Kepler's Three Lines of Evidential Reasoning

Astronomia Nova (1609)

> Start from Tycho's observations and use past practices in mathematical astronomy, including most notably Tycho's solar theory, to leverage reforms in those practices and a new orbit for Mars, invoking plausible physical considerations and precision of inferences from observation to conclude that the reforms and new orbit amount to something more than merely a representation of Tycho's data to (surprisingly) high approximation; thereby justify the claim that, absent the emergence of any substantial discrepancies with observation, the reforms and hence the orbital schema for Mars hold for the other planets as well.

Epitome Astronomiae Copernicanae (1618-21)

> Start from proposed physical principles, defended in part through analogy with known physics and in part by anticipatory claims about their consequences agreeing with observation, to derive, with minimal auxiliary assumptions, the reforms and orbital schema as holding exactly (where no exteernal, secondary physical effects involved) for all the planets; and then (attempt to) show that the far more complicated motion of the Moon, theretofore never successfully represented to within observational precision, can be derived from the same physical principles without need of further auxiliary assumptions.

Tabulae Rudolphinae (1627)

> Start from the reforms and orbital schema, taken as given, and use appropriate observations to derive values of the elements for each planet, opening the way to comparisons between calculation and all available observations, with provision for refining the values of the elements on the basis of these and further observations; success in reducing the discrepancies between calculation and observation through such refinements is evidence that the reforms and orbital schema amount to something more than merely one among many possible representations of Tycho's data to high approximation.