

guished, is, essentially, that method of modern European science which is subsumed by the legacies of Nicholas of Cusa and Johannes Kepler. In this method, the notion of the existence of universal physical principles as defined by the common features of the method of Cusa, Johannes Kepler, Fermat, Leibniz, Riemann, et al., is only conditional, but nonetheless crucial. That distinction which I have defined in sundry locations as the principle of the *ontologically infinitesimal* character of the infinitesimal of the Leibniz calculus,¹⁷ provides a model definition of all true universal physical principles, principles such as Kepler's uniquely original discovery of universal gravitation, and Albert Einstein's related emphasis on an unbounded, but finite universe of universal physical principles.

All valid universal principles are expressed in detail, as Kepler defined the principle of gravitation, in the form of their characteristic experimental expression as "ontologically infinitesimal."

The appearance of this discovery of what became known later as Leibniz's principle of the "ontologically infinitesimal,"

17. In defiance of the common, empiricist Sophistry of de Moivre, D'Alembert, Leonhard Euler, Joseph Lagrange, Laplace, Cauchy, Clausius, Grassmann, et al.

mal," by Cusa, also marks the moment of birth of modern science as modern science, including the science which must be employed to define the principles of the subsumed Biosphere and abiotic domains.

That discovery, as presented by Cusa, marks the rebirth of the same principle implicit in the work of the Pythagoreans and Plato. Cusa, recognizing a systemic error in Archimedes' quadrature of the circle and parabola,¹⁸ first presented the principle of the *comma*, from ancient *Sphaerics*, into the practice of modern European civilization. This notion by Cusa was the foundation of competent development of modern science, as from the discovery of the principle of gravitation by Kepler, the notion of a principle of least action associated with a discovery by Fermat, and the first development of a calculus, by Leibniz, based on the notion of the *ontologically infinitesimal* expression of universal physical principles, as those are rightly premised on the previously stated principle of Kepler for this purpose.

Briefly consider the crucial historical implications of the immediately foregoing statements.

For example: the essential experimental basis for Ein-

18. I.e., Cusa's exposure of the systemic error in Archimedes' quadrature of the circle.

Kepler on Aristotle's Sabotage of Astronomy

Johannes Kepler (1571-1630) refuted Aristotle's geocentric cosmology, and charged that Aristotle held science back for nearly two millennia, until the advent of Copernicus, by rejecting the Pythagorean idea that the Earth moves in an orbit around the Sun ("the fire"). Kepler's full document was published in 21st Century Science & Technology, Winter 2001-02, in a translation by George Gregory. Here are excerpts.

[The Pythagoreans] spoke in a veiled way; by fire they understood the Sun, and I agree with them, that the Sun is in the center of the world, and never moves away from this place, and that, on the other hand, the Earth moves once in one year around the Sun, that is, it revolves around the center position of the world, as otherwise also five other wandering stars [that is, the planets]...

[Aristarchus of Samos (310-ca. 230 B.C.) was accused of blasphemy and threatened with death for endorsing a heliocentric system.] On account of this fear, and on ac-



Johannes Kepler, the founder of universal modern physical science.

count of the reputation of Aristotle, who rejected this teaching (although he did not yet fully understand it), this teaching was suppressed, and particularly because it was difficult to understand, it was nearly forgotten for 1,800 years...

I am as little satisfied with Aristotle, when he thinks it is sufficient to have asked why the Earth remains at the center of the world, and to answer, that nature assigned this

position to it. For it is entirely uncertain, and not conceded by me, that the Earth is in the middle of the world; and were it so, it would be so indeed on account of nature, but in the same way that all things are on account of nature. But one is not satisfied to know that things are according to nature, but one asks why they are that way and not some other way, and what means nature used to bring this about...