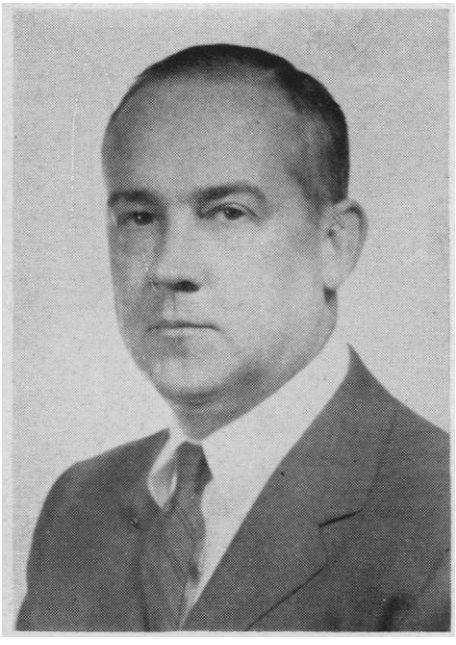
Science in the News

National Standards for Teacher Certification To Be Studied under Carnegie Grant to AAAS

The American Association for the Advancement of Science has received an $81,000 grant from the Carnegie Corporation of New York to support an 18-month study of certification requirements for teachers of secondary-school science and mathematics. The grant was made in response to a proposal that was submitted to Carnegie by the National Association of State Directors of Teacher Education and Certification, an independent group that is made up of the chief certification officer in each of the states. Since the organization is not incorporated, and therefore not directly eligible for a Carnegie award, the AAAS will hold the funds and administer them in cooperation with NASDTEC. Work will commence on 1 December at headquarters that are being established in the AAAS building in Washington, D.C.

John R. Mayor, AAAS director of education, is part-time director of the new study. He will provide some leadership, but full-time responsibility for the investigation will be carried by the associate director, William Viall, who has just resigned his post as chief of the Bureau of Teacher Education and Certification for the state of New York.

Viall, immediate past president of NASDTEC, has been on the staff of the New York State Education Department since 1951. His experience there, and his earlier career, provide him with outstanding qualifications for his present assignment. He has served as teacher in a one-room country school, as instructor in a small-town junior high school, as assistant principal in a practice school for teachers, as professor of education and director of demonstration schools and student teaching in a teachers college, as director of elementary schools



William Viall

for a state department of education (New Hampshire), and as summer lecturer at a number of universities.

Objectives

It is hoped that the new study will provide a basis for establishing state and national standards of teacher certification and for promulgating reciprocity agreements among the states. At present such reciprocity exists only at the elementary-school level, where it is possible because there is a nationally accepted program for the education of elementary teachers.

However, there is not a single reciprocity agreement, even between two states, on any certification at the secondary-school level. This has been a major concern of the National Association of State Directors of Teacher Education and Certification.

The members of the association have concluded that to be most effective the study should be concentrated on a specified field. It was decided that the area of greatest need at the present time is that of science and mathematics.

Operation

The study will be conducted on a state, regional, and national basis. Initially, five regional groups will carry out status studies. The groups will all examine much the same type of material, then each will draft what it conceives to be an ideal program. To accomplish this, they will review current certification programs, special attention being given to those which are judged to be superior; the several statements that have already been prepared as a result of special state surveys; and the recommendations of curriculum groups and other appropriate bodies, such as the AAAS Cooperative Committee on the Teaching of Science and Mathematics.

In each state a committee of scientists, teachers, and professional education administrators will be appointed to serve under the director of teacher education and certification. These state groups will consider the results of the status studies and draw up a minimum training program for science and mathematics teachers that is in keeping with the conditions in their particular state. This program will be submitted to state authorities for tentative approval, with the understanding that further study is to be carried out by the National Association of State Directors of Teacher Education and Certification for the purpose of making a proposal at the national level.

The status studies are expected to take 9 months, and the state action, another 9 months. At the end of the 18-month period, a national conference will be held to examine the findings, to focus public attention on the work, to lay plans for the development of reciprocity agreements on a national basis, and to inaugurate studies in other disciplines.

While the members of the National Association of State Directors of Teacher Education and Certification are principally responsible for administration of certification requirements, they provide active leadership in the determination of these requirements in the various states. Through this AAAS-Carnegie study, it is hoped that the group may be able to establish a new framework for certification of teachers in the public schools.

Hesitancy of Europe To Invest in U.S. International Atom Program To Be Studied

The hesitancy of European investors to participate in the U.S.-sponsored Euratom program has led to a call by the Joint Congressional Atomic Energy Committee for a full study of the United States' international program for the development of atomic energy. In announcing the new study, Senator Clinton P. Anderson (D-N.M.), chairman of the committee, named Robert M. McKinney, a former U.S. representative with the International Atomic Energy Agency, to be its director. "The time is appropriate," the senator said, "for a reappraisal of our various international atomic energy programs and policies in terms of whether they are fulfilling their original purposes and premises, and, if not, what changes are necessary or desirable."

The study planned by the committee will include examination of the bilateral agreements of the U.S. that bear on the development of atomic energy, the work of the International Atomic Energy Agency, and the U.S.-Euratom relationship. Among the particular points to be examined by the study will be these: In industrial countries, should emphasis be placed, at this stage, upon broad-scale research, development, and demonstration programs or upon the construction and operation of commercial plants? Is sufficient attention being given to the special problems of less developed countries? What are the implications of the present international policies of the United States for our domestic atomic-equipment industry, and what impact will developments abroad have upon our domestic atomic power programs?

European Program Faltering

Behind the study is the fact that only two European utilities have submitted firm plans for the construction of atomic power plants with U.S. technical and financial aid. The deadline for such proposals was 20 October. Earlier in the year five letters of intention were received at the Brussels headquarters of Euratom, but these were only for the information of officials and did not commit the utilities to build plants. This response was disappointing to U.S. and Euratom officials, who had hoped that six or more plants would be constructed under the program. However, an increase in fuel reserves from known sources and the discovery of new reserves within the earth have made the energy problem in Europe less pressing than it was at the time Euratom was conceived.

McKinney has recently evaluated this situation in Europe during tours of atomic installations and while attending the meetings of the International Atomic Energy Agency. In addition to his past work with the IAEA, McKin-