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THE PLANET SATURN,
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THE
STORY OF THE HEAVENS.

BY

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PREFACE.

I HAVE to acknowledge the kind aid which I have received in the preparation of this book.

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I have also to thank Dr. Copeland and Mr. L. H. Steele for their kindness in reading through the entire proofs; while I have also occasionally availed myself of the help of Mr. G. Cathcart.

ROBERT S. BALL.

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17th April, 1885.

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Mathematical Astronomy—Recapitulation of the Facts of the Earlier Researches—Another great Step has been taken—Lagrange's Theories, how far they are really True—The Solar System is not Made of Rigid Bodies—Kepler's Laws True to Observation, but not Absolutely True when the Bodies are not Rigid—The Errors of Observation—Growth of certain Small Quantities—Periodical Phenomena—Some Astronomical Phenomena are not Periodic—The Tides—How the Tides were Observed—Discovery of the Connection between the Tides and the Moon—Solar and Lunar Tides—Work done by the Tides—Whence do the Tides obtain the Power to do the Work—Tides are Increasing the Length of the Day—Limit to the Shortness of the Day—Early History of the Earth-Moon System—Unstable Equilibrium—Ratio of the Month to the Day—The Future Course of the System—Equality of the Month and the Day—The Future Critical Epoch—The Constant Face of the Moon accounted for—The other Side of the Moon—The Satellites of Mars—Their Remarkable Motions—Have the Tides Possessed Influence in Moulding the Solar System generally?—Moment of Momentum—Tides have had little or no appreciable Effect on the Orbit of Jupiter—Conclusion 510

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