SCIENCE

FRIDAY, JANUARY 7, 1898.

CONTENTS:

The Philosophy of Hyper-space: PROFESSOR S. NEWCOMB 1

Report upon some Preliminary Experiments with the Röntgen Rays on Plants: PROFESSOR G. F. ATKINSON 7

Some Considerations upon the Functions of Stomata: PROFESSOR CHARLES E. BESSEY 13

Recent Progress in Agricultural Chemistry: DR. H. W. WILEY 16

The American Society of Naturalists: PROFESSOR H. C. BUMPUS 21

Scientific Notes and News 23

University and Educational News 27

Discussion and Correspondence:—

Water Surface Temperature of Lake Titicaca: R. DEC. WARD. *Zirkelite—A Question of Priority:* PRESIDENT M. E. WADSWORTH 28

Scientific Literature:—

Catalogus Mammalium tam viventium quam fossilium: DR. C. HART MERRIAM. *Guide to the Genera and Classification of the North American Orthoptera found north of Mexico:* PROFESSOR A. S. PACKARD. *Les Ballons-Sondes:* DR. A. LAWRENCE ROTCH. *Russell's Volcanoes of North America:* PROFESSOR WM. NORTH RICE 30

Societies and Academies:—

New York Academy of Sciences—Section of Geology: PROFESSOR RICHARD E. DODGE 36

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

*THE PHILOSOPHY OF HYPER-SPACE.**

THERE is a region of mathematical thought which might be called the fairyland of geometry. The geometer here disports himself in a way which, to the non-mathematical thinker, suggests the wild flight of an unbridled imagination rather than the sober sequence of mathematical demonstration. Imaginative he certainly does become, if we apply this term to every conception which lies outside of our human experience. Yet the results of the hypotheses introduced into this imaginary universe are traced out with all the rigor of geometric demonstration. It is quite fitting that one who finds the infinity of space in which our universe is situated too narrow for his use should, in his imaginative power, outdo the ordinary writer of fairy tales, when he evokes a universe sufficiently extended for his purposes.

The introduction of what is now very generally called hyper-space, especially space of more than three dimensions, into mathematics has proved a stumbling block to more than one able philosopher. The question whether a fourth dimension may possibly exist, and whether it can be legitimately employed for any mathematical purpose, is one on which clear ideas are not universal. I do not, however, confine the term 'hyper-space' to space of more than

*Address of the President before the American Mathematical Society, December 29, 1897.