SCIENCE

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CONTENTS

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

THE DERIVATION OF ORBITS, THEORY AND PRACTISE[1]

LESS than twenty-five years ago it was commonly accepted among astronomers and mathematicians alike that the orbit problem had been solved both in theory and in practise. Without detailing the well-known history of the development of orbit methods before that time it is sufficient to remind you that although Newton, after successfully integrating the differential equations in the problem of two bodies and verifying Kepler's laws, proposed a geometrical method which was successfully applied by Halley particularly in determining the orbit of the well-known comet which bears his name, the integrals derived by Newton were not translated into a thoroughly practical method for determining the constants or elements from the initial conditions furnished by observation until 1797 when Olbers published his famous method of determining parabolic orbits for comets from three observed positions. This special method was followed at the dawn of the last century by the general method of Gauss which permits of the determination of the elements from three observations without previous hypothesis regarding the eccentricity, a method applicable equally to comets and to planets. It is to be noted that both Olbers's and Gauss's methods rest on the previous analytical solution by Newton of the equations of motion in the two-

[1] Address of the vice-president and chairman of Section A, American Association for the Advancement of Science, read at a joint meeting of Section A, the American Mathematical Society and the American Astronomical Society, on Thursday, December 28, 1917, at New York.