

The importance of this point is so crucial for all competent science, including economic science, that we must emphasize the relevant connections once more, here.

As emphasized above, the definition of meaning of “universal physical principle,” or, said simply, a “universal principle” of any quality, must be a principle

which encloses, rather than merely “connects points within” the universe, or the phase-space of the universe under consideration. It may also connect points within the universe, but that connection may occur only as a subsumed expression of its essential character as enclosing the universe, or relevant qualitative phase-space.

## Fermat's Principle

*The following is excerpted from EIR, Dec. 23, 2005. The full text is available at [www.larouchepub.com](http://www.larouchepub.com).*

What the reason was for the change in light's direction when passing from one medium to another was a major fight in the 17th Century, and it must become so, again, today. Pierre de Fermat's principle that light's action is determined by the principle of quickest time, was a political statement, a clear attack on the prevalent empiricist thinking, and a call back to the method of Greek knowledge. It demanded a conception of physical science that places man in his proper place—as in the image of, and participating in a single Creation, overthrowing the oligarchical view that placed man infinitely below the incomprehensible caprice of the Olympian gods and human feudal lords.

The refractive behavior of light had been a source of study and consternation for centuries, since no simple relationship between the angles of incidence and refraction could be determined (see diagram). It was in 1621, that the Dutch investigator Willebrord Snell determined that it is the sines of the angles of incidence and refraction that maintain a constant ratio for a given pair of media, an experiment that is worth carrying out yourself.

Although Snell is correct, this observation of effects does not address itself to cause. Descartes, insisting that light had to be understood as ballistic par-

ticles (in opposition to Leonardo da Vinci, and to keep his own purely mechanical outlook) was forced to conclude, erroneously, that light actually sped up

upon entering water. He also claimed Snell's discovery as his own! Fermat found this speeding up to be absurd, and sought to determine the *cause* for light's behavior.

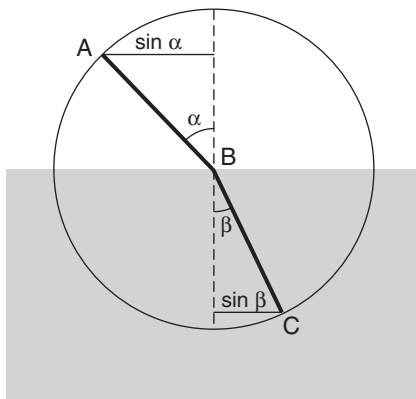
To note the sine relationship is good, but to actually assert that this trend *is* a scientific principle would not be an honest blunder, it would be an admission by anyone who would make that statement, that that person believes principles are unknowable.<sup>1</sup>

Fermat sought not to describe the motion of the fish, but the

shape of the aquarium in which they swam: He returned to the Greek discovery that light reflected off a mirror takes the path of minimal distance, an experiment worth performing on your own.

Fermat took up this approach, and hypothesized and demonstrated in 1662 that light follows a path of quickest *time*, rather than shortest distance: As far as the light is concerned, it is always propagating straight ahead by this principle. This hypothesis results in the sine ratio discovered by Snell, but Fermat *delivered* the child whose form Snell accurately reported. . . .

—Jason Ross, *LaRouche Youth Movement*



*Snell determined that the ratio  $\sin\alpha : \sin\beta$  is maintained for two media, no matter at what angle the light hits the boundary.*

1. One could just as well make the (admittedly, true) statement that middle schoolers with larger feet are better spellers. Larger feet do not confer orthographic proficiency; the education that comes with being older does. Retrospective musings on the results of completed action in the past are not hypotheses of motive powers.