predict neutron stars or electromagnetic waves? Antirealism is weak enough as academic philosophy; it is hopeless as a public response to creationists.

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Melott replies: Science and religion can validly interact in some ways. Science can comment usefully on such issues as the age of the Shroud of Turin, the parting of the Red Sea, or genetic studies of alleged lost tribes of Israel. These are all related to religion. In turn, religious (or antireligious) interpretations of science may add meaning or provide the values needed to judge technological possibilities. Problems arise when either sphere, science or religion, pretends to constrain the other, because miracles and empiricism don't mix well.

Beware of using the presence of junk DNA to judge intelligent design. In fact, much so-called junk DNA has been found to have a biological function; ID proponents call this support for their position.

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Singham replies: Ted Lawry argues that the predictive power of theories is indicative of their truth. But dominant scientific theories have always made successful predictions; that is how they gained their ascendancy in the first place. The geocentric model of the Solar System, for example, had enormous predictive power. So did the phlogiston theory of combustion. But that did not prevent those theories from being supplanted by other theories that, in key respects, directly contradicted their predecessors.

One way to sustain the position that, if a scientific theory works well and is predictive, it must be true is to add the supposition that we are currently living at the end of science, that is, that our current scientific theories are the final word. That position is more or less the one taken by science writer John Horgan.[1] But if we follow historical precedent and allow for the fallibility of even current highly successful theories, as David C. Nobes argues, then we are faced with the problem of how we would ever know when we have achieved "truth."

Reference

1. J. Horgan, *The End of Science*, Addison-Wesley, Reading, Mass. (1996).

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Can GPS Test Gravity's Speed of Propagation?

Neil Ashby's article (Physics Today, May 2002, page 41) about the satellite network that was installed for the global positioning system is very impressive; the precision to which the orbits of the individual satellites are known is fantastic. Relativistic corrections of the order of 10^{-10} and smaller are relevant and need to be applied; that level of precision is a real challenge and allows researchers to test the predictions of special and general relativity with comparable precision.

I wonder if the system's achieved precision is sufficient for determining the fundamental constant of the gravitational action's propagation speed, and if it has been determined yet. One possible way to do that would be to analyze the eccentricity effect on the satellites' orbits from the tidal force of the Moon. On a geostationary satellite at a height of 36 000 km, the effect is ±2 km, and the axis of eccentricity precesses around Earth following the Moon's 28-day journey. The phase of that precession follows the Moon's orbit with a delay of 1 second, if one assumes a gravitational propagation speed equal to the speed of the electromagnetic interaction. Within 14 days, the eccentricity has rotated by 180 degrees. The challenge for researchers is to determine the precession to better than 1 second, the time the gravitational field needs to travel from the Moon to the satellite. Determining the 4-km eccentricity in 14 days to better than 1 second calls for a precision of 1 part in 10^{10}.

Perhaps this analysis has already been done. Physicists may think it is trivial, because all predictions of special and general relativity have proven to be correct so far. However, I think this investigation would be a fundamental one, since the expansion speed of two different interactions, gravitational and electromagnetic, need not be identical.

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