The first author who explicitly described the method that according to most contemporary philosophers of science, characterizes physics was Christiaan Huygens He prefaced his Treatise on light by stating that in presenting his theory of light he had relied upon demonstrations of those kinds which do not produce as great certitude as those of Geometry and which even differ much therefrom, since whereas the Geometers prove their Propositions by fixed and incontestable Principles here the Principles are verified by the conclusions to be drawn from them What I wish to suggest is that to a far greater extent than is commonly realized mathematicians have employed precisely the same method-the so-called hypothetico-deductive method Whereas the pretense is that mathematical axioms justify the conclusions drawn from them the reality is that to a large extent mathematicians have accepted axiom systems on the basis of the ability of those axioms to bring order and intelligibility to a field and/or to generate interesting and fruitful conclusions In an important sense, what legitimized the calculus in the eyes of its creators was that by means of its methods they attained conclusions that were recognized as correct and meaningful Although Hamilton Grassmann and Cantor to name but a few, presented the new systems for which they are now famous in the context of particular philosophies of mathematics (now largely discarded) what above all justified their new creations both in their own eyes and among their contemporaries, were the conclusions drawn from them This should not be misunderstood; I am not urging that only utilitarian criteria have determined the acceptability of mathematical systems, although usefulness has undoubtedly been important. Rather I am claiming that characteristics of the results attained - for example their intelligibility—have played a major role in determining the acceptability of the source from which these results were deduced. To put it differently calculus complex numbers non-Euclidean geometries etc. were in a sense hypotheses that mathematicians subjected to tests in ways comparable in logical form to those used by physicists

Michael J Crowe