Daniel Kennefick

PROFESSOR of PHYSICS

University of Arkansas

Email Correspondence

September 23 – November 29, 2014

PREFACE

Kennefick is probably best known as the author of a book about gravitational waves, *Traveling at the Speed of Thought* [Princeton, 2007]. More obscure is Kennefick's essay about the difference between *belief* and *imagination* in children's movies and literature: *A Few Beasts Hissed: Buzz Lightyear and the Refusal to Believe.**

I began my correspondence with Kennefick by suggesting a connection between these seemingly disparate categories: gravitational physics and children's fiction. Kennefick expressed some appreciation and amazement that I had read his work in both fields. So we were off to a good start.

In his second paragraph Kennefick agrees that it would be a good idea to perform Galileo's Small Low-Energy Non-Collider experiment. A couple weeks after the dialog had fizzled out, I tried to rekindle it by referencing Martin Beech's essay on the *Tunnel-Through-the-Earth* thought experiment. To illuminate this context, I have inserted my communication with Beech in the following pages.

My dialog with Kennefick continued after I sent him a few hard-copy documents. He subsequently offered to introduce me to the Canadian physicist and General Relativity expert, Eric Poisson. But this never happened.

Coming back to where our communication started, a striking parallel presents itself. The pattern is revealed, on one side, as a key theme in Kennefick's *Buzz Lightyear* essay. On the essay's first page, Kennefick begins explaining the difference between, and significance of, *belief* and *imagination* in childhood development and adult society, by recounting a tension-filled scene in the early 1900s story *Peter Pan*. (See enclosed.)

In the storybook dreamworld called *Neverland*, the magical fairy, Tinkerbell is dying, as an audience of children and imaginary creatures look on. Peter Pan implores the audience to clap as a way of keeping her alive. At this juncture it is written: "Many clapped. Some didn't. A few beasts hissed." Following Kennefick's analysis, these words also bring his essay to a close, because we should now be able to answer the question he opens with: "*Why did those beasts hiss?*" In Kennefick's first paragraph, he begins his answer:

> "The children who believe in fairies were the ones who didn't clap. The more vocal of them might have hissed."

How, if at all, does this scene relate to the current state of gravitational physics? I think a connection can be made as follows. First consider Kennefick's observation:

> "Peter's appeal [presumes] that fairies cannot continue to live unless we believe in them. Nothing admits disbelief more than the demand that we must all believe or what we each believe will no longer be true."

Kennefick's argument here is that the belief that Peter's plea is intended to evince is *conditional*—in two ways: 1) It regards belief as a largely communal act, dependent on and

* In the collection of essays, *The Galaxy is Rated G,* Eds. R. C. Neighbors and Sandy Rankin (McFarland, Jefferson, North Carolina, 2011) pp. 83–95.

influenced by the words and actions of others. And 2) It requires a kind of ritualistic gesture (clapping) to make the believed thing "come true" or remain true. (Echoes of *religion* are inescapable.)

Now consider the over-arching context: It's the fantasy world of a child, which also resembles a dream-like state—both of which may be likened to a *level of consciousness*, a level of consciousness in which thoughts and ideas are not constrained by physical reality. Different responses to the problem (Will Tinkerbell die? Do fairies exist?) evidently reflect different states of slumber or wakefulness; child-likeness or maturity; delusion or enlightenment. To hiss, not clap, or clap.

The latter responses reflect a spectrum upon which hissing, I would argue, represents the least enlightened, most aggressive perpetuation of the fantasy state. (*My world is real! Don't need no stinkin' clapping!*) This interpretation is bolstered by the fact that in the original story it was only beasts who hissed—the ones whose "reality" is most definitely threatened by lack of belief. (Even as the successfully revived Tinkerbell said she wanted "to get at the ones who had hissed"—about which more below.)

Note that Kennefick reasons that older children who would rather grow up or be treated more as adults may also be among the hissers, because it is insulting to be implored to "believe on cue." This is a different reason for hissing than that of the beasts. So Kennefick's argument is more complicated than my simple one which, in any case, is more conducive to comparison with the *belief system of academic physics*.

With that in mind, now consider the next steps on the spectrum. *Not clapping* is more ambivalent, but leaning toward an implicit acceptance of things as they are (fantasy).

Whereas clapping reflects at least some acknowledgment of cause and effect. *What we end up believing depends to some extent on our conscious action.* By consciously *deciding* what to believe our actions could even cause our beliefs to transform. Consistent with this analysis is that "Tinkerbell did not think of *thanking* those who believed" (clapped) because doing so would evoke thoughts of the opposite; it could fuel the alternative of *not* believing. Whereas the thought of revenge on the angry hissers would thicken the plot and thereby deepen and perpetuate the fantasy state. Tinkerbell's investment in fantasy is 100%.

Conscious reinforcement of fantasy by politely clapping may thus be the most "mature" action of the three. But it falls woefully short of the fully adult response of perceiving the need to awaken from the dream and face the real world, either by gradually evolving (growing up) or snapping out of it. To neither hiss nor clap, nor passively accept, but to put an end to all the hooba gooba by recognizing the story for what it is: *just a story*.

With this pattern in view, the following parallel may thus be drawn: We illustrate the pattern by following the same progression up the spectrum outlined above. A few of my correspondents (most notably Strassler and 't Hooft) appear to have felt it worthwhile to reply to my pleas to perform Galileo's experiment by "hissing," by exhibiting defensive umbrage at the idea of doubting Newton and Einstein (fairies? gods?). *How dare you question my reality. How dare you suggest that my reality needs validation by more empirical evidence than we already have.*

The thousands of recipients who have *ignored* my pleas correspond (roughly) to the unclapping characters in the story. I.e, those who are comfortable enough with the status quo, to not be bothered with advancing science by looking under any unturned stones. *No worries. Tinkerbell will be fine.*

Those who clap politely (civilized email reply)—being more common than hissers—do so, perhaps, *to convince themselves* that Galileo's experiment need not be done: It's already "been done" or it's been "effectively" done. These "clappers" open themselves to a further response from me, in which I point out the wishful, unscientific character of their arguments; to engage their "better angels," as it were. What better angel is there than the spirit of Galileo himself ("father of modern science")? Would Galileo say, "I already *know* the result of the undone, yet doable, experiment," or would he rise to the occasion and actually *DO* it?

In the interest of transcending the storybook options, up the spectrum (by quantum leap?) to a state of enlightened wakefulness, I repeatedly pound the Galileo connection, urging that we live up to the scientific ideals that he also urged. So far, my correspondents have not yet been compelled into action by such arguments. Somehow they justify ignoring the ideals of science. (*Not my department. Nothing worth investigating. Ignorance is bliss.*) In the best cases, they just wish me luck and go on their merry ways.

Yet I persist. Surely somebody out there is awake enough to understand that we really ***MUST***

replace the big red question marks in the *Small Low-Energy Non-Collider* graphs with physical data. (See next page.) Surely a higher level of consiousness corresponds to having obtained the result of Galileo's experiment by actually doing it. Surely.

Now to the role of *imagination*. How does childhood imagination differ—if at all—from adult imagination, in quality, quantity and significance? And what has it to do with *belief*?

Imagination is the tool of invention and discovery. It's what makes us human. What we imagine can be used for bad or good; to foster delusion or enlightenment. It is the driving force from which we acquire both belief and knowledge. Curiously, the word *knowledge* does not appear in Kennefick's essay even once.

A long time ago humans imagined intentionally planting seeds to grow food in an organized way (agriculture); we imagined a thin slice of a rolling stone (wheel); we imagined printing presses, radios, cars, rocket ships, geodesic domes, computers and robots. We've drawn pictures of these things, built them and discovered that they work! *Hallelujah!* The imagined ideas come true—not by arbitrary rituals, but by sweaty trial-and-error, because they are consistent with the actual facts of the Univere. This short list represents a vast store of reliable empirical *knowledge*, all of which originates in human imagination, and which grows ever larger by its conscious application.

Humans have also imagined monsters under the bed; tyrannical gods who we're supposed to fear lest they send us to Hell. We've imagined colorful muscular superheros (*Vroom! Smash! Bam! Kapow!*) who make us feel small and weak. We've imagined Earth being the center of the Universe. We've imagined magical forces of attraction "mediated" by loopy or stringy "gravitons," which flavor of thinking has also spawned dark inflatonic stringbrane holograms and an overall portrait of a bizarre, fragmented and grotesquely ugly Universe. We've imagined a Universe that supposedly *began* pretty much like it says in the *Bible*; multiverses, singularities and static chunks of stuff. And that a Small Low-Energy Non-Collider (Galileo's experiment) produces an oscillatory motion between the extremities. All of these imagined things are consistent with the *Neverland* belief that a *real world* accelerometer reading does not have to mean what it says. Regardless of reading, it either is or is not accelerating, the choice is yours.

Unlike the inventions listed in the paragraph just prior to the last one, though some of these latter imagined things can be drawn, none of them represent reliable *knowledge*. They are not thoroughly, if at all, *tested* in the court of physical reality. They are just and only stories; beliefs, not knowledge, contrary to impressions sometimes given by academic authorities.

We might come to expect such a babelesque view of the world, given the truth in Kennefick's assessment of the connection between belief and imagination:

> By practice one's imaginative faculty becomes able to maintain a single belief for long long periods, essentially indefinitely. Then one has achieved adulthood and one is expected not to "play around" with this belief any longer…It is considered bad form in the adult world to play with belief.

As justification for resigning oneself to the world of adult belief, Kennefick appeals to examples such as the widespread use of paper money. In my opinion, such social practices are less about "belief" than agreements about the meaning of *symbols*. Do we *believe* in the letter Q or the number 17? No, we simply agree on what they mean.

As noted above, Kennefick refrains from connecting imagination with *knowledge*, by contrast with its clear connection to *beliefs*, both harmless and pernicious. Nevertheless, Kennefick acknowledges that: "There is no more empirical evidence for the existence of God than for the existence of the Tooth Fairy, in fact there is rather less!" He also makes the hugely important point:

> [Children] are freer to run through [beliefs] more quickly [than adults]. Thus we could say they are *more* imaginative to the extent that they have *less* belief, because by stopping more briefly at each imaginary place they can visit more widely amongst them than is true of those (for instance, adults) with more belief.

Physicists' adamant refusal to believe accelerometer readings is, I believe, an exercise in stunted imagination run amok. Since they are now adults, physicists are no longer inclined to "play around" with this disbelief. It's their story and they're sticking to it. If only they would have retained more of their child-like flexibility, they would happily revisit the possibility: "Hey, maybe accelerometers tell the truth. Let's play with this; let's test it."

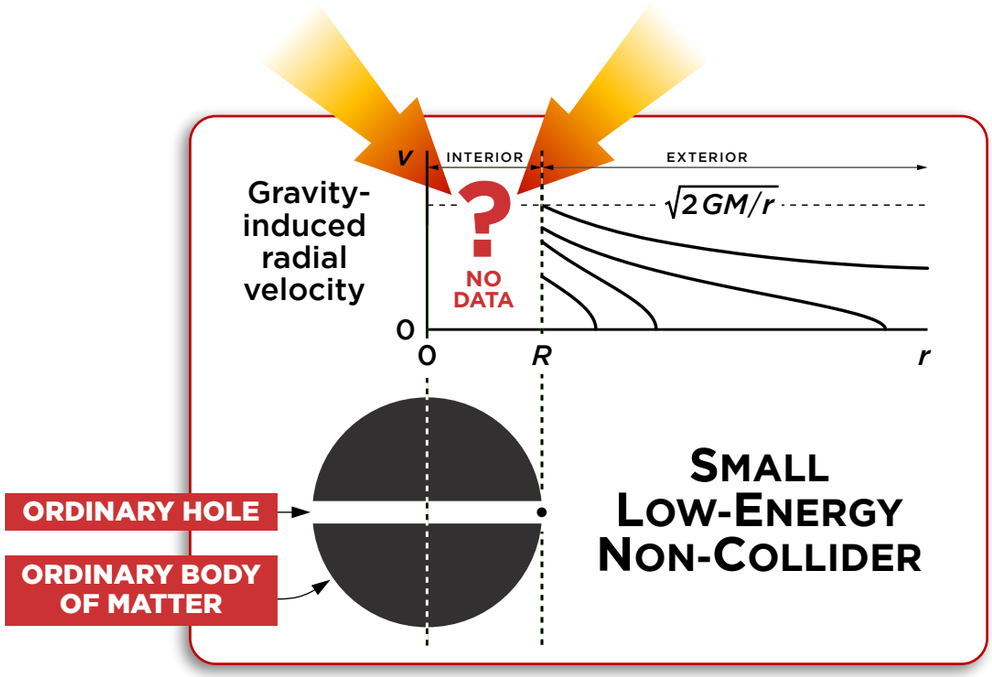

Figure X. Evidence gathered from above the surfaces of large bodies of matter like the Earth or Sun allow plotting the curves for the exterior region as shown. In the case of Earth, some evidence has been gotten from shallow holes close to (essentially *at*) the surface. But from well below the surface, especially near the center, we have no data. (As indicated, with some modest exaggeration.) The data is there to be gotten, not from astronomical bodies, but from laboratory sized bodies of matter. Instead of merely *assuming* that we know how to complete this graph for the interior region, conducting a preliminary demonstration on or near Earth would be a prudent first step before sending such a device to deep space.

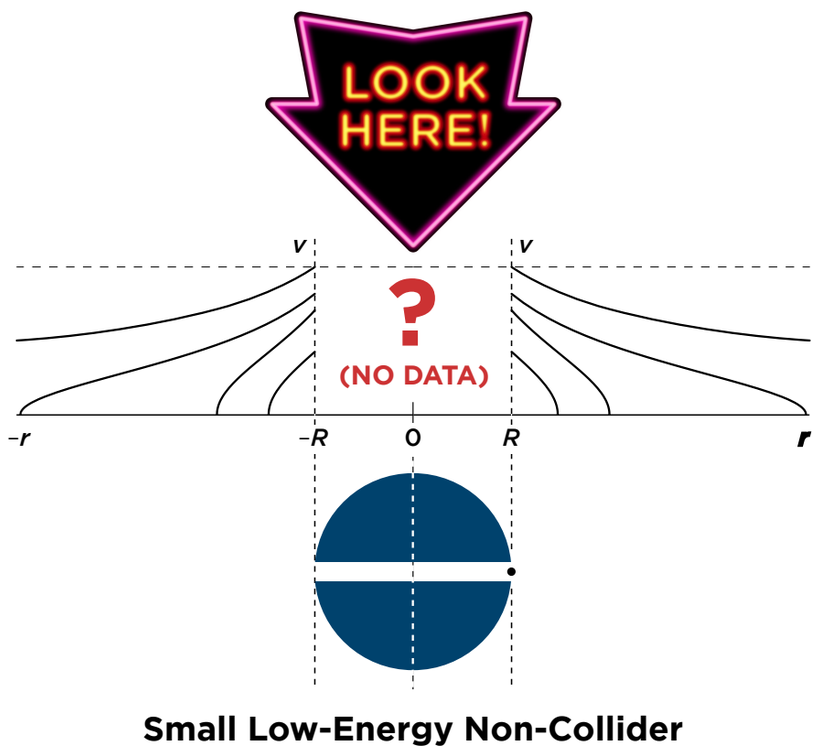

Figure Y. Huge gap in gravitational data. Almost all published evidence in support of Newton's and Einstein's theories of gravity is based on observations made *over* the surfaces of large massive bodies such as the Earth or Sun. Though discussions of the interior falling (i.e., Galileo's) experiment that would replace the question mark with data are common in physics classrooms and the literature, it has never been done. The results are therefore unknown, as indicated.

Kennefick provides an explantion for why this hasn't happened. Childhood experience, as reinforced by adults, seems to support the widely held belief—because it's as *obvious* as the non-motion of Earth, if not more—that matter is composed of static chunks of stuff and gravity causes downward motion. Being a kind of default background belief from ancient, primal experience, this conception of matter and gravity has sunken into the deepest psychic depths and has remained there intact because, as children:

> We flex and develop our belief muscle until it is strong enough to withstand the rigorous exercise of adulthood.

Adults will sometimes indulge the fantastic imaginings of children, just as physicists will sometimes indulge the fantastic imaginings of crackpot/amateurs. But in both cases, the traditional authority figure "knows" they know best—which, I freely admit, they *almost* always do. Unfortunately, due to the disproportionate rigidity of their belief muscle they are generally unprepared for those exceptional cases in which they are wrong. Maybe the child/amateur has imagined up a new idea that will withstand testing against physical reality. This must be judged on a case-by-case basis, and tested by experiment whenever possible.

In the present case, the idea is to test an idea imagined by Galileo. It remains in the literature as a (Neverland) *thought* experiment, and not a *real* (Science) experiment, because of the widespread *belief in authorities* whose human fallibility renders them as mere pipsqueaks (fairies) compared to *Nature*.

In my imagination the factual evidence gathered by physicists and astronomers can be cogently woven into a picture according to which the Universe is actually as eternally durable as it is beautiful and harmonious. It is nothing at all like the inflatonic Cold Dark Matter monstrosity envisioned by the beastly authorities. But they've made enormous investments in their beliefs, beliefs which, Kennefick tells us, they are not at all inclined to "play around" with. So they refuse to wake up to the possibility that the world would benefit from a *PUBLIC* endorsement to do Galileo's experiment. They might hiss at the idea in public (as in Strassler's blog). In personal correspondence they might offer encouragements to do the experiment: "The experiment is worth doing…the reward [might] be enormous." Why must such positive responses *remain* private? They seemingly come only with the tacit rejoinder: *Just leave me out of it.* Don't expect me to make any recommendations to my colleagues (who would surely judge me harshly for doing so).

In conclusion, for all the thoughtful replies I've gotten from kind and generous respondents like Kennefick, it seems to me they remain in a state of slumbering belief, of feigned knowledge. Their *imaginations* have not yet escaped the bondage, the insidious influence of peer pressure. In other words, I think their imaginations are grossly *underdeveloped* because they've been suckered into the dreams of others, as though *gullibility has become the new imagination*.†

In the age of Trump, when 40% of the US population still can't see that their leader is a narcissistic psychopathic cowardly conman, perhaps it's not surprising that the same malady (i.e., gullibility) touches even physics, the king-daddy of the sciences. Welcome to the world of gravitons and multiverses, ruled by math-geeky divide-by-zeroists and Marvel Comics, where nobody has time to contemplate the scientific unacceptability of the big gravitational question marks inside matter.

Extending our metaphor slightly, what's needed is a sufficiently *sustained* or sufficiently *loud* clap to alarm the herd members to disperse; to dissolve the frighteningly real beast of conformity; to consciously exit the ancient (static-chunk-o-thing-stuff) stomping ground and explore new gravitational territory, inside matter. As a solitary fly on the hide of this beast, I've not yet figured out how to get through. With amazing, if discouraging consistency, my correspondents routinely fall back into their belief-filled, copycat dreams. They continue to *pretend to know* or to not care if they don't. Meanwhile, their gravitational *Neverland* has blossomed into a most lucrative entertainment industry.

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† Tired of trying to invent your own reality? No problem. I've got a dozen of 'em right here. Get yours now! Two for a dollar. *Step right up!*

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

Dear Professor Kennefick,

I think your sensitivity to the human aspects of physics is as exceptional as it is valuable.

This impression sprouted upon reading your book, *Traveling at the Speed of Thought*. More recently, it was reinforced by reading *A Few Beasts Hissed*, which was not intended to pertain to physics, but I think maybe it does.

That something as unrigorous and unphysical as "folk memory" could play a role in modern physics suggests that adult physicists' beliefs can form—e.g., as a face-saving gesture—by "believing on cue," even if this is at the expense of the ideals of science.

By sending you the attached paper, I am consiously running the risk of "remembering and overstressing something which may be seen as vaguely disreputable to the field." Following this paraphrase from your book (p. 183) is the disconcerting observation that:

"*It is a characteristic aspect of physics that to pose a problem or a question may, in itself, be taken as a sign of bad character.*"

The attached paper urges physicists to perform a simple experiment that Galileo proposed 382 years ago. Even though the prediction for its result is common fare in freshman physics texts, we have no direct empirical support for the prediction because the experiment has never been done.

Finding a physicist who thinks it would be a good idea to do the experiment has been difficult, I think, because it is immediately understood that the physics community unanimously believes they already know the result and because to admit that there actually is no empirical evidence to support the belief is embarrassing ("vaguely disreputable to the field").

Surely the many discussions about the result of the experiment deserve to be based on direct empirical evidence. I hope you see that it is less important to save face than to discover the truth and let it be known.

I'd be grateful for any feedback.

Thank you for your good works.

Sincerely (and intending only the best of character),

Richard Benish

Daniel Kennefick, 9/26/14 10:51 AM -0700, Re: Gravity Experiment **1**

Date: Fri, 26 Sep 2014 12:51:01 –0500
From: Daniel Kennefick <danielk@uark.edu>
To: Richard J Benish <rjbenish@comcast.net>
Subject: Re: Gravity Experiment

> Dear Richard,
>
> Thank you for your letter with its kind remarks about my book and essay. I am amazed that you happen to have read both!
>
> Your experiment sounds fascinating and I am sure you are right that it has never been performed before. I agree with you that an experiment is worth doing even when physicists are sure they know what the result will be. Even if physicists are usually right, the reward from one experiment that confounds all expectations is likely to be enormous.
>
> In the field of experimental gravity the main caveat is likely to be, how difficult will the experiment be to perform, how much will it take in the way of resources? What do you think it would cost to perform?
>
> Best wishes,
>
> Dan

Daniel Kennefick, 9/26/14 2:41 PM -0800, Re: Gravity Experiment **2**

To: Daniel Kennefick <danielk@uark.edu>
From: Richard J Benish <rjbenish@comcast.net>
Subject: Re: Gravity Experiment
Attachments: <SLENC as Clock Smalley 1975.pdf>

> Dear Professor Kennefick,
>
> I am extremely grateful for your insightful response.
>
> Concerning cost, it depends a lot on the method. The ideal method—apparatus in an orbiting satellite—is known to be expensive. Somewhere I recall hearing of 6 or 7 digit dollars per kilogram, plus design and execution issues.
>
> Compared to the cost of many experiments underway or on the drawing board, this is still only a "modest" drain on resources.
>
> Note that one of my correspondents, David Levi—when he was of high school age—entered the recent world-wide contest to propose an experiment to be conducted in the International Space Station. He proposed Galileo's experiment. It was not selected, but David's video won an honorable mention:
>
> http://magnetovore.wordpress.com/2011/12/11/lets-look-inside-gravity/
>
> Note also that in the early 1970s, various proposals were considered to make a space-based measurement of Newton's constant using a Small Low-Energy Non Collider as a clock. The attached paper by Larry Smalley is a review of these proposals.
>
> As for Earth-based methods, my correspondence with the apparatus-builder, George Herold is pertinent. When I learned of Herold's work at the Buffalo, New York company, TeachSpin, I sent him a brief essay that proposed conducting the experiment with a modified Cavendish balance.

Herold's first response was encouraging:

At 10:40 AM –0400 7/2/09, George Herold wrote:
> *I have thought about doing exactly what is in your paper.*

Later in our correspondence I inquired about the price to make such a thing. Herold replied that it depended on issues like whether it was to be a prototype for a mass-production run or a one-off deal. When it became apparent that he was not going to give me a figure, I wrote back (half in jest): "Evidently the cost would be about as I expected: half a million bucks, give or take half a million bucks."

To my surprise, Herold wrote back saying, "That sounds like some serious money."

From this inadvertent and very rough estimate, it seems safe to guess that Galileo's experiment could be done in an Earth-based laboratory for less than a million dollars.

Putting it in perspective, an experiment proposed by Craig Hogan, reported in *Scientific American* (Feb 2012, p. 34) gives the impression that we are in the realm of small change. Hogan was awarded $2 Million and the article made light of it, stating: "The experiment is so cheap because…"

My dream is to be able to get back to George Herold with a check for two or three hundred thousand dollars, upon which occasion I'd ask: "Is this enough to get you started?"

As I see it, the spirit of Galileo ought not to have to wait any longer.

Thanks again for your interest.

Best regards,

Richard Benish

Daniel Kennefick, 10/22/14 5:29 AM -0800, Re: Gravity Experiment **4**

Date: Wed, 22 Oct 2014 08:29:23 –0500
From: Daniel Kennefick <danielk@uark.edu>
To: Richard J Benish <rjbenish@comcast.net>
Subject: Re: Gravity Experiment

Dear Richard,

I am sure you are right as regards cost, i.e. expensive in space, "relatively" cheap on Earth, but not so cheap that anyone is going to fund from our pocket of expenses. Unfortunately, I am no help whatever in giving advice as to where to get money of this kind, but I do know funding agencies are very unlikely to go for it.

Even getting a few hundred thousand dollars from them is very competitive and they are likely to want to select more topical problems. There is no doubt that there is a real dearth of funding sources for just this kind of project.

Dan

Start: Martin Beech Offshoot

danielk@uark.edu, 11/6/14 10:30 PM -0800, Eric Poisson? 5

To: danielk@uark.edu
From: Richard J Benish <rjbenish@comcast.net>
Subject: Eric Poisson?
Attachments: <Hole Through Earth Beech 2013.pdf> <Physics World TeachSpin.pdf>
<GR Interior Oscillator Taylor 1961.pdf>

Dear Professor Kennefick,

In my continuing mission to generate interest in doing Galileo's Small Low-Energy Non-Collider experiment, I found a recent paper by Martin Beech that reviews the history of its discussion in the literature (attached).

Since Beech's review includes discussion of the experiment only in the context of Newtonian gravity, I sent him references to its appearance in the context of General Relativity (copied below or attached).

Beech teaches at the University of Regina in Canada. He did not reply to my last message, but I have a hunch that he forwarded my message eastward to Eric Poisson in Guelph. This hunch is based on the appearance the next day of a conspicuously large download of documents from my website to the server at the University of Guelph, where Poisson is the resident General Relativity expert.

My hunch may be quite wrong, of course. But if it is right, since Poisson has been one of your co-authors, perhaps you have an ally with respect to my (dangerously subversive?) ideas.

I hope all is well in Arkansas.

Gratefully,

Richard Benish

http://www.gravitationlab.com/

Martin.Beech@uregina.ca, 10/12/14 4:41 PM -0800, Gravity Experiment 6

To: Martin.Beech@uregina.ca
From: Richard J Benish <rjbenish@comcast.net>
Subject: Gravity Experiment
Attachments: <Gravity-Experiment-in-Waiting.pdf>

Dear Professor Beech,

I have recently purchased your book on the *Pendulum Paradigm* and have inquired as to obtaining a copy of your *Observatory Magazine* article on the Earth tunnel problem.

I look forward to reading the details you've provided about this experiment, initially proposed by Galileo. In the meantime, I am eager to share with you my thoughts about it, as expressed in the attached paper.

Everybody knows about the harmonic oscillation prediction, but nobody has ever seen it happen (gravity-induced radial motion through a massive body's center).

Martin.Beech@uregina.ca, 10/12/14 4:41 PM -0800, One More Thing **7**

Would it not be worthwhile to obtain the empirical evidence to support the well known prediction? Would it not be a wondrous thing to see it unfold?

I'd be grateful for any feedback.

Thanks for your good works.

Sincerely,

Richard Benish.

Martin.Beech@uregina.ca, 10/13/14 11:35 PM -0800, One More Thing **8**

To: Martin.Beech@uregina.ca
From: Richard J Benish <rjbenish@comcast.net>
Subject: One More Thing
Attachments:

> Dear Professor Beech,
>
> I forgot to mention David Levi's proposal to do Galileo's experiment on the International Space Station. NASA and others sponsored a world wide contest a few years ago for high school aged students whose winners would have their experiments carried out on the ISS.
>
> David's idea was not chosen, but it did get an honorable mention:
>
> http://magnetovore.wordpress.com/2011/12/11/lets-look-inside-gravity/
>
> Cheers,
>
> Richard Benish

Martin Beech, 10/13/14 12:39 PM -0800, Re: Gravity Experiment **8**

Date: Mon, 13 Oct 2014 14:39:16 –0600
From: Martin Beech <Martin.Beech@uregina.ca>
To: <rjbenish@comcast.net>
Subject: Re: Gravity Experiment

> Hi Richard,
>
> Many thanks for your email. I hope that you enjoy the *Pendulum Paradigm* and I have attached a copy of the *Observatory* paper I put together about the Earth tunnel problem. I look forward to reading through your paper and will get back to you once I have had a chance to think the details through. It certainly would be a wonderful experiment to conduct.
>
> With best wishes,
>
> Martin

To: Martin Beech <Martin.Beech@uregina.ca>
From: Richard J Benish <rjbenish@comcast.net>
Subject: Re: Gravity Experiment
Attachments: <Intro GR Tangherlini 1961.pdf> <Physics World TeachSpin.pdf>
<GR Interior Oscillator Taylor 1961.pdf>

Dear Professor Beech,

Marvelous! Now I've got the skinny on the history between Galileo and modern times. I was especially surprised to learn of how Euler botched the problem.

Since your paper refers only to treatments based on Newtonian theory, I thought you might be interested in a few general relativistic treatments.

I was directed to a couple of them by the thorough bibliography given in L. Marder's *Time and the Space Traveler* (1971).

I've attached one of them (Taylor). Another is in F. R. Tangherlini's succinct Introduction to GR, which appeared in *Nuovo Cimento Supplement*, vol 20, series 10 #1 (1961). (The Earth-tunnel problem is given on p. 66.)

In both cases the main focus is the comparison of clock rates and elapsed times as between falling observers, observers at rest at the center, and observers at rest on the surface. Tangherlini points out the seemingly paradoxical fact that, contrary to the common result from Special Relativity, it's the falling observer whose accelerometer reading stays zero, that is supposed to age slower than the "stay-at-home" positive accelerometer reading surface observer.

In addition to Misner, Thorne, and Wheeler's brief treatment in their classic tomb (on p. 37) the solo Wheeler devoded a whole 9-page chapter to the subject in his *Scientific American* volume A *Journey into Gravity and Spacetime* (1990). Wheeler calls the oscillation "boomeranging."

I've also attached a review paper by L. Smalley which mentions the space-based G-measurement proposals of Forward-Berman and Worden-Everitt. Too bad none of these were brought to fruition.

You may also be interested to learn that in response to one of my brief essays on the subject, the apparatus builder, George Herold (of TeachSpin in Buffalo, New York) remarked that he had "thought of doing exactly what is in [my] paper." By this he meant an Earth-based demonstration using a modified Cavendish balance. Curiously, Herold also mentioned that he thought his idea to do the experiment was going to appear in *Physics World*. I learned about Herold's work from a *Physics World* interview, which did not include any mention of the experiment. (Also attached.) Evidently, I saw the published version of the interview before Herold did, because he said that his suggestion to do the experiment was discussed; he seemed a little surprised to learn that this part of the interview did not appear in print.

If you have an interest in pursuing the idea of doing the experiment, connecting with Herold might be a good place to start.

Regarding the "many (many)" theoretical discussions of the problem, I find it disconcerting that none of them (to my knowledge) voice any concern about providing *empirical evidence* to make sure the standard prediction is correct. Maybe it isn't. Intuitively, it makes more sense to me that the rate of a clock at the center would be a maximum, not a minimum (as argued, e.g., from the rotation analogy). This corresponds to a very non-Newtonian result: no harmonic oscillation. We cannot know for sure what happens until Nature is allowed to testify.

Thanks for the paper and your good work.

Sincerely,

Richard Benish

End: Martin Beech Offshoot

Daniel Kennefick, 11/7/14 5:56 AM -0800, Re: Eric Poisson? **10**

Date: Fri, 7 Nov 2014 07:56:21 -0600
From: Daniel Kennefick <danielk@uark.edu>
To: Richard J Benish <rjbenish@comcast.net>
Subject: Re: Eric Poisson?

Dear Richard,

I got your package of materials, by the way, thank you for sending them on. It might well be that Eric was asked about your work. He is very conscientious and would certainly not comment without first checking into your actual work rather than speaking off the top of his head. You could write to him yourself, if you like, or I could introduce you if you prefer. If it did happen that he had already looked over your work then his opinion would certainly be valuable.

best wishes,

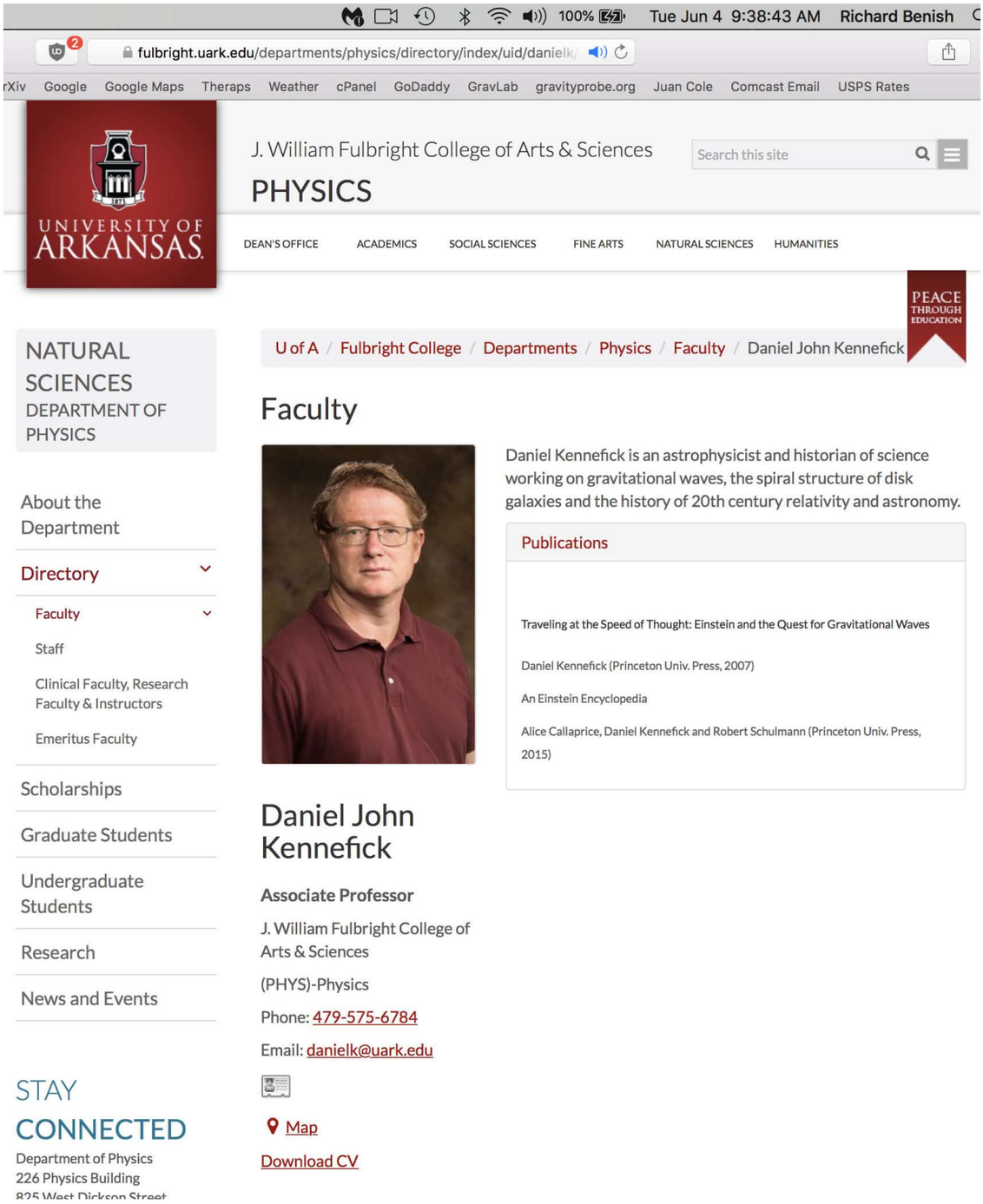
Dan

Daniel Kennefick, 11/8/14 11:44 AM -0800, Re: Eric Poisson? **11**

Date: Sat, 8 Nov 2014 11:44 AM–0800
To: Daniel Kennefick <danielk@uark.edu>
From: Richard J Benish <rjbenish@comcast.net>
Subject: Re: Eric Poisson?

> Dear Professor Kennefick,
>
> I would feel honored to be introduced to Eric Poisson by you.
>
> In anticipation of such an eventuality, I've ordered Poisson's recent book (co-authored by Clifford Will, 2014) on *Gravity*, and I've begun watching his (2012) lectures on advanced General Relativity for his course taught at the Perimeter Institute.
>
> By now you will have notcied that, depending on circumstances, I have tried to carry out my "mission" by using two distinct strategies. *Plan A* appeals to childlike curiosity and the empirical ideals of science. Galileo's experiment ought to be done if only to affirm that these scientific attributes are alive and well in the world of academic physics.
>
> *Plan B*, once revealed to a given audience, pretty much disallows going back to *Plan A*, because it involves divulging an all out interrogation and possible replacement of ideas like the attraction of gravity, energy conservation, black hole horizons, and other huge mental investments. I am fully prepared to put *Plan B* into effect, as I have begun to do in papers such as *Maximum Force*… and *Rethinking Einstein's Rotation Analogy*. As far as I can tell, the positon of the "Rotonians" (in the latter paper) is perfectly defensible.
>
> After their first encounter with a "planet," Rotonians perceive the possible need to describe the circumstance using differential geometry in (4+1)-dimensional spacetime. They conceive a body of matter not as static and attractive ("telling spacetime how to curve") but as an inhomogenous outwardly moving matter-space-time continuum. Their deep trust in clocks and accelerometers inspires the Rotonians to conceive that matter and space are in perpetual states of motion; that this motion is the cause of spcetime curvature.
>
> In response to Sean Carroll's invitation to revise his list of *Top 10 Questions in Cosmology*, I have briefly described the Rotonian position:
>
> http://www.preposterousuniverse.com/blog/2014/10/03/ten-questions-for-the-philosophy-of-cosmology/
>
> [about 2/3 of the way down the comment list, under Richard Benish, Oct. 7, 12:38 pm.]

> The question comes back, as it must, to empirical evidence. The Rotonians allow that their Earthian hosts, with their bi-polar views on gravity, may be correct. But the verdict is not up to the cultural conditioning, nor the mathematical whims of sentient beings. It is up to *Nature*, whose answer is not likely to be revealed before we conscientiously "look under the hood" of a body of matter (i.e., by conducting Galileo's experiment).
>
> For a child or a Rotonian, the appropriate course of action is obvious: do the experiement. For those who have been rigorously trained extremely otherwise, seeing the logical imperative of this course of action requires exceptional mental flexibility, such as you have already demonstrated.
>
> With feelings of enormous gratitude, I want you to know that I am eager to engage in a critical discussion with Eric Poisson or any other physicist on these matters.
>
> Sincerely,
>
> Richard Benish


100% Tue Jun 4 9:38:43 AM Richard Benish
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Faculty
Daniel Kennefick is an astrophysicist and historian of science working on gravitational waves, the spiral structure of disk galaxies and the history of 20th century relativity and astronomy.
Publications
Traveling at the Speed of Thought: Einstein and the Quest for Gravitational Waves
Daniel Kennefick (Princeton Univ. Press, 2007)
An Einstein Encyclopedia
Alice Callaprice, Daniel Kennefick and Robert Schulmann (Princeton Univ. Press, 2015)
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