

reason why they have not succumbed, sharing the same fate as the purely philosophical theories of earlier times, can be traced to the following causes. The first consists in this, that science has a definite object to deal with—namely, the phenomena of nature, which present at least as much uniformity and regularity as is necessary to afford a firm and unaltering foundation for human thought, a strong foothold for the searcher and explorer. Of this *sine qua non* scientific workers have continually availed themselves wherever their results have been attacked; they have always retired into the stronghold of a small number of undisputed facts based upon observation and verifiable by every beginner or any critic who is qualified or willing to take the trouble. The philosophical or introspective thinker cannot do the same, and this is owing partly to the subjective nature of the object of his research, but equally perhaps to the fact that he is not so far removed from his object as is

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recently by Stanley Jevons and Karl Pearson. In Germany they have two quite independent beginnings, the first in the 'Critique' of Kant, who looked upon mathematics and natural philosophy as proving by their existence and their results the possibility of scientific knowledge. Somewhat later, and for a long time unknown to the scientific world, the great mathematician Gauss began to question for himself, and in correspondence with some friends, the fundamental axioms of geometry. In the sequel there arose out of these speculations the non-Euclidean geometry of Vasiliev Lobatchevsky and others. As this seeming paradox led to an extension of geometrical ideas, so in arithmetic the so-called imagin-

ary quantities led Gauss in Germany, De Morgan and Hamilton in England, to an extension of our algebraical and arithmetical conceptions. Kirchhoff, and following him Mach, in Germany, and, as it appears, independently, Karl Pearson in England, defined more clearly the real processes of dynamical reasoning and the fundamental notions of mathematical physics. Of this subject, which belongs as much to science as to philosophy, I have treated in the last chapter of the first section of this History. In so far as it affects philosophical thought, I shall deal with it in a later chapter of the present section, which will be occupied with the problem of Nature as a whole.