

an important record for reference in the future progress of seismology, I have thought it desirable that it should be presented to the Royal Society, with a view to it being preserved in the Archives of the Society; and I would beg to be informed whether the Council may think fit to accept the deposit.

I remain, dear Sir,

Truly yours,

ROBERT MALLET.

The thanks of the Society were given to Mr. Mallet for his valuable Present.

The following Paper was read :—

“On the Integration of Algebraical Functions, with Illustrations in Mechanics.” By W. H. L. RUSSELL, F.R.S.
Received December 17, 1874.

(Abstract.)

The profound researches of Weierstrass, of Riemann, of Clebsch, and Gordan on the higher integrals have of late attracted the attention and been the admiration of mathematicians. There is, however, this difference between these researches and the corresponding investigations in elliptic functions—in the latter we investigate the properties of the integrals themselves; in the former we investigate the properties of certain differential equations, involving these integrals, and with more than one variable. How the values of the integrals themselves are to be found from these equations is difficult to see, and at all events must be a subject of enormous complexity. Accordingly it becomes desirable to ascertain, if possible, a more simple method of evaluating the integrals themselves. This is what I have attempted in the first section of this paper. I express the values of irrational algebraic quantities by means of linear differential equations with rational coefficients, and then express their integrals by means of converging series.

In the second section I consider, to a certain extent, the inverse problem—namely, to ascertain under what circumstances linear differential equations of the second order are satisfied by irrational functions. This problem I have already considered, although in an incomplete manner, in the Proceedings of the Royal Society.

In the third section I illustrate the principles enunciated in the first section by the solution of dynamical problems. I show that the principle of *vis viva* enables us to resolve these problems to a great extent by means of hyperelliptic functions and the higher transcendents.

Altogether I venture to hope that the memoir which I have the honour to lay before the Society will be read with interest by mathematicians.