

Complementarity and Eucharistic theology: two studies in metaphor.

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The findings of the physical sciences are necessarily mutable and change with fresh evidence or with fresh interpretation of the same evidence. This is an important point to remember with regard to the whole of this section of my text where I employ ideas based on more or less current interpretations of archaeological and anthropological data. Such interpretations, of whatever degree of probability, remain hypothetical. The layman can but employ for his own purposes the pattern available during his lifetime. The poet in c. 1200 could make good use of a current supposition that a hill in Palestine was the centre of the world. The poet of the seventeenth-century could make use of the notion of gravitational pull. The abiding truth behind those two notions would now, in both cases (I am told), be differently expressed. But the poet, of whatever century, is concerned only with how he can use a current notion to express a permanent mythus.

David Jones, General Note to Section 1 of *The Anathemata*

Prologue

When this seminar was being planned, Yorick suggested that I give this talk partly because (a) having just finished studying mathematics and theoretical physics at Cambridge, I could talk to Ted about his thinking and having had some experience in computer programming, I could also talk to Margaret about her ideas and could implement them on the Cambridge University computer; and partly because (b) while I was working at CLRU 1964-8 I lived with the Braithwaites at 11 Millington Road for much of that time and therefore became acquainted with their thinking as it developed. It was also suggested that I try to explain how these two separate strands could be brought together.

I have divided this talk into two main parts: in the first part I shall talk about Ted and his ideas on quantum theory and the search for a "new physics", and in the second part I shall talk about some of the EP ideas about religious language and practice and relate them to the ideas expressed in the first part. Finally I shall conclude with a short personal epilogue to complement this prologue.

Part I Complementarity

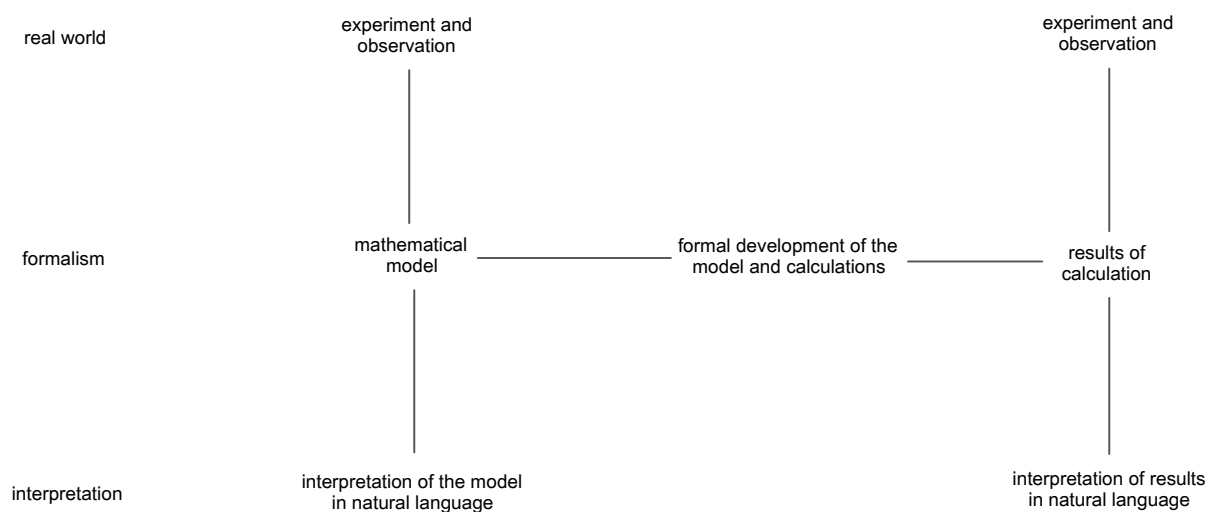
To explain Ted's work,* a bit of background in quantum theory is necessary. In 1900 or thereabouts it was hypothesised in order to account for a serious discrepancy between current theory and experimental result, that energy was not infinitely divisible into smaller bits, but that it came in packets of a very small but finite size, called a quantum (*pl. quanta*) that could not be split up any further. This was later confirmed by many experiments. Also, physicists in the first decade or so of the twentieth century realised that experiments pointed to the fact that an electron, the unit of electric charge, could behave like a particle or like a wave, and which behaviour was observed depended on the precise setup of the observing and measuring apparatus. This became known as the wave-particle duality.

These experimental results, the quantum and the wave-particle duality, could not be expressed in the standard mathematical formalism of the time and so the development of a new mathematics –quantum theory– was necessary. The broad outlines of the theory were developed between 1910 and 1930 and were fleshed out during the next four decades, until today it is universally accepted and is extraordinarily accurate (indeed almost unreasonably so) in its predictions. However, the debate about why it is so accurate has been going on for almost as long –a century– as the development and use of the theory, since the accuracy comes at the cost of some apparently quite unreasonable claims (as judged by our normal understanding of things) such as electrons being in two (or more) different places simultaneously, or perhaps nowhere at all.

At this point I would like to introduce a simple diagram showing the general epistemological structure of an empirical science such as physics.

- 1) develop a vocabulary of things in the world and how they (are thought to) behave (e.g. electrons, waves, particles).
- 2) develop a mathematical framework in which the results of stage 1 can be expressed (e.g. Hilbert spaces, eigenvalues, partial derivatives).
- 3) manipulate the mathematical framework (calculate) and see what the answers are.
- 4) compare the answers with experiment (prediction, postdiction). If the answers do not correspond, adjust stage 1 and/or stage 2.

*I am aware that what I say in this part about quantum theory has been somewhat simplified. I could be more accurate, but this would be at the expense of comprehensibility to the lay reader. The tradeoff here has been carefully considered.



If the answers that correspond to the interpretation of the mathematics predict accurately but cannot be understood in commonsense terms (e.g. “the electron has to be in two different places at the same time”), then there is something to be explained. The answer lies in considering the use of metaphor, something I shall return to in Part II.

The point that is important here is the interpretation, not the mathematics. Because it is in natural language, it will have to use words such as ‘wave’ and ‘particle’. But because things like electrons cannot be observed directly by the senses, such words refer to elements of the formalism, not to things we see at the seaside or in a dusty room. They are being used metaphorically. To the mathematician, a wave is something described by a certain kind of second order differential equation. A particle is something that has mass and position, both of which can be measured (though perhaps not both at the same time).

Furthermore, there can be more than one interpretation of the same formalism. The same formal symbol may refer to something with wave-like characteristics or particle-like characteristics or a mixture (in some sense) of both. It may refer to an electron with negative charge or one with positive charge (positron) or something else altogether. The possibility of multiple interpretations is precisely what gives mathematics its power.

A particular example of the kind of difficulty being discussed is that of ‘complementarity’, which lies at the heart of quantum theory. According to the standard interpretation (the ‘Copenhagen interpretation’), physical systems at the atomic level (an ontic concept) do not have definite properties prior to being measured (an epistemic concept). According to this interpretation, an unobserved electron is neither a wave nor a particle and only exhibits characteristics as being definitely in one state or other as a result of observation (but ‘observation’ is not discussed or defined). Ted objected to this interpretation, as have many other physicists before and since. To this day, there is no satisfactory and universally agreed solution to the philosophical problems of epistemology and ontology in quantum theory, though quite a few have been proposed. What Ted wanted to do was to look again at the basic natural language vocabulary of quantum theory and how it might be mathematically formalised in order to guide the development of a reasoned reassessment of the difficulties that have to be overcome in order to arrive at a philosophically sound interpretation of the mathematics.

Problems arise in discussing to what extent the formalism represents “physical reality” (scare quotes!). On the one hand, it can be argued that the calculus just works and the question of why it works is a bit of a mystery (the so-called “no-nonsense formalism” or “shut up and calculate” view); on the other hand if the formalism is an accurate description of physical reality, reality has some peculiar properties including the fact that the observer and the experimental apparatus determine the nature of the reality being observed. According to the accepted principles of scientific epistemology, neither of these points of view seems entirely acceptable. In a paragraph from

his book (pages 7-8) Ted writes “[The Copenhagen interpretation], reminiscent of one theological tradition for dealing with a mystery... is the best that can be done for no-nonsense formalism. [It] leaves the mystery as stark as possible and says that the facts, in the physical case (it is revelation in the theological) demand it. However, one feels bound to protest that there is something very odd about renouncing the hope of understanding something and yet claiming to know that it is that something and nothing else to which experiment leads us. To put the point more sharply, no amount of experimental evidence can count in favour of a logical muddle.”

This philosophical dilemma at the heart of quantum theory greatly concerned Ted, and led him to organise an informal colloquium held at Cambridge in July 1968. It was intended to provide an opportunity, first to discuss the seriousness of the difficulties in quantum theory from points of view which did not presuppose the inevitability of the current approaches, which Ted thought arose from a muddle of epistemology and ontology; and secondly to discuss some possible alternatives to see what a real change might involve.

It is, I think, fair to say that the first of these objectives was more successfully achieved than the second. Ted’s editorial contributions to the book are as good a discussion of the difficulties as had been written up to that time and much of his analysis still holds today. His alternative proposals, however, have not been accepted, partly because later formal and experimental work shows that some of his assumptions do not appear to hold. He was on firmer ground in his objection to the (then generally accepted) Copenhagen interpretation of quantum theory, and also to other conceptual difficulties, such as the nature and role of observation and measurement, which he regarded as contributing to logical muddle arising from confusing ontological and epistemological aspects of the theory. His assessment of the philosophical difficulties and obscurities in quantum theory that had to be overcome before any change in the basic structure could take place was penetrating; it was only his attempt to overcome the formal difficulties that failed.

Part II Eucharistic theology

In this part I want to look at the relationship between religious language and metaphor, and point out some similarities between this topic and the view of quantum theory I looked at in Part I. I am not saying that the EP's were explicitly trying to study this relationship at the time. I was asked to give my view on what connections there were between Ted's work on physics and the mainstream EP thought being discussed at Millington Road and the retreats in the Burnham Overy Staithe Mill. In considering this topic I can now say more clearly what I was dimly aware of at that time, that Ted's work on physics and Margaret and Richard's separate views on religious language were looking at different aspects of the same structure, and my understanding of the differing aspects might help better understand the metaphorical nature of both quantum theoretical and religious language.

Metaphor is now a well-studied topic in linguistics, and I don't want to add much to that debate. I have, however, long been struck by a quotation from a letter the poet Basil Bunting wrote to the literary scholar Thomas Dilworth in 1979: "... the Mass is a complex of symbols capable of ordering and interpreting pretty well the whole of the history of the world and the whole order of nature. I can say that because I am not a Catholic and am thoroughly out of sympathy with Catholicism". I knew Basil Bunting when he lived near Newcastle in the 1980's and I went to poetry readings which he also attended, and the last clause of this quotation is an example of a figure of speech I heard him use only rarely: polite understatement. What is relevant is his understanding that symbolic language can have multiple meanings simultaneously (he was a poet, after all) and that any one reading either by poet or reader does not deny the possibility of other meanings in quite different contexts, and that the relationship between these meanings is part of our understanding of all of them. This is of course the essence of metaphor, which Margaret studied and talked to me about quite a lot. And a poem which Basil knew well and probably gave rise to his remark, *The Anathemata* by David Jones, is written to show exactly this point, that the Mass not only embodies what it says it does, but its language can be also interpreted as saying something about the cultural history of Western civilisation. In this context, I remember vividly Margaret saying to me "If you want to understand how language works, don't look at prose, look at poetry." You do not need to be a Catholic to see wider uses of such words and phrases as body, blood, bread, wine, the bonds of death, sacrificial victim, lamb of God, bearing away the sins of the world (incidentally, for a reader of Latin poetry, the Latin word *tollis* is a most beautiful word to use here because of its connotations).

But this issue of multiple interpretation is just the same situation as applies to the mathematical symbols used in quantum theory. It has long been known that theory under-determines models of the theory and differing models need not be consistent with each other, the inconsistencies lying not in the symbols of the theory but in their interpretations, and this is true of both quantum theory and Eucharistic theology.* I have long thought that the question "was Jesus of a human or divine nature?" is as thoughtless an oversimplification as the question "is an electron a wave or a particle?", and both raise exactly the same philosophical problems and in some sense have the same unhelpful answer: "both, sort of". In both cases, the same thing is going on.

I remember Margaret remarking "Paradox is the most extreme form of metaphor, just as metaphor is the most extreme kind of simile." She is using the word "paradox" here because she is discussing the use of language in a scientific context, where there is clear meaning attached to the words 'true' and 'false'. In poetic language, there may be no such clear distinction; but there may well be confusion and contradiction if the poet uses too many metaphors which do not work together too well in trying to express the poet's intention. What she is getting at is that language such as poetic language which violates with increasing recklessness the ordinary rules of consistency and coherence may end up saying something that is less preposterously untrue (in the usual sense of 'true') than a literal interpretation would suggest. She argues that only by engaging with the "paradox" can one finally arrive at,

* Certainly I find reading a 20th century theologian such as Maurice de la Taille reminds me more of reading a mathematical proof than it does of reading something relevant to my spiritual and earthly life.

in her words, “a fully ripened stage of tense despair, out of which some unforeseen intellectual leap can come”. I think that Ted understood that this was at the heart of his problems with complementarity; but although the ‘tense despair’ was clearly there, I don’t think that the ‘unforeseen intellectual leap’ ever came.

As an aside, Tom Dilworth informs me that in the 1930’s there was a group of Augustinian catholics in London who were trying to see analogies between reconciling catholic and humanist world-views on the one hand and Einstein’s attempts to unify theories of gravitation and electromagnetism (his ‘Unified Field Theory’) on the other. One of their problems (and reasons for failure) was that at least most of them did not have the mathematical background to understand Einstein and what he was trying to do, let alone his choice of mathematical theory. But I don’t think the attempt is in itself a daft thing to try, because analysing the reasons for failure is often more instructive than any insight gained from success.

But in pointing out the similarities between multiple simultaneous meanings (or interpretations), whether in quantum theory or Eucharistic theology, arising from their use of metaphor, we must remember that in quantum theory the role of the experimenter cannot be ignored. What was distinctive about the EP’s understanding of religion was the same point: that it cannot be fully understood unless it is practised. The role of the experimenter corresponds to the role of the communicant at Eucharist. The ceremony is not just an anamnesis and the actual consumption of the consecrated elements cannot be separated from the Eucharist any more than the role of the experimenter and apparatus can be separated from quantum theory — at least in its present form.

I think this is where Basil Bunting’s comment is incomplete. In his dislike of Catholicism, he overlooks the role of the participant in the Mass. I agree with what he says, since I now profess to be an atheist (i.e. as an ontological fact, there is no God, never has been and never will be) — though there are things I don’t understand, that is not one of them. But just as Basil didn’t need a God to understand how the language of the Mass could be used in a metaphorical sense to interpret the world, so I don’t need it for the same reason and I don’t need it either to interpret the act of participation in the Eucharist. But it does need a sort of philosophical re-evaluation of the basic theory (and I have some idea of how it might be done). And I think that is part of my understanding of what the EPs were trying to do, in both quantum physics and Eucharistic theology.

Epilogue

When I started thinking about this talk, I thought I was going to say something about how the EP's thought. However, I have finished up saying something about how the EP's thought has formed my own thinking — and for me that is more important. In drawing together some similarities between quantum theory and eucharistic language, both based on how I interpreted the EP's influence on my thinking, I may be accused of engaging in retrospective rationality — though I sometimes wonder if there is any other form of rationality.

Well, yes. But simply to talk about what a historical person thought seems to me to be a piece of history. If I talk about how the thinking of that person has influenced my own thinking which I have developed along the lines of what that person might have thought, had they lived to see later developments in the world, is in part a personal testimony, but is more an act of *poiesis* — a making — which continues the tradition. This is what David Jones was saying in the epigraph to this essay. In that sense, we are all poets, even (or especially) mathematical physicists.

In any case, the basic idea that understanding quantum theory is an interpretation of a set of mathematical symbols, and understanding religious language is interpretation of another set of symbols, and that these acts of interpretation are very similar cognitive acts in which the interpreter is also essentially involved as a participant in that which has to be interpreted, is something that occurred to me during my sojourn with Margaret, Richard and Ted at Millington Road. I now regret a bit that at that time I was perhaps too shy, too lacking in self-confidence, to pursue the idea more forcefully, particularly in the presence of such forceful people. But I am grateful to them for teaching me the meaning of charity.

To summarise: the philosophical problems of epistemology, ontology and semantics, that arise in interpreting quantum theory are the same as those that arise in interpreting Eucharistic theology. They are both metaphors I live by.

Acknowledgements

To Margaret, for teaching me how to understand language.

To Richard, for helping me understand the relationship between religious language and religious belief.

To Ted, for teaching me about epistemic and ontic issues in quantum theory and discussing with me the various interpretations of the theory.

To the EPs generally, for the most intellectually stimulating four years of my life.

To Yorick and my other friends here gathered together today, for organising this seminar and giving me this opportunity to express these thanks publicly.