

and all the Sons of God shouted for joy." On the 18th of September, 1846, Leverrier wrote to Galle of Berlin to direct his telescope to that part of the heavens which his calculations had determined as the place where it would be found. On doing so the planet was seen that very night in a position less than one degree from the point indicated!

It was a remarkable coincidence that the same result should have been obtained from the same data, about the same time, by another young astronomer, Mr. Adams of Cambridge. In January, 1848, he commenced to work on the hypothesis of an exterior planet, and continued till October, 1848, when he sent a paper to Mr. Airy, the Astronomer Royal, embodying calculations which virtually solved the problem. Thus Adams was some months in advance of Leverrier, but unfortunately the communication was not made public. Mr. Airy, instead of at once taking measures to test the correctness of such remarkable calculations, and thus securing the honor of the discovery to his youthful countryman, laid aside the manuscript till he received a copy of the memorandum of Le verrier in July of the following year, when on observing how closely the two independent estimates as to the position of the planet—differing only to the extent of about a degree and a half—agreed, he wrote to Professor Challis of Cambridge to institute a search for the planet. But as the Professor had not a star map of the locality, and was thus obliged to make observations with the view of forming one for himself, the glory of the discovery was lost to England.

Two questions are here naturally suggested.

1. Is there any reason to suppose that another planet—or more than one—exists beyond the orbit of Neptune? To that question no satisfactory answer can be given till the elements of its orbit are better known—unless, indeed, an outer planet might be accidentally discovered, as in the case of Uranus. The theoretic calculations of Leverrier prove that distance makes no difference in the absolute control exercised by the sun on the members of its family—Neptune being held as firmly in its grasp as Mercury; and we know—as we shall have occasion to point out in our next

paper—that comets whose known orbits extend far beyond the orbit of Neptune, are subject to the sun's power, though the substance of which many of them are composed is so attenuated that no fluid in nature, save light, can compare with it. The enormous distance by which our sun is separated from the nearest sun to it, in connection with the fact that the mass of the sun exceeds 174 times the masses of all the known planets, is further presumptive evidence that we have by no means reached the limits of the planetary system. But, on the other hand, we must bear in mind, as operating against the theory of further extension, that the light furnished by the sun to Neptune, is only a mere fraction of the quantity which we enjoy, and on the assumption of the relative existing distances of the planets being maintained beyond Neptune, that fraction would be reduced in the case of a new planet about one-half—rendering even the optical discovery of it difficult, particularly in the event of its being of moderate dimensions.

2. Are the planets inhabited? We have seen that in Mars at least there are continents and seas, and also an atmosphere—that it has seasons like our own, and nearly the same alternations of day and night. With these necessary conditions to animal and vegetable existence as *known to us*, it is almost impossible to avoid the conclusion that life in forms adapted to its condition exists upon it. In the case of the more distant planets, the comparative absence of light and heat may be compensated by internal combustion, the nature of the atmosphere in which they are enveloped, and the peculiar organism of the beings that inhabit them. Who can tell what functions may be performed by the rings of Saturn, as bearing on the well-being of its inhabitants; and philosophers of no mean reputation are of opinion that the enormous velocity with which Jupiter and Saturn, and probably the other outer planets revolve on their axes, generates a degree of heat which may meet the requirements of the kinds of life which exist on those vast globes. And on the other hand, with respect to Mercury and Venus as being apparently subjected to an intensity of heat incompatible with life, it requires no unphil-