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SELENOLOGY AND COSMOGEOLOGY

COSMIC AND GEOLOGIC IMPORT OF THE LUNAR FEATURES

By Dr. HERMAN L. FAIRCHILD

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APOLOGY: In slight excuse for trespassing in the astronomic field it may be said that a geologist, cooperating with an astronomer, showed the fallacy of the nebular hypothesis, which had been cherished by astronomers and selenographers for more than a century; and that a student in geology may have some reasonable ideas in selenology.

Thesis: The basins and pittings of the lunar surface are impact craters and are ocular confirmation of the view that the planets and satellites were built by cold accretion. This implies acceptance of the planetesimal hypothesis of Chamberlin and Moulton. The genesis, growth, history and structure of the earth and moon are here considered from the planetesimal view-point.

Ever since Galileo first peeked at the moon through his crude telescope, the lunar surface has been perhaps

the most singular, fascinating and puzzling of telescopic objects. Galileo's surprise and delight have been reexperienced by all observers, and for four centuries selenography has been a favorite pastime for sky-gazers. Description and portrayal of the so-called craters and of the plains, mountains and the many peculiar features make an extensive literature. In recent time photography has largely displaced pen and pencil. Naturally the moon has been the subject of much speculation and imaginings and the cause of superstition and mental aberration. Scientific literature includes much lunar description that is unscientific and even unreasonable. The most pretentious treatise on the moon in American literature argues for the existence on the moon of atmosphere, snow, ice and vegetation. This ignores the heated condition of the surface during the long lunar day. It would be a new

TABLE 2

EFFECT OF VITAMIN B₁, NICOTINIC ACID (0.5 MG PER LITER) AND "PEA ROOT AMINO ACID MIXTURES" DONE IN COMBINATION, ON THE GROWTH OF ISOLATED PEA ROOTS

Growth factors added	Growth in mms per week, average for 2 weeks		
	II and III	IV and V	VI and VII
B ₁	41.1	23.6	11.6
Amino acids	32.5	22.1	5.9
Nicotinic acid	45.8	25.0	9.2
Nicotinic and amino acids	46.3	18.4	16.2
B ₁ and amino acids	47.0	30.1	20.1
B ₁ and nicotinic acid	55.8	70.6	72.6
B ₁ , nicotinic acid and amino acids..	54.2	68.6	77.7

growth rate with each weekly transfer. Nicotinic acid alone, however, supported growth of the isolated pea root at least as well as did vitamin B₁. Combination of the amino acid mixture with either nicotinic acid or with vitamin B₁ supported the growth at a somewhat higher level than did either substance in the absence of the amino acid mixture. Combination of nicotinic acid with vitamin B₁ or with vitamin B₁ and the amino acid mixture, on the other hand, resulted in a steady

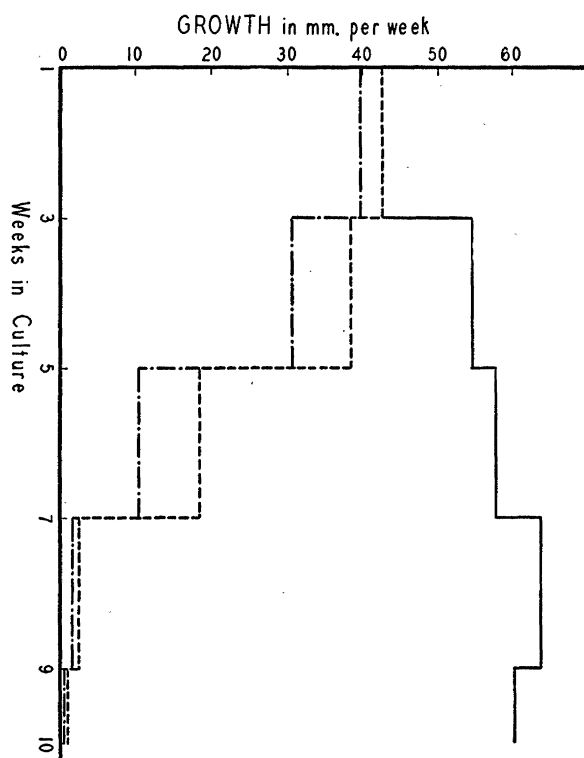


FIG. 1. Growth of isolated pea roots with and without nicotinic acid in addition to vitamin B₁ and the optimum mixture of amino acids: Solid line, nicotinic acid plus vitamin B₁ plus amino acids; dotted line, vitamin B₁ plus amino acids; dot and dash line, vitamin B₁ alone. Nicotinic acid was introduced into the medium of part of the series which had been cultured in vitamin B₁ and amino acids at the end of the third week. No accessory growth substances are added to the roots during the first week.

increase of growth rate. This increase has been found in several different experiments and is of the order of 50 per cent. above the initial level. Although the experiment recorded in Table 2 was maintained through only 7 weekly transfers, a second experiment was maintained through 10 weeks with undiminished rate of growth of the roots which received nicotinic acid in addition to vitamin B₁ and the amino acid mixture (Fig. 1). Such roots were indistinguishable in appearance (except for their greater length) from roots which had been but 2 weeks in culture.

Although the data presented (in Table 2) do not yet permit of a definitive decision, still it seems possible that the amino acid mixture is not essential to the continued optimal growth of isolated pea roots. Nicotinic acid, however, must apparently be regarded as a factor quite as significant as vitamin B₁ in the nutrition of the isolated pea root. The promotive influence of nicotinic acid on the shoot growth of the isolated pea embryo⁸ also must in all probability be attributed to the effect of this substance on the growth of the root.

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OF THE BIOLOGICAL SCIENCES,
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⁸ J. Bonner, *Plant Physiol.*, in press.

BOOKS RECEIVED

- ALBERT, ARTHUR L. *Fundamental Electronics and Vacuum Tubes*. Pp. ix + 422. Illustrated. Macmillan. \$4.50.
- ANSLEY, A. J. *An Introduction to Laboratory Technique*. Pp. xiii + 313. 121 figures. Macmillan. \$4.50.
- BEAN, R. BENNETT. *The Peopling of Virginia*. Pp. viii + 302. Illustrated. Chapman and Grimes. \$3.00.
- BINGER, WALTER D. *What Engineers Do; Engineering for Everyman*. Pp. xviii + 304. 111 figures. Norton. \$2.75.
- BRANSON, E. B. *Stratigraphy and Paleontology of the Lower Mississippian of Missouri*. Pp. 208. 9 figures. 20 plates. University of Missouri. \$1.25.
- CHAPMAN, KENNETH M. *The Pottery of Santo Domingo Pueblo; A Detailed Study of Its Decoration*. *Memoirs of the Laboratory of Anthropology*, Vol. I. Pp. 192. 79 plates. 34 figures. The Laboratory, Santa Fé, New Mexico. \$4.00.
- COE, CARL J. *Theoretical Mechanics; A Vectorial Treatment*. Pp. xiii + 555. 102 figures. Macmillan. \$5.00.
- MCBRIDE, J. FRANCIS. *Flora of Peru*. Pp. 665-1136. Field Museum. \$2.50.
- Memoirs of the College of Science, Series B, Vol. XIV, No. 2, (Articles 6-15)*. Pp. 155-352. Illustrated. Kyoto Imperial University, Japan.
- National Research Council. *Transactions of the American Geophysical Union; Regional Meetings, Reports and Papers; Part I, Sections on Geodesy, Seismology, Meteorology, Terrestrial Magnetism and Electricity, Oceanography, Volcanology and Hydrology*. Pp. 585. *Part II, Sections on Hydrology and Western Interstate Snow-Survey Conference*. Pp. 588-744. National Academy of Sciences.
- NEBLETTE, C. B. *Photography, Its Principles and Practice*. Third edition. Pp. xi + 590. 229 figures. Van Nostrand. \$6.50.

NEW BOOKS

*The Structure of
Economic Plants*

by HERMAN E. HAYWARD
Professor of Botany, University of Chicago

tato, the tomato, squash, and lettuce. Throughout the book the dynamic, developmental aspects of plant anatomy have been as fully discussed as the morphological. Valuable, up-to-date bibliographies are given at the end of each chapter. A ten-page glossary of scientific terms is appended to leave no doubt as to the meaning of terms employed in the book. There are 340 illustrations, more than half of which are original. \$4.90

*The Phylum
Chordata*

by H. H. NEWMAN
Professor of Zoology, University of Chicago

of the work adequately covered in the laboratory—this book deals with the Phylum Chordata as a whole, the evolutionary history of the group, the interrelation of surviving groups, the general biological principles illustrated by the phylum, and significant aspects of the natural history of the chordates such as their modes of life, special adaptations, habitat, distribution, breeding habits, etc. It provides an excellent text and reference book for the lecture part of an interesting course in vertebrate zoology. To be published in December. \$3.75 (probable)

This book provides for the first time a comprehensive summary of all research bearing on the structure and developmental anatomy of sixteen important economic plants. The first part of the book gives a digest of the principle facts of plant anatomy in general as a background for the discussion of individual plants. The second part then treats in detail the following plants: corn, wheat, the onion, hemp, the beet, the radish, alfalfa, the pea, flax, cotton, celery, the sweet potato, the white po-

This new text is based upon the author's *Vertebrate Zoology*, but has been newly written to cover the many research findings which have accumulated since the original book was published. It is a book particularly well adapted to modern methods of teaching in that emphasis is put on the broad underlying principles and a rich and interesting fund of related detail is included. Thus, instead of taking up in detail the comparative study of the standard representative species—a part

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