

about 1,800,000,000 of miles, and its size about eighty-two times that of the earth. This discovery was remarkable as extending the boundaries of the solar system to twice their previously ascertained limit. The new planet was named Uranus.

We now come to one of the most interesting discoveries ever made in connection with the theme of our contemplations, one which is eminently calculated, from the remarkable mental power displayed in the analytical reasoning and calculations which led to it, to exalt our conceptions of man as an intellectual being, reminding us of Hamlet's words—"what a piece of work is man! how noble in reason! how infinite in faculties! in form and moving how express and admirable! in action how like an angel! in apprehension how like a God! The beauty of the world! the paragon of animals!" Our limits will not permit us to make a full statement as to the process by which the planet Neptune was discovered in 1846. Hitherto discoveries were mainly made by means of the telescope, guided by analogical reasoning. The problems now for solution were to measure the distance, trace the orbit, and estimate the mass of an unknown planet, as well as indicate the point of its immense orbit where it would be found at a given time! The intricate calculations involved in these difficult problems were made by a young French astronomer of the name of Leverrier. What wonderful work young men may accomplish.—Thomas Campbell wrote his best poem—the pleasures of Hope—McAulay his most sparkling essay—that on Milton—when they were very young men. and Isaac Newton—whose case is more to the point—made the three great discoveries for which he is pre-eminently distinguished—fluxions, universal gravitation, and the decomposition of light—ere he had attained his twenty-fourth year. Leverrier, having given practical evidence of his attainments as a mathematician, in his tables of the planet Mercury, as confirmed by the realization of his predictions as to a recent transit of that planet, he was advised by his friend Arago to undertake the task of discovering analytically the planet whose existence was strongly conjectured. With consciousness of power, and a noble am-

bition to distinguish himself, the youthful astronomer bent his mind to the work. The irregularities of Uranus' orbit produced a conviction amounting almost to certainty that it must be affected by an exterior body. Some, indeed, imagined that its irregularities were owing to a relaxation of gravity at the great distance of the planet from the sun—others attributing them to cometary attraction, whilst a third party conjectured that its course might be influenced by the attractions of a large satellite. To present a scientific solution of the difficulty Leverrier suspended all other studies and applied himself ardently to the difficult investigation. He first set himself to determine, independently of former calculations, the extent of perturbation produced on Uranus by its magnetic neighbours Saturn and Jupiter. Having ascertained that he presented a memoir on the 10th November 1845 to the Royal Academy of Science in Paris, embodying the result of his labours. That memoir was followed by another in the month of June 1846 in which he proved that it was impossible to account for the perturbations of Uranus otherwise than on the supposition of the existence of an exterior planet. In August, 1846 a third memoir was presented to the Academy which specified the elements of the orbit of the supposed planet, together with its mass and actual position. These results were truly wonderful considering the comparatively limited data on which the astronomers' calculations were based. The greatest displacement of Uranus apart from the attraction of the other planets and consequently produced by the theoretic planet did not exceed in apparent extent the tenth part of the moon's diameter as seen from the earth, yet that comparatively minute anomaly which could not have been detected by the keenest vision irrespective of telescopic aid, was the grand central fact on which the determination of the unseen planet's mass and motions was to rest. How exact and wide must be operations of that law by a fragment of whose effects the daring mind of the astronomer penetrated to the depth of three thousand millions of miles in search of a world that had probably been revolving in its orbit unseen by human eye since the time when "the morning stars sang together,