SOME MATHEMATICAL ASPECTS OF THE NEW MECHANICS*

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1. *The Antecedent of Any Mechanical Conception. The Moving Point.* The mental pictures of natural phenomena are of very different kinds. Among the simplest and most basic of these mental pictures we may include the kinematical model of the motion of a geometrical point. Such a picture is an abstraction, i.e., an ideal construction, which may be obtained conveniently through axiomatic treatment of geometry and time.

The use of this model for real bodies necessitates, of course, a further *physical* postulate, or axiom, quite independent of previous kinematical assumptions. But it is so intuitively evident, in common-life scale, that no thinker has till now felt the need of elucidating or criticizing its adoption. We may designate it as the "axiom of substantiality of matter," or more briefly, of Descartes, if we agree to give this precise meaning to the famous assertion of Descartes "tout se fait par figure et par mouvement." Indeed these words have been rather interpreted as generally alluding to a mechanical explanation of nature. Such an explanation, for a great body of facts (including terrestrial and celestial motion), was offered by Newton and his successors, and prevailed undisputed in the 18th century.

2. *Autonomous Phenomenological Theories.* In the following century new classes of phenomena were detected and thoroughly investigated, especially the propagation of heat and electromagnetism, for which autonomous theories were established which were entirely satisfactory as representations of experience and highly valuable from a mathematical point of view, but which were entirely or almost independent of mechanical framework. I need hardly mention the classical treatises of Fourier and Maxwell. Such phenomenological, even somewhat detached,

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