

This is not an effort to draw a fine distinction between a sciolist and a scientist; or, between a charlatan and a honest ~~man~~ ^{man}. I am going to confine myself to a few examples from history which show that fallibility in scientific work is the result of insufficient or wrong evidence rather than culpable ignorance. In most cases we are aware of the deficiency and try ~~to~~ ^{to} allow for it, but too often the investigator finds that his speculations have taken him into a quagmire from which he has to extricate himself with great difficulty.

One of the first examples of insufficient evidence with an abundance of involved circumstances goes back to the historic moment when the astronomers of the sixteenth century decided to get rid of deferents and epicycles for describing the motions of planets and moons by shifting the center of ~~gravity~~ ^{origin} of the solar system. By the thirteenth century when King Alphonsus of Navarre had put his arabic astronomers to work on a set of tables from which one could ~~predict the~~ predict the positions of planets. The Alphonsine Tables as they are called were perhaps the best piece of work ever produced for that purpose, and ~~they~~ ^{they} are still useful within a certain degree of accuracy. The only trouble with such tables however is the number of epicycles one has to resort to in order to describe the motion of the planet Mars. I believe the number reaches somewhere around twenty-five or more epicycles. Then by placing the origin of the coordinates in the sun instead of in the earth, the number drops to about one or two ^{epicycles} and when ellipses rather than circles are used the number drops to zero. Copernicus, Galileo and Kepler certainly discovered a great simplification. But they had a wonderful piece of geometry without a law of gravity. They had the laws of motion without the dynamical principal to explain the laws. They had all arrived at the point where observation needed a theory for its explanation, and all struggled to find the theory but without real success. And, unless you can prove something the world too often questions your facts.

Kepler tried to find his solution in elaborate geometry with polygons inscribed or circumscribed about the orbits of the planets. He found a harmony that really described the scale of the solar system but he lacked the law of gravity that could explain why it was so. Galileo was frustrated with proofs that appealed to him and to no one else. After all he did see four moons encircling the planet, Jupiter, and that was a fact. He saw the phases of