Robert Jacobsen

Professor of Physics

University of California, Berkeley

Email Correspondence

July 28 – 30, 2015

Preface

Jacobsen echoes the most common response with uncommon brevity: "Been done." He thus claims, in two words, that Galileo's Small Low-Energy Non-Collider experiment has already been carried out. Even if he meant only that it has been *effectively* done, he is obviously quite wrong. Putting "gravitometers into deep boreholes" is nothing at all like observing the path of a test object moving all the way from the surface to the center of a source mass.

The appropriate response to a plea to do Galileo's experiment is, as suggested elsewhere, something to the effect: "Good catch. Looks like we've missed a spot. Let's take care of that right away." Out of personal or collective embarrassment, it seems, Jacobsen cannot bring himself to be so humble.

Instead, at best, Jacobsen feigns "logic" with a grossly unwarranted extrapolation. At worst, he perpetuates a lie, borne of insecurity and sloppy thinking. Insecurity and overconfidence are of the same cloth. Insofar as well-founded confidence and a scientific attitude would *invite* testing, and insecurity would *fear* it, the latter assessment seems, in this case, more likely. Either way, the spirit of Galileo is trampled once again.

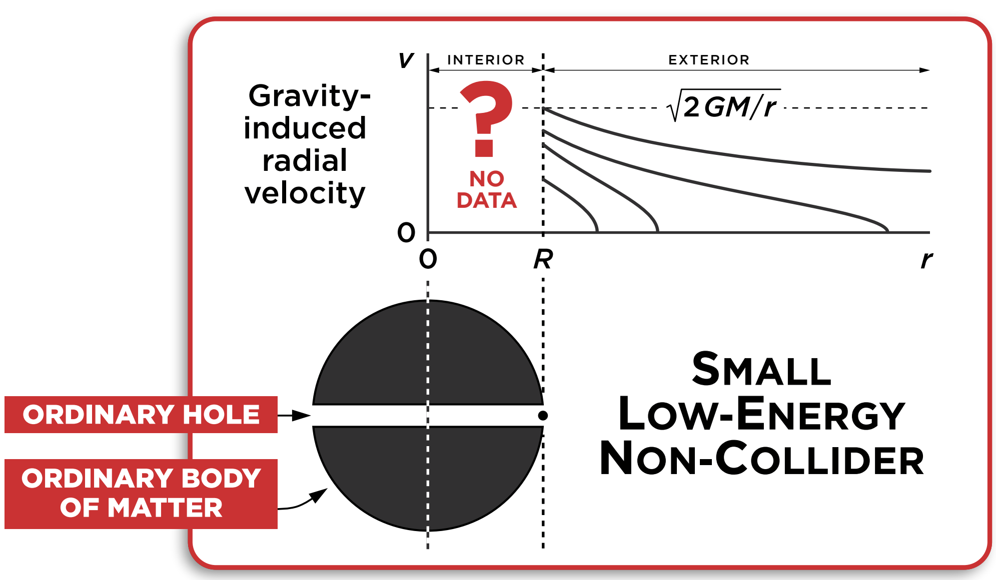

Figure 1. Recording gravitometer readings in tiny holes near the surface is not the same thing as tracking gravity-induced radial motion from the surface to the center of a massive body. (Duh!)

jacobsen@berkeley.edu, 7/28/15 11:55 PM -0800, Galileo's Gravity Experiment **1**

To: jacobsen@berkeley.edu
From: Richard J Benish <rjbenish@comcast.net>
Subject: Galileo's Gravity Experiment
Attachments: <Galileo's-Belated-Experiment.pdf:> <Mr-Natural-Says-LR.pdf>

Dear Professor Jacobsen,

The attached paper argues that until we do Galileo's experiment, we cannot be certain whether or not an important stone in gravitational physics has been left unturned.

I hope you have some interest in filling this large gap in our empirical knowledge of gravity.

Thank you for your good work.

Sincerely,

Richard Benish

Bob Jacobsen, 7/29/15 10:42 PM -0800, Re: Galileo's Gravity Experiment **2**

Subject: Re: Galileo's Gravity Experiment
From: Bob Jacobsen <jacobsen@berkeley.edu>
Date: Wed, 29 Jul 2015 23:42:38 -0700
To: Richard J Benish <rjbenish@comcast.net>

> Been done. It's routine to put gravitometers into deep boreholes, sometimes several km deep. No anomalies found. Usual equations work so well that people use them to back-calculate the geophysics, and the oil is found where the equations say it'll be.
>
> Bob

Bob Jacobsen, 7/30/15 7:09 AM -0800, Re: Galileo's Gravity Experiment **3**

To: Bob Jacobsen <jacobsen@berkeley.edu>
From: Richard J Benish <rjbenish@comcast.net>
Subject: Re: Galileo's Gravity Experiment
Attachments:

>> Dear Professor Jacobsen,
>>
>> Thank you for the reply.
>>
>> The key thing about Galileo's experiment is that it involves observing the MOTION of a test object induced by gravity to MOVE radially toward and past the CENTER of a larger massive body.
>>
>> "Been done"? By whom?

> I understand how knowledge of static forces inside a body (as obtained, for example by Spero, Hoskins, et al, 1985) suggests the possibility of deducing the motion that would seemingly result from the existence of these forces. But the motion has not actually been observed. Static forces and motion are not the same thing.
>
> If Galileo were alive and had the resources to do a scaled down version of his experiment, do you think he would just say, "Naw, I already know what happens"? My guess is that he would want to see it with his own eyes, as would a good detective or a curious child.
>
> Furthermore, the GR counterpart for the motion predicted by Newtonian theory is that the rates of clocks inside the source mass decrease to a minimum at the center. This weak-field prediction of GR has never been tested.
>
> The stone remains unturned. Why not simply admit it? Why not help to generate interest in finally doing the experiment proposed by Galileo 383 years ago?
>
> Sincerely,
>
> Richard Benish

Physics @BERKELEY

BOB JACOBSEN

PROFESSOR
DEAN, UNDERGRADUATE STUDIES, COLLEGE OF LETTERS & SCIENCE

Office:425 LeConte

jacobsen@berkeley.edu

Main: (510) 708-5988

Other: (510) 486-7355

Back to Directory

Research Area(s): Particle Physics

BIOGRAPHY

Bob obtained a B.S.E.E. from MIT in 1978. He spent 1976 through 1986 working in the computer and data communications industry for a small company that was successively bought out by larger and larger companies. He left in 1986 to return to graduate school in physics, obtaining his Ph.D. in experimental high energy physics from Stanford in 1991. From 1991 through 1994, he was a Scientific Associate and Scientific Staff Member at CERN, the European Laboratory for Nuclear Physics, in Geneva Switzerland. While there, he was a member of the ALEPH collaboration concentrating on B physics and on the energy calibration of the LEP collider. He joined the faculty at Berkeley in 1995.

RESEARCH INTERESTS

Fundamental particle physics, particularly from the experimental perspective, is my primary research interest. Over the past 20 years the "Standard Model" of high energy physics has triumphed in precise tests of predictions of various quantities. The next step is to learn more about the unknown parameters, particularly in the neutrino sector, and to search for hints to the remaining phenomenological mysteries: Dark Energy and Dark Matter.

The LHC collider and experiments provides one powerful approach to these next steps. But it's also possible to make progress with smaller projects that address specific questions. For example, a number of different techniques are being used, and new ones are being proposed, for experimental searches for dark matter. My interest lies with using very quiet targets, for example heavily-shielded and high pure targets of liquid Xenon, and watching them with high-sensitivity phototube arrays to detect possible interactions with dark matter particles as they transit through the Earth. Much like the initial solar neutrino experiments of decades ago, this is an exercise in careful understanding of backgrounds and observation of very small, low-rate signals with high confidence levels. Experimentally, it's hard, but also a lot of fun. From a physics perspective, confirmed observations of dark matter particles would open up an entirely new window on fundamental physics.

Current Projects

The LUX detector is located 4850 feet underground at the Homestake Mine in Lead, South Dakota. In 2013 it published the best-yet limits on WIMP-type dark matter. In 2014 and 2015 we'll have a longer run to gather more data, along with new calibration methods to improve our ability to understand that data. After that, the next step is a larger detector, called "LZ". This 6+ tonne liquid Xenon detector will replace LUX in the cavern, and provide a large improvement in sensitivity. It's being designed now (2014) and will be constructed at LBL and other sites over the next few years. We expect "first dark", the initial operation, some time in 2018.

PUBLICATIONS

R. Assmann, et al. (The LEP Energy Group), "The energy calibration of LEP in the 1993 scan," Z. Phys. C 66, 567 (1995).

"LEP data confirm train timetables," CERN Bulletin 48, 95 (27 November 1995).

The BaBar collaboration, The BaBar Physics Book: Physics at Asymmetric B Factory, SLAC-R-0504.