http://www.geology.19thcenturyscience.org/books/1858-Whewell-HistSci/README.htm

cients are to be determined for each case by appropriate experiments: when the experimenters had obtained these data, as well as the mathematical solutions of the problems, they could test the truth of their fundamental principles by a comparison of the theoretical and actual results in properly-selected cases. This was done for the law of conduction in the simple cases of metallic bars heated at one end, by M. Biot,[7] and the accordance with experiment was sufficiently close. In the more complex cases of conduction which Fourier considered, it was less easy to devise a satisfactory mode of comparison. But some rather curious relations which he demonstrated to exist among the temperatures at different points of an *armille*, or ring, afforded a good criterion of the value of the calculations, and confirmed their correctness.[8]

We may therefore presume these doctrines of radiation and conduction to be sufficiently established; and we may consider their application to any remarkable case to be a portion of the history of science. We proceed to some such applications.

Sect. 4.—The Geological and Cosmological Application of Thermotics.

By far the most important case to which conclusions from these doctrines have been applied, is that of the globe of the earth, and of those laws of climate to which the modifications of temperature give rise; and in this way we are led to inferences concerning other parts of the universe. If we had any means of observing these terrestrial and cosmical phenomena to a sufficient extent, they would be valuable facts on which we might erect our theories; and they would thus form part, not of the corollaries, but of the foundations of our doctrine of heat. In such a case, the laws of the propagation of heat, as discovered from experiments on smaller bodies, would serve to explain these phenomena of the universe, just as the laws of motion explain the celestial movements. But since we are almost entirely without any definite indications of the condition of the other bodies in the solar system as to heat; and since, even with regard to the earth, we know only the temperature of the parts at or very near the surface, our knowledge of the part which heat plays in the earth and the heavens must be in a great measure, not a generalization of observed facts, but a deduction from theoretical principles. Still, such knowledge, whether obtained

[7] *Tr. de Phys.* iv. 671. [8] *Mém. Inst.* 1819, p. 192, published 1824.