

"Philosophical Problems of Quantum Ontology"

Typographical errors etc.

p. ii non-relativistic (line 1 para 2)

2 Lorde (accent please)

24 phenomena (line 3 of quotation)

25 phenomena (line 4 below quotation)

37 2 omitted (below eq. 3)

38 may → might (line 5)

50 retardation (line 3)

52 asocial (line 6 - 6 quotation)

66 Schrodinger (initial omitted) - certainly
~~sturdy~~ that ~~there~~ except in bibliography)

71 2 omitted (lost line)

98 supercede (line 10, para 1)

109 appearance (line 3, para 2)

111 ~~consequences~~ consequences (line 6, quotation)

115 bound (lost line para 2)

145 obtainer (line above eq. 22a)

146 advocated (line 5, para 3)

146 'comparable' → 'compatible' (penultimate line)

146 → ~~dead~~ and C

153 likes (delete first 5, penultimate line para 2)

163 immoderate (6 lines from end of page) - advice please.

164 straightforward is one word.

178 underway should be two words (line 12 para 1)

179 Gamo v (line 3 para 3) - still with a v

183 eq. 36 - poor presentation

187 On the other hand, however, while, according to - - -
 — not very elegant English.

p 190 Dirac (line 5)

194 Bellentine (line 3, para 2)

199 measurements (line 10)

199 aggregation (line 15) plural please

200 is omitted (8 lines from end of page)

201 Bellentine (7 lines from end of page)

202 Longheld (line 6) hyphen please.

203 Bell Bellentine (penultimate line)

207 Tutsch (1971) not listed in bibliography

213 beared (line 5)

215 clae (line 1 para 2)

217 relativistic (5 lines from end of para 1)

217 Dirac (line 1, para 2)

218 spin angular momentum of electron is $\frac{1}{2} \hbar$
 (line 9) spin → spin component (line 11)

219 extrinsic (line 13, para 1)

219 positive (5 lines from end of para 1)

219 $e I \rightarrow e H$ (line 15, para 1)

231 logarithmically → exponentially (after eq. 61)

233 ~~logarithmically~~ accord → accordees (3 lines from end of page)

237 asymptotic (3 lines from end of para 1)

238 well defined (lost line 6 footnote) hyphen please

239 observers → uniformly moving observers (line 4 para 2)

240 continuous → smooth (line 6, para 1)

245 divergent → divergences (line 8, para 1)

247 qualitative (6 lines from end of para 1)

247 the omitted before decision (line 4, para 2)

253 ideais (line 1 para 2)

254 mass → (rest) mass (line 2 para 4)

257 spin $\frac{1}{2}$ → half integral spin (Bohr's)

257 spin $\frac{1}{2}$ → integral spin (mesons)

Supervisor M B Hesse: conclusions

UNIVERSITY OF CAMBRIDGE
 DEPARTMENT OF HISTORY AND PHILOSOPHY OF SCIENCE
 FREE SCHOOL LANE
 CAMBRIDGE CB2 3RH
 TEL. (0223) 58381 EXT. NO.

5 Feb. 1977

Dear Graeme,

You will by now have heard the bad news from the Board of Graduate Studies. I am extremely sorry, & though I was afraid this would happen after hearing from the Examiners, I could not warn you of it until it was official.

As I feared some time ago, they did not think you had anything sufficiently original in the thesis to warrant a Ph.D. This meant either philosophically, which would have needed a great deal more (rather tedious) pure philosophy of space, time, probability etc (a la Mellor), or physically, which would have meant complete acquaintance

with the technical literature & original ideas about it. This is what Redhead was looking for, & he didn't think either that you ought to be given a chance to re-write since (I gather) in the oral you didn't show sufficient acquaintance with the literature.

This must be a great shock to you, but I think you should take some comfort that you persisted through all the financial ups & downs sufficiently to get an R.Litt. The Examiners were complimentary about the clarity & comprehensiveness of your account. A Cambridge R.Litt by their actually is quite a good standard - much more than the average R.A., but of course it was not what you hoped.

I'm afraid this may change your plans somewhat, & I'll be glad to hear what you plan to do, & see you if you come down here. With many regrets
 Yours R. G. H.

📞 07980-788-648
☎ +44(0)1256-364071
🌐 <http://robertson.uk.net>
✉ graeme@robertson.uk.net

✉ 15 Little Basing
Basingstoke
RG24 8AX

The Examiners
Faculty of Philosophy
University of Cambridge
Sidgwick Avenue
Cambridge
CB3 9DA

10th November 2010
(with the images added 23rd July 2018)

Dear Examiners,

Introductory Summary Statement

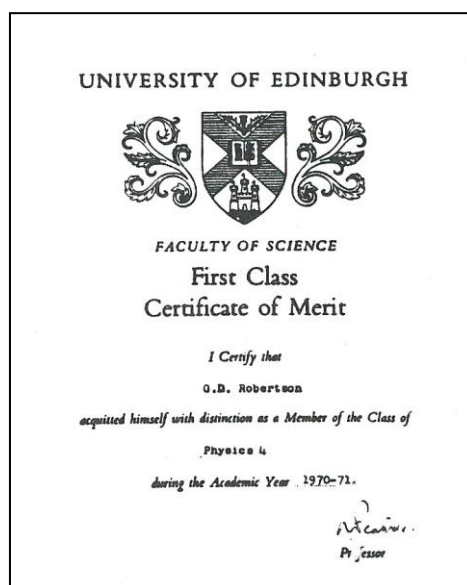
Thirty three years ago I failed a PhD in the philosophy of science at Cambridge having submitted for oral examination a thesis that explores the meaning of quantum ontology. Two years later, after approaching the Board of Graduate Studies, I was given leave to resubmit a published work for that degree. In 1995 I published the book that I now submit for examination. As well as submitting a published work, I am also obliged to submit an introductory summary statement which I do by way of this letter.

I am now quite well acquainted with **failure**. Let me recount some unfortunate examples ...

Philosophical Problems of Quantum Ontology

At Edinburgh University I started in electrical engineering and changed to physics in my second year. I was awarded a merit certificate in every subject I took for examination at Edinburgh, with a first class merit in final year physics and top marks in the theoretical option, “Advanced Quantum Mechanics” given by Professor Nicholas Kemmer. There reluctantly I finally accepted that there is no way back to a classical understanding of nature and I began to rethink my scientific world-view.

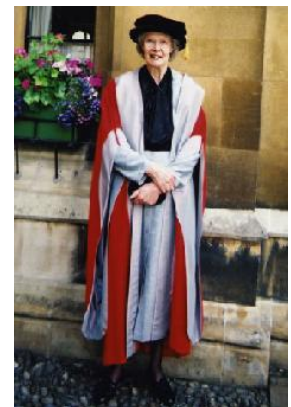
Shortly before the finals I was informed by the laboratory director that I would **not** be awarded a first class degree in these ‘all-important’ exams because of my behaviour in the labs. Sure enough, I was awarded a second class degree. That was outrageous. Nevertheless this was sufficient, so said Professor Kemmer, to get me into Part III Maths at Cambridge. Part III was the most academically exhilarating year of my life, and what is more I was admitted to the legendary Trinity College.



By that time (1971-72) I had explored many philosophers' philosophies. The great Bertrand Russell, and to a lesser extent Ludwig Wittgenstein, had been great heroes of mine. I read Russell's autobiography in which he talked so engagingly about the great Trinity College that I fell in love with the place before I ever saw it. There was the railway toilet incident. It was only

when I actually took the train (many times) from Edinburgh to Cambridge that I really found out just how far the shy young Bertie had had to walk back from Trinity to use the toilet when he sat the entrance exam. Then there was the “**ABC 123**” Great Court incident which I have often recounted with a Bayesian moral. For me going to Trinity was like Harry Potter going to Hogwarts. My academic tutor was none other than Jeffrey Goldstone – I met him only once, to register for Part III, and I had no idea then about the Goldstone boson, later to evolve into supersymmetric partner of a Goldstino.

I **didn't** get a distinction in Part III. (Only recently I was informed that distinctions are *never* given to Part III students coming from outside Cambridge.) Professor John Polkinghorne told me that the UK subscription to CERN had gone up significantly this year (1972) and consequently there was less funding for research studentships in particle physics and I could **not** be offered one. I was eager to study in Cambridge, in Trinity, so I approached the History and Philosophy of Science department where I met an extraordinary, impressive and inspiring lady called Dr Mary Hesse. She helped me to apply to study for a PhD in the philosophy of physics. I remember that I was not allowed to use the word ‘reality’ in the application form. It seemed to me a good word for the sort of thing I wanted to study (quantum reality), being already not unacquainted with philosophy either at Edinburgh or at Cambridge. But anyway I was accepted to study with Mary Hesse and I was absolutely delighted to be able to research in the philosophy of science under her guidance at Cambridge. At Edinburgh I had attended R.Stoothoff’s lectures in logic and Larry Briskman’s lectures in the philosophy of science, as well as introductory courses in metaphysics and the theory of knowledge, all out of deep philosophical curiosity while studying physics, so I already had a fair idea of where I was heading.



Unfortunately I did **not**, after all, get a grant to study for the PhD, but my father agreed to pay the college fees. In my second year of research, I looked around for proper funding and was very happy to be offered a demonstratorship in physics at the University of the West Indies, Jamaica. Cambridge allowed me to work away while still under Mary’s excellent supervision. After a year in Jamaica, I came back, via South America, to Edinburgh where, after a few false starts in which much of the proposed material was deemed **inappropriate**, I wrote up a PhD thesis.

Wigmore Museum
Free School Lane
Cambridge
1 April 1974

Dear Graham,

Many thanks for your letter. I'm glad things are going well to you. We shall be able to do some research. I am sending your letter back on that is the same way of writing comments.

In answer I must say that for a Ph.D. in philosophy (to you could be better than for physics as this is your field!) it is much more important that you get the technique of precision of expression right than that you have interesting speculative ideas. Almost every sentence should be acceptable as it stands, & must be free over & over again to eliminate ambiguity, shifts & meaning & bad arguments. Our worked conclusion in p.7, has occurred just because you are vague in your expression in the preceding paragraph. If you still want to maintain the conclusion, much more explanation & argument is needed. I know this is only a summary, but you are likely to do this in longer pieces too.

I tried, for example, to argue that “One is complete sense!” to which Mary’s response was “Nonsense!” In my book I attempt to explain what I mean by bald statements such as that.

UNIVERSITY OF CAMBRIDGE
DEPARTMENT OF HISTORY AND PHILOSOPHY OF SCIENCE

DEER HOUSE, 100, MARKET STREET, CAMBRIDGE CB2 3RQ
TEL. (0223) 35399

14 May 1974

Dear Graham,

Thank you for sending your seminar paper. I realize it was only a seminar talk, but as you expected. It's not very happy with its style! Section 4 is particularly in certain not what I meant - it is impossible to comment because I don't know what any of your 'proposition' mean.

The only have to think, seriously, whether you need to do something acceptable for a Ph.D. thesis. This is a serious argument that would be acceptable to have loaded paragraphs (though I know you need to come to their conclusion). This, too, is not a subject in which 'bald' statements of opinion are abandoned.

It's a pity you are not here this time to hear Mary Gellman's. She is doing an admirable course in philosophy. She is really examining attempts to show that Popper's 'hidden variable' theory (implying the 'quantum interpretation') is consistent with G.N. experiments. She has refused to be following recent papers, which between them indicate that anyone intending to write a Ph.D. paper to start:

On the 5th of November 1975, when my first niece was born in California, I wrote a short celebratory essay, later lost in London, on a restatement of Heisenberg’s uncertainty principle. Basically, I wondered what would happen if one treated time and energy as imaginary quantities as is suggested by one formulation of special relativity. Then

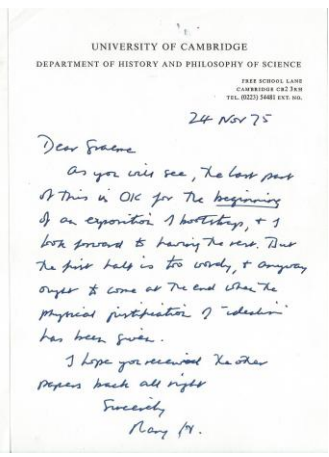
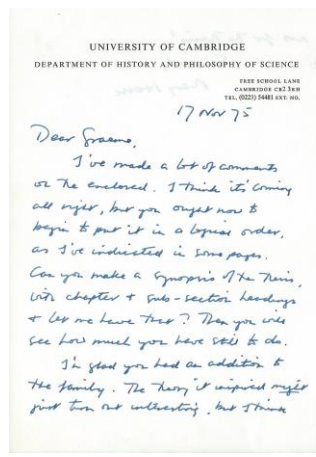
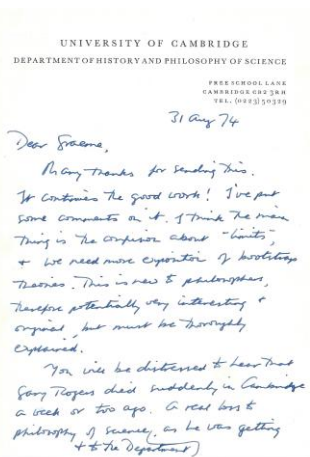
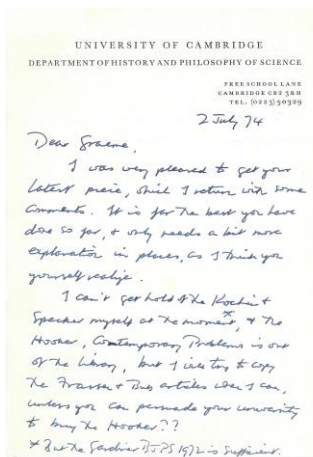
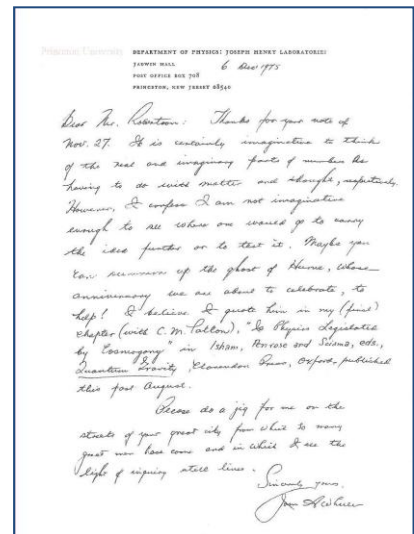
$$\Delta t \Delta E \geq \hbar \text{ becomes, } \Delta i\tau \Delta iE \geq \hbar, \therefore -\Delta\tau \Delta E \geq \hbar, \therefore \Delta\tau \Delta E \leq -\hbar,$$

which I attempted to interpret as a certainty principle for *ideas*. I called things with imaginary properties 'sophons' and things with real properties 'megons'. Mary wrote, "The theory .. might just turn out interesting, but I think **not** for the thesis!"

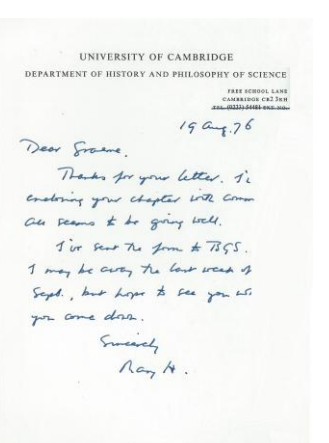
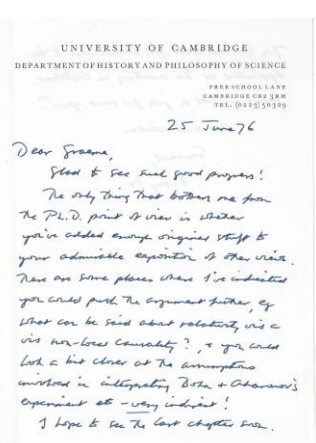
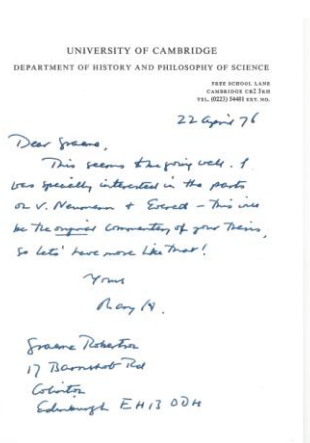
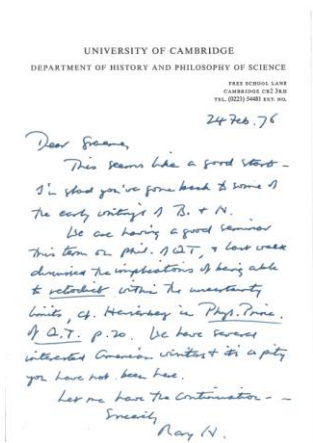
I wrote to John Archibald Wheeler at Princeton whom I knew could entertain radical speculations because he understood Feynman's vision that there need be only one electron in the universe. He sent me back a very kind letter. I also visited Professor Kemmer to explain the idea to him. His reaction was that this would introduce negative probability which is hard to interpret. At the same time I told Kemmer about my current best attempt to unify general relativity and quantum theory with the equation

$$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} = -\kappa\langle\psi|i\gamma_\mu\partial_\nu|\psi\rangle$$

to which he replied that one side of the equation is symmetric in $\mu\nu$ indices while the other side is anti-symmetric – he went on to indicate how that fatal problem might be resolved.



After a few attempts to begin a thesis, some of which were deemed **unacceptable** for a PhD in philosophy by Mary whose advice I greatly respected and understood, I went back to basics and wrote an acceptable first chapter that analysed Bohr's concept of complementarity and Heisenberg's uncertainty principle. I quickly moved on to chapter two in which I analysed Schrödinger's cat, Wigner's friend, von Neumann's theory of measurement, Everett's interpretation, and what would now generally be called 'entanglement'.



Chapter two was received quite enthusiastically by Mary who wrote, “.. this will be the original commentary of your thesis, so let’s have more like that!” Two months later I posted chapter three on the EPR paradox and Bell’s theorem, and two months after that, chapter four on hidden variable theories to which Mary replied, “All seems to be going well.” I added a fifth chapter on relativistic quantum field theory and bootstrap philosophy which Mary considered to be unnecessary, but anyway a date was set for the oral examination.

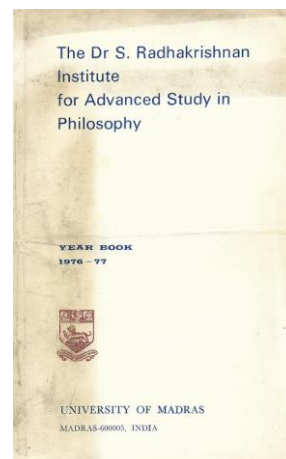
I **failed** the oral and was not permitted to resubmit a revised dissertation. That judgement was outrageous. One exchange epitomizes the tone of the meeting. Redhead asked, “What is the most important aspect of the Kochen-Specker proof?” to which I replied, “I don’t know [what *the* most important aspect of the Kochen-Specker proof is].” He moved on to the next question, seeming to conclude that I knew nothing about the Kochen-Specker proof, while I thought to myself that if he had actually read my thesis then he might know what I *think* is the most important aspect of the Kochen-Specker proof, namely that you can’t embed a quantum logic in a classical logic. I was disappointed by his dismissive attitude to my interest in Indian philosophy and I was already rather frustrated with philosophers generally for reasons alluded to in this letter, hence my curt reply. The interference pattern all too subtly evident on the contents page of my 1976 thesis was intended to signify this frustration.

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Two years later, in 1979, I was persuaded to approach the Board of Graduate Studies. An amendment was made to the special regulations and I am now, as required, submitting a published work (albeit published by myself) and respectfully request an oral examination under these new regulations.

Subsequent Life-Changing Failures

In 1977 I found a job at Ferranti in Edinburgh as a systems analyst writing machine code programs. During the year that I was there I wrote three successful machine code programs for aircraft navigation systems. While living at home with my parents, I saved enough money to go to Madras to study Indian philosophy for two years at the Radhakrishnan Institute for Advanced Study. When I arrived the academic year had not yet started so I continued on to Sri Lanka where I had been offered a lectureship on condition that I pass the Cambridge PhD but they were not allowed at that time to take on foreign students due to political upheaval. I budgeted for £500 per year in India. Unfortunately Indian banks would **not** transfer funds from Scotland and, after a short spell in Sri Lanka, I set off with less than £100 cash in my pocket overland through Afghanistan and Iran to Italy. That was in 1978, at the time when Russia invaded Afghanistan and Ayatollah Khomeini returned to Iran.



After an eventful journey home I found a job in London with a small Canadian computer company called I.P.Sharp Associates which introduced me to *A Programming Language*. *APL* is a wonderful, general purpose computer language that is still largely unappreciated. In 1984 I led a team of *APL* programmers on a complex project for a large multi-national bank. We completed the project very successfully for just £50k. During the project we discovered that the bank budget and at least two other bids for the project were well over £1m! Clearly the project could have been a far greater success for I.P.Sharp, were it not for my significant **lack** of business acumen. One year after I left I.P.Sharp, the company was sold to Reuters who wanted the extensive databases and global communications network. I.P.Sharp had not anticipated the catastrophic collapse of

mainframe timesharing due to the rapid rise of the personal computer.

Another failure... I submitted a paper entitled 'Giant Variables' to the 1986 international *APL* conference in Manchester. This paper described two short computer programs that enabled huge volumes of data to be handled much more easily in *APL* applications. I had already, and have since, used these programs very successfully in important applications for large organisations (Midland Bank, Eastman Kodak and Commercial Union). In the paper I included a very simple illustrative model just to demonstrate how the programs might be incorporated into the *APL* language itself. The paper was **rejected**. Some time later I obtained this report by an anonymous and badly mistaken referee. He wrote:

"I disapprove so totally of basing a working system on a 'kluge' that I **cannot** recommend this paper. Computers have suffered for more than 20 years from clever tricks which 'work' - *APL* is one of the few consistent and coherent environments where things actually do work practically as well as theoretically and one does not have to rely on clever tricks to get by. To show off in private to one's friends this may well be a useful toy to those very few people who still use SHARP *APL*, but a useful topic to the *APL* community at large it is not, not even to the vast majority of SHARP users who rely on packaged solutions. I do not think this should be seen in public – **it's the sort of exotic rubbish that gets the computer community a bad name!**"

I am **still trying** to persuade *APL* language designers to incorporate the idea. Thoroughly convinced the idea is good and useful, I demonstrated a more elaborate model to the 2005 Dyalog *APL* conference in Denmark. (I also wrote and published two educational books on the *APL* language in 2008.)

After seven productive years at I.P.Sharp Associates, in September 1986 my wife and I left London, taking between us an 84% pay drop in order that I might study for a PhD in theoretical elementary particle physics at Durham where I had been accepted by the department of Mathematical Sciences. In 1989 I was awarded a PhD for my discovery, under the inspiring supervision of Dr Ed Corrigan, of knotted instanton solutions to Polyakov's theory of rigid string and I was accepted as a research assistant for one year at Lancaster University. In the first six months I pursued with interest the research topics of the Theory Group, led by my formidable external PhD examiner Professor Robin Tucker. In the last six months I pursued my own interest of simply trying to understand the standard model of elementary particle physics which was, after all, my reason for going to Durham, and Cambridge, in the first place.

During the two years of **unemployment** that followed Lancaster: I wrote the book that I now submit for examination, I obtained a vocational business qualification and I wrote a computer application called 'SEEK' that I attempted to sell to qualified prospects. Eventually I found a permanent position in Basingstoke in another *APL* company, a position I held for just over ten years, until 2003.

I suffered a **particularly awful failure** in Basingstoke. One of the projects I undertook was the single-handed conversion of an *APL* system from DOS to Windows. During this conversion, the system was bought by a new owner, Adaytum Software, who presented my work at a successful users' conference in Birmingham in 1995. Adaytum then hired some more *APL* programmers from UK and Denmark to join me to complete the new product. Eventually Adaytum sold the system to Cognos for \$160m in January 2003! In May 2003, after ten fruitful years, and without *ever* having asked for a pay rise, I was '**let go**' with minimal compensation from Dyalog Limited, a world-leading company of just four employees and three directors. The reason for my sudden dismissal is probably related to the fact that, soon after I left, the three directors sold their *APL*

company for many millions to Danish recipients of some of that large fortune from Cognos.

YOU are Special

Now I am approaching you in order to defend my thesis. Essentially, it is very simple and would appear to be easy for you to dismiss. (Actually I thought that it would be hard for you to dismiss my first attempt all those years ago.) Although, as is clear from the back cover I realise that the book I am sending you is not in the usual style expected of a British philosopher, this time I am not going to let you fail me without a good argument.

In my undergraduate years I eventually accepted the truth of quantum theory. We could argue forever about “What is truth?” I start from the premise that there *is* some deep truth in quantum theory. I regard it as the job of the philosopher to extract this truth rather than try to deny, ignore or even doubt it. There is no way back to a classical understanding. When whole new branches of mathematics have been brought into service for physics then philosophers of physics have to move forward too and not expend all their energy attempting to refute the new theories in order to sustain an old comfortable conceptual understanding. Things don’t usually go backwards in science. Even the bootstrap idea, the physics fashion of the early 70’s about which books were written saying things like, “The rules of formal logic favor the bootstrap over the fundamentalist interpretation of hadronic constituents,” and which was trumped by QCD in 1973, is actually still a live issue implicit in M-theory. There is something very, very true about quantum theory.

Today philosophers have an open invitation to speculate about the meaning of the new physics. Inspired by Descartes and Eugene Wigner, I begin from a thoroughly scientific proposition that is immediately rejected by almost all philosophers and scientists alike but which nevertheless is rooted in empirical observation and refutable only by appeal to metaphysics. ***There is only one consciousness in the universe.*** “This is solipsism!” dismisses Mary. Yes, but it is the foundation of my interpretation of quantum mechanics, which might explain why at many places in my book the typical reader will balk and refuse to proceed with this ‘quantum hype’. Polkinghorne would not even open the cover when I handed him my little black book. Is it quantum hype if I choose to talk about ‘quantum karate’ with a very specific analogy in mind? I don’t think so.

“You see, it is true. There is only one consciousness in the universe.”

“Whose universe?”

“The whole universe! The universe. The whole known and knowable universe!”

“But which Everett cut? Which Carr verse?”

“This cut, this verse, this one here and now, this place, this time. Of this singular person.”

“And who is that?”

“You! You are special!”

You have manifest proof that you are special, but you have chosen to ignore the evidence because your scientific theories and philosophies tell you otherwise. Karl Popper claims scientific theories cannot be proved, only at best confirmed. Yet surely direct observation of the plain facts must be believed if immediately demonstrable and verifiable. Paul Feyerabend says that every fact is theory-laden. But some facts are so striking that one feels obliged to believe they are true independent of any particular theory, or rather, perhaps, dependent on *every* reasonable theory.

Descartes and Hume showed how one could doubt almost everything except for this one

thing; **I am**. One cannot doubt that one exists because existence is a prerequisite for understanding the thought, “Cogito, ergo sum.” The proof that you are special is this; as far as you are aware, without introducing any metaphysical assumptions, *yours is the only consciousness in the universe*. Wherever you go, from birth to death, it goes with you. It is absolutely attached to you, which makes you absolutely different from everyone else in the world, from your point of view. This point of view is the only one you have and, although you may deeply empathise with others, even other animals, you will forever remain you. In this sense, you are **ABSOLUTELY** special and you cannot deny that. One’s self is unique and absolutely different from every other person. This scientific observation, that *there is only one consciousness*, is ignored, denied or derided in conventional physics and most Western philosophy.

Everyone is conscious, are they not? Descartes pointed out that one can only prove to oneself one’s own consciousness. No one else can prove that you are conscious, and you cannot prove that anyone else but you yourself is conscious. Consciousness, by virtue of its very nature, is something that one can only observe internally, in oneself. The assumed consciousness of others is an implication of a theory which says, “You are not so special, you are so like everyone else and everyone is very like you.” Western science strongly supports this view because the laws of nature are demonstrably the same for everyone. This indeed is an explicit axiom of general relativity. The fundamental laws of physics are necessarily the same for all observers. But what if the laws of nature turn out to be tautologies - necessary truths of the logic of the mathematical foundations, holding no physical content other than that this is the way things must be? What then?

The conditions under which an observation is made, the context not the laws, reveal the fabric of reality and the light of awareness is where all meaning is rooted. The ultimate laws of nature appear to be tautological. If so, only boundary conditions have real content - *a posteriori* meaning. We can accept that geometry is empirical and logic is quantal. Now consider that laws are theorems and only environmental contexts can reveal reality and meaning.

Consciousness is this immediate experience. It is not about what was or what will be. It is about this here and now awareness. This is reality - where consciousness is - always in the present as compared with memories of awareness, or assumptions of awareness, or endowment of awareness in others. We normally endow fellow citizens with consciousness - their equivalent of our experience. However, this is a metaphysical presumption which is not testable except by inference from the normal paradigm. From a purely empirical stance, there is and can only conceivably be one consciousness, only one immediate and present reality, only one fountain of direct awareness. All other hypothetical consciousnesses are metaphysical assumptions without scientific basis, except in so far as our philosophy of science might presuppose them. Hearsay, experience and rhetoric will convince us of other minds - a complex tangle of states leading to complex behaviour patterns - but consciousness is certainly singularly solely one’s own, is it not?

According to my interpretation of quantum mechanics alluded to obliquely in *Philosophical Problems of Quantum Ontology* which I urge you to read, the state of a system is only determinable through consciousness. If not immediately observed then the state soon becomes a superposition - an unreal mix of all possible states. This means, in particular, that the states of mind of other people have to be taken generally as superstates - a hypothesis that must have testable consequences.

Wigner’s interpretation of “Wigner’s friend” rests on the natural assumption that we believe a friend when he tells us that he was never in a superposition of two states, one seeing a live cat and another seeing a dead cat. This led Eugene Wigner to conclude that, at least by the time the information had arrived at his friend’s consciousness, the state of the cat had already ‘collapsed’.

This is not my interpretation. Consider instead that the only reality is one's immediate conscious experience with all that is mathematically implied by that experience. The state is an evolving, changing, complex function. Only when directly observed can many properties that were previously manifestly latent be said to take on anything like definite real values. That includes friends' thoughts too!

Inferences about the past, specifically about the past state of mind of a friend, cannot be made glibly and without reference to the physical theory. Einstein, Tolman and Podolski showed that determining completely the state of a quantum system now does not imply that the past can have all quantum uncertainty squeezed out of it, and Wheeler has shown with a delayed choice experiment that state 'collapse' cannot be assumed to happen at the moment of the nominal event. Wheeler helped Feynman to understand how only one electron might be required in the whole universe. Similarly we might be able to go in some way from a conception of many consciousnesses to just one consciousness by an analogous route of quantum identity reasoning.

My world view might be labelled '*solipsistic pantheism*' because there is only one consciousness in the universe (hence solipsistic), and that which is experienced is a phenomenal unity emerging from a complex noumenal state underlying all reality. That noumenon we may call Nature in herself, or God if we like (hence pantheism). This Kantian-like noumenon underlies all that we call reality. It is interpreted mathematically as an evolving complex function in Hilbert space that represents everything known and knowable. Nothing like this is entertained as physics in Newton's natural philosophy, wherein everything is accounted for directly in terms of real numbers and real functions of real numbers, plus God.

Quantum operators which act on complex functions in a Hilbert space may be associated quantitatively with real phenomena by projecting real measured numbers out of the state functions. Thus the forms of human sensibility and the consequent conditions of human understanding may be identified with specifically humanesque arrays of operators, relating directly to the human sense instruments which act on states of a noumenal '*complexity*' (c.f. '*reality*').

Deep Symmetries Lead to Physical Forces

In 2006 I lived in Denmark while working on an *APL* project. I loved the Danish people and the whole experience was so deeply moving that my research interests widened from particle physics to encompass the physical nature of agape, or pure love. I began to muse on a possible application of quantum field theory that I call '*G₂ Love*'.

The attractive force between two oppositely electrically charged particles circling around one another is most elegantly derived from the premise that the state of the system, a complex function in Hilbert space, has a certain invariance best described by an exact local $U(1)$ symmetry. By close analogy, the strong attractive force between two differently coloured quarks circling around each other is ultimately deducible from the premise that the state of the system has a similar invariance described by a local SU_3 symmetry. From this principle of 'gauge invariance', the mathematical theory of the quantum chromodynamics of quarks and gluons may be derived in the same manner as the theory of quantum electrodynamics of electrons and photons. (From these gauge principles quarks seem to imply the existence of gluons and electrons of photons in a fashion somewhat reminiscent of bootstrap philosophy.)

Now consider two oppositely gendered butterflies fluttering around one another and imagine that this demonstration of 'animal magnetism', this palpable force of attraction, is likewise ultimately explicable in terms of some deep exact symmetry of nature. Of course there is already

an obvious symmetry between the two butterflies. They are the same species: they look the same, talk the same and even (presumably) smell the same - but we are looking for a *mathematical* understanding of their mutual attraction. While it might



seem perfectly satisfactory to seek an account of what is happening in terms of the colours and scent experiences of the individual butterflies, perhaps their state is better understood as an entangled quantum state requiring a very different mode of explanation. They have the same genetic origins; their genomes are almost identical – plus a certain complementarity. Could this allow the quantum identity principle for fermions, the Pauli exclusion principle, to introduce quantum superposition or interference or entanglement? Surely their

states *are* entangled. Could their mental states, also quantum states, interact through gauge bosons analogous to photons and gluons?

Gauge theories are ‘effective’ theories, supposedly one day to be replaced by the actual ‘M-theory’. The ‘effective’ mathematical theory that I am postulating here is based on the continuous Lie group, G_2 , which encapsulates a wonderful symmetry with, as yet, no definitive application in normal science. Nevertheless applying the same mathematical reasoning using G_2 as was done with $U(1)$ and SU_3 produces a deep new theory of new forces. Since love is a real and powerful force in human lives, we may look for mental dimensions that fit in with this new way of looking at the internal space of human minds and their relationships and interactions.

The search for dimensions of mind is not a new quest; however the mathematics of G_2 could provide a much needed clue involving Cayley-calibrated space. G_2 has a real representation and the theory has a classical formulation. It may be discussed non-relativistically and without some of the more abstruse quantum ideas such as intrinsic spin or anti-matter. This model of mind is a renormalisable non-relativistic Yang-Mills theory with G_2 symmetry into which quantum concepts may be introduced consistently.

My book is filled with speculations like this. Some might turn out to be significant, others not. My ultimate goal is in any case not that, but rather to wrestle the reader free from his usual conceptual constraints in order that he might confront the proposed paradigm shift without requiring psychotropic drugs or other shocking sobering experiences such as near death experience.

B.F.Skinner showed that, by focusing entirely on behaviour, one can, in some psychological contexts, totally ignore the hypothesis of consciousness without a complete loss of substance in psychology. Minds must be treated rather like this. We must try to view other minds like quantum computers holding stable superpositions of many entangled possibilities. Then, sometimes, understanding a dear friend’s outbursts might require an unreal combination of opposing classical ideas ☺+☺!

There is a huge symmetry between members of the same biological species, as is evidenced by the near identity of their DNA. Could this deep symmetry conceivably lead to a clear physical explanation of their ‘magnetic’ attraction and repulsion? One consequence of Bell's theorem is that correlation between quantum states can be significantly greater than one is able to contemplate from a classical perspective. Nature may have found ways of using this ‘passion’ while we can hardly yet imagine how and what it signifies. Could love itself succumb to an exact characterisation?

Science and Religion

New applications of Riemannian geometry, Hilbert space and Lie groups have led to a completely new world-view which is almost inconceivable in traditional Western metaphysics. Is it possible that Eastern metaphysics could provide a better philosophical foundation? Western academic philosophers such as A.C.Grayling are beginning to take Indian philosophy seriously, partly perhaps because they have discovered that not all schools of Indian philosophy are mystical - some are realist and even atheistic. But what we are looking for is a way to understand a new reality which can accommodate lack of determinism, lack of locality, increased correlation and a paradigm shift in what we mean by reality itself.

It is the traditional mystical schools of Indian philosophy such as Vedanta and Yoga that are most likely, in my opinion, to enlighten the West. In order to learn more about Indian philosophy, I went to the Radhakrishnan Institute in Madras in 1978 where they ran a two year course that included classes in Indian logic and Indian epistemology. Unfortunately I was not able to stay.

Although religion is often condemned in the West for being unscientific, in India yoga is considered to be a science. There are many branches of yoga, including raja, hatha, karma, bhakti, jnana, kundalini, kriya, mantra and tantra yoga, to name a few. The primary branch of yoga, Patanjali's *raja yoga*, has eight limbs, or stages, to union: *yama* or loss of ego, *niyama* or purity, *asana* or posture, *pranayama* or breath control, *pratyahara* or withdrawal, *dharana* or concentration, *dhyana* or meditation and *samadhi* or union when the mind becomes still. Samadhi has been described as the state of being aware of one's existence without thinking. This is a state of mind, apparently foreign to Cartesian thinking, which adherents over millennia have claimed can be attained by scientific training and practice. I approached yoga, a practical philosophy that purports to be true and valid, with the aim of understanding the quantum world. This is perfectly reasonable and justifiable when Western philosophy has been reduced to ridicule in its account of life, the universe and everything.



Vedanta states that अटमन is बरमन, loosely translated as 'the self is everything'. This encapsulates a fundamental scientific observation that is thoroughly ignored by hard science. **One faces the world from within, looking out.** The approach of physics has been to discount this manifest truth as contingent; necessary perhaps in order to progress, but contingent to the final goal of an objective description of the world, independent of all souls.

The Eastern religious stance is clearly different. The deep Vedic foundations of Hinduism emphasise and encourage intuitive direct experience rather than blind faith and ridiculous unfounded dogmas. Individual souls are taken to be central to the description and final understanding of a 'spiritual' world. All the traditional religions and philosophies are essentially venerable attempts to understand the world. They must now take full account of the discoveries of modern science if they are to survive and flourish. Scientists should ask philosophical questions and philosophers and clerics must understand science as well as possible.

I have written a short book, [*Unity Consciousness and the Perfect Observer: quantum understanding beyond reason and reality*](#), in which I have tried to explain what I understand by quantum theory and how this theory might change our perception of ourselves and the world. The book attempts to convey a philosophy involving a paradigm shift. Read it with an open mind, and, if possible, review my previous work, [*Philosophical Problems of QUANTUM ONTOLOGY*](#), for a more traditional critical background.

What is the meaning of your life? Do you accept the prevailing view that you got here by pure chance and that there is no higher meaning to life? Do you believe that all of the world's ancient philosophical and religious teachings about life amount to nothing when contrasted with the deep new explanations of biology? Or do you dogmatically hold to tradition and culture?

These 120 pages begin with an original examination of the quantum-theoretical understanding of reason (logic) and reality (existence) and find both to be at odds with common sense. Furthermore, there is no way back to any classical metaphysic.

*Our consciousness is this immediate and direct experience. But, empirically, clearly there can only be one consciousness in the knowable universe. This manifest truth forms the foundation of a new **solipsistic pantheism**.*

This ultimate observer, like all life forms, appears to have perfectly balanced senses and therefore should be capable of making perfectly good sense of this present world.

A theory of everything is a reduction to a single grand idea! A quantum theory of everything is a mathematical theory of a consciousness realizing this grand idea! That is what this book tries to comprehend by means of five indisputable propositions.

So there it is... I reinstate the soul to the centre of understanding, where it was before Copernicus or Galileo, Leucippus or Democritus, Katyayana or Kanada. Unaccounted for by them, our forms of perception and categories of understanding are preset through evolution to give us our normal perspective. With extended senses has come new knowledge and new understanding whose meaning surely can, and must, help to enlighten and satisfy all of humanity.

Can you entertain a genuine mysticism beyond flat atomism, logicism, structuralism, functionalism or even existentialism? Because there is indeed a mystery.

I look forward to receiving your reply and hope that one day we shall meet to talk about life, the universe and everything - seriously though!

With due humility and great respect,
Yours faithfully,



Graeme Robertson.

P.S. I have included two other original scientific papers in my application just in case you can't decide whether my book is philosophy or nonsense. The [first](#) paper proposes a completely new mathematical theory of everything and the [second](#) progresses my long search for certain knotted quaternionic p-branes. Both papers are worthy of philosophical attention, I contend.

Peter Carr
Graduate Examinations Manager

Dr G. D. Robertson
15 Little Basing
Basingstoke
RG24 8AX

29 March 2011



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A cheque for £396 (three hundred and ninety six pounds sterling) refunding part of your fee will be sent to you shortly. Your work will be returned in due course under separate cover.

Yours sincerely

Mr Peter Carr
Graduate Examinations Manager

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4 Mill Lane, Cambridge CB2 1RZ
Telephone: +44 1223 338389
Fax: +44 1223 338398
graduatestudents@gradstudies.cam.ac.uk
www.admin.cam.ac.uk/offices/gradstud/