

# Francis Everitt

PROFESSOR of PHYSICS

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Stanford University

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*Email and Hard Copy Correspondence*

September 17, 2014 • September 24, 2015

## PREFACE

For over 40 years Everitt was the principle investigator and driving force behind the NASA-funded mission known as Gravity Probe B. He responded to my email query and brief essay attachment in 2014. Everitt also responded to my Mr. Natural postcard, with its succinct experiment proposal on the address side in 2015. (Both sides, attached below.)

Since Everitt is such a diligent experimentalist, it was disappointing to learn that he didn't "know what to say" about Galileo's experiment. Why is it so hard to simply say, "Hmm, yes, looks like we've missed a spot. Let's take care of that right away. The sooner the better. Yep."?

Having gotten so many similar rejections, I've deduced that the main reason is personal and collective *embarrassment*. Everybody already "knows" the result. So why bother? Why draw attention to a gap in our actual knowledge that we can get away with pretending doesn't exist.

To actively promote doing the experiment is tantamount to admitting that we don't really know its result, and/or that the physics community dropped the ball by not conducting the experiment already. Much too embarrassing. Just pretend we've got it covered and move on. That seems to be the prevailing strategy.

This situation is especially curious because of the uncanny *consistency* with which physicists respond—as if hard-wired to a collective mind, like the Star Trekian Borg. They've all dedicated decades of their lives to the same rigorous training: mathematical, theoretical, and sociological.

As Galileo rolls in his grave.

To: francis1@stanford.edu  
From: Richard J Benish <rjbenish@comcast.net>  
Subject: Gravity Experiment  
Attachments: <Gravity-Experiment-in-Waiting.pdf>

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Dear Professor Everitt,

After so many years of hard work by so many dedicated scientists, the successful completion of Gravity Probe B is a marvel to behold.

By stark contrast, then, is the experiment discussed in the attached paper. It is one that Galileo proposed in 1632, but remains undone. I am writing in hopes that you would see fit to help generate interest in conducting Galileo's experiment, which has been waiting nearly 400 years.

Thank you very much.

Sincerely,

Richard Benish

Date: Thu, 18 Sep 2014 08:33:51 -0700  
To: Richard J Benish <rjbenish@comcast.net>  
From: Francis Everitt <francis@relgyro.stanford.edu>  
Subject: Re: Gravity Experiment

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Dear Richard Benish

Thank you for forwarding that paper. **I don't know what to say about the proposed Galileo experiment**, but physics is full of unanswered questions. To me the most extraordinary one is the weakness of the gravitational force. Take two electrons: there is an electrical repulsion between them and a gravitational attraction. The attraction is 42 orders of magnitude smaller than the repulsion. Most people don't have an intuitive feel for what 42 orders of magnitude means. The image I like is that it is the ratio of the mass of the sun to the mass of the eye of a flea.

Regards,

Francis Everitt

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To: Francis Everitt <francis@relgyro.stanford.edu>  
From: Richard J Benish <rjbenish@comcast.net>  
Subject: Re: Gravity Experiment  
Attachments:

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Dear Professor Everitt,

Thank you very much for the kind reply.

I am puzzled by your silence on the Galileo experiment.

Would it not be a good idea to see this experiment come to fruition? Ought we not to provide the empirical evidence to directly support the well known prediction?

Respectfully,

Richard Benish



# Mr. Natural SAYS:

**If** YOU'VE BEEN NERVOUSLY ROOTING FOR "NATURALNESS" TO WIN THE DAY...

**If** YOU'RE BEFUDDLED BY THE LHC'S FAILURE TO FIND SUSY...

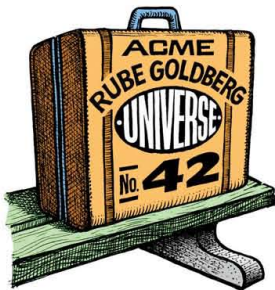
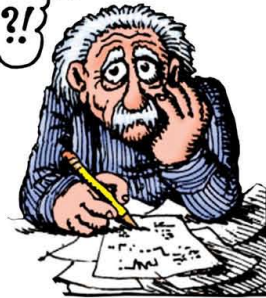
**If** YOU'RE STILL SCRATCHING YOUR HEAD ABOUT THE DIRECTION OF TIME...

**If** YOU'RE STRESSED OUT BY THE EMBARRASSING  $10^{120}$  COSMIC VACUUM DISCREPANCY...

$$\frac{\Lambda_{SM}}{\Lambda_{OBS}} = ?!$$

OR

**If** YOU'VE NOTICED THAT THE POPULAR PLETHORA OF PLANCK-SCALE INFLATONIC SINGULARITY-STRICKEN HOLOGRAPHIC STRING-BRANES INHABITING A DARK MIRAGE OF MULTIVERSES RESEMBLES A HOLLYWOOD FANTASY, THEN...



## Lighten Up!

Some fundamental, yet unexplored science has been knocking at the door for centuries. Simply accept the invitation to do an experiment proposed in 1632 by the Father of

### MODERN SCIENCE

Galileo



Galilei

**Galileo asked:** What happens when a small body of matter falls radially into a larger body without collision? At the opposite extreme of the LHC's high-energy collision experiments, Galileo's experiment requires only a relatively inexpensive Small Low-Energy Non-Collider:

TWO UNDISTURBED BODIES OF MATTER



SMALL LOW-ENERGY NON-COLLIDER

**Mr. Natural** UNDERSTANDS WHY YOU MAY THINK YOU ALREADY "KNOW" THE RESULT OF THIS EXPERIMENT. BUT HUMANS HAVE NEVER YET **OBSERVED** GRAVITY-INDUCED RADIAL MOTION THROUGH THE CENTERS OF MASSIVE BODIES. FOR THIS WE HAVE **NO DATA**, SO WE DO NOT REALLY KNOW.

**Therefore** IT BEHOOVES US TO JOIN MR. NATURAL AND ALL SCIENCE-MINDED SEEKERS OF THE TRUTH TO FULFILL THIS HUMBLE GOAL, TO BUILD AND OPERATE HUMANITY'S VERY FIRST **SMALL LOW-ENERGY NON-COLLIDER**.



[GravitationLab.com](http://GravitationLab.com) • [rjbenish@comcast.net](mailto:rjbenish@comcast.net)

June 17, 2015

Dean Professor Everett,

Your laboratory proving in experiment gravity are a true inspiration. Curiously, like almost all other empirical papers, Gravity Probe B also measured effects found above the surface of the gravitating source mass (Earth). Whereas gravity induced radial motion through the center of a source mass has never yet been observed.

The impressive results of your experiment contribute to the common belief that GR has been well tested on scales from mm to AU. Just as this may be for the Schwarzschild EXTERIOR solution, it is not at all true for the INTERIOR solution.

In terms of GR, the most physically significant feature of the interior field of a uniformly dense sphere is that the rate of a clock at its center is supposed to be a MINIMUM. So it is predicted. Humanity has not yet tested this prediction on any scale. The most ponderous half of the gravitational universe (under our noses) thus remains to be empirically explored.

One of the kinematic consequences of the central clock rate minimum (as commonly treated in Newtonian gravity) is the excitation of a test mass dropped into a hole through the center of a larger massive body. Evidence bearing on the kinematics and (indirectly) clock rate could be gotten by conducting Galileo's experiment, as described on the front of this card. It could be done in an Earth-based laboratory (with a modified Cavendish balance) or in an orbiting satellite.

I would therefore urge you to please help to generate interest in performing this experiment that Galileo proposed so long ago. To be truly diligent in an investigation of gravity and the physical world, should we not bring Galileo's proposal to fruition by building and operating humanity's very first

SMALL LOW-ENERGY NON-COLLIDER?

Thank you very much.  
Sincerely,  
Richard Bevil,

PostCard



THIS SIDE FOR THE ADDRESS

TO: Professor FRANCIS EVERETT

GRAVITY PROBE B  
M.W. HANSEN EXPERIMENTAL PHYSICS LAB  
PHYSICS/ASTROPHYSICS BUILDING • 1ST FLOOR  
452 Lomita Mall  
Stanford University, MC 4085  
STANFORD, CA 94305-4085



Date: Thu, 24 Sep 2015 12:44:48 -0700  
To: rjbenish@comcast.net  
From: Francis Everitt <francis@relgyro.stanford.edu>  
✱ Subject: Tunnels Through the Earth

Reply to hard copy of  
Mr. Natural Postcard:  
*"Tunnels Through the Earth"?*  
Ahh, yes, another exhibition of  
the Art of Missing the Point.

Dear Richard Benish

Thanks for your June 17 card. My recollection the calculated time of fall of a mass through a tunnel from one side of the Earth to the other is 88 minutes, whatever the direction of the hole. No one has ever done or is ever likely to do the experiment but it is an elegant calculation to reverify for oneself.

Regards

Francis Everitt

To: Francis Everitt <francis@relgyro.stanford.edu>  
From: Richard J Benish <rjbenish@comcast.net>  
Subject: Re: tunnels through the Earth  
Attachments: <Galileo's-Belated-Experiment.pdf>

Dear Professor Everitt,

Many thanks for your reply.

Assuming uniform density, the predicted period is about 84 minutes, so a trip from one side to the other would take half that time.

More importantly, the essence of Galileo's experiment has no need for a whole planet.

What I have called a "Small Low-Energy Non-Collider," Larry Smalley has called a "Gravitational Clock," as in the title of his 1975 NASA Memorandum, which reviewed proposals for using such a device to measure big G:

<http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19750014902.pdf>

None of these proposals were ever carried out.

A less expensive Small Low-Energy Non-Collider would be a modified Cavendish Balance installed in an Earth-based laboratory. The apparatus builder George Herold (at TeachSpin in Buffalo, NY) once expressed an interest in building the device. Perhaps his interest in doing so could be revived.

In any case, since the result of the experiment is routinely presented in elementary physics texts, wouldn't it be nice to finally back up the prediction with empirical evidence? Hasn't the spirit of Galileo been waiting long enough (too long)?

Thanks for your good work.

Sincerely,

Richard Benish

# Francis Everitt

C. W. **Francis Everitt** (b. 8 March 1934) is a US-based English physicist working on experimental testing of general relativity.

Everitt was educated at Imperial College London and the University of Pennsylvania in low-temperature physics.<sup>[1]</sup> He is Professor at the Hansen Experimental Physics Laboratory of Stanford University and is also an Associate Member of the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC).

Everitt is Principal Investigator of the Gravity Probe B mission mainly aimed to test frame-dragging at an expected accuracy of 1%. According to general relativity, it is an effect induced by the rotation of the Earth on orbiting gyroscopes. Everitt spent more than 40 years on the project and was awarded with the NASA Distinguished Public Service Medal. The results were published in Physical Review Letters in May 2011.<sup>[2]</sup> The results confirm general relativity's predictions, though not to the project's ambitious goal of 1% precision.

**Francis Everitt**



Francis Everitt at a NASA press conference

<b>Occupation</b>	Physicist
<b>Known for</b>	Gravity Probe B, relativity

## Bibliometric information

As of November 2013, according to the NASA ADS database, the h-index of C.W.F. Everitt is 18, with a total number of citations (self-citations excluded) of about 900. The tori<sup>[3]</sup> index and the riq<sup>[3]</sup> index are 12.1 and 62, respectively.

## References

- Kahn, Bob (May 9, 2005). "Stanford physicist Francis Everitt awarded NASA Distinguished Public Service Medal" (<http://news.stanford.edu/pr/2005/pr-everitt-051105.html>). *Press release*. Stanford University. Retrieved May 5, 2011.
- Everitt; et al. (May 11, 2011). "Gravity Probe B: Final Results of a Space Experiment to Test General Relativity" (<http://prl.aps.org/abstract/PRL/v106/i22/e221101>). *Paper*. Physical Review Letters. Retrieved Dec 4, 2011.
- Pepe, Alberto; Kurtz, Michael J. (November 2012). "A Measure of Total Research Impact Independent of Time and Discipline" (<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0046428>). *PLoS ONE*. 7 (11). arXiv:1209.2124 (<https://arxiv.org/abs/1209.2124>). Bibcode:2012PLoSO...746428P (<http://adsabs.harvard.edu/abs/2012PLoSO...746428P>). doi:10.1371/journal.pone.0046428 (<https://doi.org/10.1371%2Fjournal.pone.0046428>). e46428. Retrieved 8 November 2013.

## External links

- Prof. Everitt webpage ([http://www.stanford.edu/dept/physics/people/faculty/everitt\\_cw\\_francois.html](http://www.stanford.edu/dept/physics/people/faculty/everitt_cw_francois.html))
- NASA Distinguished Public Service Medal to Francis Everitt (<http://news-service.stanford.edu/pr/2005/pr-everitt-051105.html>)
- Gravity Probe B homepage (<http://einstein.stanford.edu/>)

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