

rzero

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Dedicated to Katherine



# Preface

*“I am a Quantum Engineer, but on Sundays I Have Principles.”*

– J.S. Bell, March 1983, as quoted by Nicolas Gisin, [10]

## About Tom

I didn’t have a choice. I think that’s the case for many people in science.

## Education

I attended high school in the small lakeside community on the Great Lakes, Canada. I attended University of Toronto for my undergraduate studies, starting with a cohort of over 100 students in the Physics Specialist program, which the University of Toronto Department of Physics had just finished remodelling after other top departments around the world. It was a disaster - there were maybe 10 people left by the time third year started - and I wasn’t one of them. Thinking that maybe I had made a mistake, I tried a half a year of other topics, before deciding that physics could not be removed from me. So I switched to a double major in math and physics. And by fourth year (ok sixth depending on how you count), I was doing well in any course I cared about, which turned out to be some more abstract math courses, my undergrad thesis course (on Bell’s Theorem), and General Relativity. Our fourth year courses were mixed with graduate students entering U of T’s physics department.

Trying to attend graduate school was, I was informed, impossible, as my marks were too low. So I again tried to convince myself that physics wasn’t for me, and I painted houses for a year and used the savings to travel around the world. I then met the love of my life, Katherine.

I applied at a few schools for a masters program in physics, and got in at Laurentian University of Sudbury, Ontario. I lucked out on my choice of advisor, Prof Doug Hallman, as he was collaborator in the then proposed Sudbury Neutrino Observatory. At a Sudbury collaboration meeting in 1992, my future PhD supervisor John Simpson stood up and said “We have an emergency - we’ve been funded!”. After my masters, I went on to John’s

low level lab at the University of Guelph, where I did my PhD on a few things, mainly the water team, where we built a novel Radon detector and the software side, where I poked around in the 'SNOMAN' software, writing some muon tracking software. John was an amazingly smart, generous and kind advisor. When we went to off site meetings he would always buy wine way above my palette, I think trying, and succeeding at, educating us on the finer points of living. He was an honest gentleman.

## Aside

The Sudbury Neutrino Observatory was a great success, we built a remarkable ten story high detector 2km under ground at the Sudbury nickel mine. The project leader, Art McDonald won the Nobel prize, and the entire collaboration won the Breakthrough Prize in Physics. I even got a nice certificate and a small cheque.

## Career

After my PhD, we were starting to have children, and a post doc just didn't seem the way to go. For me this was the right decision. I instead started a software company with a dear friend, Ted. We built the world's biggest (so like 8 person) astronomy software package, called Starry Night, which made it easy for everyone from ordinary people to scientists to see where everything was in the night sky, to visit planets, etc. I can't resist blowing my own horn at this point:

"In the first five years or so of both the Spirit and Opportunity Mars rover missions, Dr. Jim Bell (lead scientist in charge of the on-board Panoramic camera, Pancam) and colleagues on the rover science team occasionally used Starry Night Pro to verify the positions of the moons Phobos and Deimos in the Martian sky, given the positions of the rovers on the surface and the dates and times of the intended observations. These predictions allowed both rovers to acquire time-lapse images of these moons, including daytime "solar eclipse" transits of both Phobos and Deimos across the Sun as well as nighttime "lunar eclipse" passes of Phobos entering and emerging from the shadow of Mars."

It really was cool that Starry Night was right on! It was like having a planetarium program made for Martians! (and you can quote me on that!)

Thanks again, Jim<sup>1</sup>.

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<sup>1</sup>Private communication, 2019

For a reason having everything to do with the tech stock market bubble of 2000, we ended up selling the entire operation to Space.com. I was not rich, but hey it helped.

## Why this book

While working on several software projects, over years I have kept up with the fields of quantum foundations, general relativity, and experimental quantum gravity (which is now a thing!)[35]. I was originally hopeful that physics would soon jump ahead, but it just hasn't happened. Physics isn't dead, it's a big field. But the supposed cutting edge is, as Sabine Hossenfelder points out, Lost in Math[29].

I have always had a different vision on the foundations of quantum mechanics than the mainstream physics community, a vision that is frankly easier to keep by being somewhat on the outside of academia.

Throughout my software career, I published several papers and attended conferences on quantum foundations and General Relativity. It's hard to publish papers, and often even to attend conferences with a busy job (and three wonderful sons). What I learned from my software career is that marvelously complex things can be built with simple underpinnings. My favourite example of that in software is that the 'c' programming language - a human creation just decades old - runs the entire world. And it's a short book[31].

Physics is in crisis [29]. I'm not the only one, of course that thinks this, but it is by no means an accepted fact in the academic world. To continue my software analogy, physics has gone the way of C++ - an extremely useful convoluted mess (only worse). My hope of standing back and watching the community leaders guide physics into the next revolution has more than faded over the past 20 years. I have about zero hope.

So I have decided to put my ideas - such as they are - into a book form, as I feel books can teach much better than papers. Papers are too short and formal. Books by such greats in Physics as Lee Smolin, Carlo Rovelli, etc (to me anyways) give a much clearer idea of where these people think physics is or should be going. Journal papers feel like straightjackets on free expression.

So the purpose of the book is simply to reveal another viewpoint on where physics should go, and it's a very different direction than where it's headed today. The first chapter runs over the plan and outline of the book, but I will tell you right now that this new viewpoint I have runs on one theory - Einstein's General Relativity. The thesis is that the other fields and phenomena of the world we live in can be built with this 'one simple trick'.





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# 1

## TL;DR

*“You guys need more money. You struck the worlds worst licencing deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube*[21]

### 1.1 Everything all at once

It seems obvious that I should start the book with a chapter on the present state, and what’s wrong, etc. But I don’t. Instead I’ll outline the entire program, like an executive summary. That way, if you’re bored you can cut out early and use the saved time to work on a few more eigenvalues or that pickle ball swing.

#### 1.1.1 It’s all gravity

Really. That’s it.

Everything that we know and care about is just gravity (really Einstein’s General Relativity) formed, like clay, into atoms and light. The forces of nature emerge from dynamical phenonemna in General Relativity, like beer forming from malt, hops, yeast and water.

Here’s the equation:

$$R_{\mu\nu} = 0.^1. \tag{1.1}$$

Looks simple enough, but there is a lot going on behind there, it’s really a set of non linear partial differential equations, (math speak for complicated). The freedom in these non linear equations is crucial for building out a (what you are surely thinking at this point is silly) model of our universe from one concept.

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<sup>1</sup>But see chapter 6. Damn that fine print!

It does have curb appeal though. So IF one could build something like the phenomena of our universe around us with such a simple equation it would be great. I have been waiting decades for someone to start doing just that. No luck, likely because it's a bad idea, but here we go.

## 1.2 General Relativity

If the other fields of physics were this smooth, I maybe wouldn't have had to write this book. That's how smooth it is. General Relativity describes how space and time, known as spacetime, for some reason, behaves (or is it behave?).

## 1.3 Newton

Newton figured out how the planets orbit, and his theory of gravity is amazingly accurate, but perhaps his biggest message - one that still runs underneath all of (non General Relativity) physics - is that spacetime is a perfect, god - given grid, and on that grid, we have forces. That is the major concept of physics even today.

He endures always and is present everywhere, and by existing always and everywhere he constitutes duration and space. Since each and every particle of space is always, and each and every indivisible moment of duration is everywhere, certainly the maker and lord of all things will not be never or nowhere ... God is one and the same God always and everywhere. He is omnipresent not only virtually but also substantially; for active power cannot subsist without substance. (Newton 1999: 941).

Einstein's special relativity did not change that.

Theoretical physics went well until about 1980. Theoretical physics then got worse over time. The culprits were the astronomers, who found that 95% of the world wasn't in the Standard Model, the experimental physicists, who showed that the world really has faster than light effects, high temperature superconductivity. But perhaps the biggest enemy of all was the top end schools of thought themselves. Only a few lines of thought have been permitted at all, and if 10,000 person years of effort are any indication, these directions are not useful.

Science is supposed to proceed by opening

What has worked, as

After that, two things happened. Firstly, the model of nature that was settled on around that time, the Standard Model, has gone from explaining

virtually everything in the world to about 3-5% of it. Extensions to that theory, primarily, Super Symmetry, String Theory, and Loop Quantum Gravity have proved unfruitful to say the least. [woit][SmolinTrouble][SabineLost].

Explain the layout:

1. Generally Covariant<sup>2</sup>.
2. Has the .

- What's right and wrong in present day physics.
- General Relativity
- Quantum Mechanics
- Energy in General Relativity (foundational field)
- Emergent Quantum Mechanics
- Quantum Gravity
- Electromagnetism
- Goopy thoughts
- Goodbye for now

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<sup>2</sup>Chapter xxx will try to argue not only that Einsteins ether exists, but is at rest in our universe.



## 2

# Electromagnetism

*“You guys need more money. You struck the worlds worst licencing deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube[21]*

## 2.1 What is Electromagnetism

Essentially, it's light and electricity. Beams of light move at the speed of light, and electrons and other particles carry charge.

## 2.2 Electromagnetism from General Relativity

Here is the part where I get to do the physics equivalent of pulling a rabbit out of a hat. Everyone *knows* that since electromagnetism is so much stronger than gravity, my task here is not merely hopeless. So let's see just how funny we can get here.

## 2.3 Starting

The emergence of electromagnetic phenomena from General Relativity comes from starting at an electron model. Since an electron is a spinning thing, with known mass and angular momentum, I start with the known General Relativity solution for a spinning thing with mass, the solution found in 1963 by Roy Kerr[32]. I don't use the Kerr - Newman 'charged' solution[39], after all I am attempting to get electromagnetism to emerge from General Relativity, so I can't just toss electrical stuff in there at the outset, right? Burinskii[14] and others have employed Kerr Newman solutions as possible models for the electron, but, as I stated, I'm not using built in charge. I am attempting to construct charge from phenomena.

The Kerr solution for a particle of the same mass and spin as an electron is known in the biz as a 'naked singularity', which is a thing that 99 $\frac{99}{100}$ % of physicists think can't exist, but they won't argue that it is a solution of Einsteins vacuum equations from equation (1.1). So yes, we are going to have to throw caution to the wind here and just assume that the Kerr solution (or something like it as we will see in chapter 8) is a reasonable model of the electron.

As a defence of my so far nascent electron model, I will point out that there is no truly self consistent model of the electron known at this point. As the Richard Feynman one of a few authors of QED, our best 'standard physics' model of the electron pointed out[25] (page 127):

"The shell game that we play to find  $n$  and  $j$  is technically called "renormalization." But no matter how clever the word, it is what I would call a dippy process! Having to resort to such hocus-pocus has prevented us from proving that the theory of quantum electrodynamics is mathematically self-consistent. It's surprising that the theory still hasn't been proved self-consistent one way or the other by now; I suspect that renormalization is not mathematically legitimate."

A typical physics professor will tell you that renormalization isn't a problem - and they are right - but only because so many worse problems have arisen in theoretical physics over the past 7 decades since QED, that QED renormalization now seems like a walk in the park. To be fair, it does actually work. (Although see Consa[18] for a negative outlook on the QED industry.)

Basically, the problem in all electron models, including QED, is quite simple to elucidate: the electron explodes when you try to assemble a model from charge - the energy you need to bring together 'bits of a charge' to form a small thing that looks like an electron goes to infinity. The problem is that charge is modelled as a 'charged goo' and each bit repels all the other bits as you try and squeeze it all into one place. I'll go into this more in chapter 3.

This Kerr naked singularity turns out to be very long (some  $num1e42$  longer than the natural size of the electron). Conceptually dividing this long singularity into  $num1e42$  sections, I find that each section has a gravitational interaction about equal to the gravitational interaction between two electrons. And all these small interactions add up to a huge Coulomb level force between two of them.

### 2.3.1 How to add it up

The expression for the electromagnetic Coulomb force  $F_e$  between two electrons is



$$F_e = k_e \frac{q^2}{r^2} = \pm \frac{\alpha \hbar c}{r^2}. \quad (2.1)$$

The second version is for single point charges only. It is a more fundamental way of looking at electrostatics, since in reality all charges are of unit size. I will use the second one. Note that:

- $\alpha$  is a number, about  $1/137$ .<sup>1</sup>
- $\hbar$  is the famous quantum constant.
- $c$  is the speed of light.
- $r$  is the distance between the two electrons.

For for the force of gravity  $F_g$  we have

$$F_g = G \frac{m_e^2}{r^2}. \quad (2.2)$$

Where

- $G$  is Newton's gravitational constant.
- $m_e$  is the mass of the electron.
- $r$  is the distance between the two electrons.

The large, famous value of the ratio between these two forces, which I will call  $k'$  is by inspection of eqn (2.1) and (2.2)

$$k' = \text{ratio}_{electric} = \frac{k_e q_e^2}{G m_e^2} = \frac{\alpha \hbar c}{G m_e^2} = 4.166 \times 10^{42} \quad (2.3)$$

I will now construct a force  $k'$  stronger than the usual gravitational force using only the Kerr solution of Einsteins equations, with no reference to electromagnetism.

## 2.4 The Kerr Singularity with Electron Parameters

The well known Kerr solution of Einsteins equations has a naked ring singularity for  $J/mc > Gm/c^2$ , somewhat better known as  $a > m$  in geometric units. I use SI units in this section. In Kerr-Schild coordinates (a coordinate system that is Minkowskian almost everywhere)[46], the expression for the

---

<sup>1</sup>Feynman - "all good theoretical physicists put this number up on their wall and worry about it." (I doubt they do any longer -tom)

location of the ring singularity is  $x^2 + y^2 = (J/mc)^2$ , (avoiding the use of  $r$ , as  $r$  has a meaning on its own in the Kerr solution in Kerr-Schild coordinates). Using the measured experimental values for the mass  $m_e$  and spin angular momentum  $\hbar/2$  of an electron, the radius of the ring singularity is:

$$R_{ring} = J/mc = \hbar/2m_e c = 1.93 \times 10^{-13} m \quad (2.4)$$

Thus the ring singularity is 0.5 of the Compton wavelength in circumference. This is a *huge* radius, and I will go into how this sort of thing might be possible in chapter 8. This radius can also be calculated as a ratio. The obvious other gravitational length to compare it to is the Schwarzschild radius  $r_s = 2Gm_e/c^2$  for the electron mass:

$$size\ ratio = \frac{\hbar/(2m_e c)}{(2Gm_e/c^2)} = \frac{\hbar c}{4Gm_e^2} = 1.4 \times 10^{44} \quad (2.5)$$

It is noteworthy that this ratio is already very close to the ratio  $k'$  of the strength of the electric Coulomb force to the gravitational attraction between two electrons. Indeed, multiplying this ratio by the four times the fine structure constant (i.e.  $\approx 0.029$ ) gives one *exactly*  $k'$  - the ratio of the electric and gravitational force on two electrons.

$$ratio = 4\alpha \frac{\hbar/(2m_e c)}{(2Gm_e/c^2)} = \frac{\alpha \hbar c}{Gm_e^2} = 4.166 \times 10^{42} = k' \quad (2.6)$$

These are of course the same arrangement of constants as in (2.3). The difference here is that this ratio is now calculated without any references to the electric Coulomb force. It is simply a ratio of the radius of a Kerr singularity of the electron's mass and spin angular momentum to that of Schwarzschild radius for the electron mass  $r_s$ , along with a factor of  $4\alpha$  added in by hand (see the next section).

Things are getting interesting, but we're not there yet. What we have is a ring that measures  $1.4 \times 10^{44}$  times the size of an un-spinning black hole the mass of an electron. The next question is how do two of these rings a distance  $r$  apart interact strongly?

## 2.5 Gravitational Waves as carriers

If one imagines the ring singularity is cut into  $1.4 \times 10^{44}$  pieces each of size  $r_s$  and each piece interacts with the nearby electron with a 'gravitationally sized' force on each section of  $\alpha Gm_e^2/r^2$ , perhaps one can create electromagnetic strength forces from entirely gravitational means.  $4\alpha$  then is perhaps some scale factor/antenna cross section of 'order 1' (well 0.029).

How can a single section of the ring with a tiny mass of  $10^{-44}m_e$  and length  $r_s$  interact so strongly? The answer must lie in gravitational wave interaction. That's all I really have since the point of this book is to build

physics with nothing but General Relativity. It seems that the properties of a singularity are such that it should interact very well[38] with gravitational waves. A gravitational wave effect could thus be strong enough to provide a net force of  $\alpha G m_e^2 / r^2$  per segment, with super radiance and absorption taken into account. For comparison, an astrophysical black hole of radius  $r_s$  can emit or absorb a significant ( 10%!) of its energy given the right gravitational wave parameters.[12].

Each section would need to be interacting with gravitational waves of a fantastic frequency - the wavelength would have to match the Schwarzschild radius ( $r_s$ ) of the electron. This is of course a frequency well beyond that usually conceived in accepted quantum physics - but remember - I am trying to also emerge quantum mechanics from General Relativity, so I'm asking you to sit on this 'annoyance' for a while (until chapter 5. In for a penny and all that.

The amplitude of the gravitational waves at this incredible,  $2 \times 10^{65} Hz$  frequency is tiny, much too small to cause measurable 'gravitational' effects - we would only see the force of one electron on another as they exchange gravitational wave energy. These waves are of many orders of magnitude smaller in amplitude than those measured by LIGO, for example.

Once we have individual segments interacting with a the right force we have recreated the Coulomb force, or at least a rough mechanism as to how it would work. Another way of thinking of it is to look at the overall energy balance - the waves configuration of two electrons will drop in energy as the two electrons move further apart from each other. Cetto[16] outlines a physical description of QED, one that uses a more physical model of QED.

An electron model based on a Kerr ring has some references in the literature - see for example Burinski[13]. The more general model of an electron as a ring of some sort (or a particle on a ring) of Compton radius is discussed mostly in respect to the zitterbewegung motion from the Dirac equation. See Hestenes[28], Maddox[34], and Barut[7].

## 2.6 Electromagnetism - non Coulomb interactions

Essentially, electromagnetic waves - photons are constructed as modulations of these fundamental gravitational waves - the gravitational waves are carrier waves. In this model, spin 1 is simply a result of moving a charge up and down.

If you think you know that spin 1 photons can't be built with spin - 2 gravitational waves, I have news for you. Here, for instance is someone[42] building spin 1 from a scalar (pressure wave) acoustic field. Basically, you get spin 1 by taking a source exchanging energy and wiggling it up and down. Another source/receptor will see the other source and vibrate up and down in the same direction.

The idea is to use this fundamental energy exchange via gravitational waves as a carrier wave for electromagnetic waves. An EM wave is thus composed of trillions of trillions of gravitational carriers - underneath it, so to speak.

I am going to need to expand this, get some drawings going, etc.  
 Lorentz + Coloumb == EM.

## 2.7 Calculating $\alpha$

The hypothesis that these ultra high gravitational waves

## 2.8 Discussion

While there are of course other more pedestrian explanations, this ratio result is exact - it is not approximate numerology.

The interpretation section above postulated gravitational wave interactions between Kerr solutions with electron mass and angular momentum parameters as a mechanism to start to build electromagnetism from general relativity. Irrespective of any validity to those guesses it's *still* a mystery as to why the scale of the Coulomb force to the gravitational force is identical with the radius of the Kerr ring singularity to the much smaller Schwarzschild radius of an electron mass.

Indeed, this Kerr - Coulomb ratio is interesting in its own right, even if a direct physical interpretation is not imagined. Wheeler's Geometrodynamics [50] seeks an already unified picture, but Wheeler in no way hypothesizes that EM can emerge from gravitation.

# 3

## Physics Today

*“You guys need more money. You struck the worlds worst licening deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube*[21]

### 3.1 This chapter

Hello



## 4

# Monopole Gravitational Waves

*“You guys need more money. You struck the worlds worst licening deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube*[21]

### 4.1 Monopole Waves

Monopole Waves are waves that emanate spherically from a source. Due to symmetry, they can really only be pressure, also known as longitudinal waves. The typical example is a spherical speaker (who has spherical speakers?) turned on. The sound (sound is a pressure wave) goes in all directions and each wave crest forms a spherical pattern, moving away from the speaker at the speed of sound.

### 4.2 They Can’t Exist

One of the most famous theorems of General Relativity is Birkoff’s Theorem[11]. It’s clear, the gravitational field outside a spherical mass is always exactly the static Schwarschild field. So with that big word static in there, it seems there cannot be and monopole gravitational waves. Case closed.

One can, however, make (an almost trivial) ‘dragged along’ monopole gravitational wave by imagining a typical supernova explosion, with an (unlucky) observation spacecraft orbiting around it. The basics are depicted in figure (4.2.1) In a supernova a large amount of energy is emitted as neutrinos as the first step, about 1/1000 of a solar mass worth of energy. The spaceship has no decent neutrino detector on board, but can of course observe its own motion accurately. It will notice the central mass drop. This wave (not self supported), is a monopole  $p$  – wave, it’s spherically symmetric, and

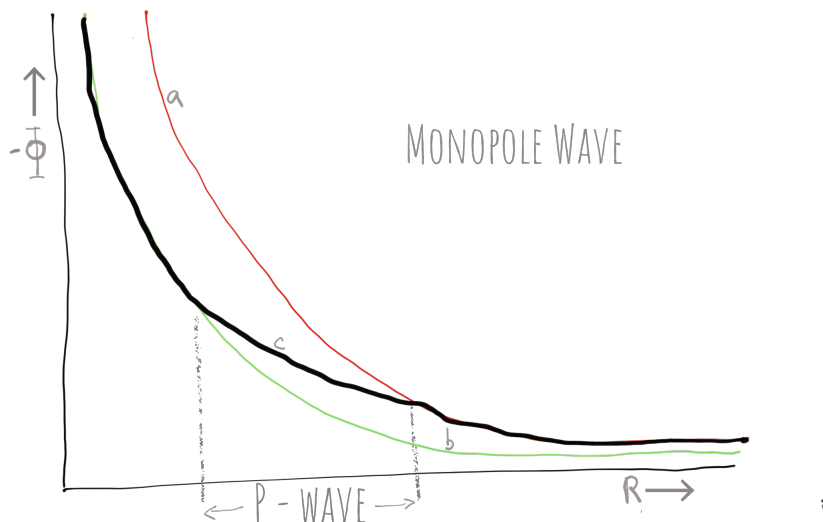


Figure 4.1: Monopole Wave: Birkhoff's theorem holds even for a dynamic situation as, for instance discussed in the text. The left axis is the negative of the gravitational potential, bottom axis is radius. Curve  $a$  is for a large mass,  $b$  for a small mass, and  $c$  for the actual physics. The region shown by the label  $P - Wave$  is the location of the moving monopole gravitational wave.

will bend a ring of beads in manner so as to allow the extraction of energy (Feynman's criteria).

#### 4.2.1 Vacuum solution

Another example of this phenomenon is looking at a typical LIGO[17] like this using the vacuum Einstein Equations. In that case 5%, or 3 solar masses of energy passed by our unlucky satellite. It's interesting to think about this monopole wave as a necessary part of even the vacuum field equations. In linearized General Relativity there is no accompanying monopole 'depression' under a wave packet, leading to the common belief that the gravitational field contains no energy. It's more than a belief though, as the vacuum Einstein equations have no term for the self field energy. It may be that the Einstein theory of General Relativity is missing something![8]. See chapter 6 - where I look at this in depth.



## 4.3 Energy argument for their existence

### 4.3.1 Velocity of Monopole Waves

Like  $10 \times 10^4 c$

## 4.4 With Einsteins

## 4.5 Assuming Chapter 6 Works

refer heavily back to chapter 6. Maybe quote some stuff on other theories of gravity having monopole

## 4.6 Experimental Findings

Faster than light collapse

## 4.7 Quantum Mechanics from General Relativity

my theory

## 4.8 Dark matter is quantum mechanics

Model is laid out



## 5

# Quantum Mechanics

*“You guys need more money. You struck the worlds worst licening deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube[21]*

### 5.1 Madelung 1927

While quantum mechanics was becoming the buzz in physics, Madelung[23] tried to break the field open into the direction it should have gone (and yes that is my opinion). 1927:

It is shown that the Schrödinger equation for one-electron problems can be transformed into the form of hydrodynamical equations.

His observation was that one can take the Schrödinger equation and pull it apart into two equations involving real phenomena, without the pesky  $i \equiv \sqrt{-1}$  that causes undergrads all that trouble.

Turns out  $i$  is often concered with drag or honey, etc. So hydrodynamics drops right out of quantum mechanics, if you let it.

We all know the outcome of that, Madelung was footnoted away, and complex algebra in quantum mechanics became so ingrained in the mind of the standard model physicist that now they are saying it's required![6] No, American Physical Society  $i$  is not required.[37]. If you want a simpleton explanation (i.e. by me) you can have a look at the American Physical Society paper and see if the hydrodynamic formulation is mentioned. It's not. The American Physical Society paper does have this 'get out of jail free' scentence in it, though:

As Renou and his co-workers point out, these results would not be applicable to alternative formulations of quantum me-

chanics, such as Bohmian mechanics, which are based on different postulates. Therefore, these results could stimulate attempts to go beyond the standard formalism of quantum mechanics, which, despite great successes in predicting experimental results, is often considered inadequate from an interpretative point of view

Ok - so maybe I'm being a little harsh on them. After all it's a great segue.

## 5.2 Emergent Quantum Mechanics

Everything, according to this thesis, is emergent, so then must be quantum mechanics. There is even an honest to goodness entire (ok small) research community publishing papers like [43],[26],[1],[48], [22], [5] etc.

These emergent quantum theories all say (including mine) that there is some underlying process or commonly a field from which quantum effects emerge.

### 5.2.1 Hydrodynamic Quantum Analogs

One of the most inspiring discoveries in theories of quantum mechanics has been the development of Hydrodynamic Quantum Analogs, which is tech speak for little drops of silicon oil that 'self float' above a vibrating little bathtub (watch the videos if you don't believe me). Couder and Fort [24] are the acknowledged pioneers of this macroscopic quantum emulation in a petri dish business. (Although I remember being at Dinty's coffee in 1986 and vibrating styro coffee cups, watching the little balls of coffee running around on top of the coffee and thinking - 'thats a great model for particle physics'.) Here are a couple of fun movies to watch - [4], [45]

These videos, are 'actually good'[44] as this comment attests:

Dude, I have a PhD in quantum information theory, and I've never heard of these droplets. This analogy is absolutely beautiful.

Please read this Physics Today<sup>TM</sup> article by Bush and team.[15]. A bit of a teaser are these great images, in figure 5.2.1.

### 5.2.2 The de Broglie Bohm Model

Perhaps the most famous theory of quantum mechanics that comes to mind when one thinks about emergence, is the de Broglie - Bohm theory. From my point of view, de Broglie's theory is more in line with emergent QM,

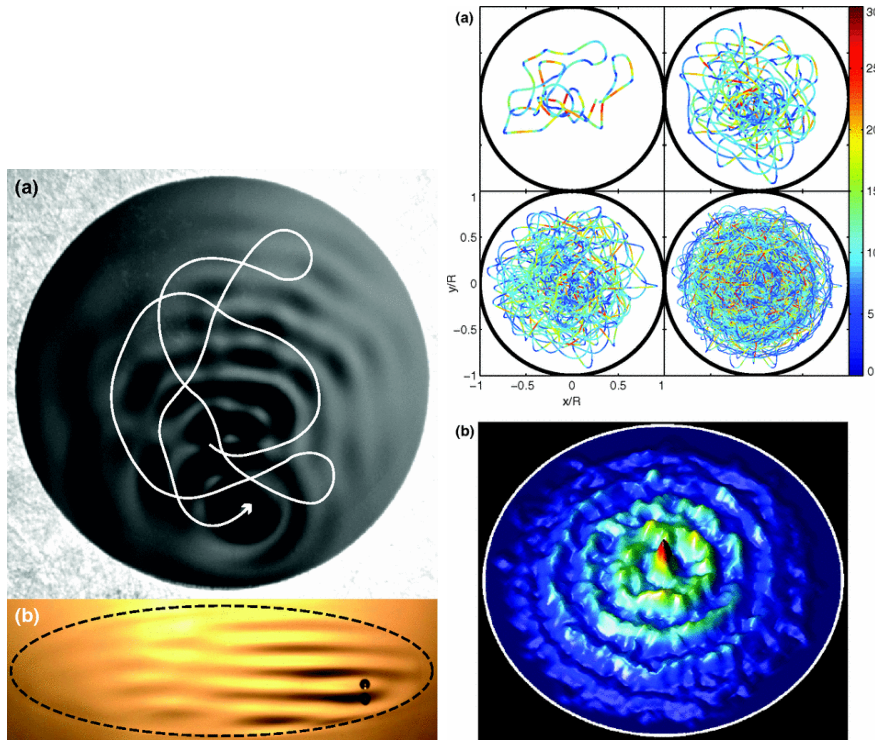


Figure 5.1: Walker: Bush, continuing and expanding on by earlier experiments by Couder, has shown just how a millimetre sized droplet on a vibrating bath can emulate a analogous quantum mechanical system. From[27] Used with permission

while Bohm showed the world that quantum mechanics can be built with particle positions and waves.

As J.S. Bell put it [9]:

Why is the pilot wave picture ignored in text books? Should it not be taught, not as the only way, but as an antidote to the prevailing complacency? To show that vagueness, subjectivity, and indeterminism, are not forced on us by experimental facts, but by deliberate theoretical choice?

About the only thing I have against the pilot wave theory of Bohm is that it's *too good* - it has predictions identical to that of quantum mechanics - it *is* quantum mechanics, after all. The wave function of Bohm is also just as multidimensional as all the Hilbert spaces out there, which also is a little sus.

### 5.2.3 Other models

Of course no one really thinks that quantum mechanics is powered by  $10^{-19}m$  drops running around on some 2D oil bath. Although certain people have nonetheless tried to argue on that basis. Shame on them (not the reporter - the scientists, lol).[51]

So typically, and with a generous oversimplification by me, one posits a scalar field which is quite classical (remember, we are building quantum mechanics here, so it would be a little circular to start with a quantum scalar field). Adler[2] is a pioneer, and Grössing is a person I admired for his attitude, leadership and organizational skills (great EmQM conferences in the mid 2010s)[26].

de la Peña and Cetto, being non typical, have worked on a theory of emergent quantum mechanics from electromagnetism - and it's pretty nice, too.[19].

The main purpose of this book is to show that such alternative exists, and that it is tightly linked to the stochastic zero-point radiation field. This is a fluctuating field, solution of the classical Maxwell equations, yet by having a nonzero mean energy at zero temperature it is foreign to classical physics. The fundamental hypothesis of the theory here developed is that any material system is an open system permanently shaken by this field; the ensuing interaction turns out to be ultimately responsible for quantization. In other words, rather than being an intrinsic property of matter and the (photonic) radiation field, quantization emerges from a deeper stochastic process.

Me, being bat crap crazy, have worked on a theory of emergent quantum mechanics from General Relativity - and it's pretty weird, too.[5].

## 5.3 Experimental Findings

What do we know about quantum mechanics?

1. Quantum mechanics has faster than light parts.
2. The normal stuff that they teach in uni

I put item 1 in there just to get proper standard model physicists upset. But I really believe it - from an experimental viewpoint, quantum mechanics is 'non local'. The Nobel Committee agrees[3] (well they did in 2022). Here is what Maudlin has to say about it[36]:

I retrace the history and logical structure of these arguments in order to clarify the proper conclusion, namely that any world that displays violations of Bell's inequality for experiments done far from one another must be non--local. Since the world we happen to live in displays such violations, actual physics is non--local.

Since Tim Maudlin is a philosopher, physicists can and do ignore him, or try and bury him[49], but he does fight back[47].

For me, non-locality is an imprecise description of what is going on. In the sense discussed here 'non local' means 'faster than light' - not acausal. Many physicists hold that these are equivalent ideas, because any faster than light effect can be looked at in a frame that violates causality, but as Sabine Hossenfelder[41], 'Dialect'(who is that?)[20] and this fine gentleman, Lukas Rafaj (reluctantly)[40] point out, there is no proof that Einstein's philosophical 'the way it is' approach to special relativity is any better than the Lorentz physical contraction theory viewpoint. **There may be a grand rest frame.** Special Relativity does not rule it out. It 'merely' says that we can't use light beams, rocket ships and rulers to find it.

*A bit long winded, maybe?*

## 5.4 Quantum Mechanics from General Relativity

Finally, I will spill the beans on what I think is happening with quantum mechanics.

### 5.4.1 Some sort of Emergent Quantum Mechanics holds

I'll start by saying that I think that one of the extant models of emergent quantum mechanics as outlined in section 5.2 above is approximately right, and quantum mechanics is riding on top of some sort of field. I'm here to sell you on General Relativity being this field.

### 5.4.2 General Relativity has an ability to send signals faster than light.

What?

Did you not read chapter 4? I tried to show that General Relativity, if one counts energy in a reasonable manner, seems to allow for the possibility of a faster than light pressure wave which has a speed of  $\approx \sqrt{r/m}$  (relative to the master 'Cosmic Microwave Background' frame. This pressure wave is distinct from all the light speed stuff we know, which includes:

- Light (duh).
- Gravitational waves.
- Matter.
- Other stuff I have likely forgot about.

Matter is on the list as experimentally, it follows the Lorentz transformations. Basically all the stuff we know and love is made of transverse waves. Well except for the quantum mechanics stuff that seems to be in charge when it comes to the rules of the game.

### 5.4.3 Experimental Physicsts

Us simple minded folk[30] like to think of the effects of quantum mechanics in the real world most often as just de Broglie wavelength effects. So while the theory people live a more Hilbert like lifestyle, us(? am i still one?) experimenters are still dealing with waves and particles, like Issac Newton and Thomas Young.

So I'm going to concentrate on that bit of quantum mechanics, the source of these de Broglie waves.

### 5.4.4 The de Broglie - Compton wave

- —frequency - compton see 8
- —de Broglie effect - well known.

## 5.5 Dark matter is quantum mechanics

Model is laid out



## 6

# Energy In General Relativity

*“You guys need more money. You struck the worlds worst licening deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube*[21]

## 6.1 This chapter

It may be that the Einstein theory of General Relativity is missing something![8].

## 6.2 Kutchetera

Tom views this paper as a plea for solving the gravitational energy problem - that if one takes a energy  $M$ , and converts it to a gas of photons that the energy doubles (density term the same in  $T$ , pressure terms now exist!). This bothered Landau, etc...

I will first look at Kutschera (2003)[33], *Monopole gravitational waves from relativistic fireballs driving gamma-ray bursts*

Kutschera studies the impact of this pressure - density formulation in General Relativity. He uses the Einstein Equations as given, and then comes up with ‘

The gain of a significant amount of active gravitational mass during the formation period is a direct consequence of Whittaker’s formula. It is the pressure-generated contribution that grows rapidly and eventually levels off. The other contribution to the gravitational mass is provided by the total energy of the fireball, which, as a conserved quantity, remains unchanged. Before the formation of the fireball this energy is included in the progenitor mass. **Hence the gravitational mass of the fireball, composed equally of energy density and pressure**

**contributions, is not a conserved quantity.** This has profound consequences as it implies emission of monopole gravitational waves.

(I added the bolding of one sentence).

So he finds massive amounts of mass created when matter turns into a non equilibrium gas...a strange consequence of the Einstein equations.

On a more general level, people have studied this problem. There is no easy solution. One would like a covariant gravitational energy tensor to be able to bolt onto the Einstein equations, and fix all this, but Einstein, Landau, Wheeler, etc have looked. It seems it cannot be done. [8].

# 7

## Quantum Gravity

*“You guys need more money. You struck the worlds worst licening deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube*[21]

### 7.1 It’s Simple

Well - honestly it is! Since in chapter 5 and the thesis of the work, we posit that everything is built of gravity, we gravity can’t be in a superposition. Particles can’t either, and we have a Bohmian trajectory like solution....

Take a double slit experiment. You *can*, in theory use gravity to tell which slit the particle went through, and also see a perfect interference pattern.

This results in specific experimental predictions:

Put poster in here...



## 8

# The Electron Model

*“You guys need more money. You struck the worlds worst licening deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube*[21]

### 8.1 This chapter

Hello



## 9

# Thanks

*“You guys need more money. You struck the worlds worst licening deal.”*

– Eric Weinstein talking to Brian Keating, *Youtube*[21]

### 9.1 This chapter

Hello





# Bibliography

- [1] D Acosta et al. “EMERGENT QUANTUM MECHANICS AS A CLASSICAL, IRREVERSIBLE THERMODYNAMICS”. In: (2012). arXiv: 1206.4941v2. (Visited on 10/30/2016).
- [2] Stephen L. Adler. *Quantum Theory as an Emergent Phenomenon: The Statistical Mechanics of Matrix Models as the Precursor of Quantum Field Theory*. Cambridge: Cambridge University Press, 2004. ISBN: 978-0-521-83194-9. DOI: 10 . 1017 / CB09780511535277. (Visited on 10/26/2024).
- [3] *All Nobel Prizes 2022*. <https://www.nobelprize.org/all-nobel-prizes-2022/>. (Visited on 10/26/2024).
- [4] American Physical Society. *Faraday Instability in Floating Drops* <https://www.youtube.com/watch?v=> Youtube, Nov. 2014. (Visited on 10/26/2024).
- [5] Thomas C Andersen. “Can a Sub-Quantum Medium Be Provided by General Relativity?” In: *Journal of Physics: Conference Series* 701.1 (Mar. 2016), p. 012023. ISSN: 1742-6588. DOI: 10 . 1088 / 1742 - 6596 / 701 / 1 / 012023. (Visited on 05/20/2016).
- [6] Alessio Avella. “Quantum Mechanics Must Be Complex”. In: *Physics* 15 (Jan. 2022), p. 7. DOI: 10 . 1103 / PhysRevLett . 128 . 040402. (Visited on 10/26/2024).
- [7] A. O. Barut and Nino Zanghi. “Classical Model of the Dirac Electron”. In: *Physical Review Letters* 52.23 (1984), pp. 2009–2012. ISSN: 00319007. DOI: 10 . 1103 / PhysRevLett . 52 . 2009.
- [8] Yu V. Baryshev. *Energy-Momentum of the Gravitational Field: Crucial Point for Gravitation Physics and Cosmology*. Sept. 2008. DOI: 10 . 48550 / arXiv . 0809 . 2323. arXiv: 0809 . 2323. (Visited on 10/07/2024).
- [9] J. S. Bell. “On the Impossible Pilot Wave”. In: *Foundations of Physics* 12.10 (1982), pp. 989–992. ISSN: 00218707. DOI: 10 . 1016 / 0021 - 8707 (60) 90029 - 0.

- [10] Reinhold A. Bertlmann and Anton Zeilinger. *Quantum [Un]Speakables: From Bell to Quantum Information*. Berlin, Heidelberg: Springer, 2002. ISBN: 978-3-642-07664-0 978-3-662-05032-3. DOI: 10.1007/978-3-662-05032-3. (Visited on 10/18/2024).
- [11] G. D. Birkhoff. *Relativity and Modern Physics*. Harvard University Press, Cambridge, Massachusetts, 1923.
- [12] Richard Brito, Vitor Cardoso, and Paolo Pani. *Superradiance*. Vol. 906. Cham: Springer International Publishing, Jan. 2015. ISBN: 978-3-319-18999-4. DOI: 10.1007/978-3-319-19000-6. arXiv: 1501.06570. (Visited on 10/03/2015).
- [13] A. Burinskii. “Gravity beyond Quantum Theory: Electron as a Closed Heterotic String”. In: *Physics of Particles and Nuclei* 43.5 (2012), pp. 697–699. ISSN: 10637796 15318559. DOI: 10.1134/S1063779612050085. arXiv: 1109.3872v1.
- [14] A. Burinskii. “The Dirac-Kerr-Newman Electron”. In: *Gravitation and Cosmology* 14.2 (2008), pp. 109–122. ISSN: 0202-2893. DOI: 10.1134/s0202289308020011.
- [15] John W. M. Bush. “The New Wave of Pilot-Wave Theory”. In: *Physics Today* 68.8 (Aug. 2015), pp. 47–53. ISSN: 0031-9228. DOI: 10.1063/PT.3.2882. (Visited on 08/06/2015).
- [16] Ana María Cetto, Luis de la Peña, and Andrea Valdés-Hernández. “Atomic Radiative Corrections without QED: Role of the Zero-Point Field”. In: (Jan. 2013). arXiv: 1301.6200. (Visited on 09/13/2015).
- [17] The LIGO Scientific Collaboration et al. *GW150914: First Results from the Search for Binary Black Hole Coalescence with Advanced LIGO*. Apr. 2016. DOI: 10.48550/arXiv.1602.03839. arXiv: 1602.03839. (Visited on 10/26/2024).
- [18] Oliver Consa. “Something Is Wrong in the State of QED”. In: 6 (Oct. 2021). arXiv: 2110.02078.
- [19] Luis de la Peña, Ana María Cetto, and Andrea Valdés Hernández. *The Emerging Quantum*. 2015. ISBN: 978-3-319-07892-2. DOI: 10.1007/978-3-319-07893-9.
- [20] Dialect. *What Time Dilation ACTUALLY Is In Relativity (Hint: It Has Nothing to Do with Time)*. Aug. 2023. (Visited on 10/26/2024).
- [21] Dr Brian Keating. *Eric Weinstein: Theoretical Physics Is the Intellectual Equivalent of Seal Team 6!* May 2020. (Visited on 10/14/2024).
- [22] Matthew Durey, Paul A. Milewski, and John W. M. Bush. “Dynamics, Emergent Statistics, and the Mean-Pilot-Wave Potential of Walking Droplets”. In: *Chaos* 28.9 (2018), pp. 1–18. ISSN: 10541500. DOI: 10.1063/1.5030639.

- [23] E. Madelung. “Quantum Theory in Hydrodynamical Form”. In: *Zeit. f. Phys* 40 (1927). (Visited on 10/16/2016).
- [24] Antonin Eddi et al. “Information Stored in Faraday Waves: The Origin of a Path Memory”. In: *Journal of Fluid Mechanics* 674 (May 2011), pp. 433–463. ISSN: 1469-7645, 0022-1120. DOI: 10.1017/S0022112011000176. (Visited on 10/06/2023).
- [25] Richard P. Feynman. *QED: The Strange Theory of Light and Matter*. Princeton University Press, 1985. (Visited on 10/03/2015).
- [26] G Grössing et al. “The Quantum as an Emergent System”. In: *Journal of Physics: Conference Series* 361 (May 2012), p. 012008. ISSN: 1742-6596. DOI: 10.1088/1742-6596/361/1/012008. arXiv: 1205.3393. (Visited on 06/14/2015).
- [27] Daniel M. Harris et al. “Wavelike Statistics from Pilot-Wave Dynamics in a Circular Corral”. In: *Physical Review E* 88.1 (July 2013), p. 011001. DOI: 10.1103/PhysRevE.88.011001. (Visited on 10/26/2024).
- [28] David Hestenes. “The Zitterbewegung Interpretation of Quantum Mechanics”. In: *Foundations of Physics* 20.10 (1990), pp. 1213–1232. ISSN: 00159018. DOI: 10.1007/BF01889466.
- [29] Sabine Hossenfelder. *Lost in Math: How Beauty Leads Physics Astray*. Hachette UK, 2018.
- [30] Institute for Advanced Study. *Spacetime and Quantum Mechanics; Particles and ”Strings”; Polytopes, Binary... - Nima Arkani-Hamed*. Oct. 2021. (Visited on 10/26/2024).
- [31] Brian W Kernighan and Dennis M Ritchie. “The C Programming Language”. In: (2002).
- [32] Roy P. Kerr. “Gravitational Field of a Spinning Mass as an Example of Algebraically Special Metrics”. In: *Physical Review Letters* 11.5 (Sept. 1963), pp. 237–238. DOI: 10.1103/PhysRevLett.11.237. (Visited on 10/20/2024).
- [33] M. Kutschera. “Monopole Gravitational Waves from Relativistic Fireballs Driving Gamma-Ray Bursts”. In: *Monthly Notices of the Royal Astronomical Society* 345.1 (Oct. 2003), pp. L1–L5. ISSN: 00358711. DOI: 10.1046/j.1365-8711.2003.07045.x. arXiv: astro-ph/0309448. (Visited on 10/18/2015).
- [34] John Maddox. “Where Zitterbewegungen May Lead”. In: *Nature* 325 (1987), p. 385.
- [35] C Marletto and V Vedral. “Gravitationally-Induced Entanglement between Two Massive Particles Is Sufficient Evidence of Quantum Effects in Gravity”. In: *Phys. Rev. Lett.* 119.24 (Dec. 2017), p. 240402. DOI: 10.1103/PhysRevLett.119.240402.

- [36] Tim Maudlin. *What Bell Did*. Tech. rep.
- [37] Matthew McKague, Michele Mosca, and Nicolas Gisin. *Simulating Quantum Systems Using Real Hilbert Spaces*. Oct. 2008. DOI: 10 . 48550/arXiv.0810.1923. arXiv: 0810.1923. (Visited on 10/26/2024).
- [38] Takashi Nakamura, Masaru Shibata, and Kenichi Nakao. “Naked Singularity Dries Up ?” In: 89.4 (1993), pp. 821–831.
- [39] E. T. Newman and A. I. Janis. “Note on the Kerr Spinning-Particle Metric”. In: *Journal of Mathematical Physics* 6.6 (June 1965), pp. 915–917. ISSN: 0022-2488. DOI: 10.1063/1.1704350. (Visited on 10/20/2024).
- [40] Physics - problems and solutions. *Is One Way Speed of Light Problem For Special Relativity???* Dec. 2023. (Visited on 10/26/2024).
- [41] Sabine Hossenfelder. *I Think Faster Than Light Travel Is Possible. Here’s Why*. Apr. 2023. (Visited on 10/26/2024).
- [42] Chengzhi Shi et al. “Observation of Acoustic Spin”. In: *National Science Review* 6.4 (July 2019), pp. 707–712. ISSN: 2095-5138. DOI: 10.1093/nsr/nwz059. (Visited on 10/20/2024).
- [43] Gerard ’t Hooft et al. “Emergent Quantum Mechanics and Emergent Symmetries”. In: *AIP Conference Proceedings*. Vol. 957. AIP, July 2007, pp. 154–163. DOI: 10 . 1063 / 1 . 2823751. arXiv: 0707 . 4568. (Visited on 03/20/2016).
- [44] The Onion. *YouTube Contest Challenges Users To Make A ‘Good’ Video*. Nov. 2008. (Visited on 10/26/2024).
- [45] Veritasium. *Is This What Quantum Mechanics Looks Like?* <https://www.youtube.com/watch?v=U2Xo3419180> Nov. 2016. (Visited on 10/26/2024).
- [46] Matt Visser. “The Kerr Spacetime: A Brief Introduction”. In: *arXiv:0706.0622* (2008). arXiv: 0706.0622. (Visited on 04/01/2017).
- [47] Tim W Maudlin. “Reply to Comment on ‘What Bell Did’”. In: *Journal of Physics A: Mathematical and Theoretical* 47.42 (2014), pp. 1–5. ISSN: 17518121. DOI: 10.1088/1751-8113/47/42/424012.
- [48] Jan Walleczek et al. “Emergent Quantum Mechanics: David Bohm Centennial Perspectives”. In: *Entropy* 21.2 (Feb. 2019). ISSN: 10994300. DOI: 10.3390/e21020113.
- [49] Reinhard F. Werner. “Comment on ‘What Bell Did’”. In: *Journal of Physics A: Mathematical and Theoretical* 47.42 (2014), pp. 1–8. ISSN: 17518121. DOI: 10.1088/1751-8113/47/42/424011.
- [50] John A. Wheeler. “On the Nature of Quantum Geometrodynamics”. In: *ANNALS OF PHYSICS* 2 (1957), pp. 604–614.

- [51] Natalie Wolchover. *Famous Experiment Dooms Alternative to Quantum Weirdness*. <https://www.quantamagazine.org/famous-experiment-dooms-pilot-wave-alternative-to-quantum-weirdness-20181011/>. Oct. 2018. (Visited on 10/26/2024).