

Dear Dave,

Re Cerebus #289/290:

Nice issue. A little late.

I was surprised to see you including the footnotes along with the pages of the actual story, though given the layout of the issue it seems like the only logical place for them to go. Will they be reproduced this way in the phone book?

Drawing was excellent. You did most of the stars and planets yourself this time, correct? The use of paste-ins (computer printouts?) was a little distracting at first, but after a couple of re-reads it all seems to coalesce smoothly.

As part of the *Cerebus* storyline, I thought this fit well (gracious of me, yes?). I'm sure you'll be hearing from a lot of people who didn't. No matter, the allusions drawn to the past creation stories in the book were clear. I think the writing here was particularly strong. Very enjoyable read, in spite of some factual mistakes I think you made in the footnotes (specifically as pertains to the relevance of the Fomalont & Kopeikin experiment to the quantum theories of physics, and some of your other mentions of complex physics problems -- I think in some of this you may have glossed over the mathematics to make your story point thematically; which can detract from a clear understanding of the phenomena in question, since these types of theories are derived from mathematics in the first place).

Research is a bitch, isn't it? You have to draw the line somewhere, and just get on with whatever you're writing. You mention in a couple of places that you hope to never return to (those specific) physics texts again -- is this literal? A major problem with modern science is keeping up with the current state of "reality" as its currently being described. It's impossible now for a single person to even have a clear overview of all the various fields which compose the truly rational world view. It's often necessary to accept a learned expert's

testimony on the state of certain collections of knowledge. On closer inspection, it becomes evident that the experts don't always agree. How does the uneducated select the proper expert? I've attached a recent article on the "speed of gravity" debate as an illustration of this dilemma.

I'm looking forward to the remaining ten issues. Any chance of a color segment in #300? ...Yeah, I know you're not going to tell me.

Ray Earles

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[ [http://www.space.com/scienceastronomy/gravity\\_speed\\_030116.html](http://www.space.com/scienceastronomy/gravity_speed_030116.html) ]

*Speed of Gravity Results 'Incorrect,' Physicist Says*  
By Robert Roy Britt

*Senior Science Writer  
posted: 01:30 pm ET  
16 January 2003*

*Physicists leveled heavy criticism Thursday on a report from last week that claimed the speed of gravity had been determined by observation and was equal to the speed of light.*

*One physicist called the interpretation of the finding "nonsense". Others were more diplomatic, suggesting that the experiment, involving observations of the bending of light from a distant galaxy as the light sped by the planet Jupiter, had instead measured other phenomena.*

*The brewing controversy, which illustrates the fits and spurts with which science sometimes grudgingly moves forward, appears to have ground to a stalemate for now as the two scientists who conducted the experiment categorically defended their work.*

*"The claim that they've measured the speed of gravity is simply incorrect," said Clifford Will, a physicist at Washington University in St Louis, Missouri, and an expert in the field.*

*Interestingly, Will is friends with one of the researchers whose work he knocks.*

*In a telephone interview this morning, Will hailed the intricate observations as possibly "a great achievement" but said the interpretation of the data "clouded what would otherwise have been a really cool result."*

#### *Defending the claim*

*Ed Fomalont of the National Radio Astronomy Observatory and Sergei Kopeikin from the University of Missouri in Columbia, performed the experiment. They watched light from a faraway galaxy bend as the planet Jupiter passed almost directly between the galaxy and Earth. Their theory stated that the bending would occur due to the gravitational influence of Jupiter.*

*By noting the extent of the bending, the researchers claimed to have measured whether gravity acted instantly or somewhat more slowly, at light-speed.*

*Proving that gravity works at the speed of light would add support to Einstein's General Theory of Relativity and place limits on fringe theories in cosmology. Most physicists are confident that this is the case, but no one has ever confirmed it by direct measurement.*

*Isaac Newton long ago argued that gravity instead propagates instantaneously. The suggestion has not died. If it were true, a big door would open to wild theories of how the universe might work on the grandest scales, including its possible interaction with other universes or other dimensions. Even a slight difference in the speeds of light and gravity would give theorists nifty wiggle room to craft bizarre ideas about the mechanics of the unseen universe.*

*Fomalont, an observational astronomer, calmly refuted the criticisms one-by-one this morning.*

*"We're really confident that we've measured the speed of gravity and that our interpretation of the results of our experiment are as stated," Fomalont told SPACE.com.*

#### *Behind the scenes*

*The finding, announced Jan. 7 at a meeting of the American Astronomical Society (AAS), was controversial well before it was reported to the general public. Two papers on the work had in prior weeks been submitted for peer review and possible publication in the Astrophysical Journal Letters. One describes the technique, another details the results. Both are still being reviewed.*

*Will, the Washington University physicist and a self-proclaimed longtime colleague and friend of Kopeikin, was asked to review the theoretical paper for the journal. Will recommended it not be published. The paper has since been sent to another referee.*

*Will explained his reasoning: A moving body, like Jupiter, produces additional gravitational effects that Kopeikin did not take into account in his theoretical calculations. Will was surprised that the findings were announced last week, before the papers had been accepted for publication.*

*It is not uncommon for discoveries to be presented to reporters at AAS meetings prior to having been through peer review. Numerous other findings, by NASA scientists and others, are announced in press releases every year prior to any formal peer review. Scientists are sometimes critical of this so-called "science by press release" process. Others see it as a natural and inevitable flow of information into scientific and public hands.*

*Ultimately, Will said, the scientific community will sort out the truth in this case.*

*"Will is one of the giants in this field," Fomalont said. He added that Kopeikin and Will have gone politely back and forth on their differing interpretations of subtleties in what might be observed in the experiment, and are simply at loggerheads over which approach is correct.*

*Kopeikin said he has found a mistake hidden deep in Will's calculations, and that other mathematicians concur. "He does not agree," Kopeikin said of Will today. "But mathematics is against him."*

*Kopeikin, too, said the review process would ultimately reveal the truth.*

#### *Long-running debate*

*Kopeikin began circulating his theoretical idea for the experiment more than two years ago, and criticisms began well before the observational*

*work was carried out last September.*

*Japanese physicist Hideki Asada published a paper, also in the Astrophysical Journal Letters, about a year ago arguing that Fomalont and Kopeikin would actually be measuring the speed of light, not gravity. That paper has been a thorn in Kopeikin's side ever since. During the AAS press conference last week, when questioned about Asada's work, Kopeikin was visibly frustrated and said Asada had made a mathematical mistake.*

*Fomalont said this morning that Asada's paper was "not valid." But because it was published, however, it had been given "a standing which it does not deserve."*

*Today, also in the Nature Science Update article, Peter van Nieuwenhuizen, a physicist at Stony Brook University in New York, called the interpretation of the results by Fomalont and Kopeikin "compete nonsense," but the comment was not expanded upon.*

*Fomalont chose not to respond to van Nieuwenhuizen's choice of words. He also said he had no regrets over announcing the results prior to peer-reviewed acceptance in a journal.*

*The whole issue seems to have caught many physicists by surprise.*

*Fomalont notes that during the two or three years that scientists had to review the idea, most did not think the measurements could even be made (regardless of what was being measured) so few spoke up about the potential interpretation of the results (that the speed of gravity could be determined).*

*"Then they see that we can measure it, and that fostered a lot of bubbling up of criticism," Fomalont said.*

*There remains little doubt that something was measured last September when the largest planet in our solar system fortuitously passed in front of a bright galaxy some 9 billion light-years away. What remains is for physicists to agree on what was seen.*