



XXXIII. On $\sqrt{-1}$

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the discovery of the infinitesimal calculus at once to Newton and to Leibnitz. Mr. Airy, the Astronomer Royal at Greenwich, has published a complete and authentic report on the labours of Mr. Adams relative to the existence of the Trans-Uranian planet. In that report, we see that in September 1845 Mr. Adams arrived at a result, and that in October he transmitted to Mr. Airy a paper containing elements of the present planet so nearly approximative that it might have been found in the heavens ten months before it actually was. But Mr. Adams's labours were unsuccessful, because the two astronomers (Mr. Challis of Cambridge and Mr. Airy of Greenwich) to whom they were known hesitated to admit them without further examination. Their doubts are explained by the importance and novelty of the object, and by the extraordinary difficulty of the research itself, which might well have been deemed beyond the powers of a young *savant* till then unknown. These doubts were accordingly not dissipated until the moment when M. Le Verrier published the results of his admirable investigations, which led to the most brilliant discovery in the astronomy of the solar system, while the other astronomers of Europe had no suspicion of the existence of Mr. Adams's labours. M. Galle of Berlin, was the first to find the planet indicated by M. Le Verrier. While we consider all these circumstances attendant on the discovery of the new planet, we at the same time conceive that we find the adhesion of M. Le Verrier to the name of Neptune, not only in his announcement to us of the 1st of October, but also in his later letters addressed to the Academy of Sciences and to two astronomers of the central observatory—letters which make no objection whatever to the name of Neptune chosen by the Bureau des Longitudes.

"Consequently, we will retain the name of Neptune; and will make no change unless hereafter the general voice shall determine in favour of another name.

"In the name of the astronomers of the Central Observatory,
"Polkowa, 17 (29) Dec. 1846." W. STRUVE."

Mr. Airy adds, that he quite agrees with M. Struve in his reasons and in his conclusions.

XXXIII. On $\sqrt{-1}$. By H. S. WARNER, Esq.

[The following Note, appended to a communication received from Mr. Warner on the use of the symbol θ (but not adopted for insertion), relates to a Paper signed "Shadow" in our Number for September 1846.]

IN relation to the article of "SHADOW," I may observe that I did not expect that my conclusions would be admitted
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by those (of whom "SHADOW" seems one) who deny the correctness of the assumption upon which the argument depends; the agreement of my results with well-known formulas would be merely an additional argument in favour of the new mode of regarding imaginaries.

Opposed as his views appear to be to this manner of interpreting impossible quantities, it seems to me (unless I have mistaken the sense in which he uses the term "*incongruous*," which is the case perhaps) that they in reality support it.

Thus, incongruity in geometrical problems (and of course in those only can we consider $\sqrt{-1}$ a symbol of perpendicularity) can only affect the *length* or the *direction* of a line: if it affected the length of a line, this would be evidenced by our obtaining such a result as the coexistence of the two equations $A=B$, $A>B$.

When the incongruity affected the direction, it would be evidenced by the appearance of $\sqrt{-1}$. It being once admitted that $\sqrt{-1}$ marks an error in estimating direction, it is easy to show that this error is one of a right angle; for the error shown by $\sqrt{-1}$ being twice repeated, gives $-a$ in place of $+a$, or an incongruity of two right angles; hence the incongruity represented by $\sqrt{-1}$ must be half of two right angles, that is, one right angle.

Port of Spain, Trinidad,
Oct. 3, 1846.

XXXIV. *On the Induction of Atmospheric Electricity on the Wires of the Electric Telegraph.* By Prof. JOSEPH HENRY*.

THE action of the electricity of the atmosphere on the wires of the electrical telegraph is at the present time a subject of much importance, both on account of its practical bearing, and the number of purely scientific questions which it involves. I have accordingly given due attention to the letter referred to me, and have succeeded in collecting a number of facts in reference to the action in question. Some of these are from the observations of different persons along the principal lines, and others from my own investigations during a thunder-storm on the 19th of June, when I was so fortunate as to be present in the office of the telegraph in Philadelphia, while a series of very interesting electrical phænomena was exhibited. In connexion with the facts derived from these sources, I must ask the indulgence of the Society in frequently referring, in the course of this communication, to the results of my previous

* From the Proceedings of the American Philosophical Society, vol. iv. p. 260.