

Because I too, among so many others, have had the idea to submit to the judgment of the public what I think not only about the location and motion of this light but also about its substance and its origin and because I believe I have found an opinion which contains no obvious contradictions and which, therefore, might be true, it has been necessary for me, so that I might be sure of myself, to go ahead slowly and await the return of this star in the east after its separation from the Sun, and to observe again very diligently what changes it might have undergone both in its location as well as in its visible brightness and the quality of its light; and continuing my speculations about this marvel, *I have finally come to believe that I could know something more than what ends in mere conjecture.* And because this fantasy of mine draws out, or rather puts forth, most weighty consequences and conclusions, I have resolved to change my lessons in one part of the discourse, which I am now elaborating in regard to this material. (X, pp. 134-135, italics added)

Galileo (1605) on the Supernova of 1604

Beyond Mere Conjecture: Alternative Conceptions

1. A “science” seeking detailed agreement, within observational accuracy, between all of its predictions and the results of experiments in which “external” confounding effects have been suitably controlled.

Discrepancies: a source of continuing evidence

2. A “science” seeking agreement between its more striking (mathematical) consequences and the results of select experiments centered on unusual, distinctive phenomena to a degree sufficient for it not to be clearly falsified.

Discrepancies: to be explained away

3. A “science” seeking, once it is suitably calibrated, sufficiently good agreement with empirical phenomena of interest for it to serve practical purposes – in prediction primarily, but also in explanation.

Discrepancies: to be “swept under the rug”

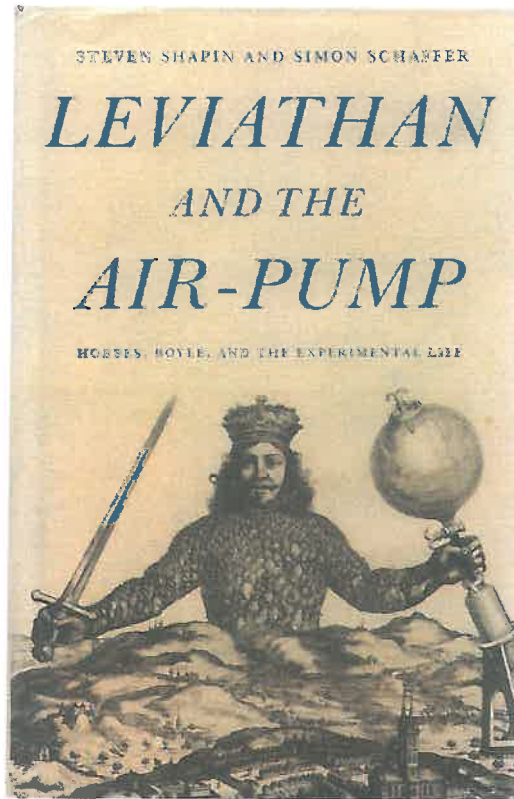
Experiment in *Two New Sciences*

Galilean Innovations

1. Because of the need to eliminate or at least to control for real-world complexities, mere observation and intervention in nature are not enough; experiments need to be *designed* and *developed*, leading to their often involving highly contrived situations that never occur in nature.
2. Theory can and should play a large role in the design of experiments, first in singling out situations in which the results can be most telling, second in supplying enhanced means for indirect measurement, and third in providing justification for background assumptions.

Uses of Experiment

1. To falsify opposing (e.g. Aristotelian) theoretical claims
2. To justify initial conceptual assumptions (generally by means of qualitative “cross-roads” experiments)
3. To confirm theory via successful salient predictions (or more modestly, via failure to falsify)
4. (*Mersenne and Riccioli*: to measure the constants of a theory, especially constants of proportionality)



“Establishing matters of fact did require immense amounts of labour. Here we endeavor to recover this labour for our historiographical purposes: *to show the inadequacy of the [historiographical] method which regards experimentally produced matters of fact as self-evident and self-explanatory.*” [p. 225, italics added]