

ZULF'S JANUARY 30 2022 RUMINATIONS OF MATHEMATICAL UNDERSTANDING PAST RIGOUR

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I am deeply interested in the *substance* of Mathematics, and at first this seems to be a well-trodden ground that is boring. I will attempt to convince my dear reader that this is not so. I have been doing mathematics for quite a long time. From roughly seven or eight, around 42 years. I am not a professional mathematician at the moment, but I have need of deeper understanding of Mathematics and am raising my skill level these days doing Stanford Analysis Ph.D. Qual problems. Slowly my mathematical education and instincts are returning from my undergraduate years 1991-1995.

What I mean by substance of Mathematics is that Mathematics is, contrary to some remarkably dull and erroneous views, not a formal game of any sort. It is true that there are formal aspects to it, but it is not a formal game. The formality is superficial. What is always sought is substance in Mathematics.

For example, a wrong view of engaging with mathematics is that there are some arbitrary axioms and then based on these one tries to prove various theorems. This is horribly wrong. The axiomatisation is simply accounting that is necessary. What is being sought is knowledge of truth about Nature. We live in an Age where the mindset of the world is set regarding Science, about Nature, and about Mathematics in particular ways – whatever ways they are I won't try to give you a synopsis. But if you study philosophy of Science, of Mathematics and history, you can gain some sense of it. It is not infinite but it's complex enough that I won't try to give you a synopsis.

Study of history and philosophy of Mathematics and Science will inform you that over time, the assumptions and outlook and prejudices among laypersons and practitioners have changed and have evolved; there have been some radical changes, some slow changes. What is important to understand is that modern Mathematics and Science is very recent and before 1650 roughly none of it even existed. This is important to understand if you want to understand what I am attempting to get to in this note and what is important about substance in Mathematics.

Mathematical understanding, from my own experience, comes with time and effort and habituation. The various popular stories of how various prodigies were born with Mathematical Consciousness and zipped and zapped all sorts of things are mostly not serious. Even the greatest and most talented mathematicians in history had to put in effort, fail, succeed, and have their good days and bad. The more interesting question is what is it that they are doing, with their lives, with their work?

I think it's fair to say that Mathematicians and Scientists too, especially because Mathematics and Physics were born together and were indistinguishable in eighteenth and early nineteenth centuries are attempting to decipher Nature. That

is not what the orthodox theories are of scientific philosophy and mathematical philosophy. That is what I believe is going on.

If any part of Mathematics seems arbitrary then it is because the people who worked on it failed to do a good job putting things together. Mathematics is neither formal nor arbitrary. The progress in Mathematics has substance and it is terribly difficult to understand what that substance is.

I will tell you a story. I was at Princeton and I was mathematically trained. And I was talking one day to my friend the late Waheed Hussein, who was there and he loved to discuss philosophical issues. He asked me about what the status is of numbers and mentioned Frege. I was totally clueless. For me real numbers, rational numbers, analysis, geometry, topology and other things were just things you did. I had no idea that anyone would spend their time trying to think about whether they are anything else. I had no idea what he was talking about at all. There was nothing more boring than Peano axioms and Dedekind cuts or definition of real numbers as Cauchy sequence classes. To me those are the things you did like plumbing in a luxury Mansion. Who cares about those things. All the real mathematics was in the fascinating theorems that led to deeper understanding of all sorts of things. Did you even see how gorgeous the hyperbolisation of three manifolds is that William Thurston did? Now that's substance, real theorems.

I am not interested still in the sort of question of formal foundations of Mathematics that many people have asked before. In fact nothing has changed in my attitude. I still think that the substance is not hiding behind the foundational formality.

Rather it is better to think of mathematics as knowledge of various sorts of things that we have a lot of trouble reaching. And all our foundations are like ladders and scaffolding to try to reach those things. There are things that *exist in reality* that our clumsy attempts at building foundations barely address. Foundations and axioms are *variable* and they are formalities to reach something that is solid and valuable. That's the substance part of mathematics. Mathematicians are the worst communicators about this. They are so horribly inarticulate that one winces in pain and sympathy just reading their efforts. But they are less inept in knowing instinctively the substance.

You see, there is nothing more drab than thinking that some tome of axiomatic treatment of some parts of Mathematics is substance. That's not the substance of Mathematics at all. Mathematical substance is harder to describe. Axiomatic foundations are just attempts to be organised. It's like saying that the accounting books of a company that makes medicine to prevent life threatening diseases is the substance of the company.

The sad truth is that this elementary truth is not even generally understood.

1. INTELLIGENT EDUCATED PEOPLE DON'T REALLY HAVE ANY IDEA WHAT MATHEMATICIANS DO

The sad truth I have learned from experience is that most intelligent educated people do not have any idea what Mathematicians do. They could be *Medieval Theologians* hidden away in secluded Monasteries for all they know. They don't think Mathematicians do anything useful either. For that you can thank people like Richard Feynman who used his clout in physics to spread the word that Mathematicians don't know what they are doing.

You see, four-sphere theory did not come out of the sort of seat-of-the-pants feeling physicists are supposed to have. It did not come from worry about rigour without care about the natural world either. It came from a balance of scientific philosophy, of scientific experience, and mathematical intuition. It was because mathematical substance was reliable that I gained conviction that four-sphere theory was true and worked on it for a decade in isolation without funding or serious income. I am challenging Quantum Electrodynamics and my challenge is almost sure to succeed. The *substance* of Mathematics is most definitely not formal. The substance is difficult to describe, however, but it is important for all people to understand something about it.

You go on Amazon and look at books. Or Scribd or other places in the internet. You will come across a lot of junk for Mathematics. Serious books are quite expensive \$80-120. This is not exactly a good age for all people to have any particular feeling that Mathematics is something other than theological speculation.

2. THE BALANCE OF RIGOUR AND SUBSTANCE IN MATHEMATICS

Jesper Lützen's *The Foundations of Analysis in the 19th Century* gives us some history of the concept of a function. Both Augustin Louis Cauchy and Jean Baptiste Joseph Fourier had defined functions in general ways but when using it implicitly assumed that it is continuous.

Rigour grew in the nineteenth century because, I would submit, human beings are not exactly built to be precise. By and large all mathematicians work intuitively and rigour grew I think mostly to have some objective discipline. It's just wrong to think that Mathematics is an axiomatic game. All the axiomatization just grew as an aid so that Mathematicians were more careful and explicit, as a counter to the natural intuitive tendencies in human beings that lead to errors. Anyone with experience will know that errors in Mathematics are easy to make and require discipline to contain. That's the purpose of axiomatisation.

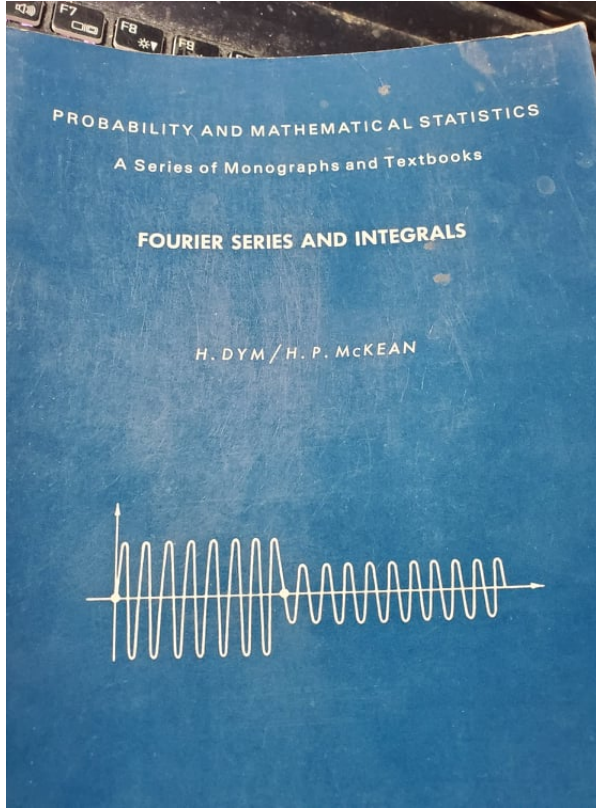
The substance of Mathematics is of course that the world will obey precise mathematical laws so the objects that Mathematicians define are geared towards seeking some solid ground. Maxwell's laws were formulated for vector fields. And I am putting down my laws for spinor fields on a four-sphere. And I fully expect to obey my law, even though the inspiration was mostly based on Mathematical substance.

2.1. Convergence Of Fourier Series. In order to truly appreciate the substance of Fourier series, we have to understand that all things of the world can be described by spherical harmonics of $S^4(R)$. The primordial case is Fourier Series, originally from the bold claim of 1811 of Fourier. There is little question now from my work that zonal harmonics will describe photons and particles exactly. The mathematical analysis of spherical harmonics has a great deal of exact analogy to Fourier sines and cosines. Gustav Ferdinand Mehler worked on Spherical Harmonics Expansions in 1866.

Ah, I just learn that Mehler had used zonal spherical harmonics in electromagnetic theory just now.

3. THE BEAUTIFUL BOOK OF HENRY P. MCKEAN AND H. DYM

I am talking about one of my most beloved books of all time. I have many most beloved books of all times, so that's not exactly a unique moniker.



Now Henry P. McKean is a truly gifted Analyst. His mathematical thought and ideas are so beautiful and his taste so refined that I consider this book as some do the Holy Bible or Qur'an.

You see, nothing more certain has ever been discovered about space and time than that it is just $S^4(R) \times \mathbf{R}$ and nothing but $S^4(R) \times \mathbf{R}$ and for the past trillion years and for trillion years in the future it will not be anything other than $S^4(R) \times \mathbf{R}$.

Today, when Einstein's Relativity Theory and Expansionary Cosmology are still established, this will seem strange, but I am 100% confident that this is the final answer for what spacetime is, can be, and will never be anything else. This, I expect, will be so routine and boring in a century that it will be as clear to all human beings on Earth as sunrise in the East and need for oxygen to live.

This, my dear reader, is one of my great contributions to the world, absolute truth about space-time, invariant for eternity. All parts of four-sphere theory will have crisp understanding in due time, and all of macroscopic Science will be understood with precision and clarity that would have been too difficult for Isaac Newton to have even imagined. This is the legacy of mathematics to a large extent.

Fourier series are the precursors to Four-sphere theory in an obvious way. Quantisation of energy and particle nature of light and wave particle duality are all due to strict four-sphere geometry of absolute space. With precision we will have a

full theory of particles and photons thanks to the precise analysis that have been developed for homogeneous manifolds. Nothing more beautiful or deeper into the heart of Nature has ever been offered in the 350 years of Science as this certain knowledge that I offer to my beloved people the human race.

4. MORE THOUGHTS ON FOUNDATIONS

One of the things that ensures that I will never be a truly great historian of mathematics or of science is precisely that I am a Scientific Revolutionary. I do not have the temperament to produce great works in history of Mathematics. Instead I have an agenda, one that differs from the historians and philosophers and sociologists of Mathematics and Science. I see everything of history in the context where I have been successful, i.e. the context of Four-Sphere Theory. I worked on four-sphere theory and other matters without any income at all between 2008-2018 and there was no significant income in the past four years either and I subsisted on minor disability income from United States Social Security. These were years when my age was 35-49, for most people mature periods of their life's work. And for me it was in relative isolation. And I was met with success in the end, and so I was sure that I had overthrown general relativity, expansionary cosmology and quantum field theory. But there was relative lack of interest from the scientific and mathematical communities.

Only after empirical successes and attempts to regain my life I worked on Medium Frequency Strategies, only to draw attention of the horrid vile evil savage destructive hick illiterate racial murderer, thief, and robber Bill Gates who made it his full-time project to deny me \$620 million that was owed to me from ECB and David E. Shaw that I was planning to use for some extremely important projects in San Francisco.

I decided to do the Stanford Mathematics Ph.D. Quals to regain my footing. I had not been interested seriously in Analysis for most of my life and suddenly realised that there can be no more progress if I do not gain some deeper understanding of Analysis.

I was already older and did not want to stress myself too much and decided that I would forego the pressure and just take a relaxed route. And so this is how I am gaining understanding, by doing various exercises to strengthen my skills and knowledge of Analysis while studying the history of Mathematics.

It is very clear that all of Nature will be described, at least all of Nature above $\delta = 10^{-15}$ cm by my Ahmed-d'Alembert Law, or S4 Electromagnetic Law. As this is a classical wave equation, I thought it best to just slowly build up my Analysis skills and knowledge, with the expectation that with higher level of understanding I will be able to examine the specific requirements of wave equations on spinor fields of a scaled four-sphere. There are various points of views possible of course, but since Analysis is older, from 1650s, I thought it was best to study Analysis for a while.

5. UNIFORM CONVERGENCE

Karl Weierstrass first used uniform convergence for series of analytic functions in a paper of 1841 that was not published until 1896 in his collected works. The mathematical world learned about uniform convergence until his lectures in University of Berlin in 1856. (Jesper Lützen, *The Foundation of Analysis in the 19th*

Century). I remember being quite impressed with the subtlety that convergence of series does not guarantee continuous limits but uniform convergence does when I was an undergraduate.

I am astounded by how recent these things are, really. Augustin Louis Cauchy was still confused in 1823, and so Karl Weierstrass in 1841 was the first man to make clear use of uniform convergence. I recently worked on a problem in Stanford Mathematics Ph.D. Qualls where there was a nice effort to attempt to produce a smooth function with arbitrarily specified derivatives a_n . The function is convergent to a continuous function but surely none of the derivatives converge if a_n are badly behaved. The mathematical substance here, therefore is deep. Intuition about these situations is not normal for human beings without habituation, that's my explanation. These things make mathematical thought quite challenging. Awareness of certain sorts of issues literally had taken the greatest mathematical minds of Europe an entire century to grasp. Of course you will see great tomes of Ivor Grattan-Guinness on search for roots 1870-1940. The truth is that these rigourisation efforts are really efforts at trying to produce some organisation with a hidden hope that with this 'rigorous' setting people will naturally absorb mathematical thought.

But there is no guarantee of this at all. In fact I will be so bold as to claim that no amount of finicky rigorousness will actually be able to produce the result that we truly desire, but do not articulate, that *there exists some sort of procedure that will allow human beings to be able to correctly decipher mathematical truths without error*. I don't think the problem has ever really been addressed seriously at all. What I can assure you from my own experience is that *the answer is not rigour*. Rigour is accounting, form, not substance. I do not know what the right answer is except habituation to repeated examination of the difficulties we have till they disappear.

6. MATHEMATICAL SUBSTANCE IS ESSENTIAL FOR SCIENCE

I want to make this subtle point that some Mathematicians are overly concerned about formalities and axioms and rigour. These are aids to gaining understanding of substance, but the actual substance is not helpful but *totally essential* for Science. The universe does indeed work Mathematically. That was my conviction from before 2008 and the conviction is infinitely deeper now 15 years later. I do think that not just physicists but all scientists need to have sense of mathematical substance for their livelihood.

Now the problem is that substance is not rigour. Rigour at some level is necessary for pragmatic reasons, to be able to have communicability between people who cannot read other people's minds, to have explicit clarity of concepts used, and so on. But it is mathematical substance that allows sense of what is happening in Nature, even in copper and glass and jiggling and teeming particles of gases and other things that physicists claim to have monopolistic understanding. They too need mathematical substance to understand Nature.

Richard Feynman's attitude about Mathematicians as constantly talking about axiomatic mumbo jumbo is not the right story at all. Long years of habituation does give physicists feel and intuition about the right answers but ultimately the mathematical substance is necessary even in physics.

You see, four-sphere theory solves Hilbert's Sixth Problem for most of Science. This is not yet appreciated because those things take time. But Nature does work exactly by mathematical principles. The quantum revolution was itself off the rails pretending that nature will suddenly require a mystical cult claiming special understanding of Nature that is *not Mathematical*. This divergence hurt both mathematics and physics and all sciences. We have a great task of mending the rift permanently.

You see computations of molecular processes in four-sphere theory are just taking place with $L^2(\Gamma\Sigma S^4)$ which is an ordinary Hilbert Space whose mathematical behaviour is similar to that of square integrable functions on the circle. The mathematics for the circle case is understood to extreme depth. The analogous situation for square-integrable spinor fields do not have any arcane mysticism attached to them. They are straightforward extensions of Fourier Series theory. Hilbert's Sixth Problem is just an exercise in Analysis in four-sphere theory and presents no difficulties.

I personally have the conviction that there will never be any natural phenomena that will ever fall outside the range of four-sphere theory for $\delta = 10^{-15}$ cm and Nature for this range will be totally mapped within this theory perfectly.

7. UNIFORM CONTINUITY AND HEINE-BOREL THEOREM

I use the Heine-Borel theorem quite often; I would say it is ingrained in me by now. Closed and bounded subsets of \mathbf{R}^n are compact in the sense that every open cover has a finite subcover. This is related strongly to the theorem of Heine 1872 that every continuous function on a bounded interval is *uniformly continuous*. The distinction between pointwise continuity and uniform continuity was made by Eduard Heine.

Quite recently I proved the compactness of the embedding $H^1[0, 1] \rightarrow L^2[0, 1]$ using a modification of Arzela-Ascoli theorem and the Heine-Borel theorem. These sets of ideas are mathematical substance to give an example. Mathematical substance is still unclear, but it involves understanding what makes certain *natural* and nontrivial features available to us in the mathematical setting. The issue of mathematical substance has always been quite challenging throughout history of mathematics because real numbers are not actually man-made creations. The particular way in which they have been defined and formalised seems arbitrary and formal, but they are substantial things. You see in the eighteenth century, they were considered natural to such an extent that mathematics was guided by physical experimental verification. Now when you do that you obviously are dealing with something that is not formal and artificial. And that is the essential issue, that real numbers are not artificial.

Take the series

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

Never mind how Euler arrived at the formula. This is not artificial at all. These sorts of numbers occur in Nature. That's the deep issue, that even though mathematicians had put together some formal foundations that are axiomatic, the substance is not in the axioms and the formal steps. Those are just for accounting. The substance is in what one discovers about the objects and their properties.

And then the mathematical physics that one produces is expected to be verified in measurements and experiments.

Now you could say, "There is an overwhelming variety of points of view, Zulf, about formality and beliefs about mathematical efficacy in Nature. Why should we take your word for this?" Well it's because I am right, and time and experience will repeatedly show you that mathematical substance is not formal. When you discover something about mathematical properties even of an ideal system, you are examining the substance of Nature. It's possible to work on artificial problems in mathematics, but those are not important. At least in Analysis, these are theorems that have substance and these will represent Nature exactly. It is a marvelous achievement the formalisation of some of the concepts so you do not have to do experiments to find some understanding. But in fact, it's not particularly good unless the representation of external Nature is central to the formalisation. Mathematics is definitely not a formal game.

7.1. Pathological Function Regime 1870-1900. The concepts of measurability ended a period of mathematics between 1870-1900 when mathematicians were constructing continuous nowhere differentiable functions and other bizarre functions. Poincaré was not particular enthusiastic. You see I am also not very keen but I spent some time on the problem of constructing a continuous function that is not Hölder α -continuous anywhere on $[0, 1]$.

Is this substance? It's not deep substance but some. What we are actually interested in is not these but to understand stochastic processes for 'arbitrary functions' on the interval. The Bachelier Process, i.e. the so-called Brownian Motion, named after Robert Brown the botanist who had never constructed the process and never did the hard work that Bachelier did in 1900.

"This motion is named after the botanist Robert Brown, who first described the phenomenon in 1827, while looking through a microscope at pollen of the plant *Clarkia pulchella* immersed in water. In 1905, almost eighty years later, theoretical physicist Albert Einstein published a paper where he modeled the motion of the pollen particles as being moved by individual water molecules, making one of his first major scientific contributions."

I am so outraged by this total lack of regard for Louis Bachelier I do not know how to react. *Everyone who did not do great work on Gaussian homogeneous Markov continuous-time process but Louis Bachelier got it named after them.* Robert Brown was not talking about Gaussian Markov homogeneous processes. He was just talking about some random jiggle juggle he saw in a microscope. How did this even happen? I am just outraged about the mistreatment of Louis Bachelier.

8. WHO IS THIS MISERABLE WRETCH BILL GATES EXACTLY?

This low, vile, illiterate, disgusting, evil, savage and barbaric charlatan named *Bill Gates* has taken upon himself to 'prevent my rise' while I am American with USCIS# 046-077-179 granted in 1997 and the government of this nation has been told that he has used (a) US War Power, (b) European Black Magic forbidden since thirteenth century, (c) White Racial Power and (d) US Industrial Power to invade into my personal and ethnic meta to cause massive destructive harm that includes physical (not subjective psychological but actual physical) pains in my body and degeneration of my health. Stanford University, where I am seeking tenure, has not announced any tenure decision yet and I can here this miserable

wretched disgusting little twit's thoughts nonstop which are usually just intolerably stupid and vile such as 'whites are superior' and other rubbish. I fail to understand how United States Government pretends to be running a civilised nation at all. The charter of the organisation, the US Declaration of Independence and the US Constitution explicitly state that governments' purpose is to secure natural rights of Americans like myself but for whatever inscrutable reasons, the government seems to feel that it does not have to do that when non-white people are murderously assaulted by vile pathological liars and disgusting charlatans who walk around in public with jars of feces pretending to be philanthropists but with ulterior motives of destroying and enslaving non-white peoples at home and abroad. I am recording these and archiving them as the experiences of an immortal genius in America of 2022.

9. MEASURABILITY

Not long ago I made the proposal that measurable spinor fields on a four-sphere ought to be considered the models of matter fields in the universe. I think it most useful to examine the history of mathematics between 1870-1900 to really appreciate the wisdom of my proposal. I have been examining from Christian Bär's work of 1996 [2] the basis of spinor fields of a four-sphere, of sixteen dimensions, and the fact that the Dirac eigenspinors have the form

$$s = \sigma_1 h_1 + \dots + \sigma_{16} h_{16}$$

where σ_j are Killing spinor fields and h_j are spherical harmonics. Our long experience with Fourier series guides our way here and tells us that arbitrary matter fields in the universe ought to be

$$s = \sigma_1 f_1 + \dots + \sigma_{16} f_{16}$$

with Lebesgue measurable real-valued $f_j : S^4(R) \rightarrow \mathbf{R}$. Measurability is the key to producing solid theory of matter fields in physics. We ought to also consider distributions on $S^4(R)$ in analogy with those on the circle \mathbf{T} and extend all results of distributions.

This is example of substance in Mathematics. You see, the fact that Killing spinors 'trivialise' the spinor bundle globally will be extremely significant to physical laws in Nature. This proposal of mine is not frivolous. In a sense all the work that analysts had done between 1870-1900 to refine the foundations of mathematics finally shows its fruits here in this proposal, as all of macroscopic Science reduces to the dynamics of spinor fields by my four-sphere theory. We have here the true fruits of mathematical labour that merges with exact physical science.

In a sense all the analytical work on Fourier series was preparation for this convergence of analysis and physics that is perfect and without troubles. With this merge, there is perfect concordance between the work of mathematicians and physicists in human understanding of Nature. I, Zulfikar Moinuddin Ahmed, believe I was born to provide this clarification regarding Nature to my beloved people the human race before I leave this world. And I will record these carefully and archive them for posterity so that in the thousand years following humanity will have clear understanding of Nature.

10. BILL GATES WHERE DO YOU FIND MISSING GERMAN MIND HERE?

Look Bill Gates, Christian Bär is German. He produced a beautiful paper where Dirac eigenspinors on four-sphere are treated in the best way that I had seen. The paper is here [2]. He provided a purely mathematical paper. I had been using his particular results to produce a *Scientific Theory of Nature* from 2008. He did not propose a scientific theory in his paper.

Where in the world did you get any idea that the German Mind was not involved in my work? The German Mind in this case did a fabulous and beautiful treatment of Dirac eigenspinors on a four-sphere. I am just amazed at idiocy of racial people like Bill Gates who think that German Minds and Indian Minds are producing totally different sort of things. In fact German Mind Gustave Ferdinand Mehler in 1866, another German Mind was doing spherical series expansions long before I was born in the East in November 19 1973. I only discovered this a year ago or less. I was very busy for years on empirical fits because people did not accept my refutation of Expansionary Cosmology and I take credit for an alternative explanation of the redshift phenomena than expansion a la Alexander Friedmann which I have solidly refuted. Here German Mind of Christian Bär did wonderful mathematical work but the English-Scottish mind of Bill Gates produced only trash for five decades.

11. ZULF EXPLAINS WHAT IS WRONG WITH SPECIAL RELATIVITY BRIEFLY

Albert Einstein's Special Theory of Relativity is quite successful and established itself. First of all it is *false* about Nature. It's not true that time dilates in Nature. The context is that after Michelson-Morley experiments of 1880s physics in Europe faced a crisis. Without James Clerk Maxwell's luminiferous aether, there was a gigantic gap in understanding light at all. I handle this by noting that Michelson-Morley only culled aether that is three-dimensional with the assumption that Earth moves through this medium. That's not my aether. In four-sphere theory the medium is four-dimensional perfect sphere, whose surface is the medium. All of existence is then a vibrating membrane. The radius of this homogeneous sphere is eternal and constant, and proportional to $1/h$ where h is Planck constant. Suddenly you see the truth, that the Schroedinger operator with $\hbar^2\Delta$ has the constant appear because we're in sphere of radius $R = 3075.69Mpc$. This is the source of all quantum phenomena. There is no 'flat empty space' in Nature. This was the figment of the Euclidean imagination for several millenia. The cosmological constant $\Lambda = 1.11 \times 10^{-52}m^{-2}$ is just the curvature of absolute space, proportional to h^2 . So there is aether, but it does not behave in the way that Michelson-Morley thought it would behave. It is more subtle.

You see, the four-sphere has four spatial dimensions all of which are electromagnetic. They do not correspond to the three spatial dimensions of our experience. The three spatial dimensions of our experience are *emergent*. Then you can see things clearly. You have an eternal absolute space that is a homogeneous four-sphere $S^4(R)$ and then all of physical world evolves in it, always staying embedded in $S^4(R)$. You can represent this symbolically like:

$$M(t) \rightarrow S^4(R)$$

Time extends to infinite past and future, represented by the real continuum $t \in \mathbf{R}$. That is all there is to geometry of Nature. All movement of three dimensional universe, which I like to call the *physical hypersurface* $M(t)$ is determined by a

single law, the Ahmed-d'Alembert Law, acting on spinor fields of $S^4(R)$. That is absolute space. You can put absolute coordinates on it that are fixed and eternal. But the physical universe will always be moving and not be still. When now you look at Einstein's Gravitational Field Equations, you can ignore what he thought it meant. Instead you will instantly recognise the equation of Ricci curvature of an arbitrary three dimensional hypersurface of a four-sphere once you remove the annoying mixing of time and space that he did.

How did it happen that until I produced my four-sphere theory all of humanity did not know the truth of how Nature worked? Well, you see a lot of things were simply not known in 1900-1940 period. Einstein put in the cosmological constant by gravitational reasoning. But as you know from my work, there is no mass-based long range force in Nature. Gravity, you see, is just aggregation of Van der Waals forces between electrically neutral particles. So I had to work hard to straighten out all the confusions established today and get the right answer with a lot of labour.

With four-sphere theory there is a theoretical physics that will be true for eternity. That's my contribution to my beloved people the human race. Now some will say this is 'classical'. It's Zulfikar Moinuddin Ahmed's work and my lifetime is 1973-2022 so far. If you think this is a classical lifetime, that's your headache. No one in nineteenth century produced four-sphere theory, so it's not classical in that sense. It is a deterministic infinite time field theory in a sense. But those terminology does not matter. What matters is that this is absolute truth.

So why did Albert Einstein go wrong? He really could not do much else. He had to stand on Maxwell's Equations as truth, and they were for \mathbf{R}^3 and he did not have reason not to do that. I am from a different school, a mathematical school, than Einstein. For me, quantisation of energy and localisation were immediately indicative of compact geometry of absolute space, from 2008. So I did not stand on Maxwell. Time had passed and I knew evidence of four spatial dimensions quickly and I had available $\Lambda > 0$ which I don't think Einstein lived to know. Einstein died in 1955 (and the world was unfortunate to allow birth of Bill Gates that year). Hermann Weyl too died in 1955. They even missed Bohm-Aharonov reality of electromagnetic potential in 1959. So I was more fortunate than them.

12. MATHEMATIZATION OF NATURE

The extant major established scientific theories of this age, relativity and quantum field theory and expansionary cosmologies are what I call *the 1900-1930 Paradigm*. These do have some mathematical elements but I believe that time will show that my four-sphere theory will provide a far more exact mathematical description of Nature that is *far more accurate* and *infinitely superior as scientific theory* than the 1900-1930 paradigm established theories. This is one of the major contributions of my life and so I am extremely diligent about studying the history of mathematics and natural philosophy over the past 350 years in order to understand more clearly the achievements and errors of our precursors.

It had become a conviction of mine that the major blunder made by physics and the other sciences as well is to misunderstand the role of mathematics in their work. Nature is governed by *yet imperfectly understood mathematical laws*. I have claimed that the fundamental and central law of nature is my Ahmed-d'Alembert Law, and this will be the foundations of an accurate and coherent Science for millions of years of future of humanity.

13. EXAMINATION OF ACTION-AT-A-DISTANCE

With the successes of four-sphere theory, I will immediately propose a thorough examination of concepts of *forces* in Nature. I will ask all Mathematicians and Physicists to collaborate on an accurate Mathematical theory of forces that are adequate for perfect representation of Nature. We have today an opportunity to fully mathematize all aspects of Nature, and it would be foolish to pass this opportunity. Measurable spinor fields on four-sphere of radius $R = 3075.69 Mpc$ will, I will claim, be the final objects constituting all of Nature. We need perfection in our notions of electromagnetic *force* that has exact capability of representing nature *without any exception possible*.

We are grateful to Charles Augustin de Coulomb (1736-1806) for a very good start. His Coulomb's law was good. In four-sphere theory we have sharpened the Coulomb potential to

$$\frac{1}{|\sin(|x|/R)|}$$

and we claim this is the true electromagnetic potential that was not known to history. Precision measurements for this potential ought to begin around the world. My calculations suggest that the deviation from Coulomb's $1/|x|$ potential is a subtle matter. Our potential I would like to be called just *S4 Electromagnetic Potential*. There are reasons that this is the natural potential in Nature and Coulomb's is a very good approximation because $R = 3075.69 Mpc$ is large.

Let me just show you how good Coulomb's potential fares against S4 Electromagnetic potential; it is remarkably good as approximation to the true S4 Electromagnetic Law.

Although these computations are just arithmetic, it is worthwhile to examine them to gain sense of how it maps to the world we know from experience.

You see 1 Megaparsec is $Mpc = 3.086 \times 10^{22}$ meters. So $R = 9.491579 \times 10^{25}$ meters. What is a reasonable way to compare?

Let's ask what is the difference between the Coulomb potential and the S4 Electromagnetic potential when $|x| = 10^{10}$ meters. That's quite a large distance. So we do the following. We define distance in the same scale and consider

$$\delta(r) = \frac{1}{|x|/R} - \frac{1}{\sin(|x|/R)}$$

Now

$$\frac{|x|}{R} = \frac{10^{10}}{9.491579 \times 10^{25}} = \frac{1}{9.491579} \times 10^{-15} = 1.053565 \times 10^{-16}$$

Let $a = 1.053565 \times 10^{-16}$. Then

$$\sin(|x|/R) = a - \frac{a^3}{6} + O(a^5)$$

And so we can say

$$\frac{1}{a} - \frac{1}{\sin(a)} \geq \frac{1}{a} - \frac{1}{a - a^3/6}$$

This will yield an error

$$E = \sum_{k=1}^{\infty} (a^3/6)^k$$

This is just

$$\frac{a^3}{6}(1 - a^3/6)^{-1} \leq a^3/3$$

So that is

$$a^3/3 = 9.898 \times 10^{-49}$$

At least in units where $R = 1$ the error is really small. This says that Coulomb's potential is an exceedingly good approximation to truth. But I expect that careful experiments can detect that S4 Electromagnetic potential is more accurate.

14. SOME DEDUCTIONS FROM THE EXERCISE

I want to highlight several propositions we can deduce from the preceding exercise. First, Charles Augustin de Coulomb richly deserves to be immortalised for his great works because his potential is numerically almost impossible to measure from what we are claiming is absolute truth.

This is because $R = 9.491579 \times 10^{25}$ meters is a large radius and locally flat approximations of the universe are remarkably accurate quite often.

On the other hand, we note that *Mathematical sophistication is necessary in physics* because it is the *compact geometry* of the absolute space in Nature that has many consequences that are crucial such as (a) localisation of particles, (b) wave-particle duality, and (c) the discreteness of all molecular spectra.

Our calculation above highlights both. Physics cannot rely on numerical measurements alone to decide truth of nature because in truth the global effects are all the subtlest features of nature. And the entire 1900-1930 period did not discover this fact. The quantum theorists proceeded to attempt models on \mathbf{R}^3 continuously running against features that could not be naturally explained. My four-sphere theory resolves these issues permanently.

15. EXPANSION AND QUANTUM THEORY AND RELATIVITY THEORIES ARE ALL DISPLACED BY MY FOUR-SPHERE THEORY

Four-sphere theory displaces expansion (predicting redshift in static four-sphere) and gravity (reproducing gravity by Van der Waals) and Quantum Theory (showing that wave-particle duality is automatic) and relativity (denying time dilation). The universe is governed in long ranges by only my S4 Electromagnetic force and Ahmed-d'Alembert Law.

Cosmologists have good observations but the the universe is governed only by a single force that is a wave equation (with appropriate source terms) on spinor fields on a four-sphere of radius $R = 3075.69 Mpc$. This will rationalise all Science on Earth above $\delta = 10^{-15}$ cm.

I am religious but my religious faith is not Islam, Christianity, Judaism, Hinduism or Buddhism, and four-sphere theory is absolute truth but the convictions are based on empirical fitting. I stand on several centuries of Mathematical thought from eighteenth century. Four-sphere theory is the truth of Nature, and will stand for millions of years in the future as a testament for Man's grasp of the fundamental governing laws of Nature. No other theory will be able to compete or dislodge it at all for reasons that are quite clear to me. It is just how Nature operates. There will be new things to discover in a fourth, and macroscopic, but not detectable by ordinary sense organs of human beings, but whose configurations do have physical effects in the material world, the physical hypersurface. Eventually

human beings will be able to find instrumentation to observe the entire four-sphere universe. There will never be any conflict with four-sphere theory and phenomena in the macroscopic physical world. It is perfect and eternal truth of Nature.

You are welcome, if you like to read my notes [3].

REFERENCES

- [1] <https://www.youtube.com/watch?v=obCj0DeoLVw&t=63s>
- [2] Christian Bär, The Dirac Operator On Space Forms Of Positive Curvature, J. Math Soc. Japan, 48(1), 1996, 69–83
- [3] <https://github.com/zulf73/S4TheoryNotes>