tirely to the immediate route, notes are given on short side trips at two or three points. A list of 45 publications on the region and a glossary of geological terms are appended.

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PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (NUMBER 7)

THE seventh number of volume 1 of the *Proceedings of the National Academy of Sciences* contains the following articles:

1. *Nova Geminorum No. 2 as a Wolf-Rayet Star:* WALTER S. ADAMS and FRANCIS G. PEASE, Mount Wilson Solar Observatory, Carnegie Institution of Washington.

A continuous series of observations on Nova Geminorum No. 2 has shown the development of the spectrum of this star through the successive stages characteristic of novæ into one very strongly resembling that of planetary nebulæ; and then by the gradual elimination of the nebular lines and their replacement by Wolf-Rayet bands, into a spectrum identical with this characteristic type of stellar spectra.

2. *The Ruling and Performance of a Ten-inch Diffraction Grating:* A. A. MICHELSON, Ryerson Physical Laboratory, University of Chicago.

A ten-inch grating (actual ruled surface 9.4 inches by 28 inches) having a theoretical resolving power of about 660,000 shows an actual power of about 600,000. The method of obtaining exact ruling is also discussed.

3. *A Singular Dark Marking on the Sky:* E. E. BARNARD, Yerkes Observatory, University of Chicago.

From a dark object in Cepheus and those in Taurus the author gets the impression that the interstellar spaces are suffused with a feeble nebulosity and that the dark marks are due to the projection upon this background of nearer dark, opaque objects.

4. *A Highly Sensitive Electrometer:* A. L. PARSON, Chemical Laboratory, University of California.

The principle of working in a condition approaching instability is used to increase greatly the sensitiveness of electrometer and obtain an instrument theoretically sensitive enough to detect 10^{-6} volt (though unsteadiness makes it as yet impossible to detect an isolated potential-difference of less than 3×10^{-5} volt).

5. *The Distribution and Functions of Tribal Societies among the Plains Indians: A Preliminary Report:* CLARK WISSLER, American Museum of Natural History, New York.

Field-work conducted by the writer and his associates in the American Museum of Natural History leads to the conclusion that the societies have spread from tribe to tribe by culture diffusion of a desultory kind; that certain features of organization are traceable to particular tribes, and no one tribe can be the originator of the society as a whole.

6. *The Determination of Surface-Tension:* T. W. RICHARDS and L. B. COOMBS, Wolcott Gibbs Memorial Laboratory, Harvard University.

Attention is called to various sources of error in the measurement and in the calculation of surface-tension by the capillary-tube method, an improved form of this method is described, a new correction for the meniscus is proposed, and exact measurements with a number of liquids are presented.

7. *An Exhibit in Physical Anthropology:* ALES HRDLIČKA, Division of Physical Anthropology, U. S. National Museum, Washington.

The exhibits prepared under the direction of the author for the exposition at San Diego are described briefly to indicate their breadth, their permanent value, and their capability of forming the foundation of an anthropological center.

8. *The Compressibilities of the Elements and Their Relations to Other Properties:* T. W. RICHARDS, Wolcott Gibbs Memorial Laboratory, Harvard University.

This paper records all the recent work on the compressibility of the elements performed at Harvard, reduced to the best available standard—the newly determined compressibility of mercury. It is pointed out that the reciprocals of the melting points are very closely associated with the coefficients of expansion, and that

both of these properties seem to be essentially connected with atomic volume and compressibility.

9. *Radial Velocities within the Great Nebula of Orion:* EDWIN B. FROST, Yerkes Observatory, University of Chicago.

We must alter our conceptions of the nebula as an enormous mass of quiescent gas, and regard it as seething with local whirlpools besides perhaps having a considerable motion of rotation as a whole.

10. *The Radial Velocities of the More Distant Stars:* WALTER S. ADAMS, Mount Wilson Solar Observatory, Carnegie Institution of Washington.

The radial velocity of stars increases rapidly with the proper motion, and only very gradually with the spectral type. This agrees with Eddington's hypothesis that the relation between velocity and spectral type may be a relation between velocity and distance.

11. *Localization of the Hereditary Material in the Germ Cells:* T. H. MORGAN, Department of Zoology, Columbia University.

The chromosomes not only furnish a mechanistic explanation of Mendelian heredity, but in the case of non-disjunction and in the case of the point-by-point correspondence between the linkage groups and the chromosomes, furnish a verifiable explanation of the results. In the case of crossing-over and of interference the chromosomes give us the only objective explanation of the results that has been as yet offered.

12. *Researches on the Chemical and Mineralogical Composition of Meteorites:* GEORGE P. MERRILL, Department of Geology, United States National Museum, Washington.

Abstract of extensive investigations which will appear as a memoir in the series of *Memoirs of the National Academy.*

13. *On the Representation of Arbitrary Functions by Definite Integrals:* W. B. FORD, Department of Mathematics, University of Michigan.

The function $f(x)$ is represented as the limit of a definite integral depending on a parameter when the parameter becomes infinite, or by a series of definite integrals.

14. *The Lymphocyte as a Factor in Natural and Induced Resistance to Transplanted Cancer:* JAMES B. MURPHY and JOHN J. MORTON, Rockefeller Institute for Medical Research, New York.

A marked increase in the circulating lymphocytes occurs after cancer-inoculation in mice with either a natural or induced immunity. When this lymphoid reaction is prevented by a previous destruction of the lymphoid tissue with X-ray the immune states are destroyed; hence the lymphocyte is a necessary factor in cancer immunity.

15. *Some Theorems connected with Irrational Numbers:* WILLIAM DUNCAN MACMILLAN, Department of Astronomy, University of Chicago.

The presence of the factors $i - j\gamma$ in the denominators of series arising in celestial mechanics does not affect the domain of convergence of the series, provided γ is a positive irrational number which satisfies a rather mild condition.

EDWIN BIDWELL WILSON

SPECIAL ARTICLES

ON HYDRATION AND "SOLUTION" IN GELATIN

I

THE importance of the swelling and of the "solution" of protein colloids for the interpretation of many biological phenomena has been emphasized repeatedly.[1] Thus, the laws governing the absorption of water by simple proteins like fibrin, gelatin, gluten, etc., and those governing the absorption of water by animal and plant tissues are identical. It has thus become possible to explain on a colloid-chemical basis not only the normal water content of cells and tissues, but also to account for the abnormally great absorption characteristic of excessive turgor, plasmoptysis, and edema. On the other hand, the changes characteristic of the "solution" of previously solid

[1] See Martin H. Fischer, "Œdema and Nephritis," second edition, New York (1915), where references to the older literature on this subject will be found.