# UNIVERSITY AND EDUCATIONAL NOTES

DR. ALEXANDER RUTHVEN, dean of administration in the University of Michigan, has been appointed acting president of the university.

DR. WILLIAM S. FRANKLIN, since 1917 professor of physics at the Massachusetts Institute of Technology, has become professor of physics at Rollins College.

PROFESSOR ALDEN B. DAWSON, of the University Heights section of the department of biology, New York University, has accepted a call to the department of zoology at Harvard University. The following new appointments in biology at University Heights have been made: Associate Professor Otto M. Helff, of the University of Iowa, to be associate professor; Dr. Daniel Ludwig, University of Pennsylvania, to be assistant professor, and Dr. Carl J. Sandstrom, University of Chicago, instructor.

APPOINTMENTS at Union College include the following assistant professors: Ernest E. Dale, of the University of Porto Rico, in biology; Dr. Hugh H. Hyman, in physics, and Dr. Ernest M. Ligon, in psychology.

MILLARD PECK, bureau of agricultural economics of the Department of Agriculture, has become professor of agricultural economics in Iowa State College, Ames.

JAMES R. THAYER has resigned his position as research chemist at Parke, Davis and Company, to become assistant professor of materia medica in the California College of Pharmacy, San Francisco.

DR. EARL C. O'ROKE, of the University of California, who has been carrying on research in zoology for the California Fish and Game Division, has been appointed assistant professor of forest zoology in the University of Michigan School of Forestry and Conservation.

DR. NORBERT WIENER, of the Massachusetts Institute of Technology, is visiting professor of physics at Brown University, and Dr. Arthur M. Banta, of the Carnegie Institution at Cold Spring Harbor, N. Y., has been appointed acting professor of biology. Dr. William A. Noyes, Jr., of the University of Chicago, has been appointed associate professor of chemistry.

PROFESSOR DR. CHARLES TERZAGHI, of the Massachusetts Institute of Technology, has accepted a call to a professorship of hydraulics at the Viennese Technical High School.

M. DAGUIN has been appointed professor of geology and mineralogy at Bordeaux to succeed M. Mengard.

# DISCUSSION

## SOME NEW LAWS FOR THE SOLAR SYSTEM

APROPOS of A. E. Caswell's suggested law, namely, "the mean distances of the planets from the sun are proportional to the squares of simple integral numbers," the writer wishes to point out the following corrections, extensions and other new laws.

(1) The percentage deviation from proportionality to the *squares* of the integers is double that indicated by him.

(2) Since the earth's distance is taken as a standard in all measurements, one would expect a good reason for not assuming its distance to correspond to a perfect square of an integer (in this case 5). If this is done the deviations from the above law are as high as 12 per cent.

(3) One would expect similar relations to hold for the satellites of the planets. For the satellites of Mars the ratio $5^2:8^2$ holds quite closely. For the four satellites of Uranus the ratio $5^2:6^2:8^2:9^2$ holds poorly. But for the satellites of Saturn and Jupiter one must either omit several or resort to initial numbers greater than $5^2$ for the nearest satellite. Of course, if large integers are to be admitted one may get as close a fit as one pleases for almost any distribution of distances. On the whole the evidence from this source is unfavorable to a deep-seated significance for the relation cited.

(4) The writer would point out a relation that depends *strictly* on the square root of the distance of a planet from the sun or a satellite from its planet. It is the velocity, which varies inversely as the square root of the distance from the axis of revolution. For the planetary system one could then state as a law: *The velocities of the planets are inversely in proportion to simple integral numbers.* Thus,

| Planet | Period | Mean velocity | 30.3/mean velocity | Nearest integer |
|---|---|---|---|---|
| Mercury | 0.2408 | 10.1006 | 3 | 3 |
| Venus | 0.6152 | 7.3872 | 4.1 | 4 |
| Earth | 1.000 | 6.2832 | 4.83 | 5 |
| Mars | 1.88 | 5.0924 | 5.95 | 6 |
| Jupiter | 11.86 | 2.7563 | 11.0 | 11 |
| Saturn | 29.46 | 2.0344 | 14.9 | 15 |
| Uranus | 84.01 | 1.4346 | 21.1 | 21 |
| Neptune | 164.6 | 1.1464 | 26.5 | 27 |

(5) Another law may be stated, as a consequence of Kepler's third law and the distance relation, namely, *the periods of the planets are proportional to the cubes of simple integral numbers.*

The same integers as above are involved.

(6) In this connection the writer would bring to the attention of American scientists an effort by Viktor Goldschimt[1] to elucidate some of the numerical regularities in the distances of planets and satellites from their axes of revolution. The journal in which it occurs is not generally known. He observes the distances of the planets to be quite closely in the sequence 1/13, 1/7, 1/5, 1/3, 1, 2, 4, 6. The four larger planets are considered to have condensed together before the group of the four smaller ones. A mathematical treatment strictly analogous to the phenomena of *standing waves in sound,* the distribution of lines in spectra, the progress of crystallization and similar phenomena gives the same law of harmonic relations of distances not only for the planets but also for satellites. The harmonic sequences are as follows:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Condensations | 0 | 1/3 | 1/2 | 2/3 | 1 | 3/2 | 2 | 3 | ∞ |
| Large planets | 0 | | 1/2 | | 1 | | 2 | 3 | ∞ |
| Small planets | 0 | 1/3 | | 2/3 | 1 | | 2 | | ∞ |
| Jupiter's satellites | 0 | | 1/2 | 2/3 | 1 | | 2 | | ∞ |
| Uranus' satellites | 0 | | 1/2 | 2/3 | 1 | 3/2 | | | ∞ |
| Saturn inner satel. | 0 | | 1/2 | 2/3 | 1 | 3/2 | 2 | | ∞ |
| Saturn outer satel. | 0 | | | | 1 | (6/5) | | 3 | ∞ |
| Earth moon | 0 | | | | 1 | | | | ∞ |

The sequences are brought into line by transformations derived from considerations of the dominance of certain positions, as the 0, 1 and ∞ in condensation.

(7) The writer would further approach the question of the regularities of the spacing of the planets from another basic point of view. In brief, considering the accurate correspondence of the velocity of a planet or satellite inversely to the square root of its distance from the axis of revolution, we may conceive the propagation of a wave of velocity at the initiation of revolution to follow the law of a logarithmic spiral. We should then expect the distances of the planets as well as their velocities to be represented as the radii vectors of a logarithmic spiral. The law we would propose is: *A small integral number of geometric means will determine the positions and velocities of all the planets and satellites.* This is suggested by the well-known properties of such spirals. Symbolically,

$$\log \mathrm{d} = \mathrm{nk}, \text{ or } e^{\mathrm{nk}} = \mathrm{d}$$

where $d$ is the distance, $k$ is a constant and $n$ is a *simple integer.* A fairly accurate straight line plot is obtained by using values of $n$ for the entire series between Mercury and Neptune, *1, 4, 5, 7, 10, 13, 16, 19* and *21.* The interval of 3 predominates. The velocity, $v$, is related to the above by the relation

$$\log \mathrm{v} = \mathrm{k}' - \frac{\mathrm{nk}}{2}$$

where $k'$ is another constant and $n$ the *same simple integer as above.* It follows also that a similar logarithmic relation exists for the periods, that is, *a small number of geometric means will determine the periods.* If $p$ stands for the period, then

$$\log \mathrm{p} = \frac{3}{2}\mathrm{nk} + \mathrm{k}''$$

where $k''$ is still another constant and $n$ is *the same simple integer as above.*

Similar relations may be derived for centripetal force and the like, but enough has been given here to indicate the underlying principle.

WILLIAM MARIAS MALISOFF
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[1] *Annalen der Naturphilosophie,* Vol. V, pp. 51–118.

## A STUDY OF THE FIRE BLIGHT PATHOGEN, BACILLUS AMYLOVORUS, WITHIN LIVING TISSUES

IN a previous article Rosen and Groves[1] showed that blossom infection of Japanese (flowering) quince may readily be accomplished either by injections or by spraying with a water suspension of *Bacillus amylovorus.* The relative ease with which infections were obtained by either of these methods suggested a reexamination of the methods by which blossom infections are brought about under field conditions upon various hosts. In the meantime, an article by Miller[2] appeared in which stomatal infections were described for a young apple leaf and for the "inside of the receptacle cups of apple and pear flowers that were open when inoculated." The present note is for the purpose of calling attention to the wholly unexpected results that have been obtained in petalary infections of pear blossoms. A more detailed report, with photomicrographs, will appear later.

When pear blossoms in which the petals are closed and tightly clasped together are sprayed with a water suspension of *B. amylovorus* and placed in a moist chamber for twenty-four to forty-eight hours, infections will commonly occur on receptacles, sepals and petals. The number of infections as well as the extent of any one individual infection will depend on a number of conditions and it can be reported that infections may be obtained in great numbers within forty-eight to seventy-two hours after inoculation. It seems

[1] *Jour. Agr. Res.,* 37: 493–505, 1928.
[2] SCIENCE, 68: 386–388, 1928.