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Reading a formula(ting) of space(,)time and Quantum Mechanics.

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Bonnie Ellen McGill

Declaration: I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Bonnie E. McGill

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Abstract:

If I could to do this properly, and know this as what is proper (to, of, the thesis), I could say that this is to have balanced the (energy) books – in sum. That a framework of being (multiple) books, I could say text, I could say space, is already in place to have *then* the balance. Overall – in sum, average, to conserve. I could say, *what* is already in place?

I could say, the atom, rather than the (text)book, if I did not know better, that is, that I can add to the atom in its division: it could (also) be a particle or a wave. So it might be that I adumbrate how it is that de Broglie first thought matter waves, and by so doing, I might observe that the velocity of the phase wave associated to a particle is excessive to the system which produces it. Or rather that to carry energy requires a modification of this phase wave; no specifics, but rather a group (velocity). And in observing this, think through what is at stake in the claims to observers observing that which can(not) be seen.

I could say, that *this* is key (words); how to (re)order the infinite to (re)produce itself? And this in relation to energy. I might (probably) be questioning frames, the mathematics, mechanics; how and why this is invested in as supplement and proof of what *is*. What would be unity? What *is* proper (for there to (probably) be unity)? This in relation to eigenvalues, and Schrödinger's Wave Equation – what is properly characteristic of the being particle, wave?

I can only gesture towards this, the field –

Indexing, contents:

I am going to tell you what you are going to read.

Not because I can know a future (although I can perhaps construct one, already lost), or (re)constitute the past as such (but I could start equating one thing with another as what is always already (t)here).

I could never say that I have *written* what you are going to read; I cannot say that I know the thesis in its being thesis, or indeed that I know you well enough to be able to trace your reading, but I am going to tell you what you are going to read because this 'what' is my in(ter)vention. Just now.

So, I am going to tell you what you are going to read.

Not just in the abstract.

Then again, here is the following: what you are going to read is perhaps to do with a set (of) possibility.

But by another turn, just possibly, I am, *was*, (also) thinking of '[t]his therefore will not have been the book'[1], in the 'Outwork, prefacing', of Jacques Derrida's *Dissemination.*

Or, Richard P. Feynman's claim in *QED: The Strange Theory of Light and Matter*:

> I'm only going to tell you about photons […] to keep it simple […] What I'm going to tell you about is what we teach our physics students […Y]ou think I'm going to explain it to you so you can understand it? No, you're not going to be able to understand it […] *I* don't understand it. Nobody does.[2]

'You' is not one of the 'physics students', and although there is an assumption attributed to the 'you' of being given an 'explan[ation]' which gives 'understand[ing]', this is not going to happen. There can only be an understanding if '*I* […] understand it'. There is an understanding of it.

So, to keep it simple, 'photons' can be talked of, explained, in a space of (understanding) non-understanding. So there is always the promise of understanding, and this would be the corollary of understanding non-understanding.

[1] Jacques Derrida, *Dissemination*, trans. by Barbara Johnson (London: Bloomsbury, 2013), p.3

[2] Richard P. Feynman, *QED: The Strange Theory of Light and Matter* (Princeton: Princeton University Press, 1985), p.9

So I am going to tell you anyway – for it would be to think about understanding non-understanding, about the assumptions inherent in this position.

How might I know this? In 'The Logic of Quantum Mechanics' I would have to be in (the outside of) some field (of logic) to be able to think back over, retrieve, as over (t)here, what is already set. How might I think outside of this net(work) of 'Logic'(?):

(8.1) In any lattice L, the following formal identities are true,

L1: $a \cap a = a$ and $a \cup a = a$.
L2: $a \cap b = b \cap a$ and $a \cup b = b \cup a$.
L3: $a \cap (b \cap c) = (a \cap b) \cap c$ and $a \cup (b \cup c) = (a \cup b) \cup c$.
L4: $a \cup (a \cap b) = a \cap (a \cup b) = a$.[3]

So I could (re)define the field – here it is rather to do with 'any lattice L'. More than one, this logic goes beyond the singular. But I wonder whether this singularity (or not) is precisely what is at stake here; that this is *not* to do with a 'lattice L', because *a* 'lattice L' would be insufficient. 'The Logic of Quantum Mechanics' has to account for 'Quantum Mechanics' in its entirety.

But what would this be? A lattice? An *inter*connection?

If an interconnection, this 'Logic of Quantum Mechanics' constitutes a difference, that the 'Logic' of itself is the separation of '*a*' and '*a*'. The 'any', or a(ny), is such that there is no idea of the singular as such, except in its being (able to) account(able) for (no) more than *it* is.

What is it?

But this would be what you are going to read.

Or what I am going to read – what *it* is.

Some kind of in(ter)vention of what *it* is which can only renegotiate *with*in a field which is produced within itself (a subset which is the set).

So 'any lattice L' is known (to be) by 'the following formal identities'; 'any lattice L' is not set itself of itself. Here is a 'formal identity': 'L1: $a \cap a = a$ and $a \cup a = a$.'

[3] Garrett Birkhoff and John von Neuman, 'The Logic of Quantum Mechanics', *Annals of Mathematics,* 37.4 (Oct. 1936), 823-843 (829)

Another intersection: '$\cap$', so that the 'lattice *L*' would have to do with '*a*' as what is common to itself. '$a \cap a = a$' is in such a relation *to* itself that '*a*' and what belongs to '*a*' is (also) what belongs to '*a*'.

What is properly within the bounds of (*eigen-*, to project ahead, although perhaps rather more to (re)iterate what is already *not* (t)here, waiting, what I have already found as lost (again) what belongs to itself), '*a*'.

'*a*' is not all there is to say about '*a*'; if there is an idea of what belongs to (both) '*a*', the division which is required to guarantee (for it may well have been in doubt what properly belongs, what *is* the belonging of '*a*' to be '*a*'), '*a*' as '*a*', or again '*a*' as (also) '*a*', is here that which produces an identity.

'[A]ny lattice *L*'.

Any thesis, *T*?

That somehow I can reduce whatever I or anyone else might say (would not this be *I* as another?) to some*thing* (pre)scriptive, that cannot escape the bounds, or is, at least, always traceable back to this logic which sets the field.

Already a field.

I may just have stumbled upon it.

With the help of von Neuman and Birkhoff: 'L1: $a \cap a = a$ and $a \cup a = a$'. But if an intersection, *and* then again, (inter)section, there is another section '$a \cup a = a$'. But this would be that not only can I (can I?) hold on to (in some way) some whole to know the section, *and* that I already have a knowledge of the totality, it will remain as such while I read *this* section, and I can return to the whole later.

So I know what I am going to read.

$T \in T$.

I will come back to this later. (Watch me).

'$a \cup a = a$'. So there must be the same difference, that is, '*a*' must already be multiple to itself, be in excess of itself to be itself; the union and intersection of itself.

Which is (not) '*a*'. What is '*a*'?

I cannot help but think this would work so much better in French: plus d'un.

Perhaps this is not so unmotivated as I had thought – for the question of why quantum physics, and this reading of 'The Logic of Quantum Theory' *as though* the logic is something behind, in advance of, *it*, to be able to set the field, provide the justification, would be to do with an idea that a shifting to *another* ground would in some way (there are a lot of these *some ways* – are they all in the same field? Perhaps a map…)[4] justify what was over there; what would justify a difference?

How can difference be justified?

Should it?

Can it?

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[4] I am thinking about the claims around structure made in: Ernest Nagel and James R. Newman, *Gödel's Proof* (New York: New York University Press, 2001), that is, mapping abstract structures to show relations between different (mathematical) objects:

> The basic feature of mapping is that an abstract structure of relations embodied in one domain of "objects" can be shown to hold between "objects" (usually different from the first set) in another domain. It is this feature which stimulated Gödel in constructing his proofs. […] Gödel showed that meta-mathematical statements *about* a formalized arithmetical calculus can indeed be represented by arithmetical formulas *within* the calculus. (p.66)

It would be to do with a questioning of what is (applicable as) structure. That is, 'an abstract structure of relations' is (already) 'embodied' – there is already a modification of what the 'relations' are, and are known to be something other than 'relations […] between "objects"' as such. So, if 'Gödel showed that meta-mathematical statements *about* a formalized arithmetical calculus can indeed be represented by arithmetical formulas *within* the calculus', there is a thinking around what it is to claim a division – *where* the map has its limits. What, or rather *where* is the '*about*', and the '*within*'? For I read Gödel *as* thinking *about* this very (im)possibility of the object, structure as itself. For 'meta-mathematical statements', if '*about* a formalized arithmetical calculus' are not, as such, the 'formalized arithmetical calculus' – '*about*' (dis)places. Or again, I could say that this is *about* what is 'represented'; that is, that in representation, a system of representation holds. For the 'formalized arithmetical calculus [to…] be represented by arithmetical formulas *within* the calculus', already has a difference from itself to be able to ' be represented'. Therefore, if the '*about*' is already '*within*', not only would the mapping (of the structure) from '*within*' be without ((of) the structure), but also, the structure circles about itself infinitely. I could say (again), this would be to do with the abstract as that which exceeds itself in the constituting of the '*within*'; the impossibility of the centre, the (absolute) proof at the centre.

And indeed, if structure is then that which cannot speak itself, itself as (self)-statement as structure, cannot prove itself as structure, the structuring limit, this would be to do with what is 'undecidable', that is, Gödel's claims that any mathematical structure will always have undecidable propositions.

For if I start to think through this logic of quantum physics in 'The Logic of Quantum Physics' then this is not 'Quantum Physics' as such. The 'Logic' would be something apart, would (re)play this shift, or at least gesture to what may well be the ghost of a shift.

But I am thinking: 'In any lattice *L*, the following formal identities are true'. Where might I draw the (border)line? That is, if what is under (in?) discussion is what is '[i]n', what makes up 'any lattice *L*', this is not that '*L*' is therefore nothing other than, *no more than*, what is '[i]n', which, if there is only the '[i]n', 'any lattice *L*' being that which is produced out of the '[i]n', is that there can be no perimeter to this 'lattice *L*', which *in* any way (lost the field anyway; the only way?) can be in advance as already being: what is *in*.

Or out.

'L3: $a \cap (b \cap c) = (a \cap b) \cap c$ and $a \cup (b \cup c) = (a \cup b) \cup c$.' It would be that the bracketing off does not alter whatever is '*L*'. That is to say, '$a \cap (b \cap c) = (a \cap b) \cap c$' is to already have set a field whereby '$(b \cap c)$' precedes '*a*' to have '$a \cap (b \cap c)$'. And yet, if this is that '$a \cap (b \cap c)$', it would be to do with an idea that the sets '*b*' and '*c*' are already demarcating what is common to *both*, and only both, for '*a*' to be, in addition, also to do with a sharing of what is common. So, the bracketing, or rather the order of the bracketing, does not alter '*L*' because the commonality would be that which is positioned as itself to be defined by '$a \cap (b \cap c)$'.

But what *is* this common(ality)?

> There are […] reasons[17] which impel one to admit as a postulate the stronger statement that the set-product of any two subsets of a phase-space which correspond to physical qualities, itself represents a physical quality[.]
>
> [17] The first reason is that this [L1-4] implies no restriction on the abstract nature of a lattice - any lattice can be realized as a system of its own subsets, in such a way that $a \cap b$ is the set product of *a* and *b*. The second reason is that if one regards a subset *S* of the phase-space of a system $\mathfrak{S}$ as corresponding to the *certainty* of observing $\mathfrak{S}$ in *S*, then it is natural to assume that the combined certainty of observing $\mathfrak{S}$ in *S* and *T*

is the certainty of observing in $S \bullet T = S \cap T$, – and assumes quantum theory.[5]

The commonality would be to do with a positioning of belonging – a means of categorization. Yet even within this *categorization* there is at stake an idea of a change, of a putting in place of the category by which there is a sharing. And all this hinges on the sets, of the fields, and where their (border)lines are constituted. For if this is to do with an idea of ‘the set-product’ and ‘subsets […] which correspond to physical qualities’, there is an investment in the mathematical object as that which can wholly be the same as, and in, its correspondence[6]. That is to say, that nothing is lost in the transfer.

And yet since ‘this [L1-4] implies no restriction on the abstract nature of a lattice - any lattice can be realized as a system of its own subsets’, L1-4 are such that there is a potential increase of what ‘correspond[s] to physical qualities’. So ‘no restriction’ would be to do with an increase (can I be sure however, if ‘implies’?) of what already belongs – ‘its own subsets’. Although there is a gesture to ‘*L*’ being that which is constructed from what is *within*, the ‘subsets’, it is not that ‘*L*’ is produced as the only ‘system’, but rather ‘can be realized as *a* system of its own subsets [my italics].’ Therefore, if ‘*L*’ is ‘realized’, it is not to say that this realization accounts for itself absolutely: ‘*L*’ can be another ‘system’. Whatever ‘system’ of ‘*L*’ is ‘realized’ is bound up with the loss of the other systems, or the system which is ‘*L*’, and that this is known to be the case. What is ‘realized’ operates in a field in which there is already the knowledge of a loss, which would be the addition of an alternative, and yet never anything other than ‘*L*’.

The alternative would carry this sameness of ‘*L*’, even in its non-realization, according to this formulation, there being ‘no restriction on the abstract nature of the lattice – any lattice can be realized as a system of its own subsets[.]’ The ‘abstract nature’ would be to do with this ‘any’ – there is no ‘lattice’ as such except in its being known as having ‘no restriction on the abstract nature’ of it.

[5] ‘The Logic of Quantum Mechanics’, p.829

[6] I am thinking here (also) of Jacques Derrida’s thinking around sameness for the geometrical object in *Edmund Husserl’s* Origins of Geometry*, An Introduction*, trans. by John P. Leavey Jr. (Lincoln, Nebraska: University of Nebraska Press, 1989), particularly p.85

For there to be a lattice, or rather, for it to be 'realized', 'the abstract nature' of it must already be excessive. 'L4: $a \cup (a \cap b) = a \cap (a \cup b) = a$', is this the 'abstract nature' of '*L*'? Or have I realized something – '*L*'? Or at least, 'a system' of it? And if this latter, '*L*' as such can never *be* realized. This non-realization would be the possibility of its being.

'L4: $a \cup (a \cap b) = a \cap (a \cup b) = a$' maintains '*a*', or rather, maintains '*a*' as a system of difference from itself which is itself. How so? It is setting a field within which, here, '*a*' is, despite and because of the difference from '*b*'. In this lattice, it is not to do with the sets '*a'* and '*b'* as such, but rather that this despite *is* because of '*b*' as that which makes no difference. Difference, to be (a) part of what it means to be the same. There would have to be a shift within the system, but the system, *'L*', would always have to be that which is *in place*, in its absence. At least in the abstract – there are 'no restrictions' to this. For this 'no restriction', even as it gestures to the excess of 'the abstract' is nevertheless the (im)positioning of a limit in there being 'no restriction'. That is to say, this 'no restriction' is claimed from a position outside of the 'no restriction on the abstract nature of the lattice'.

Although perhaps this is not realized? For it would be that this thinking around 'no restriction', the infinity which is 'the abstract nature', would have to be that which is positioned as outside of realization, and yet known to be so; that which is beyond the *seeing* of what is, to be able to be realized in its difference(s) – 'any lattice can be realized as a system of its own subsets'.

Have I realized something? I cannot help but *think* this is to do with a rehearsal of the system as what is to be drawn round again. That is to say, to circulate within that which is set up to come (back). For my (re)formulation of 'L4: $a \cup (a \cap b) = a \cap (a \cup b) = a$' – I cannot say it is 'L4: $a \cup (a \cap b) = a \cap (a \cup b) = a$' – would be to inscribe borderlines which are equivalent to another. So this lattice is constituted out of an idea of restriction, in contrast to its 'abstract nature' of which there is 'no restriction'. 'L4: $a \cup (a \cap b) = a \cap (a \cup b) = a$' is to secure the passage of '*a'*, and that which '*a*' contains, for '*a'* has to be multiple within itself to be that which frames '$\cup$' and '$\cap$'. But in this there is already at work an idea of space, 'phase-space': that '*a'* is a set and a space within which there can be an addition of '*b*', or at least a part of '*b*'. And this space, '*L*', 'any lattice', is constituted out of an *and* and *or* of 'U' and '∩'.

The 'abstract nature' holds the system in reserve, or at least, that which comes to give the system in its 'realiz[ation]', and since there is 'no restriction' here. It is abyssal, necessarily, for if L1-4 are that out of which there is a system, the realization of the lattice would be operating out of a system which has to be (re)claimed.

There is something more to this system:

> The second reason is that if one regards a subset *S* of the phase-space of a system as corresponding to the *certainty* of observing in *S*, then it is natural to assume that the combined certainty of observing in *S* and *T* is the *certainty* of observing in *S* • *T* = *S*∩*T*, – and assumes quantum theory.

This logic would have 'quantum theory' as that which is in combination, or again, a logic in which there is an idea of what follows on: 'then it is natural to assume', and what is 'natural to assume […] assumes quantum theory'. At least in terms of 'observing'.

So this logic of 'quantum theory' is to do with a taking up, but a taking up which cannot be justified in its following, or what follows.

What follows?

Rather, it would be that the taking up ' – and assumes quantum theory', *cannot* follow, for if anything is 'natural to assume' it would have to do with '' following itself as produced and producing itself as difference. For 'if one regards the subset *S* of the phase-space of a system as corresponding to the *certainty* of observing in *S*,' what is being worked with is the idea that '*S*' as 'subset' *is.* That is, that any part of '' is such that it is (the only) system. And this would be to do with the 'abstract'; that is to say, both '' and '*S*' can only be interchangeable because both are the having-been-realized of the 'abstract nature of the lattice'. There is therefore a system, this 'abstract', which cannot itself be 'realized' because the 'realiz[ation]' would have to do with an investment in sight, the seeing, as an absolute. Therefore, if 'one regards the subset *S* of the phase-space of a system as corresponding to the *certainty* of observing in *S*' there will always be the (re)turn of what was put in place after as a history. That is, there is a '*certainty*', only if there is, primarily, a 'regards', and this must already have occurred. That the '*certainty*' of what is 'observ[ed]' is to do with a particular way of thinking, 'regard[ing]'. That is, to regard is a '*certainty*', that there is only a way of seeing, 'observing', which has already substituted one part for another, as a history, and therefore can no longer sustain the divisions of part and whole. The 'abstract nature of the lattice' would be the frame by which the interchangeable operates, and known to be interchangeable *as the same*. Abstract until the point of realization (what is *the point?*) This lattice – to follow. It would have to be to do with the turn.

If only time were linear.

So I might think again about what it is you are going to read; that is, what I am going to tell you. Since it is all in the abstract (still), I can (re)turn to it, knowing that there is a finite amount of possibilities, and these can be shared with you. That is, between here and *there* there is already inscribed what it is you are going to read.

Here, 'the combined certainty of observing  in *S* and *T* is the *certainty* of observing  in *S* • *T* = *S*∩*T*, – and assumes quantum theory.' I shall take up, 'assume[…] quantum theory'. Take up a position, take up that which cannot be taken up.

It is an assumption.

And a supplementary one at that.

And is (a certainty) *in combination*: more of the alternative which is the same (other one). That '', which is (not) the abstract, is that which is to do with a '*certainty* of observing'.

Certainly, there is '*certainty'* (now) of a difference in the observation, or the possibility of observing before the observation.

That is, '' as the 'lattice' can repeat itself in its other as the same: and this 'assumes quantum theory'. That there is no alternative because of this same.

Or at least, no alternative field. For if the dot-product of '*S*' and '*T'* is '*S*∩*T*', and this is the '*certainty* of observing ', there is an idea that there will always be a completeness, that is, the ‘*certainty* of observing’. That this ‘assumes quantum theory’ would therefore position ‘quantum theory’ as that which is always already known to be complete in terms of delimiting the field, and that this completeness can be separated from its sub-sets. But what would ‘completeness’ be here *now?* It would be to do with a ‘completeness’ which cannot be known in its limit (*certainty?*); it cannot be a completeness which positions the field from outside of itself, but rather from there being no limit to be reached from which to turn back. It would be, rather, that there cannot be a borderline inscribed *as such* because this completeness is in the production of a difference which is (always) within that which is already *taken* to be the same (*certainty*) field. That is, this same field because there is no limit: the same which is the same everywhere, even in its (certainty of) difference and differencing. And yet this very sameness would be that which cannot *delimit*. That is, there is no *completeness* except in the addition of the sub-sets: their (re)production. The addition would, at each (re)production, be that which threatens (*certainty)*, there being this (assumed) limit.

However, if the sub-sets are that which produces the completeness, and this is completely (a *certainty?*) within terms of what is seen, there is not only an investment in the mathematics, or, here, the set–theory which is (re)presenting the logic of ‘quantum theory’, it ‘assumes’ it, but also, and in *relation* to this, this questions the (im)possibility of the completeness of observation. That is, how far can there be a certainty of observation if this is not only to do with what is ‘assume[d]’, but also if there is a requirement to turn to set theory as the (re)presentation of the ‘certainty of observing’? Or again, the ‘*certainty* of observing’?

This, then, is something I assume – take up. But not in the sense in which I read it in ‘The Logic of Quantum Theory’, which relies on an idea of a ‘naturalness’. Rather, this taking up is *with*, or involves, a necessary (dis)placement of ‘what’ ‘it’ ‘is’ (I could have striked those three words through), I am taking up. What is assumed is precisely what is at stake in quantum theory, and particularly so when it comes to the turn to the mechanics as explanation and proof of what is, or has, been ‘seen’.

Observation is in itself that which is assumed to be self-sufficient, despite the turn to mechanics – or rather, as read above, *despite*, is rather that the turn is only possible because there is an idea that what is 'seen' is a 'certainty'.

> [P]hysicists such as myself are acutely aware that the reality we observe – matter evolving on the stage of space and time – may have little to do with the reality, if any, that's out there. Nevertheless, because observations are all we have, we take them seriously. We choose hard data and the framework of mathematics as our guides, not unrestrained imagination or unrelenting skepticism [*sic*].[7]

In assuming this questioning of observation, I cannot say that I am completely divorced from what the 'physicists […] are acutely aware' of, or at least, a particular sort of physicist. For indeed there is here a questioning of 'reality' – if there is a reality at all. However, the difference would be in the positioning of 'observations' as 'all we have', and that it is 'reality we observe', whether or not it has 'little to do with the reality, if any, that's out there.' There is set up here a position from which there is a knowing that 'observations are all we have', and that the 'observations' are that which is shared, again, as in the von Neumann and Birkhoff, among this community[8]. For whether or not 'the reality we observe [has…] little to do with the reality, if any, that's out there', this 'reality' is what is seen by the 'we' as the same; there is absolute agreement on observation, known outside of observation to be able to claim it, and this itself constitutes a totality – 'all we have', which is (then) itself gesturing to a loss. '[A]ll we have' is both everything, 'all', and also an insufficiency in this 'all'; 'all' is not enough to be absolutely certain.

My question would be: how to see outside of a seeing if what 'we observe' is what everyone sees as the same, and that this 'may have little to do with the reality, if any, that's out there'?

The question of the same would be that although it guarantees the 'we' in that 'all we have' is what is agreed upon, is in place for the 'we' to work *with*, and indeed, *with* because there is, in the 'have' a possession of what is observed, but also as something which is separate from the 'we', and

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[7] Brian Greene, *The Fabric of the Cosmos* (London: Penguin, 2005), p.ix

[8] This would (still, also) be Derrida's reading of Husserl's *Origins of Geometry* regarding the transferral of the object as the 'same' among a community.

would need to be so to be circulated among the 'we', this circulation of the same is also that which cannot, then, critique itself.

Why is this necessary? But perhaps it is not so much necessary, as rather excessive to the observation. Although 'physicists such as myself are acutely aware' of the potential problems of 'observations', these problems hinge around the 'reality' being something separable from the 'observations', and that which is it possible, at least in principle, to know. Hence the issue of whether 'the reality we observe – matter evolving on the stage of space and time – may have little to do with the reality, if any, that's out there.'

So although there is an awareness of the problems around observation, nevertheless there remains an investment in them. That is, the awareness does not extend to re-thinking what observation is, and what is at stake in this, nor that '[w]e choose hard data and the framework of mathematics as our guides'. However, if this is to do with a choice, it would be that there is some relationship taken up, chosen, between 'the reality we observe', 'hard data and the framework of mathematics'. Indeed, this relationship would be that the 'hard data and the framework of mathematics' are the excess, that is, not what 'we have' as such, for 'all we have' are the 'observations'.

But this would (still) be to do with what is (re)constituted as the same. These 'observations' cannot be seen, or rather, cannot be sufficient in a pursuit of reality, if 'hard data and the framework of mathematics' have to serve as 'guides', are taken up, *assumed* as 'guides'. *I see* there is, bound up with the 'assumes', a questioning of completeness in terms of knowledge.

Yet the question remains: 'hard data and the framework of mathematics' as 'guides' to *what*, if the 'reality' which is 'observed' is not known to be 'reality' as such, and yet this is what is pursued; *what* is pursued? Or indeed, how would there be an idea of achieving that which is not known to be outside of the 'framework'? For indeed this is not that 'mathematics' as such is the guide. The question remains:

> It is the normal belief of physicists – and it is my belief also – that there should *not* be fundamentally different laws governing different regimes of physical phenomena, but just *one* overriding system of fundamental laws (or general principles) governing *all* physical processes. […] We expect that – indeed we may have a *faith* that – physics as a whole must be a *unity*[.][9]

But also:

> [W]e should bear in mind that we do not really know the actual mathematical structure of the true physics of nature, so that the term *real physics* here refers to the particular mathematical models that are used in our current highly successful theories.[10]

Wherever, and whatever 'physics' is, and 'as a whole', it is not as yet a '*unity*'. The italics would have something to do with the difference between what *is* and *should be* the case. But this difference is, if to do with a '*faith*', that '*faith*' is not part of the 'fundamental laws'. And yet, if '[w]e expect that – indeed we may have a *faith* that – physics as a whole must be a *unity*', the 'expect[ation]' would be already to think with a system

– a lattice? All these (inter)connections of 'physics as a whole' constituted by 'hard data and the framework of mathematics', and again, 'mathematical models' –

which is somewhere *to come*. Yet there is not (yet) 'the true physics of nature', nor indeed 'the actual mathematical structure' of this.

How would 'highly successful theories' be claimed? That is, by what is it gauged?

The '*real physics*' would have to do with this '*faith*'; this difference of *is* and *should be*, is constituting the '*real*'. The '*real*' already in its difference from the ideal(ity) of '*unity*'. And again, that the '*real physics'* is here 'the particular mathematical models that are used in our current highly successful theories.'

'*Real physics*' really is 'particular mathematical models'.

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[9] Roger Penrose, *Fashion, Faith, and Fantasy in the New Physics of the Universe* (Oxford: Princeton University Press, 2016), pp. 138-140
[10] *Fashion, Faith, and Fantasy*, p. 403 (Appendix A)

Really, there is already a displacement of *physics* (physics? Perhaps not, at least, not *here*). A displacement of the ideal(ity); what is yet to come has already shifted its horizon to really be itself, in truth.

Really I could tell you what you are going to read.

Really this thesis is already a translation of what is physics – mathematics.

Really, I have lost touch with the reality of this thesis, although I would have to here, now, assume I had it at some point; *it is a model of –*

– I might come across it later.

In its *unity*.

Maybe.

And if this would be what is 'overriding' anything previous, or that which are 'current highly successful theories', these would no longer be quite so 'highly successful'. The 'unity' (re)writes '*all* fundamental laws'. The '*unity*' is not that which is produced out of what is already in place, but that which *should re*place the 'different laws governing different regimes of physical phenomena'. So there is a working with the 'current highly successful theories' despite their *not* being what is believed in.

Another in(ter)vention, someone somewhere said:

> The development of quantum mechanics in the 1920s was the greatest advance in physical science since the work of Isaac Newton. It was not easy; the ideas of quantum mechanics present a profound departure from ordinary human intuition. Quantum mechanics has won acceptance through its success.[11]

Success according to 'ordinary human intuition'? Or in its departure?

[11] I know who this 'someone' is, and their whereabouts, although maybe Δwhereabouts: Steven Weinberg, *Lectures on Quantum Mechanics* (Cambridge: Cambridge University Press, 2013), p.xv.

Except, 'quantum mechanics' is still within 'physical science' if it is 'the greatest advance *in* physical science since the work of Isaac Newton [my italics]'. '[Q]uantum mechanics' is a part of an overarching (narrative) frame[12] – 'physical science'.

And perhaps not so 'natural' in its assumptions as von Neumann and Birkhoff claim, if it was 'a profound departure from ordinary human intuition.'

But then again, what is (not) natural is perhaps to do with the difference between 'quantum theory' and 'quantum mechanics'.

But perhaps what I will advance is that the difficulty, and this is not easy, is that it is perhaps the framing limit which is the challenge – to remain 'the greatest advance' would require the being in of 'physical science', an adherence to the being 'physical science' and yet *also* being the 'profound departure from ordinary human intuition'.

So *where* might quantum mechanics be situated, if at all?

But another question would be what is quantum mechanics? And would this have something to do with the '*faith*' which is required for the '*unity*' – that quantum mechanics challenges what it is to have '*unity*'? Quantum mechanics would be to challenge what is 'physical science' as physical science? And 'physical science' as bound up with 'ordinary human intuition'. And if a challenge, I am, by another turn, thinking here of Martin Heidegger's 'The Question Concerning Technology':

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[12] And not, then, that there is some idea of an inherent, essential division between narrative on the one hand, and mathematics on the other, as I read to be the case in *Circles Disturbed: The Interplay of Mathematics and Narrative*, ed. by Apostolos Doxiadis and Barry Mazur (Princeton: Princeton University Press, 2012), even as the drive seems to be to discuss what *unites* the two – metaphor being chiefly cited, for example in 'Vividness in Mathematics and Narrative' pp. 211-231.

Indeed, in 'Adventures of the Diagonal: Non-Euclidean Mathematics and Narrative', Arkady Plotnitsky thinks around the 'quantum object', particularly pp. 421-426, as that which has never been seen as such, but is nevertheless 'seen' as the quantum phenomena. However, I read this as a displacement of the object. That is, the quantum object here would reiterate the claims around metaphor, in that there *is*, but knowable in its unknowability, or again, knowable as unknowable in its other as other.

A discussion of metaphor is also in Plotnitsky's earlier work, *Complementarity: Anti-Epistemology After Bohr and Derrida* (Durham, North Carolina: Duke University Press, 1994), again in relation to what constitutes the 'seeing' of quantum objects, or phenomena, by photographing the traces of photons. While this does undermine an idea of the object as *being*, albeit raising the issue of representation, there is, nevertheless, a claimed difference to the mathematical results as somehow separate(d) from questions of (anti-)epistemology; the mathematics, formulas, of quantum mechanics are not discussed by Plotnitsky.

> If modern physics must resign itself ever increasingly to the fact that its realm of representation remains inscrutable and incapable of being visualized, this resignation is not dictated by any committee of researchers. It is challenged forth by the rule of Enframing, which demands that nature be orderable as standing-reserve. Hence physics […] will never be able to renounce this one thing: that nature reports itself in some way or other that is identifiable through calculation and that it remains orderable as a system of information.[13]

Remains.

If here I am going to tell you what you are going to read (bring it out of the abstract, manifest the whole thesis here, again), it would be because I can rely on there already being the thesis.

That this is but a continuation of what is the thesis to be brought back.

It remains despite the challenge to it, to it as it.

Remains as *it is*: 'physics […] will never be able to renounce this one thing: that nature reports itself in some way or other that is identifiable through calculation'. The challenge to physics: another reiteration of the faith that there is really physics, except not here.

Not really.

Really, physics is in the calculation, and the calculation as what is already known to (re)turn the physics as the mathematics.

As a report – opening again to there being nothing outside of this opening of the calculation.

Why quantum mechanics?

It reports.

It already (is the) remains.

I cannot quite see it.

Maybe I have heard this report (echo; signal).

No*thing* to report.

> If modern physics must resign itself ever increasingly to the fact that its realm of representation remains inscrutable and

[13] Martin Heidegger, 'The Question Concerning Technology', in *The Question Concerning Technology and Other Essays*, trans. by William Lovitt (New York: Harper Perennial, 2013), p.23

> incapable of being visualized, this resignation is not dictated by any committee of researchers.

Perhaps, this is what is at stake: that there is no injunction to *see it*. That is, that if ‘quantum mechanics’ is a ‘profound departure from ordinary human intuition’, not only does this rest on there being an ‘ordinary human intuition’ for ‘quantum mechanics’ to be a ‘departure’ from it – but the question would be just how far a ‘departure’, if ‘quantum mechanics’ is indebted to this ‘ordinary human intuition’ for its difference in departure. But also, *why* should there be an investment in a seeing, that there *remains to be a seeing*, and this is what is invested in as ‘*faith’*, necessarily? That is, the ‘*unity*’. No longer ‘representation’, the report, or only this, with no *re-,* for *if* ‘modern physics’ can never be ‘visualized’, this is ‘not dictated by any committee of researchers’, this is not a decision taken, but rather that ‘Enframing’ as a system has already put in place that there is no*thing* to see as such. That is, ‘quantum mechanics’ is not *to be seen*, but that which *reports*, ‘Enfram[es]’ that which cannot be.

Am I back in the abstract? That is, the lattice of set theory which can (re)organise itself, challenge itself within itself to report on itself. That is, to see the whole in the part?

‘Enframing […] demands that nature be orderable as standing-reserve’. That is, ‘[t]he first reason is that this [L1-4] implies no restriction on the abstract nature of a lattice’, *primarily,* there would have to be, in the ‘Logic of Quantum Mechanics’ that which can always *give* more. The ‘standing-reserve’, that L1-4 ‘implies no restriction on the abstract nature of a lattice’.

Holes are of the essence.

Or space.

Absence as absence which *is.* Not absence from itself; this would have to be absolute absence (presence). But even within this, ‘no restriction’ is beyond L1-4 if ‘implies’. Beyond, in excess of, ‘no restriction’ in (out) of the implication. That is, there is an idea of some exteriority: the ‘standing-reserve’.

A readiness to become ‘orderable’. And there is ‘no restriction’ on this ‘orderable’. Indeed, the ‘Enframing’ would be that the framing is itself to be (re)constituted. Indefinitely.

So if by the 'Logic of Quantum Mechanics', there is 'no restriction', it would guarantee a teleology; that is, the drive to '*unity*' as the point of difference.

But the 'Enframing'? If what is at stake in the 'Enframing' is the means, and this is by no means itself *a means*, by which there is the 'system of information' as 'information', it would be a case of continually (re)thinking what *is* the framework, the quantum mechanics, the mathematics, the model.

That is, what is this which is not?

Or at least, for 'The Logic of Quantum Mechanics', observed in its production as prior, as the history.

Why quantum (mechanics)? – because of the claimed disruption of the classical, but also within itself; that there are problems within the theory.

The mechanics.

Really.

The mathematics.

The where(abouts) of quantum mechanics disrupting classical thought, what you are going to read rehearses this. *Where* is what you are going to read?

I am going to tell you. A promise.

But if this is to question the where(abouts), that is, if there are no (border)lines as such, if all this is to question what and where quantum mechanics is, then how can I hope to, no, *want to,* (re)construct a delimited field whereby I can point to my thesis, quantum mechanics, literary theory, and say *there*?

The gesture was not enough.

Really, I could have just pointed you to Geoffrey Bennington's 'Inter'[14].

I will do that now.

[14] Geoffrey Bennington, 'Inter', in *Post-theory: New Directions in Criticism*, ed. by Martin McQuillan, Graeme MacDonald, Robin Purves, and Stephen Thomson (Edinburgh: Edinburgh University Press, 1999), pp.103-119

Or indeed, J.O. Weatherall's thinking (in) 'Inertial Motion, Explanation, and the Foundations of Classical Spacetime Theories'. That is, in Weatherall's article, there is a thinking around what constitutes explanation in the spacetime theories of Einstein:

> The alternative view I will develop — I will call it the "puzzleball view" or, perhaps more precisely, the "puzzleball conjecture" – holds that the foundations of physical theories, or at least *these* physical theories, are best conceived as a network of mutually interdependent principles, rather than as a collection of independent and explanatorily fundamental "axioms" or "postulates."[15]

This question of *where*, *where* might the thesis (when it arrives, or even, for now, in the anticipation of it, $T \in T$) situate itself (*eigen*-ground might be pushing it), comes back to fields, borderlines, invokes some sort of limit, even as I question, and have questioned *why* a limit? This is perhaps more to do with a way of thinking, rather than *this* being 'quantum physics' and *that* being 'literary theory'.

Or indeed a way of thinking –

reading

– *where* hinges on sameness and difference. In taking Weatherall to be 'doing' something similar – that is, 'the "puzzleball conjecture"' would *not* be to take up assumptions, nor indeed to think of, in Weatherall's terms, '"axioms" or "postulates"' as 'fundamental' and therefore both beyond and *already within* explanation – I can invoke a position from which to depart. And indeed, although Weatherall is questioning the 'fundamental', and what can be claimed as explanation, this does not, in my reading, extend to the equations of the spacetime theories. *(T)here* is perhaps the break – for the investment in the mathematics, the equations, are that which is at once already beyond the fundamental, supplementary, and yet claimed as the (absolute) framework.

But I am thinking, now, what are the equations, the mechanics? And again, if this is to do with quantum mechanics being positioned as radically different to 'ordinary human intuition', *where* to start? Although what is 'ordinary human intuition'?

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[15] James Owen Weatherall, 'Inertial Motion, Explanation, and the Foundations of Classical Spacetime Theories', in *Towards a Theory of Spacetime Theories*, ed. by Dennis Lehmkuhl, Gregor Schiemann and Erhard Scholz (Basel: Birkhauser, 2017), pp. 13-42 (p.16)

Fortunately, Weinberg has the answer: '[t]he principles of quantum mechanics are so contrary to ordinary intuition that they can best be motivated by taking a look at their prehistory.'[16]

Having lost the 'human', 'quantum mechanics' can begin. Or at least be 'motivated'.

But not 'intuition'. And 'their prehistory' is ready and waiting.

Is 'prehistory' that which brings '[t]he principles of quantum mechanics' into line? Or is it that 'prehistory' has something of this contrariness by which the 'principles' can be traced?

Regardless, '[t]he principles of quantum mechanics' cannot quite be 'motivated' head on – but rather 'by taking a look at their prehistory'.

More fielding.

And 'motivated'?

Some energy is perhaps required for the 'quantum mechanics'.

And from 'prehistory'.

*Pre*history.

Outside of time, before its happening. This is what can be 'take[n…] a look at': the coming into being before being.

The beforeness of history – but what is this? Only claimed by what follows it – history.

Pre –

So I am (or Weinberg is, maybe both) starting again, having come back from an end-point.

To learn a reason, a motivation. *Why*, for this would be against 'ordinary intuition'.

Let's put some energy into this. It might be best, and take a look at prehistory:

[16] *Lectures on Quantum Mechanics*, p.1

– I see. (Illuminating).

That is:

1.3 Wave Mechanics

> Ever since Maxwell, light has been understood to be a wave of electric and magnetic fields, but after Einstein and Compton, it became clear that it is also manifested in a particle, the photon. So is it possible that something like the electron, that had always been regarded as a particle, could also be manifested as some sort of wave?[17]

Is it possible this is to do with continuity? In the other; that which 'could also be manifested as some sort of a wave'.

Still not (a) beginning then – this is, after all (the above), pre-history.

Following 'light'.

Already.

Or possibly, which would be rather nearer to clarity, that '[e]ver since Maxwell, light has been understood to be a wave of electric and magnetic fields, but after Einstein and Compton, it became clear that it is also manifested in a particle'. Clearly 'light' of itself has never been at issue, '[e]ver since Maxwell' and 'after Einstein and Compton', despite the change in understanding.

Would it be meaningless to ask, *what is light*, as such?

'Ever since Maxwell, light has been understood to be a wave of electric and magnetic fields, but after Einstein and Compton, it became clear that it is also manifested in a particle, the photon.'

What is 'light' is dependent on the position of '[e]ver since Maxwell' and 'after Einstein and Compton'. '[L]ight' has a history, but this history, a positioning of '[e]ver since Maxwell' and 'after Einstein' requires a stability: a stability which is 'light' as what alters. '[B]ut' breaks within the history, 'but after Einstein and Compton, it became clear that it is also manifested in a particle, the photon.' '[L]ight' is doubled, 'understood to be a wave of electric and magnetic fields', that is, already belonging to 'electric and magnetic fields', produced out of these (two), as a 'wave'; 'a wave'

[17] *Lectures on Quantum Mechanics*, p.11

(de)limits the 'fields', has some governance of 'electric and magnetic fields'. In being produced, 'a wave of electric and magnetic fields' is also inscribed 'in a particle, the photon'.

'[L]ight', to be 'understood to be a wave of electric and magnetic fields', is understood by what it is (not), these doubled fields 'electric and magnetic'.

I am wondering about 'fields' *still*, the grounding of them – *where* to begin a questioning of 'fields', perhaps not in fieldwork, fielding the questioning? Having, by this formulation, already found myself within a(nother) field, and known this field as such. Can I trace the perimeter of fields and know this as such, that is, remain within the field proper but also know its outside? In any case, 'electric and magnetic fields' is a homogeneity which is nevertheless constituted by an acknowledged difference: 'electric and magnetic'. And is it possible to read this out another way?

It is possible, *is it possible*, that I already *know* another's reading, brought back now, (t)here Slavoj Žižek as my own, meaningless to ask:

> In the course of a dialectical reflexive turn, the subject is compelled to assume that the insufficiency of his knowledge with regard to reality signals the more radical insufficiency of reality itself. […]
>
> To get an approximate idea of this dialectical vortex, let us recall the classic opposition of the two mutually exclusive notions of light: light as composed of particles and light consisting of waves – the 'solution' of quantum physics (light is both at the same time) transposes this opposition into the "thing itself", with the necessary result that "objective reality" itself loses its full ontological status – that it turns into something that is ontologically incomplete, composed of entities whose status is ultimately virtual. Or think of the way the universe we reconstruct in our minds while reading a novel is full of "holes", not fully constituted: when Conan Doyle described Sherlock Holmes's flat, it is meaningless to ask exactly how many books there were on the shelves – the writer simply did not have a precise idea of it in his mind. What, however, if – on the level of symbolic meaning, at least – the same goes for *reality itself?*[18]

It is possible that this is not what I am about to do (in my reading).

[18]Slavoj Žižek, *The Ticklish Subject: The Absent Centre of Political Ontology* (London: Verso, 2008), pp.63-4

Although, have I not already been reading? Have I been reading the 'mechanics' though?

But if this is an (ex)positioning of *why* this is not 'it', my 'it', *why* not, and *why now?*

Why 'it' – there is an investment, (t)here of 'reality itself', or again, '*reality itself*', which is known whether or not it is 'ontologically incomplete'. And if 'we construct', this ontology is no longer to do with (just) 'the subject' and 'his knowledge', which, although *he* is being constituted and read by another, (and indeed I cannot take myself out of this abyssal relationship) is nevertheless that whatever 'his knowledge' *is* is known to be 'his'. And this collective 'recall[ing]' and 'reconstruct[ing]' is to do with 'this dialectical vortex', that is to say, when positioning 'this dialectical vortex' – there are others(!) – and only '[t]o get an approximate idea', it is necessary to invoke an 'us' to 'recall […] the two mutually exclusive notions of light'. *This* was already, by this account, reading and waiting to be 'recall[ed]', already known.

But 'us' has to do with the supplementarity that is at stake in 'this dialectical vortex'. Or rather, that the 'reality itself' can only be 'reality itself' if it is known to the 'us', 'reality itself' to the collective – 'us'. It cannot be that any*one* knows, although I could also say *reads*, for 'we' all have '"holes"' in our universe(s of reading), otherwise the 'recall[ing]' could not occur, at least, not in the sense that:

> [T]he 'solution' of quantum physics (light is both at the same time) transposes this opposition into the "thing itself", with the necessary result that "objective reality" itself loses its full ontological status – that it turns into something that is ontologically incomplete[.]

Recalling – the turn would have to already have occurred – there is no more; 'it turns into something that is ontologically incomplete'. There is a knowledge of what it is to be complete, to trace the turn, to know the 'ontologically incomplete'. But there is, even in this, a further recalling, or rather a series of recallings, in that 'this opposition' is 'transpose[d]' 'into the "thing itself"', which is not quite '"objective reality"', but both are under question here, despite the 'transposes' being known as such. '[W]e' can see the movement as movement, and indeed, strictly speaking, this (absolute) move *would* prevent any idea of the '"thing itself"' as such.

But nevertheless, it is not a questioning of the thing itself, 'reality itself', there is (still) this itself, but it has rather to do with 'level[s]', and what cannot be asked.

So this is *why*, and *why not*.

Questioning, remains.

Because there *is* an investment in *being*, it is just that now it is known to be 'incomplete'. But more crucially, this turn to the 'ontologically incomplete' would be to prohibit questioning, and questioning because 'it is meaningless to ask exactly how many books there were on the shelves – the writer simply did not have a precise idea of it in his mind.'[19]

Indeed, this prohibition on what can be asked is grounded in the (claimed) knowledge of 'the writer' and what he had 'in his mind' – or not. But rather than rehearsing the issues around authorship, although I can by no means claim an absolute divide from this, I am interested here in the investment in there being this knowledge of what is, and is not, (t)here, for the question to be valid, *not* 'meaningless'. That is to say, I am interested in this system whereby there is set up parameters to think within – that it is to do with an absolute, although known to be lacking, 'incomplete', and the ability to (re)turn to this: what 'the writer […had] in his mind.' For this would be the paradox – that there *is* an idea of '*reality itself*' or indeed 'at the level of symbolic meaning' which is known apart from '*reality itself*', 'at least' – there could be another turn by which 'the same'

[19] This idea of what it does and does not 'make sense' to ask, or indeed, *what* to claim with regards to quantum systems is discussed by David Z. Albert in *Quantum Mechanics and Experience* (Cambridge, Massachusetts: Harvard University Press, 1992), particularly in relation to superposition, and by Brian Green in *The Fabric of the Cosmos* in Chapter Four, and especially p.94.

This is also something which is thought through by Niels Bohr in *Atomic Physics and Human Knowledge* (New York: John Wiley & Sons, 1958). (T)here is a thinking through of the division between the classical and the quantum, and *where* the division can be scribed. S*cribed* is perhaps apt for there is an awareness of the 'problems' of language, and also the 'division' of content and form (see p.65 and p.73). These issues I read to do more with epistemology than ontology; what constitutes 'phenomena' for the quantum is, for Bohr, bound up with the measuring apparatus, the frame, rather than that which can be known outside of the measuring. *However*, this (still) nevertheless relies upon an idea of knowing the limits of knowing, and the framing – the apparatus of the experiment – as absolute.

is not consigned to this one 'level' – and that nevertheless, this '*reality itself*' cannot account for itself.

It must be to do with prohibitions on what can(not) be asked or questioned.

Prehistory?

So, 'quantum physics', and what it does, is not only, here, related to reading, but also, for both, what makes sense, or rather is 'meaningless to ask', is bound up with an author(ity), 'the writer', '[e]ver since Maxwell'.[20] Both 'quantum physics', and asking questions within reading, only has meaning if *someone knows*, and is known to know, to already have an answer to the question.

So now what about 'his knowledge'? If 'the insufficiency of his knowledge with regard to reality signals the more radical insufficiency of reality itself', there is no knowing of 'the more radical insufficiency of reality itself' outside of 'his knowledge' which has to be read by another. This 'insufficiency' is to do with 'the subject', and not 'the writer', for the difference would be one of creation.

It is that 'quantum physics' turns on not asking because there is (already) no idea of an answer.

Or rather (more precisely?):

> [T]he "solution" of quantum physics (light is both at the same time) transposes this opposition into the "thing itself", with the necessary result that "objective reality" itself loses its full ontological status[.]

What would it be to say that '"objective reality"' had 'full ontological status' previously?

Prehistory?

More to come on this. Or to be retrieved.

The 'standing-reserve'.

[20] Although Weinberg has no time for philosophy or philosophers; it does nothing to help physics, in *Dreams of a Final Theory: The Search for the Fundamental Laws of Nature* (London: Vintage, 1993). I am thinking here of the chapter 'Against Philosophy'. It is perhaps fortunate I am not a philosopher.

It would have to be to do with an investment in what is *not* 'both at the same time'. But this in turn rests on the assumption that, regardless of whether or not '"objective reality"' *is*, whatever it is, it is to 'itself' known to be, and required to be thus, because of the loss – 'itself'.

But then again, the "thing itself", which here takes on 'this opposition', the 'mutually exclusive notions of light', is not quite itself – that is, cannot be thought as an itself of itself. Since 'this opposition' is to do with 'notions', there is an investment in the '"thing itself"' as what should not be 'notions', but especially not 'mutually exclusive notions'. Although, therefore, Žižek is questioning '"objective reality"' as '"objective reality"', there is nevertheless (still) an idea of a reality which is, whether or not it is 'full of "holes"' or has 'los[t] its full ontological status'.

Which is the answer – '[w]hat, however, if – on the level of symbolic meaning, at least - the same goes for *reality itself*?'

Well what if? I think it is rather more a question (is this meaningless? To ask, that is? But I will ask anyway, if I have not already, for the meaning is bound up in the question) of what is '*reality itself*'? For if '[w]hat […] if […] the same goes for reality itself', 'the writer' and the questioning of how many books, is not, by implication, *'reality itself'*, but that the governing of 'the same' is only to be thought out of what is set up as non-reality.

And a little further on:

> So the [ontological] gap that forever separates the domain of (symbolically mediated, i.e. ontologically constituted) *reality* from the elusive and spectral *real* that precedes it is crucial[.][21]

What if, having posed the question, there is an inability to think out of the bind?

'Enframing'.

For this 'gap' maintains the division, 'forever separates', but only because there is an idea of 'the elusive and spectral *real* that precedes it'. That this '*real*' is, but is not known in its full sense – only in its loss. Is this fully known – this loss? Measurable? But if 'quantum physics' is a way to think, at least, to 'get an approximate idea', 'quantum physics' is here seized upon as a means to think through, and

[21] *The Ticklish Subject*, p.65

maintain that there *is* a '*real'*, and that this, like 'the writer', determines what is and is not 'meaningless'. Or again that the 'imprecision of our measuring […is] not merely our epistemological defect'[22] but that 'in order for (what we perceive as) "reality" to appear, some of its features *have to remain "unspecified"'*[23]. There can only be this 'gap' if there is taken to be a structure already in place –

– back to the lattice. L1-4

– or at least projected to be in place, as what should be – this unity, '*unity*'. That there are criteria for 'some of its features […] *to remain "unspecified*"''.

Specified as unspecified.

And this is not 'perceive[d]'(?) Or at least, the non-specified has to be known as non-perceivable.

I do not have such an investment.

I was thinking about fields. Perhaps I still am.

I cannot dismiss Žižek, not least because in claiming what I do not have an investment in, I can only have invested (something) in it.

In fielding the question of fields – just what *is* (in) this thesis?

Somewhere (in prehistory?) I did promise to tell you what you are going to read.

What 'has been understood', 'but after Einstein and Compton' is 'also manifested'. The addition does not exclude what 'has been understood', does not interrupt its history. '[L]ight' is such that it can absorb the difference – or rather that 'light' can field the difference(s) of its (own?) being. 'Ever since Maxwell', and 'after Einstein and Compton', 'light' is not known outside of its (re)formulation by 'Maxwell', 'Einstein and Compton', does not self-change, in that sense.

Does it have its (own) being? What would it mean to belong wholly to itself?

Is there an eigenvector for this?

Meaningless to ask (Maxwell, Einstein, Compton), *what is light, as such?*

[22] *The Ticklish Subject*, p.67
[23] *The Ticklish Subject*, p.67

Indeed, if 'also manifested in a particle', 'light' can be elsewhere to what 'is understood'. But this is, in itself, understood: the 'manifest[ation]' is the understanding of the manifestation 'in a particle' as where 'light' appears; *appears* because 'it became clear'. This appearance of 'light' can only be that it is 'manifested in a particle' because it was not clear before, was not 'light', not 'manifested in a particle, the photon'.

This, only 'after Einstein and Compton'.

'Einstein and Compton' mark the becoming clear of the 'became clear'. '[I]t became clear that it is also manifested in a particle, the photon' is that 'light', 'it' (already some~~thing~~ then), is not 'a particle, the photon', if it is 'also manifested in a particle'.

This bringing to light of light.

A dangerous play – I am now thinking of *Dialectic of Enlightenment*[24].

But if 'it became clear that it is also manifested in a particle, the photon', what was not clear was the 'manifestation'. The difference of 'manifested in a particle, the photon' is that there is no claim to a history of 'the photon' to be 'manifested in'. The 'became clear' is the tracing of a history of separation between 'light' and 'particle, the photon'.

The history of prehistory. (Of the photon). Just how far would this have to go, to go *to* unity?

And if it is only 'after Einstein and Compton, [that] it became clear that it is also manifested in a particle', 'light' and its 'manifest[ation]' is to do with time, to 'Maxwell', 'Einstein and Compton'. History is required. That is, 'it became clear that it is also manifested in a particle, the photon' is that 'it became clear' is to do with an anteriority, that 'Einstein and Compton' are the beginning of this

[24] I could say this is a (re)reading of Feynman:

> When in mathematical procedure the unknown becomes the unknown quantity of an equation, this marks it as the well-known even before any value is inserted. Nature, before and after the quantum theory, is that which is to be comprehended mathematically.

Max Horkheimer and Theodore W. Adorno, *Dialectic of Enlightenment*, trans. by John Cumming (London: Allen Lane, 1973), p.24.

(pre)history of 'manifest[ation] in a particle, the photon'. Manifestation would be to do with its own lack: 'light' does not wholly 'manifest[…] in a particle, the photon' *to be* 'manifested in a particle, the photon'.

So 'light' cannot be that which is – this history of light, (or before the after of ~~itself~~) the *illumination* of difference, the becoming into being 'in a particle, the photon' is also the lack in what 'has been understood'. *Illumination*; it would turn on what already is, *all ready.*

Reserve without reserve.

It cannot come back round again, because it is already not there. The 'light' is lacking, in understanding, and thus also manifestation, to be able to clarify the difference – that it 'also manifested in a particle, the photon'.

Possibly this is not 'light' as such. If '[e]ver since Maxwell, light had been understood to be a wave of electric and magnetic fields' what about before 'Maxwell'?

Pre-prehistory? Meaningless to ask.

'Light' begins with 'Maxwell' as what has been otherwise before; that is, 'light' here begins as what has already begun. Already begun, but already as other to itself; 'light' is that (having dared designate, I too (re)turn (to) light) which is, and in being not itself that it 'had been understood to be a wave of electric and magnetic fields', and is 'also manifested in a particle, the photon' is the insufficiency of 'light' *to be* as such, (in)explicable, or, that is, cannot be 'understood' or 'manifested' as 'light'.

But still, 'light'. This difference which is traceable as a difference from itself. And yet, if this 'became clear' is the clarification of the truth of light, the illumination of what always was – 'that it is also manifested in a particle, the photon' – what always was, this manifestation, is 'after Einstein and Compton'. '[L]ight' 'is also manifested in a particle, the photon' after 'Einstein and Compton', attributable to, in following in their image, 'light' is a work of 'manifest[ation]' after 'Einstein and Compton'. Possibly, 'Einstein and Compton' lighted upon light – read the 'manifested' as an 'also' to the understanding. Something is not quite right. The 'wave of electric and magnetic fields' is not enough, there is still some part in the dark, and although 'it became clear that it is also manifested in a particle, the photon' to be 'also manifested', 'light' cannot be wholly circumscribed by 'the photon'. '[T]he photon' leaves 'light' somewhat in the dark; illuminates this lack. The lack of clarity.

After Einstein: 'Concering an Heuristic Point of View Toward the Emission and Transformation of Light'.[25]

And from this 'light' can be 'understood' in other terms: 'is it possible that something like the electron, that had always been regarded as a particle, could also be manifested as some sort of wave?'

'So is it'? This would be the question because of the continuity of 'manifest[ation]', that after 'light', following 'light', in the light of 'light', if 'it is also manifested as a particle' then what is 'regarded as a particle, could also be manifested as some sort of wave'. Still, the 'electron' is within sight (within (the) light?), if 'something like the electron, that had always been regarded as a particle, could also be manifested as some sort of wave' then 'manifested' as a change from 'wave' to 'particle' and 'particle' to 'wave' is that *what* is 'manifested', the 'electron' or 'light', is nevertheless maintained in its 'manifestation'.

Indeed, 'manifested' would be that the 'electron' is 'electron' while being (also) what it 'had always been regarded as [-] a particle'. The 'manifested', for both 'light' and 'electron' is 'also', that is, 'also' the other to 'particle' or 'wave', and thus conserves what 'had been understood' and 'had always been regarded'. Possibly, I could say, this is a chasing of essences, hence the 'manifested' and chasing because this other threatens what 'had been understood' and 'had always been regarded'; 'manifested' allows for the 'light' and 'electron' to be while being other.

[25] Albert Einstein, 'Concerning an Heuristic Point of View Toward the Emission and Transformation of Light', trans. by A.B. Aronst and M.B. Peppard, *American Journal of Physics,* 33.5 (May 1965), 367-374. Einstein's paper is to do with the claim to how light would be 'more readily understood […as] a finite number of energy quanta which are localized at points in space, [and] which move without dividing' (p.368). So I could say, what makes (more) sense, here, is a thinking of (the introduction) of light as an object. This idea of 'quanta which are localized' is produced out of an idea of difference, that is, which terms do not cancel out in comparison between two equations – see Section 6 of the paper.

The 'manifested' is the one as, or rather in, the other, the constituting of what (also) is by what is (also) not. So is it possible that this is to do with the manifestation of loss? But a loss of the presence of the loss of 'light' and the 'electron' as *an* other term.

Possibly.

'This was suggested in 1923 by Louis de Broglie (1892-1987), a doctoral student in Paris.'[26] Possibly not. But rather, I could say –

> Any kind of wave of frequency v and wave number $\mathbf{k}$ has a spacetime dependence $\exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$ where $\omega = 2\pi v$. Lorentz invariance requires that $(\mathbf{k}, \omega)$ transform as a four-vector, just like the momentum four-vector $(\boldsymbol{p}, E)$. For light, according to Einstein, the energy of a photon is $E = hv = \hbar\omega$, and its momentum has a magnitude $|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$, so de Broglie was led to suggest that in general a particle of any mass is associated with a wave having the four-vector $(\mathbf{k}, \omega)$ equal to $1/\hbar$ times the four-vector $(\boldsymbol{p}, E)$:
>
> $$\mathbf{k} = \boldsymbol{p}/\hbar, \qquad \omega = E/\hbar \qquad (1.3.1)$$ [27]

To set the ground – although perhaps *ground* is a little too particulate – '[a]ny kind of wave' is somewhere, for it 'has a spacetime dependence'. The 'wave number $\mathbf{k}$' claims the three co-ordinates – '$\mathbf{k}$' somewhere (between) giving over and taking for itself. Co-ordinates would (re)negotiate a space (field?), and the very idea of a dependency, at least in this formulation, if '$\mathbf{k}$' is that which constitutes the co-ordinates in the being three. That is, if '$\mathbf{k}$ has a spacetime dependence', it would be independent of the dependence to *have* the dependence.

As an aside, I could claim the spacetime as x^{μ}, with the co-ordinates running from x_0 which is '*t*', and the three space co-ordinates x_1, x_2, x_3.

How? It has to do with the 'Lorentz invariance'. Already there is a system to be upheld.

But also, this is an edit. And since this is in the edit, I am in some sort of returning relationship to this, which is (not) 'my' thesis.

[26] *Lectures on Quantum Mechanics*, p.11
[27] *Lectures on Quantum Mechanics*, p.11

So now it would be to play within a(nother) field.

Or a spacetime.

This 'spacetime dependence' and the 'Lorentz invariance' would demand that what is true in one frame of reference is true in another: that is 'just like'.

Then again, I could say I am in the *same* field.

Just like *what*, however? For 'any kind of wave', if governed by '$\exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$' would be that $\psi \in \mathbb{C}$.

So what does this mean for the 'spacetime dependence'? Or rather, what does this mean for ψ? Although the 'spacetime dependence', ψ as such cannot be seen, that is, if $\psi \in \mathbb{C}$ only in $\mathbb{R}$ would this be possible.

$\mathbb{R}$eally? But this would demand that there is a translation of ψ from one space to another. That is, that the 'manifested' can be known outside of its coming into sight.

A cycle through i?

But would that be possible? For if 'the wave function cannot itself be identified with a single physical property of the system'[28], but rather 'if we know the wave function associated with a physical system, we can calculate the probability of finding a particle in the vicinity of a particular point'[29], the 'wave function' is not so much that there *is* a wave, but rather that this is a means by which there is a knowledge of what is before itself. And if 'the wave function cannot itself be identified with a single physical property of the system', the 'finding [of] a particle in the vicinity of a particular point' is not a 'physical property of the system'. I could ask what would be 'the vicinity', but then I could also think about the construction of 'a physical system', whereby what is considered to be 'the wave function', which is to find that which is constituted as other to itself, 'a particle', is *not* considered to be the 'system'.

The finding is not a system (in all probability).

I could be a questioning how to *find* the object: the particle.

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[28] Alastair I. Rae, *Quantum Mechanics, Fifth Edition* (New York: Taylor & Francis, 2008), p.18

[29] *Quantum Mechanics*, p. 18

Or *re*find 'the particle', the particle, as the same as itself in its difference as the same (other).

I could say how to (not) know the unknowable as unknowable as knowable: the object.

Why is 'the wave function' not for the finding? I could say perhaps it has something to do with $\mathbb{C}$.

I could say that is has to do with the wave function as that which cannot be found as itself as a frame.

I could say this because, in this system, it cannot be reduced to a singularity.

So if the de Broglie relations hinge on a particle being associated with a wave, it would be that there can be no *measurement* of the particle as such.

But I wonder whether this has to do with the 'wave function [which] cannot itself be identified with a single physical property of the system'. This, in the sense that if it is already determined to be *for* the finding of the particle, and the wave function is not to do with a singularity – indeed, any such singularity would have *already* 'found' the particle – there cannot, equally, be a finding of the particle as such if the 'wave function' must be to do with the system in its entirety.

Or again, I could (probably) say that the wave function would have to be thought as a frame which does not delimit; an infinite frame. So the wave function would have to be always and everywhere associated with the system, and therefore excessive to itself.

With itself?

And yet I could *now* question what it would be to know the system in its entirety, which is nevertheless *not* to do with the particle as that which is already found, but rather remains to be found.

What would it be to be found? Or rather, that this found would have to come back from loss.

But I would like to think this out further. That is, why the de Broglie relations are necessary for this coming into being of the particle.

If $p = \frac{h}{\lambda}$ and this because I am thinking not about the particle as wave transformation, that is, '$|\boldsymbol{p}| = E/c = h\nu/c = h/\lambda = \hbar|\mathbf{k}|$', but the wave as wave, so hence this would be to do with 'λ', and if this wave is within a system of 'Lorentz invariance', *there should be* an ability to compare 'λ' in two different reference frames, since Lorentz invariance demands that, in this case, 'λ' 'has the same form in all inertial frames of reference'[30].

In other words: '$-(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2 = -(\Delta x'^0)^2 + (\Delta x'^1)^2 + (\Delta x'^2)^2 + (\Delta x'^3)^2$,'[31] why this? I will come to it in its proper place. For now, this is on borrowed ground. But if this is to think non-relativistically:

> [A]ccording to de Broglie, the wave associated with an electron in a circular orbit must have a wavelength that just fits into the orbit a whole number *n* times [...] Using the non-relativisitic formula $p = mv$, this is the same as the Bohr quantization condition.[32]

To fit within a limit justifies the particle, here the 'electron', and the 'non-relativistic formula $p = mv$'. Already within this scheme there are criteria which the 'electron' must have.

Why (again?) That is, why '$p = mv$'? I could say Galilei-Newton mechanics, that is, non-relativistic, or otherwise, to think alongside Einstein (although in thinking it over, again, perhaps this is (still) in the spirit of Einstein):

> If [...] we had taken as our basis the tacit assumptions of the older mechanics as to the absolute character of times and lengths, then [...] we should have obtained the following equation[...]:
>
> $$x' = x - vt[.]$$[33]

So, if there are two frames of reference *F*, and *F'*[34], ''' guarantees the (possibility of) comparison. The difference between the two frames is vt: or at least this is what 'we should have obtained'. In some other time(line), which would (should?) be *this* time t, to be able to subtract the difference in time, that is '$-vt$', and yet nevertheless know this. To come back to '$-vt$'; for '$-vt$' to remain '$-vt$'. vt is

[30] *Quantum Mechanics*, p.246

[31] Barton Zwiebach, *A First Course in String Theory*, *Second Edition* (Cambridge: Cambridge University Press, 2009, 2012), p.15

[32] *Lectures on Quantum Mechanics*, p.12

[33] Albert Einstein, *Relativity: The Special and the General Theory,* trans. by Robert W. Lawson (New York: Three Rivers Press, 1961), p.37

[34] Or rather two again: not only is there the non-relativistic of $p = mv$, but also that of 'special relativity' with the 'Lorentz invariance'. The question of why these multiple frames of references is a question I will be returning to.

that *F*’ would be moving along the x axis with v. I cannot quite get at this ‘$-vt$’, or indeed this move which is ‘$-vt'$’.

But *if* I had, I should have obtained –

What ‘we’ know ‘should have [been] obtained’; this possibility is itself a certainty, *certainty?* These are ‘assumptions’, and ‘tacit’ ones at that.

‘We’ decided this before I arrived. Wordlessly, silently, so I may have interrupted something.

But ‘we’ did not.

Some originary silent grounding.

‘If […] we had taken’ – so whatever the ‘we’ *is* taking, requires the ‘tacit’ – that this taking cannot be spoken, except perhaps *now*, in the ‘[i]f’ – the ‘absolute character of times and lengths’ is the possibility which must not *be*, but be (not) taken, together, to frame what is. The multiplicity of the ‘absolute character of times and lengths’, all known in and of themselves, as separate, and therefore equivalent to one another, without remainder.

Why t? It is a coordinate sometimes, that is ‘$-(\Delta x^0)^2$’, or indeed ‘$-(\Delta x'^0)^2$’, or I could very well also claim $t = t'$.[35]

And yet if, as read above, this is to do with the retrieving of a particle, but within the bounds of a wave, the wave sets a limit for the particle being somewhere within itself as (another) frame. What must, or is *to be also* claimed if ‘$x' = x - vt$’? That is, because of ‘$p = mv$’, and because *a particle*, it is (has) a mass m, and velocity v.

‘$x' = x - vt$’: ‘v’ is not the velocity of the particle, but the velocity of the frame. v is (re)constituted in each *outing*, that is, would have to have something, in this scheme, in addition to its being v; that is, it cannot be known absolutely in its being v as particle or frame – this difference, what (re)constitutes its being as *of* a particle, or *of* a frame, would be what is excessive, and yet this excess nevertheless is its *being* particle or frame, respectively. That is, a belonging–identity would be

[35] Along with some others: Paul A. Tipler and Gene Mosca, *Physics for Scientists and Engineers*, *Fifth Edition, Extended* (New York: W. H. Freeman, 2004), p.1270, and *Relativity,* p.37 in particular, and also Chapter 11, ‘The Lorentz Transformation’.

that which can never be anything other than excessive; what does *not*, then, properly belong, if here, properly would be to do with an inherency –

So I could say[36] v_p as the velocity of the particle, p as the momentum of the particle, and thus p' as its difference in *F',* and $v_p{}'$ the velocity of the particle according to the second frame *F*', and then v as the velocity between the frames, in the spirit of Einstein's '$x' = x - vt$'. After all, it is what 'we should have obtained'.

It is not enough that there is a wave; what is to be retrieved would have to be set up within the frames, to be *then* derived.

I could say that there is a requirement for renaming. That p, *F',* v , v_p, $v_p{}'$, m*,* would be a means of (re)thinking the relationship. Or I could say that this (re)naming would constitute some sort of framing of a field by which I can think *out* what is at issue. But say I were to do this, if I have not already, to a lesser or greater extent – I will leave it to another to determine, unless, of course, I had *started* with *we,* and have done with all the work which I cannot agree upon, tacitly, a particle must be somewhere within this frame *already* – I could say that I might have to tacitly take up the assumption that I have already agreed with myself on this – but could I know this (*certainty*)?

Or any frame.

I could say x'. Why (t)here?

The frames *F* and *F'.* On the one hand there is a particle, after all $'p = mv'$.

These frames, in excess.

But to continue with the thinking within *F* and *F'*

– although not quite so *in* that I cannot claim the(ir) limit –

[36] Along with so many others – would this be the 'we'? This setting up of frames is something which is invoked frequently by physicists, see *Physics for Scientists and Engineers,* p.1270*.* In what follows I would like to (re)trace this thinking of Galilean frames, taking my reading from Barton Zweibach, *Quantum Physics 1, Lecture Notes 4*, available at: https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture-notes/MIT8_04S16_LecNotes4.pdf [accessed 17 March 2018]. See also Malcolm Longair's reading of de Broglie's paper in *Quantum Concepts in Physics*: *An Alternative Approach to the Understanding of Quantum Mechanics* (Cambridge: Cambridge University Press, 2013), pp.177-181.

if there is some idea that the particle has moved, that is, is *at* x' in *F',* then I could now take a time derivative, since '$x' = x - vt$', so any frame shift would be governed by '$-vt$'. But in what sense 'moved'? That is, the 'absolute character[…]' of time would have to be in place to be able to claim the move, but what about the frames? By what tacit assumption might I have to not know my knowing of my whereabouts as a position which can 'see' these frames *as* frames (of difference)?[37]

Perhaps I should not have mentioned the absolute character of times, that is, just gone ahead with the time derivative: $\frac{dx'}{dt'} = \frac{dx'}{dt} = \frac{dx}{dt} - v \Rightarrow v_p' = v_p - v$.[38]

But '$p = mv$'; $v_p' = v_p - v$ is that v_p' is constituted out of the difference between the velocity of the particle in the initial frame and the velocity of the difference between *F* and *F'*.

To question why '$p = mv$' would be to take up again the relation '$p = \frac{h}{\lambda}$'. Within *F* and *F'* there is absolute conversion, so *p* = *p',* and thus also the (re)introduction of *m.* That is, a relation between *p, p',* and the absolute velocity of the moving frame *F',* that is, v. I could say, if '$p = mv$', '$p' = p - mv$'[39] since 'p'' is reliant on the frame shift, that is '$v_p' = v_p - v$', so that, as velocities are additive in this frame, produced out of here, *F* as that which I have (re)constituted (from others), momentum is not conserved with *a* frame.

And then '$\lambda' = \frac{h}{p'} = \frac{h}{p - mv} \neq \lambda$'[40] since '$p = \frac{h}{\lambda}$', or, $\lambda = \frac{h}{p}$, and this is to do with tracing, setting up the tracing, of λ, or λ', or λ as λ'. Or again $\lambda' \neq \lambda$. The absolute frames would demand that 'p'' is irreducible to 'p' because it is produced out of it. I could say that this exercise in the setting up of frames, and the shift '$-vt$' undermines any idea of translation here.

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[37] Bruno Latour thinks about this (framing) in relation to *Relativity: The Special and the General Theory* in 'A Relativistic Account of Einstein's Relativity', *Social Studies of Science*, 18.1 (February, 1988), 3-44. However, Latour, despite reading the shifts in narration, nevertheless reads out from Einstein's *Relativity*, and seemingly forwards, an investment in transformation, that is, an ability for information to be transmitted as itself in its other (reference frame), which I take to be the object (again) guaranteeing an escape from perspective, a universalism despite, or rather because of, transformation.

[38] Tipler and Mosca would have it thus: '$u_x = \frac{dx'}{dt'} = \frac{dx'}{dt} = \frac{dx}{dt} - v = u_x - v$', '[i]f a particle has velocity $u_x = \frac{dx}{dt}$ in frame *S*' (p.1270), or Zweibach in *Lecture Notes*: '$\frac{dx'}{dt'} = \frac{dx}{dt} - v$' (p.2)

[39] *Quantum Physics 1,* p.2

[40] *Quantum Physics 1,* p.2

So can I say, *could* I say, there is a reliance on a frame shift? I could say yes, because there is an idea of a difference between *F* and *F'*, that there is *required* to be a difference, albeit to constitute a similarity, '$-vt$', but no because if '$p' = p - mv$' there is nevertheless that which knows these frames by another frame, and that if '$p' = p - mv$' such that '$\lambda' = \frac{h}{p'} = \frac{h}{p-mv} \neq \lambda$', it would be that the framing cannot be exceeded, exorcised, because it is additive (within this frame, my frame, which is itself a framing of –).

Why the deviation into absolute frames of reference when 'Lorentz invariance requires that $(\mathbf{k}, \omega)$ transform as a four-vector'?

It is perhaps because there is something going on here to do with the interchanging of what constitutes the particle and the wave – *neither* is sufficient to constitute what is being 'manifested'. And yet this would be another question – what *is* being 'manifested'? For even within Galilei-Newtonian mechanics which rests on absolutes, and thus λ should be equivalent to λ', there is no possibility of comparison, *thus*, no possibility of measurement.

Whatever might be constituted as measurement rests on an idea of equivalence elsewhere, in a different reference frame. λ, if not repeatable as the same, even within the Galilei-Newtonian system, would be to question whether there can be a grounding for validity as produced from comparison. For although *F* and *F'* were set up to be non-relativistic, that there is nevertheless λ which cannot be the same (length) in *F'* would undermine the universality of the mechanics; or the object in translation.

So, if 'Lorentz invariance requires that $(\mathbf{k}, \omega)$ transform as a four-vector', and '$|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$', there is something at stake in the difference of the systems which would allow λ to be '$\mathbf{k}$'.

And it would be to do with light:

> For light, according to Einstein, the energy of a photon is $E = hv = \hbar\,\omega$, and its momentum has a magnitude $|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$, so de Broglie was led to suggest that in general a particle of any mass is associated

> with a wave having the four-vector $(\mathbf{k}, \omega)$ equal to $1/\hbar$ times
> the four-vector $(\boldsymbol{p}, E)$[.]

The 'wave' is in relation to, that is, 'equal to $1/\hbar$ times the four-vector $(\boldsymbol{p}, E)$'. '$\hbar$' would be the condition by which there is a wave. But not a 'wave' that is a 'particle'. The 'associat[ion]' is not to say that the one *is* the other. '[A]ssociation' keeps a necessary division. For if, as above, there is the requirement to borrow from what constitutes the 'particle' to produce 'λ'', there must be an idea of difference within which what constitutes the 'particle' can be transferred *to* the production of the 'wave'. So although in one sense there *is* a collapse of 'particle' and 'wave', that the one is constituting the other, or at least, to regress further, what constitutes the 'particle' is what constitutes the 'wave' (in part), in another sense there cannot be a complete collapse. A collapse as such which would be an absolute unity is not possible, for 'particle' and 'wave' are constituted by the other as other.

I could say that *now* I am thinking of the excess of the abstract again – that which cannot be seen, but is nevertheless to be realized in its parts and (re)produced out of these.

The question now would be what is a 'wave'? Or at least, if a particle is that which is constituted by mass and velocity, how is a wave constituted? If λ', or indeed, λ is that which, in Galilean transformation, cannot be compared or measured, how can λ be thought? I am now interested in λ as that which is *beyond* interpretation, the caveat being that this is itself an 'interpretation', but this 'beyond-ness' would have something to do with being positioned as non-repeatable in these Galilean reference frames.

'Lorentz invariance' requires a shift from Galilean reference frames to those of Special Relativity. But, if, again, this is to do with 'associat[ing]', the 'associat[ion]' can only proceed from what is already known – the 'wave' *must be* connected to the 'electron'. There has already been the decision (although perhaps not 'tacit[ly]', since this is no longer the absolute, of silence) that there is a connection, an association. It is not so much then that there is *to be* an association, but this association is because of and from the decision which already determines the particle and wave *as associated*.

I could have put it this way:

> Let us consider a moving body whose "mass at rest" is m_0; it moves with regard to a given observer with velocity $v = \beta c\ (\beta < 1)$. In consequence of the principle of energy inertia, it must contain an internal energy equal to $m_0 c^2$. Moreover the quantum relation suggests the ascription of this internal energy to a periodical phenomenon whose frequency is $v_0 = \frac{1}{h}\, m_0 c^2$. For the fixed observer, the whole energy is $\frac{m_0 c^2}{\sqrt{1-\beta^2}}$ and the corresponding frequency is $v = \frac{1}{h}\, \frac{m_0 c^2}{\sqrt{1-\beta^2}}$.
>
> But if the fixed observer is looking at the internal periodical phenomenon, he will see its frequency lowered and equal to $v_1 = v_0 \sqrt{1-\beta^2}$, that is to say this phenomenon seems for him to vary as $\sin 2\pi v_1 t$. The frequency v_1 is widely different from the frequency v; but they are related by an important theorem which gives us the physical interpretation of v.[41]

There is already 'a moving body' (I could say particle); it has mass, 'm_0', and 'velocity $v = \beta c\ (\beta < 1)$.' I could then be '[u]sing the non-relativistic formula $p = mv$'. I could say this 'moving body' does not have '$v = \beta c\ (\beta < 1)$' of itself, and therefore the 'velocity' as '$\beta c\ (\beta < 1)$' is because of 'a given observer' – or again, the 'us consider[ing…] a given observer'.

And yet, if '[i]n consequence of the principle of energy inertia, it must contain an internal energy equal to $m_0 c^2$', this would be a thinking in terms of Special Relativity, that is, since 'it must contain an internal energy equal to $m_0 c^2$', so I could say, (still in the spirit of Einstein) $E = m_0 c^2$.[42] But this 'internal energy' is not to do with 'a given observer', rather it is '[i]n consequence of the principle of energy inertia'. So this $E = m_0 c^2$, or again, 'internal energy' is not something which can be seen as such.

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[41] Louis de Broglie, 'A Tentative Theory of Light Quanta', trans. by R.H. Fowler, *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science,* 47:278 (1924; 2006 online) 446 – 458 (449). DOI: 10.1080/14786442408634378 [accessed 20 March 2018].

[42] Or, *Physics for Scientists and Engineers*, p.1290.

Since this is about electrons (in part), I will borrow a formula: '[t]he energy of an electron is $W = \frac{1}{2}\, mv^{2}$'[43], and keep it in reserve. Why *about electrons?* '[A]ccording to de Broglie, the wave associated with an electron in a circular orbit', and there is 'a periodical phenomenon'; it would be about how to think both 'the moving body', the particle, and what constitutes the electron as (a part of the) 'moving body' – photon?

I can only operate in this state of becoming other.

So to think this non-relativistically, there would need to be a relation between how the 'internal energy' is related to 'a periodical phenomenon':

> Moreover the quantum relation suggests the ascription of this internal energy to a periodical phenomenon whose frequency is $v_0 = \frac{1}{h}\, m_0 c^2$. For the fixed observer, the whole energy is $\frac{m_0 c^2}{\sqrt{1-\beta^2}}$ and the corresponding frequency is $v = \frac{1}{h} \frac{m_0 c^2}{\sqrt{1-\beta^2}}$.

If 'the quantum relation suggests the ascription of this internal energy to a periodical phenomenon whose frequency is $v_0 = \frac{1}{h}\, m_0 c^2$', although there is an idea that there 'must' be energy, this energy *now* has to be modified by 'the quantum relation', '$\frac{1}{h}$'. And yet, '[t]he quantum relation' is, by this account, beyond 'the fixed observer', as indeed the 'internal energy' is to a 'given observer': 'the quantum relation suggests the ascription of this internal energy to a periodical phenomenon whose frequency is $v_0 = \frac{1}{h}\, m_0 c^2$'. The 'ascription' is that which is not seen in the becoming of 'ascription', for 'the quantum relation' is that which 'suggests the ascription' – the coming into writing of the 'internal energy to a periodical phenomenon whose frequency is $v_0 = \frac{1}{h}\, m_0 c^2$'. The relation *in writing*. Writing is not seen. But the 'relation suggests'.

'[T]he quantum relation suggests' that which *is* already has belonging, being: 'a periodical phenomenon whose frequency is $v_0 = \frac{1}{h}\, m_0 c^2$'. Is there a relation 'to'?

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[43] And to give it back to: Malcolm Longair, *Quantum Concepts in Physics*: *An Alternative Approach to the Understanding of Quantum Mechanics* (Cambridge: Cambridge University Press, 2013), p.221

Perhaps, if there is an idea of 'whole[ness]': the 'whole energy' is what 'the fixed observer' sees, rather than the 'periodical phenomenon' as such. But the 'whole' as a frequency is nevertheless subject to '$\frac{1}{h}$' as a limit. '$\frac{1}{h}$' would be that which imposes (another) parameter on '$\frac{m_0 c^2}{\sqrt{1-\beta^2}}$', so that '$v_0$' can only ever be equivalent to a multiple of '$\frac{1}{h}$'. Yet the 'whole energy' does not have this limit: '$\frac{m_0 c^2}{\sqrt{1-\beta^2}}$'. Although governed by the Lorentz invariance, the 'whole energy' is that which is yet to be divisible, or the multiple of '$\frac{1}{h}$'. And these multiples? The relationship between frequency and energy demands the frequency have some modification by '$\frac{1}{h}$'. That is, the frequency would be such that it cannot, or does not, disrupt the frame by which there is energy. It would be, therefore, that the addition of '$\frac{1}{h}$' would be the instigation of a (dis)ordering of frequency as such. And if multiples, it would be that this ordering would be a certain repetition, but a repetition, then, which would mean that E is an accumulation (of a loss).

So now, what has this to do with the 'periodical phenomenon', and what is at stake in the periodicity? v is the means by which to return to the whole. Or to put it another way, to put in place (again, I could say, ascribe) a connection between the part and the whole by the addition of the part. Although I could turn this thinking again to question whether an additional part could be known to *be* the return to the whole if this is an accumulation of a loss.

And indeed, any return as such would demand a time frame – but what of time here? But perhaps this question has come ahead of its (proper) time.

Or rather, it would be a question of knowing absolutely an internal and an external when there is no idea of the other, except in its absence, which would also, by this account, have to be absolutely absent. Absent from absence. (I could be silent on this point).

'But if the fixed observer is looking at the internal periodical phenomenon, he will see its frequency lowered and equal to $v_1 = v_0 \sqrt{1-\beta^2}$' – why this shift? What starts as '$v_0 = \frac{1}{h} m_0 c^2$' has to come into sight. To think back through these frames, it is not so much that '$\sqrt{1-\beta^2}$'

abolishes any idea of an absolute, but that the very modification of '$\sqrt{1-\beta^2}$' demands that there *is* *something* to be modified. Or, to again, how to shift from the absolutes of time and space, the Galilean, to Special Relativity? And to *know* that shift, for it would be that whatever *gesture* is made to the relative, this can only ever be relative according to the classical, that is, what was lost, or *beyond* the 'fixed observer'.

Perhaps this would be the issue, of thinking *through* a frame, to be able to claim *I see the frame, how it works,* and yet to not see, not to see it *as frame*. To be able to know that 'the fixed observer is looking' at something in particular, to see seeing without the frame of being other which is nevertheless necessary in constituting 'the fixed observer', and yet also claiming an 'internal energy [which is ascribed] to a periodical phenomenon' which does *not* require a seeing. Yet the absolute (of suggested ascription, of absolute cause and effect), cannot be seen as such.

Is only this gesture.

In writing.

Afterwards.[44]

So if '[t]he frequency v_1 is widely different from the frequency v; but they are related by an important theorem which gives us the physical interpretation of v' what is this 'theorem'?

I might have to (re)group, to be certain that I am thinking this relation between 'v_1' and 'v'.

'$v = \frac{1}{h} \frac{m_0 c^2}{\sqrt{1-\beta^2}}$', and '$v_1 = v_0 \sqrt{1-\beta^2}$' $= \frac{1}{h} m_0 c^2 \sqrt{1-\beta^2}$, so $v = \frac{v_1}{\left(\sqrt{1-\beta^2}\right)^2}$.

Is $v = \frac{v_1}{\left(\sqrt{1-\beta^2}\right)^2}$ the 'physical interpretation of v'?

I could put again: $v = \frac{v_1}{1-\beta^2}$.

[44] I am thinking here of Einstein's thinking in *Relativity: The Special and The General Theory* trans. by Robert W. Lawson (New York: Three Rivers, 1961), p.81, when he discusses the differences between two pans on a stove, one emitting steam and the other not. He 'sees' a gas flame under one, and not under the other, so attributes the gas flame to the steam. However, in his thinking, there is a thinking of *how* to think 'back', that is, to take up a position of neutrality by thinking outside of knowing. This kind of thinking outside of knowing, or rather, the pretence of not knowing, is what I read to be at stake here also: that is, how to occupy a position by which to account for the differences within what is set up to be (already) the same field (stove), and when the 'gas flame' is already the gas flame.

Or, as de Broglie would have it: '$v_1 = v(1-\beta^2)$'[45]. And if the relation '*gives* us the physical interpretation of v [my italics]', or rather, the 'theorem' does, the 'physical interpretation' (among others), is reliant upon an idea of difference. $v = \frac{1}{h}\frac{v_1}{\left(\sqrt{1-\beta^2}\right)^2}$, or '$v_1 = v(1-\beta^2)$', is not 'physical' however, but the 'theorem' which 'gives'. Yet there is something more at stake here; if it 'gives the physical interpretation', and the 'physical interpretation' is a way of relating the two frequencies, it is not enough, that '$v = \frac{1}{h}\frac{m_0c^2}{\sqrt{1-\beta^2}}$', and '$v_1 = v_0\sqrt{1-\beta^2}$'.

What does it *give*? If the 'lowered' frequency has to do with '$v_1 = v_0\sqrt{1-\beta^2}$', '$v_1$' is slower than '$v$' because of the multiplication of 'v_0' by '$\sqrt{1-\beta^2}$'. $v = \frac{v_1}{1-\beta^2}$ would then be excessive to the Lorentz frame because it is not limited by '$\sqrt{1-\beta^2}$'.

Is this given? The 'physical interpretation of v' is not what the 'fixed observer' sees. '$v = \frac{1}{h}\frac{m_0c^2}{\sqrt{1-\beta^2}}$' as the 'corresponding frequency' would, (as) related to the 'whole energy', be an impossibility of tracing the movement as a whole. Or rather that the 'whole energy' cannot be the whole energy as such:

> Let us suppose that, at time 0, the moving body coincides in space with a wave whose frequency v has the value given above and which spreads with velocity $\frac{c}{\beta} = \frac{c^2}{v}$. This wave, however, cannot carry energy, according to Einstein's ideas[.][46]

'$E = hv = \hbar\omega$' and '$|\,\boldsymbol{p}\,| = E/c = hv/c = h/\lambda = \hbar|\,\mathbf{k}\,|$' – Einstein's ideas would place *c* as the limiting factor, such that no particle can exceed the speed of light, that is '$|\,\boldsymbol{p}\,| = E/c = hv/c$'. But '[t]his wave' is not, here, constrained by the speed of light.

This not 'carry[ing] energy' has to do with the inability to see '[t]his wave'. I could call it a ghost-wave. Or some ghost of an (abstract, excessive) structure, which would *be* structure.[47]

[45] 'A Tentative Theory of Light Quanta', p. 449
[46] 'A Tentative Theory of Light Quanta', p.449
[47] I am now thinking, *with* [44], that there is something here about the difference between Special Relativity – the seeing of the pans on the stove as a closed system – and '[t]his wave' being infinite (and indeed, again,

Or Einstein's spooky action (at a distance).[48]

Let me think this out further, or more specifically how there is 'velocity $\frac{c}{\beta}$ = $\frac{c^2}{v}$'.

(T)here are some equations so far:

$E = hv$

$\lambda = \frac{h}{p}$

$E = m_0 c^2$

$\vec{p} = m\,\vec{v} = m_0\vec{v}$, or, non-relativistically, $p = mv$

And this would mean: $\lambda = \frac{h}{p} = \frac{h}{m_0 v}$

I could put, to borrow from elsewhere again:

> [E]very harmonic $\exp(ikx - i\omega_k t)$ propagates in a simple way completely determined by the frequency-wavenumber relation ω_k [...and t]he phase propagates with the *phase velocity* ω_0 / k_0 , while the envelope (and the energy determined by $|\Psi|^2$) propagate with the *group velocity, ω'.*[49]

Einstein's claim to what is 'more readily understood' ('Concerning an Heuristic Point', p.368) as to do with discreteness, understanding, as, and of, objects). That is, how to see the infinite as infinite in its most proper sense. For, I am thinking here that what is at stake in the difference between Special Relativity – the stove – and the infinite wave, would be to do with an idea of measurement. If, for Einstein, understanding would be to do with the object as discontinuous, that is, 'the energy of a light ray spreading out from a point source is not continuously distributed over an increasing space but consists of a finite number of energy quanta' ('Concerning an Heuristic Point', p.368), not only would there already be an ordering, or even again, a minimum ordering if 'quanta', but also that the 'space' in which the 'energy quanta' are is stable. Such a frame would be the means by which there can be a 'measurement' in the sense that the limits are wholly prescribed. A tendency to infinity, that is, 'continuously distributed over an increasing space' would be to undermine an idea of the validity of measurement if there is no constructed limit; how to *then* maintain that what is true in one frame of reference is true in another? And especially so if $\lambda' \neq \lambda$.

I could say how to know the increase as increase from within if infinity disrupts any idea of an outside, a close? That is, 'an increasing space' would not conserve energy since space would be continuously becoming other to itself as (the same) space, and so the reliance of the energy on the spatial co-ordinates would mean also that energy would always already be other to itself. That is, could energy ever be known as itself if continuously changing? And changing (with)in this infinite frame and so cannot have an idea of a difference from itself to mark that change?

I could say '[a] world in a state of becoming could not, in a strict sense, be "comprehended" or "known"'. Friedrich Nietzsche, *The Will to Power,* trans. by Walter Kaufmann and R. J. Hollingdale (New York: Vintage Books, 1968), p.281

[48] That is, Albert Einstein's claim that 'physics should represent a reality in time and space, free from spooky actions at a distance', '3 March 1947', in *The Born-Einstein Letters: Correspondence between Albert Einstein and Max and Hedwig Born from 1916 to 1955 with commentaries by Max Born*, trans. by Irene Born (Basingstoke: Macmillan, 1971), p.158.

[49] Gregory Falkovich, *Fluid Mechanics: A Short Course for Physicists* (Cambridge: Cambridge University Press, 2011), p.93

At some point previously, I was thinking non-relativistically.

I keep having to gather, invoke, equations. What is happening? Just how (non-)relativistic is this thinking? For I can only have taken up a position outside of the claiming, constitution, of the non-relativistic, and thus the relativistic to be able to claim both, respectively. What *is* happening? In each turn to another text, there is a drawing of borderlines, a shift in *where* I might have been able to say *where* the equation had its origin.

On a side-note, have I left the introduction yet?

But this can only come about in retrospect; I cannot maintain (if they were ever) the equations as some abstract entity which resists textual borderlines because they are themselves as themselves.

So, phase velocity, I will put v_{phase}:

$$v_{phase} = \frac{\omega}{k} = \frac{E}{p} = \frac{\frac{1}{2}mv^2}{mv} = \frac{1}{2}v$$ [50]

Or in brief, $v_{phase} = \frac{1}{2}v$.

Should I want to go for unity, I would have to assume that all particles have the energy of an electron. But not only would this question unity as something which is already '(t)here' in and of itself, the very formulation of *going for unity*, would demand that there is a connection between '$E = \frac{1}{2}\,mv^2$' and '$W = \frac{1}{2}\,mv^2$', that is, that 'W' is equivalent to 'E'. Or rather, that if $E = W$, the specificity of 'W' is equivalent to the generality of 'E'. Is there unity?

$v_{phase} = \frac{1}{2}v$; the wave is moving with half the speed of the particle. For if 'a particle of any mass is associated with a wave', there should be some sort of sameness between the 'particle', although this is, by all accounts, also the 'electron', and the 'wave'. Or rather, that the 'electron' energy as such cannot be to do with the 'wave'.

And in another frame?

For non-relativistically, if

[50] See Barton Zweibach, 'The Frequency of Matter Waves', Lecture 4, and L4.3 here more specifically, available at: https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/video-lectures/part-1/ [accessed 17 March 2018]

$$v_{phase} = \frac{\omega}{k} = \frac{E}{p} = \frac{\frac{1}{2}mv^2}{mv} = \frac{1}{2}v$$

then relativistically

$$v_{phase} = \frac{E}{p} = \frac{\gamma m_0 c^2}{\gamma m_0 v} = \frac{c^2}{v}.$$ [51]

Does this help? I cannot *help* but think this play is to be setting up the (non)relativistic as justification of the other. The relativistic has to *begin* with an idea of the classical, or rather, gesture to the classical, the non-relativistic, as what grounds itself, even within the move that refutes the non-relativistic.

So I have come back to '$\frac{c^2}{v}$', such that '$\frac{c}{\beta}$' would be a fraction of '$\frac{c^2}{v}$', or again, that β is a fraction of v ($\beta = \frac{v}{c}$), so if $c^2 \rightarrow c$, another way, $\frac{c}{v/\beta} = \frac{c^2}{v}$.

Yet my concern is this: how do I know that I have *gone* anywhere with this?

Or again, why do I have the desire to *go* somewhere, anywhere (with this, even supposing, tacitly, perhaps, that I 'have' 'this' to go 'with' it)?

Is it possible to reach a position from which, not to adhere to the limits already in place, but rather to read these, play (within) this system, to bring about its (re)construction? Having *gone* anywhere, it would at least have to be read retrospectively, necessarily, and yet by what standard, other, which would have to be in place, as itself, without question~~?~~ For if I do start to think of a critique by which I can 'know' where I am with, here, $v_{phase} = \frac{E}{p} = \frac{\gamma m_0 c^2}{\gamma m_0 v} = \frac{c^2}{v}$, and again, in another frame $v_{phase} = \frac{\omega}{k} = \frac{E}{p} = \frac{\frac{1}{2}mv^2}{mv} = \frac{1}{2}v$, it would have to be not only that the frames (although does this account for my whereabouts, or $v_{phase} = \frac{\omega}{k} = \frac{E}{p} = \frac{\frac{1}{2}mv^2}{mv} = \frac{1}{2}v$?) are already to do with a difference, but also, that I can only read the *where* from this (position of) difference which is already where I am not.

I am thinking again about de Broglie. (At which point did I stop this?)

[51] For 'γ' being to do with relativistic mechanics, see *Physics for Scientists and Engineers*, p.1271.

Which – stopping and non-stopping being a continuum therefore? If I put ∈ $\mathbb{C}$, then I can *con*sign any excess to the non-real part. In my absence.

These waves – how do they matter, especially if the v_{phase} is excessive, even to its own demands? And this in the sense that de Broglie would be, is, questioning what it is that constitutes a 'physical interpretation'? It would have to do with some sort of agreement between the two, that is, between the v_{phase} and the velocity of the particle.

But what would *be* agreement? Perhaps there can only be a tacit-ness about this. That is, can I agree to something, or rather more, claim an agreement of those which I cannot know, as such? Would this be agreement, in a strict sense, a proper agreement, in terms of what properly belongs?

$v_{phase} = \frac{\omega}{k} = \frac{E}{p} = \frac{\frac{1}{2}mv^2}{mv} = \frac{1}{2}v$ is not a 'physical interpretation', and neither, therefore, is, $v_{phase} = \frac{E}{p} = \frac{\gamma m_0 c^2}{\gamma m_0 v} = \frac{c^2}{v}$. v_{phase} is produced out of the relationship between v and v_1, so I could put v', then $v' = \frac{v_1}{1-\beta^2}$, and so v' is the difference in the frequency between the two periodical phenomena and the whole energy. It would now be a question of what it would be to see, or rather not see, v'; how to see a difference, if this difference is constituting the wave. Here, it is not so much that there is some*thing*, but rather that this wave is, in its excess, somewhat abyssal in its difference; without energy it would be that which exceeds the system by which it is constituted, according to that system which it is (not).

It cannot carry energy – *it* is. But energy, which is that by which there *is*, in the 'physical interpretation', would be the means by which there is an agreement, but only if there is already the same.

What would be the same? The same in that it would be not, say, $\frac{1}{2}v$, but v.

$v' = \frac{v_1}{1-\beta^2}$: there has to be this relationship, or $v = \frac{v_1}{1-\beta^2}$, which is v. Or not. How to be certain of v – the corresponding frequency of the whole energy?

Am I absolutely certain of the whole (periodical)? If, for de Broglie, '[t]he frequency v_1 is widely different from the frequency v; but they are related by an important theorem which gives us the physical interpretation of v', the difference in the frequencies would have to do with a reconciliation between the 'particle' and the 'wave'. The 'particle' and 'wave' are always already the parameters to be worked *back* to and within. It is (still) a question of how to see the whole frequency, even if there is a 'fixed observer'.

The 'fixed observer' is no guarantee of a sighting; no guarantee of a proof.

Where is the observer in this: $v = \frac{v_1}{1 - \beta^2}$?

If I said $1 - \beta^2$, I could equally say Lorentz invariance, that is, the transformation between systems. Transformation of the observer between systems? This would undermine any claim to the observer as that which sees absolutely, or rather sees only $1 - \beta^2$ as transformation – in this case, of the relationship between the periodical and the whole energy.

But it is still a question of seeing the whole which produces a wave which is excessive – the impossibility of seeing the whole as such.

I could say that I am now thinking that if energy, or the lack of it, is what is at stake in this – that the speed of light cannot be exceeded, energy would have to do with there being some*thing* which is within the scope of light, that is, mass ($E = m_0c^2$) would be that which guarantees a certain physicality, or at least a 'physical interpretation'. And yet $E = m_0c^2$ would be not that E is absolute, but that this equivalence of energy and mass is specific to the Lorentz frame.

How to think this wave as that which does not obey *E*? Or at least, that energy can no longer be thought as that which is equivalent to mass.[52]

[52] Interestingly Gerard 't Hooft's *In Search of the Ultimate Building Blocks* (Cambridge: Cambridge University Press, 1997) discusses how the particles in the Standard Model are all initially massless – that is, all particles look alike until the Higgs is introduced to break the symmetry, and attribute masses to the particles. (See pp.116-7, and also Gordon Kane, *The Particle Garden: Our Universe as Understood by Particle Physicists* (Reading, Massachusetts: Addison-Wesley, 1995), pp.112-3, for symmetry breaking). Mass, then, is supplementary to there being particles. Here also would be the issue around quantum gravity - that is, the inability to 'connect' the quantum and the classical. If gravity acts only on a particle's mass, and '[t]he only reason why we can experience this force is because it is *collective*: all particles (in the Earth) pull all particles (in our body) in the same direction', (p.20), not only would gravity be itself an addition to the addition of mass – I could say a differencing of difference, although this would also demand that there is some idea of an ability to trace effect – but also that the '*collective*', would demand a division between what is not (different) in the 'all particles'. '[A]ll particles' […] pull all particles […] in the same direction.' *However*, 'all particles' requires the being 'in' of some different collective spacing, frame, which is already *in* place: '(in the Earth)', '(in our body)'.

If I were to put $\psi = \Delta \cdot v$, and I were to stipulate that Δ is the difference between the upper and lower limit of the boundaries of ψ, what would $\psi = \Delta \cdot v$ mean? That is, I am trying to think of a wave which is beyond energy and c^2, so $\psi = \Delta \cdot v$ would demand that ψ is produced through the boundaries. It has no limit in and of itself, it is, therefore, always in excess of the frame which cuts it off.

But I am now also thinking (writing, revising): why would I have to think *beyond* energy and c^2, for would not the very stipulation of the beyond retain energy and c^2 as a position from which to be beyond?

And v – if the frame is somewhat arbitrarily chosen, that is, there is no ψ outside of the frame and yet can only be excessive inside the bounds if $\psi = \Delta \cdot v$. v would have to be somewhat 'impossible'. It would trace a move which cannot account for the whole for it is not subject to Δ except in the relationship $\Delta \cdot v$, and indeed this *whole* is according to a particular frame which *constitutes* the whole only by that which it excludes. So what would v claim? At least, if this is v, and v outside of Δ, would it be that $\psi = \Delta \cdot v$ turns on the suspension of the investment in v as v as such? That is, that v is (not) known outside of Δ as an absolute move – and indeed, that there is already a move outside of any boundary frame? A move par excellence, for this would have already moved from itself, that is, would be that which can only be itself within a system which cannot account for itself.

Could I not say the same of $\sqrt{1-\beta^2}$ or γ?

And if $\psi = \Delta \cdot v$, then $v = \frac{\psi}{\Delta}$, and $\Delta = \frac{\psi}{v}$.

Although perhaps $\psi = \Delta \cdot v$ would be too much to do with classical physics – in the sense of being able to derive one from the other; I am thinking here of $F = ma$, or indeed $p = mv$.

Indeed, gravity would demand a (separation). And yet if particles are massless in the Standard Model – masses are not predicted, and particles are reliant on the Higgs particle to be given mass as that which distinguishes them – gravity requires a difference to already be in place, to be that which maintains a collective (body), (Earth) as a structuring principle in excess of a repetition of the same.

Does this go beyond *E*? Only if *E* is constituted as something in and of itself, to know its whereabouts to be able to determine the beyond or short-fall.

Or to recuperate its loss.

To be in excess of c^2 would at least disrupt time, or time as it is constituted by Lorentz invariance.

And:

> Let us suppose that, at time 0, the moving body coincides in space with a wave whose frequency v has the value given above and which spreads with velocity $\frac{c}{\beta} = \frac{c^2}{v}$. This wave, however, cannot carry energy, according to Einstein's ideas.

If 'the moving body coincides in space with a wave', whether or not 'at time 0', there is nevertheless a reliance on 'the moving body' and 'a wave' being separate, so although 'at time 0', there is already 'a wave whose frequency' is determined.

There is still something about this 'cannot carry energy' – that the very system which constitutes the wave, is also productive of this excess, or lack. I am wondering, however, about the necessity of this wave which 'cannot carry energy' – that it would be beyond (perhaps I cannot really get *beyond* anything) light speed, and therefore beyond energy transferral. This wave, which, in the excesses of light speed would not be subject to time, and not even a time*lessness*, nor time as is constituted by 'Einstein's ideas', would be able to account for this wave; non-time?

Yet if the velocity is at issue, the 'energy' is in addition to the wave. There are speeds at which (or would that be time?), 'energy' can no longer be 'carried'. Whatever 'energy' is, is according to 'Einstein's ideas', that which has an upper limit, but also, if 'carried', would be dependent upon some other *to be* 'carried'. '[E]nergy' is reliant on an other to be itself in an other. Could I *say* that I know this?

Although I am still thinking about this wave which is produced by a system which it nevertheless exceeds. And I am (still) thinking about how de Broglie reconciles this wave and the particle. That is, how to (re)turn within 'Einstein's ideas', or light.

What if this wave (re)constructed a time(frame)?

Is a time(frame) necessary?

I am thinking now of the observers[53] in de Broglie's argument:

> In fact, at time t, the moving body is at a distance from the origin $x = vt$ and its internal phenomenon is proportional to $sin2\pi v_1 \frac{x}{v}$; at the same place the wave is given by $sin2\pi v\left(t - \frac{\beta x}{c}\right) = sin2\pi vx\left(\frac{1}{v} - \frac{\beta}{c}\right)$. The two sines will be equal; the harmony of phase will again occur if the following condition is realized:
>
> $$v_1 = v(1 - \beta^2),$$
>
> a condition clearly satisfied by the definitions of v and v_1.
>
> This important result is implicitly contained in Lorentz's time transformation. If τ is the local time of an observer carried along with the moving body, he will define the internal phenomenon by the function $sin2\pi v_0 \tau$. According to Lorentz's transformation, the fixed observer must describe the same phenomenon by the function $sin2\pi v_0 \frac{1}{\sqrt{1-\beta^2}}\ t - \frac{\beta x}{c}$, which can be interpreted as the representation of a wave of frequency $\frac{v_0}{\sqrt{1-\beta^2}}$ spreading along the x axis with velocity $\frac{c}{\beta}$.[54]

So really, 'the moving body is at a distance from the origin', and not coinciding with 'a wave'. Although 'at the same place', this 'same place' gives a difference in the (sine)waves. Or I could say, if 'the origin $x = vt$', this origin is already (re)moved from itself. (re: can I guarantee this?) Not only does 'the moving body' already have an 'internal phenomenon', but it is this, rather than 'the moving body' as such, which the 'the wave', which is '*given* by $sin2\pi v\left(t - \frac{\beta x}{c}\right) = sin2\pi vx\left(\frac{1}{v} - \frac{\beta}{c}\right)$ [my italics]', is equal to. '[T]he wave' as itself is (~~still~~) the issue – that is, 'the wave' cannot be itself, but must be a part of, here, 'the moving body', which already has an 'internal phenomenon'. Yet because the 'wave' according to de Broglie, 'cannot carry energy', or non-relativistically, is moving slower that the particle (opposite readings, but in any case, there is no agreement between the particle and the wave as such), what is invoked to account for the difference is the waves according to different observers.

[53] I am (pretty) certain, that is, if O^n

[54] 'A Tentative Theory of Light Quanta', pp.449-450

How is t being constituted?

If '$x = vt$' is to do with the non-relativistic then '$v_g = \frac{d\omega}{dk} = \frac{dE}{dp} = \frac{d}{dp}\left(\frac{p^2}{2m}\right) = \frac{p}{m} = v$'[55]. v_{group} would be related to a (kinetic) energy differential, since '$E = \boldsymbol{p}^2/2m$'[56]. And a differential because of a claim to movement, but also, 'the envelope (and the energy determined by $|\Psi|^2$) propagate with the *group velocity, ω'*. 'ω''' is then a modification, constituting a difference of 'ω'', such that $d\omega$ = ω'. 'v_g' as 'the envelope', a (re)addressing of what does not properly arrive, together (particle and wave) – or rather what cannot arrive properly together.

The question remains, what is *t*? Energy would be related to time; there is no energy without a time frame, or indeed, within the excesses of 'this wave' which goes beyond the speed of light (relativistically).

A negative of time, or could it be something like $i$time? For $\psi \in \mathbb{C}$. Not *backwards* time, for this would demand an absolute position to know the direction; I could say a preferred frame of reference, if I wanted to think within relativity.

And *this time*, there is a difference in the observers – indeed, a required difference: 'the fixed observer', and 'an observer carried along with the moving body', for whom there is 'the local time', 'τ'. And it is 'v_g' which brings the wave into line, that is, 'v_g' is the means by which there is agreement between the particle and the wave velocities, to (re)produce the particle from the difference of the wave: '$v_g = \frac{d\omega}{dk} = \frac{dE}{dp} = \frac{d}{dp}\left(\frac{p^2}{2m}\right) = \frac{p}{m} = v$'.

Which frame of reference am I in now? For I am thinking about the difference in the calculated v_{phase}: $v_{phase} = \frac{\omega}{k} = \frac{E}{p} = \frac{\frac{1}{2}mv^2}{mv} = \frac{1}{2}v$, and $v_{phase} = \frac{E}{p} = \frac{\gamma m_0 c^2}{\gamma m_0 v} = \frac{c^2}{v}$. What is v_{phase}? In each (either) case, v_{phase} has been constituted in terms of the particle, that is, half the speed of the particle, or in the case of the latter, faster than the speed of light. If the particle is framing v_{phase}, and there is a difference set up between the observers, a(nother) question would be why 'v_g' is that

[55] *Quantum Physics I*, p.3
[56] *Quantum Physics I*, p.3 and *Lectures on Quantum Mechanics*, p.13

which limits v_{phase}. For v_{phase} does not of itself have a limit, in the sense that 'v_g' is bound, constituted, by the sine waves, 'the function $sin2\pi v_0\tau$', and 'the function $sin2\pi v_0 \frac{1}{\sqrt{1-\beta^2}}\ t - \frac{\beta x}{c}$'. Not only would these sine waves constitute the imposition of a limit, '2π' would be the oscillation which returns the wave to itself, but this (re)turn to itself would require an idea of a linear time (t) within which this (re)turn can be traced. That is, that the sine wave as itself is such that it *now* has a definite limit. v_{phase} goes off into infinities. Infinities, within this scheme, 'cannot carry energy' – so although there is a reliance on the wave as extended in space(time), there is also the need for there to be (a) cut(ting) of the wave; for there is, and *to be*, a definite repeat within the wave in its extension.

Infinity would not guarantee the repeat. Here the excess, so despite the need for the wave to continue always as itself, this continuity always as itself finds itself in a repetition. Would the repetition be an infinity? Here is why the two observers are necessary; v_{phase} as the wave which 'cannot carry energy' would be such that energy has to be localised – as with the particle which is set up with definite position and momentum, at least in the Galilean frame $p = mv$, and so $E = \frac{p^2}{2m}$, energy would be constituted from where is it not. v_{phase}, if produced out of the equations for the particle, and yet travelling at half the speed of the particle, would mean that the energy of the particle cannot also be attributed to the wave – yet the sameness of the energies would guarantee an equivalence of the particle and the wave. For the relativistic equations, with the wave continuing infinitely, there would be no possibility of being able to specify *where* the energy is. But *where* the energy is would be grounded in the repeat of the wave, or rather the difference of the waves.

So if I now put: '$v_g = \left.\frac{d\omega}{dk}\right|_{k_0}$'[57] as the value of k which I am propagating, and this k as the wave number is specific to the wave, that is, is an identity, I have decided that there is a particular velocity at which the wave is propagating, or rather, that there is no wave propagation as such outside

[57] Or Zweibach, in *Quantum Physics I*, p.5

of'$v_g = \frac{d\omega}{dk}\Big|_{k_0}$'. The wave is no longer to do with an identity as the self-same, but rather to do with an identity which cannot be reduced to an absolute unity.

(T)here, somewhere, the two observers. (I may have changed frames, let me say $\pm\gamma$, and this because I cannot say *absolutely* that I can construct one without the other, with any *certainty*; I have borrowed too (two) much, but to whom does this properly belong? So I can give it back – that is, where would be the proper grounds? *Eigen* – more to follow[58]).

And still there is this question of $\pm\gamma$, which is bound up with the two observers, and what each will claim the sine wave *as*. To borrow, claim (a)new, 'the function $sin2\pi v_0\tau$'; whatever 'τ' is, this *is* since 'τ' is the frame, and would be such that there is known to be 'τ' as different from that of the 'fixed observer'.

I could question how far there is a difference, since there is nevertheless 'time' which can be translated – within Lorentz invariance.

And what is grounding the translation between frames – that is, between the Galilean and relativistic frames?

If I claimed de Broglie – in this case – not only would I have proceeded *from* an idea that de Boglie cannot account for anything outside of this 'case', but also, that I cannot escape my own formulation that it is de Broglie. But this thinking would be, *seemingly*, at odds with the claims to the observers and what is taken to be the 'internal periodical phenomenon'. At odds, because the 'internal periodical phenomenon' is both what 'must' be the case, there is no possibility of it being otherwise, and also, therefore, that what 'must' be the case is *from* an absence of sight. So if the sine wave is 'the function $sin2\pi v_0\tau$', not only is '$v_0 = \frac{1}{h}\, m_0c^2$' that which has to be modified by 'τ', but also that this 'τ' can be known from a position of non-'τ'; that is, there is the possibility of thinking the local non-locally, but *this* does not alter the locality.

[58] I can, at least *(t)here* give back this 'more to follow': Jacques Derrida, 'The Animal that Therefore I Am (More to Follow)', trans. by David Wills, *Critical Inquiry*, 28.2 (2002) 369-418

Or does it? For if 'τ' is additional to '$v_0 = \frac{1}{h}\, m_0 c^2$', '$v_0 = \frac{1}{h}\, m_0 c^2$' is not a time frame, at least, not locally – so '$v_0 = \frac{1}{h}\, m_0 c^2$' would be a frequency without (local) time. '$v_0 = \frac{1}{h}\, m_0 c^2$', is rather *like* the production of energy, $E = m_0 c^2$, the difference being '$\frac{1}{h}$', the quantum limit, or again if I said $E = m_0 c^2$, it would be a difference between the invariance and the quantum limit. And if without (local) time, there is a timelessness to this – not least because this wave phase, this frequency 'v_0' produces the v_{phase} which goes off to infinity, would be to do with an inability to locate where the energy is. So the timelessness is a stability. A stability which cannot be framed would be an issue. Absolute timelessness, which here is not *timelessness* as such, would be to do with an inability to transfer energy. If this is the case, then energy would be transferred because of its change (in time), that is, because of its difference.

But more so, that absolute timelessness, and here I might just put ε, not because this in some way represents, in a strict sense, with no remainder, the timelessness, but because ε is that which demands something excessive to that which is possible within this thought-system, so now, with ε, I would have to rethink energy. ε is not within the framework of the speed of light c.

How might I think about ε further? I might turn again to '$v_0 = \frac{1}{h}\, m_0 c^2$'.

'$v_0 = \frac{1}{h}\, m_0 c^2$' cannot be to do with what is seen by an observer. This cannot be translated to another frame. But if this is what cannot be translated to another frame, it is also that which is necessary for the production of the association between the particle and the wave. There is a relationship between energy and velocity (I cannot go so far to say that these are interchangeable, however, not having *had* energy in the first place, nor indeed, velocity as velocity), but if a relationship between energy and velocity, which is nevertheless that which produces a wave which 'cannot carry energy', there is something at stake within the production of the wave.

Why is there something at stake?

That this thinking of the local non-locally would have to do with *where* the energy is – in which frame. For if the issue is around the wave going off into infinity, how would there be, strictly speaking, an idea of a distance? So distance, or rather boundaries, are required to produce the wave, and the frequency, which is, more or less, the energy. Energy cannot go off into infinity, because infinity cannot return. According to de Broglie.

This rests on the idea that not only is energy related to the speed of light, and this latter as an upper limit, but also that energy is produced only by a difference from itself in time. I am here coming back round to the observers – possibly; if I can see myself coming back from a position of difference from myself. Although this would not be too wide of the particle (wave); not least because this particle (wave) is not known outside of its production as *somewhere*. But also, if I think within ε, and indeed must do so for I cannot be *outside* of ε, I can always (re)turn to what was never there before – and this I can(not) say, since ε would disrupt any idea of there *being* a before and after in any absolute sense.

If the phase wave exceeds the speed of light, the wave would not be to do with the physical (according to de Broglie). Energy must be located if $E = m_0c^2$, for E is produced out of there already being some*thing* if m_0. And yet m_0 is not sufficient in itself to account for kinetic energy, that is E, if c^2. So, if there can only be an idea of E because m_0c^2, or again, if there is mass *which is* kinetic energy within the limit of c, c produces an idea of mass in relation to its absence within c. c as the framework cannot be some*thing*.

And the observers?

> If τ is the local time of an observer carried along with the moving body, he will define the internal phenomenon by the function $sin2\pi v_0\tau$. According to Lorentz's transformation, the fixed observer must describe the same phenomenon by the function $sin2\pi v_0 \frac{1}{\sqrt{1-\beta^2}}\ t - \frac{\beta x}{c}$[.]

One function moves slower than the other – that is, $'sin2\pi v_0 \frac{1}{\sqrt{1-\beta^2}}\ t - \frac{\beta x}{c}'$, and yet, this can only be known by a position which is neither within τ nor 'Lorentz's transformation'. The observers serve to produce a difference in the energy of the phase wave. Or rather, that the difference in time is the energy, but only as a group – that is, that the two sine waves, because they 'cannot carry energy' are therefore what must be lost (and indeed, if they go off to infinity they are already lost to this system which requires a repeat of the same difference), and so the group velocity, that is, the difference in the peaks of the two sine waves, constitute the group velocity which is the particle. And still the question, why the observers?

I could say something.

I could say because the observers would guarantee that the same is seen differently, and yet this difference is never an absolute difference.

I could say that the same as the same is not what is required – the same going off into infinities, or with half the speed of the particle.

I could say that the difference would be within the system.

I could say that the wave is now a function.

I could say:

> [D]e Broglie was led to suggest that in general a particle of any mass is associated with a wave having the four-vector $(\mathbf{k}, \omega)$ equal to $1/\hbar$ times the four-vector $(\boldsymbol{p}, E)$:
>
> $$\mathbf{k} = \boldsymbol{p}\,/\hbar, \qquad \omega = E/\hbar \qquad (1.3.1)$$
>
> This idea gained support from the fact that a wave satisfying (1.3.1) would have a group velocity $c^2\mathbf{p}/E$ of a particle of momentum $\mathbf{p}$ and energy E. For a reminder about group velocity, consider a wave packet in one dimension:
>
> $$\psi(x,t) = \int dk\, g(k) \quad \exp(ikx - i\omega(k)t), \qquad (1.3.2)$$
>
> where $g(k)$ is some smooth function with a peak at an argument k_0 . Suppose also that the wave $\int dk\;\; g(k)\exp(ikx)$ at $t = 0$ is peaked at $x = 0$. By expanding $\omega(k)$ around k_0, we have
>
> $$\psi(x,t) \simeq \exp\big(-it[\omega\big(k_{0)}\big) - k_0\omega'(k_0)]\big) \int dk\, g(k) \exp(ik[x - \omega'(k_0)t]),$$
>
> and therefore

$$|\psi(x,t)| \simeq |\psi([x - \omega'(k_0)t], 0)|. \qquad (1.3.3)[59]$$

There is a shift to the group, or I could say, $v_{phase} \Rightarrow v_{group}$, ('$v_g$').

So I am thinking now about why 'v_g' is to do with an integral, but also, why the energy is considered to move with the 'v_g', or 'envelope' (I opened the idea of an envelope). In part this has already been 'answered' by de Broglie – that is, that the v_{phase} 'cannot carry energy'. But I would like now to trace this out further (again?), in the'v_g'. For if the physical is what the v_{phase} is considered as *not*, the question would be *how* the physical is (re)constructed within 'v_g', and why 'v_g' is indebted to v_{phase} for its (re)construction.

But I am also still thinking about ε, and about E – why? Because there is some idea that energy can only be associated with a difference, but also that E is associated with mass because of the light frame – $E = mc^2$. So if v_{phase} goes beyond the speed of light, and therefore would have, according to this frame, no mass and therefore no energy, would this not demand a new way of thinking E? That is, a (re)thinking of what it means to exceed light speed?

The (re)constitution of the physical, of a wave as some*thing,* would be from this loss of the physical, or the 'physical interpretation'. And if '[t]his idea [of de Broglie's] gained support from the fact that a wave satisfying (1.3.1) would have a group velocity $c^2\mathbf{p}/E$ of a particle of momentum $\mathbf{p}$ and energy *E*', v_{phase} is 'support[ed]' only because of the'v_g' – because this latter would allow for the (re)construction of a 'physicality'. But the physical here is not self-constant – that is, does not persist in itself. The physical which would have to be the same as 'a particle of momentum $\mathbf{p}$ and energy *E*' is framed by the v_{phase} as that which is always everywhere, but always everywhere as a zero value in terms of energy. v_{phase}, not measurable because there is no difference because it goes off to infinity, that is, no repeatable difference as the same difference, and so it 'cannot carry energy', would nevertheless have to be in place.

> For a reminder about group velocity, consider a wave packet
> in one dimension:

[59] *Lectures on Quantum Mechanics*, p.11

$$\psi(x,t) = \int dk\, g(k) \quad \exp(ikx - i\omega(k)t), \qquad (1.3.2)$$

where $g(k)$ is some smooth function with a peak at an argument k_0.

I am not sure I had forgotten 'group velocity'.

Should I have?

But perhaps this 'reminder' is part of how the physical is always *to be* (re)constituted, that no matter whether there is phase velocity which is infinite, that is, is open to all horizons, there is nevertheless the guarantee, in a dichotomy between remembering and forgetting, that the physical will come back.

From infinity.

An infinite number of times.

And *times* because of Lorentz invariance.

A reminder: so the physical is always *all ready* to be returned.

'$\psi(x,t) = \int dk\, g(k) \quad \exp(ikx - i\omega(k)t)$' – in the reminding, I am (still) thinking about the observers of de Broglie.

Why? I could say '$\int dk\, g(k)$'.

I could say that the integral is the production of a single value out of a difference in the wave numbers k.

I could say that the differences in k would have something to do with the de Broglie observers - that this is difference. Not in its difference from itself, but difference as known to *be* itself, and this is what produces the superposition.[60]

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[60] See David Z. Albert's *Quantum Mechanics and Experience* (Cambridge, Massachusetts: Harvard University Press, 1992) for a discussion of how quantum states are determined. In relation to superposition, I am here thinking of:

> [I]t follows from (2.17) and (2.19) that:
>
> (2.21)
> $$|\text{black}\rangle = 1/\sqrt{2}\,|\text{hard}\rangle + 1/\sqrt{2}\,|\text{soft}\rangle$$
> $$|\text{white}\rangle = 1/\sqrt{2}\,|\text{hard}\rangle - 1/\sqrt{2}\,|\text{soft}\rangle$$
> $$|\text{hard}\rangle = 1/\sqrt{2}\,|\text{black}\rangle + 1/\sqrt{2}\,|\text{white}\rangle$$
> $$|\text{soft}\rangle = 1/\sqrt{2}\,|\text{black}\rangle - 1/\sqrt{2}\,|\text{white}\rangle$$

'For a reminder about group velocity' – so this would be going back over old ground, that is, that there is already a ground(ing) to be able to go back over. Forgetting would remain within the system as a whole, that this, that this position of knowing, and knowing as such can always be (re)achieved, and achieved as itself.

Group velocity would be to do with a set of assumptions – it would be a means of reconciling the phase velocity with the particle, for if '$\psi(x,t) = \int dk\ g(k) \quad \exp(ikx - i\omega(k)t)$' requires that '$g(k)$ is some smooth function with a peak at an argument k_0', this 'smooth function' would be in addition to the wave, that is, the wave phase as $kx - \omega t$. Or then again, since $\psi \in \mathbb{C}$, I should probably put $i(kx - \omega t)$, such that $\omega(k)$ would be the assumption, or the addition to the wave.

But I could also put, that at some point, somewhere, the wave became a wave function – possibly when $\psi \in \mathbb{C}$.

Or then again, when '$\psi(x,t) = \int dk\ g(k) \quad \exp(ikx - i\omega(k)t)$', that is, '$g(k)$'.

If $\omega(k)$ is the assumption, and the de Broglie relations demand that '*ω = E/ ħ',* the value at which the wave is propagating, that is, ω, would be that the energy is (also) assumed. And indeed, would be so if v_{phase} 'cannot carry energy'. For if energy is to do with a repetition of itself in its absence, then here energy would be to do with the (im)position of (k) – that is, '$g(k)$ is some smooth function with a peak at an argument k_0'.

Or I could put 'where' – the function has to peak somewhere for there to be $\omega(k)$, and that this peak must be specific: 'k_0', but this function could then peak anywhere.

> So sums and differences of vectors, in the algorithm, *do* denote *superpositions* of physical states; and […] states of definite color *are* superpositions of different hardness states, and states of definite hardness *are* superpositions of different color states. (p.33)

And: 'remember that the sum or difference of any two vectors in any particular vector space is necessarily yet another vector in that same space' (p.32). The same space, same wave number, to be able to guarantee the difference (of the same). If there was any doubt; '[s]o' '(2.21)' is the justification for '*superpositions*' (and 'superpositions').

And would then constitute a different wave – so is it not the wave *as such* which in turn constitutes, or rather, *re*constitutes the particle, but the function and where it peaks, that is, its amplitude value. Yet if this is the case, not only would this be that the relation between the particle and the wave, the association, is grounded in a decision of what can and cannot carry energy, but also that the particle and wave can only be associated by an imposition of a function. That is, there is no relation as such between the particle and the wave, and so the grounding of the particle, or the (re)constitution of the particle as a wave is because there is a function which governs the amplitude, and requires multiple amplitudes, that is, a superposition, for the velocities to agree.

And this 'consider[ing]' is to do with a '[s]uppose', after all, if '[s]uppose also that the wave $\int dk\ g(k) \quad \exp(ikx)$ at $t = 0$ is peaked at $x = 0$.'[61]

Or, that there has to be one function '$g(k)$' for there to be another '$\omega(k)$'.

But I cannot (now) say that 'the wave $\int dk\ g(k) \quad \exp(ikx)$' is moving; it has no velocity, since there is no longer $-i\omega(k)t$, or even $-i\omega t$. And if this is a further supposition, what is now required is that the wave is stationary.

Or then again, that the wave *is somewhere* absolutely, outside of time. That it can be known, or perhaps again, I could say, since 'suppose also', that 'the wave $\int dk\ g(k) \quad \exp(ikx)$' is set up as that to which any (dis)placement in time, that is $-i\omega(k)t$ is compared.

How many $_{\text{phases}}$ am I holding on to now?

Why a comparison?

It would have to do with what is (not) known, and this known in a loose sense, I suppose. That is, it would be a question of that which I can set up *to know*.

Remind me of this later, in case I need to measure things.

The comparison would hinge on some idea that what is already assumed to be known, that '$g(k)$' peaks at 'k_0', as produced, can be *re*produced later.

[61] *Lectures on Quantum Mechanics*, p.11

But what would happen in this stationary phase? That is, with the loss of $-i\omega(k)t$? Or, to put it another way, why is there a necessity to have a wave which does not have $-i\omega(k)t$ (is it still a wave?). '$\int dk\ g(k) \quad \exp(ikx)$', no longer to do with a difference in time, would nevertheless still be to do with a difference in the wavenumber k. But this difference in k would *not* be to do with an oscillation since there is no (longer) $-i\omega(k)t$. That is, this wave would be produced by the integral of the wave number according to the function $g(k)$, and this at a location '$\exp(ikx)$'. That there is no oscillation would mean that the two functions do not cancel each other.

Yet this comparison remains – to be questioned; I suppose it has something to do with the relationship $\omega(k)$. For since this is no longer a plane wave, which is as much to say that there is, because of $\omega(k)$ not a single value for k, $\omega(k)$ would be that ω would govern what k is in its multiplicity. That is to say, ω would already be a framing limit by which k is known, and known as other to itself as itself. Yet this would (re)turn, and indeed since ω would already be to do with a (re)turn to itself if '$\omega = 2\pi v$', it would be that the relationship can circulate within a system which (re)produces itself in its difference. And yet since '$\omega(k)$' requires the '[s]uppose also' of '$\int dk\ g(k) \quad \exp(ikx)$', and that there is a 'peak' at 'k_0', although '$\int dk\ g(k) \quad \exp(ikx)$' is necessary in the sense that there must be *a* location to the particle, whereas a wave would be to do with a constant displacement, that is, the phase of the wave $kx - \omega t$ does not vary, what governs the production of energy if $E = \hbar\omega$, would itself (also) have to be a difference in ω.

I cannot say, however, that this system *goes* anywhere, not least because '$\int dk\ g(k) \quad \exp(ikx)$'. But also, if '$\int dk\ g(k) \quad \exp(ikx)$' is such that what is required is 'expanding $\omega(k)$ around k_0', this repetition of what *is* k would have to do with the energy, or rather *how* the energy is produced by the 'expanding [of] $\omega(k)$ around k_0'. Would this be the imposition of the localizing of energy?

The reminder that there is energy, or rather *should be* energy as that which is localized would be borrowed from the claim to the particle.

For I suppose I could put that only (within the supposition), k_0 is known, and therefore the expansion of $\omega(k)$ would be to introduce, produce, other ks, but also a difference in ω.

So the question now is how the energy is being (re)produced in the wave as a particle. This dichotomy cannot quite collapse, not just yet. The particle-wave relationship has to do with the expansion of $\omega(k)$, for there is produced to be known a peak at k_0, so the difference in ω would be that which can (also) be produced from the assumption of k_0, but also of '$g(k)'$.

Or perhaps rather Δk_0.

And yet, if this is that the energy is to do with a difference in terms of Δ, it would be that the stationary phase, that there is no time (difference), is that the wave would, for *this time*, be to do with the production of the wave which is not (self)displacing. That is, at work here would be the question of *how*, or rather the impossibility of, producing energy as some*thing* of itself, despite the investment in there being a location to the energy. For if the energy is bound up in $\omega(k)$, energy would be a function, and therefore productive of a relationship, or again, that it can never be itself as itself, but only in its other.

But then again, what would be its other if there is the (im)possibility of itself, except *as* $\omega(k)$?

I suppose I could tell you that what you are going to read, in the expansion, would (probably) be: '$\psi(x,t) \simeq \exp(-it[\omega(k_0) - k_0\omega'(k_0)]) \int dk\, g(k) \exp(ik[x - \omega'(k_0)t])$'. I cannot be exactly sure, but remind me later, and I might be able to determine whether or not a particular value properly belongs to itself.

'$\psi(x,t) \simeq \exp(-it[\omega(k_0) - k_0\omega'(k_0)]) \int dk\, g(k) \exp(ik[x - \omega'(k_0)t])$', I am reminded of '$\int dk\, g(k) \quad \exp(ikx)$'.The expansion of $\omega(k)$, producing a difference within ω, is nevertheless an exclusion of what does not (re)produce '$\int dk\, g(k) \quad \exp(ikx)$'. Why it is that what is required is the expansion of ω as a function of k, or I could say (probably) $\omega(k)$. But I would have to remind myself of that which I have already decided, I suppose, the wave to be.

Or would that be the particle?

That is, I could expand the terms until I reach the frame – the framing particle:

'$\psi(x,t) \simeq \exp(-it[\omega(k_0) - k_0\omega'(k_0)]) \int dk\, g(k) \exp(ik[x - \omega'(k_0)t])$'.

What have I done? Probably assured myself that some of the expansions are not to do with k.

Can I be sure of this?

And if I said that this expansion was a Taylor series, so I could keep expanding the terms, or rather the exponentials infinitely (in theory), would this help, in the *certainty*, in this self-assurance of what it is *I* am doing?

Or not, if '$\psi(x,t) \simeq \exp(-\,it[\omega(k_0) - \, k_0\omega'(k_0)]) \int dk\, g(k) \exp(ik[x - \, \omega'(k_0)t])$'.

But perhaps this thinking about who is doing what *where* is not so far off the mark, and perhaps, by all accounts, Weinberg's, de Broglie's, Einstein's, (mine?), would be to do with a questioning of whether there can be a maintenance of a(n absolute) frame within which to work to (re)achieve this limit.

I could be a function – that is, I could suppose myself to be somewhere, to have myself in sight. Or then again, why am I not part of the integral?

I am not sure I am reliant on k.

That is, it might be a question of how I can be (assured of my surroundings). If the expansion can continue, infinitely, not only would this be a question of why *this* infinity – v_{phase} as infinity being that which is not permitted, at least, not in terms of energy – and yet *this* infinity, that is, expanding the function $\omega(k)$ would only be to do with an infinity in its possibility. There is (still) the frame.

I could say the frame is the issue – or the particle.

But I could also say that the particle is not so much a frame in that it requires its (re)constitution by the wave. And this could go on (infinitely).

If it were not for the particle (frame) which is already lost.

I may need to be reminded – what *is* a particle? Something in pre-history?

'$\psi(x,t) \simeq \exp(-\,it[\omega(k_0) - \, k_0\omega'(k_0)]) \int dk\, g(k) \exp(ik[x - \, \omega'(k_0)t])$'. What constitutes reliance? And in any case (I could say, the one dimensional case) this '$\psi(x,t)$' is not *exactly*, or perhaps I could say $\simeq$, the expansion of $\omega(k)$. For I suppose this has to do with the wave, which at '$t = 0$ is peaked at $x = 0$', so if '$t = 0$' and '$x = 0$' have already been supposed, whatever ψ is (produced) to be, would be on the supposition of the expansion. $\omega(k)$ would be, in a sense, a limit to what is (not) supposed. So I could say that another question would be why the supposition.

I could say that if $v_{phase} = \frac{\omega}{k}$, and so '$v_g = \left.\frac{d\omega}{dk}\right|_{k_0}$', and since '$\psi(x,t) = \int dk\ g(k) \quad \exp(ikx - i\omega(k)t)$', $g(k) = kx - \omega(k)t$ (why not i somewhere (t)here? I suppose I want to 'see' this wave at some point, after all $\psi(x,t)$. Potentially. But then again $g(k) = i(kx - \omega(k)t)$ since *I suppose* – $g(k) = kx - \omega(k)t$; the function would (dis)place what I suppose (I know, or someone else, 'we' 'suppose also', I suppose) that is, that there is 'a peak at an argument k_0', and so $g(k) = kx - \omega(k)t$ would be to do with what can be returned from a supposition. And so whether (or not) there is i would have to do with '$|\psi(x,t)| \simeq |\psi([x - \omega'(k_0)t], 0)|$', which would be the absolute value, or again '[t]he phase propagates with the *phase velocity* ω_0/k_0, while the envelope (and the energy determined by $|\Psi|^2$) propagate with the *group velocity, ω'* '.

If the 'the envelope (and the energy determined by $|\Psi|^2$) propagate with the *group velocity, ω'* ', and '$|\Psi|^2$' and '$|\psi(x,t)| \simeq |\psi([x - \omega'(k_0)t], 0)|$' would be because if $g(k) = i(kx - \omega(k)t)$, and $\psi \in \mathbb{C}$, the peak can be in either i or $\mathbb{R}$, the supposition of the peak questions this either/or. That is, if what is required is 'a reminder about group velocity', and this is 'where $g(k)$ is some smooth function with a peak at an argument k_0', so that 'we have $\psi(x,t) \simeq \exp(-it[\omega(k_0) - k_0\omega'(k_0)]) \int dk\ g(k) \exp(ik[x - \omega'(k_0)t])$', 'we', by this account, would already 'have

$$\psi(x,t) \simeq \exp(-it[\omega(k_0) - k_0\omega'(k_0)]) \int dk\ g(k) \exp(ik[x - \omega'(k_0)t])$$

and therefore

$$|\psi(x,t)| \simeq |\psi([x - \omega'(k_0)t], 0)|.'$$

That is, 'we have' to 'have' already the 'group velocity', and the expansion, not so much as a supposition, but as what must be the case. $i|suppose|$. It is not, then, so much that ψ challenges what is i or $\mathbb{R}$, but rather that the very production of 'a wave packet' would be do with what can be (re)formulated as the same difference. That is, what remains within the argument.

But *what* remains? For this indeed would be a contradiction in terms if the remains are *within* the argument. That at all times what is excessive to what is set up to be the phase can go no further. Go no further because if '$|\psi(x,t)| \simeq |\psi([x - \omega'(k_0)t], 0)|$', and so '$x = \omega'(k_0)t$'[62], not only would it be that x has to borrow t, hence the stationary phase, that is, $t = 0$ for there to be no differential for k_0, if $v_{group} = \frac{d\omega}{dk}$ then I could put here that $x = \frac{d\omega}{dk}\ t$, or again $x = \frac{\omega\prime}{k\prime} t = 0$.

$x = v_{group}$.

I could (still) say nothing moves.

I could say that the point is already a (re)move.

I could say that since '$\psi(x,t) = \int dk\ g(k)\quad \exp(ikx - i\omega(k)t)$', and so there are different amplitudes to this v_{group}, x cannot be the same (to itself), unless I suppose time to be another version of itself – that is, that I can take t to be both a point and its (re)move.

I could say I have supposed energy therefore if '$v_g = \frac{d\omega}{dk} = \frac{dE}{dp} = \frac{d}{dp}\left(\frac{p^2}{2m}\right)$', and so $KE = \frac{p^2}{2m}$' and

$x = v_{group}$.

I could say that all this thinking is, was, turning around some sort of repetition, of energy, and what does (not) carry *it:* the particle, the wave, as some*thing*. Of what *appears*, as object, and how this system of object, appearance, agreement, is guaranteed.

I could say it has something to do with:

> Any two-index object $M_{\mu v}$ [that] can be decomposed into a symmetric part and an antisymmetric part:
>
> $M\mu v = \frac{1}{2}\left(M_{\mu v} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu v} - M_{\nu\mu}\right)$. (2.23)
>
> The first term on the right-hand side, the symmetric part of M, is invariant under exchange of the indices μ and v. The second term on the right-hand side, the antisymmetric part of M, changes sign under exchange of the indices μ and v. If $\eta_{\mu v}$ had an antisymmetric part $\xi_{\mu v} = (-\xi_{v\mu})$, then its contribution would drop out of the right-hand side of (2.21) [$-ds^2 = \eta_{\mu v} dx^{\mu} dx^{v}$]. We can see this as follows:

[62] *Lectures on Quantum Mechanics*, p.11

$$\xi_{\mu\nu}dx^{\mu}dx^{\nu} = \left(-\xi_{\nu\mu}\right)dx^{\mu}dx^{\nu} = -\xi_{\mu\nu}dx^{\nu}dx^{\mu} = -\xi_{\mu\nu}dx^{\mu}dx^{\nu}.$$
(2.24)[63]

In terms of governance, some part(s) must be maintained, '$\eta_{\mu\nu}$' for one.

There may well be others.

And yet '[a]ny two-index object $M_{\mu\nu}$ can be decomposed into a symmetric part and an antisymmetric part'. There is, for '[a]ny two index object $M_{\mu\nu}$', the possibility of change – a decomposition. The symmetry, (and anti-), is here specific to the 'object', or would that be '$M_{\mu\nu}$,'? not '$\eta_{\mu\nu}$'.

And yet, it would be the if '[w]e can see this as follows', the (anti)symmetry which is possible for the 'object' is also possible for '$\eta_{\mu\nu}$'.

And yet '$\eta_{\mu\nu}$' by this count, does not have 'an antisymmetric part'. This property is not to do with what '[w]e can see', and the possibility of '(2.24)', but rather the 'contribution' being made. This system would be dependent upon the terms giving over something, and this giving as present on 'the right-hand side'.

There is, despite the 'decompos[ition]' of '[a]ny two-index object' a part which remains – the symmetry, and anti-symmetry, does not mean that it 'drop[s] out of the right-hand side'. If '$M\mu\nu = \frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$', then '[a]ny two-index object' is equal to this division. Equal to, in that it is, and is capable of being, this division: equal to what is challenged to it[64] by the (anti-)symmetry. There is more of the 'object' to follow, by this division. '$M\mu\nu = \frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$' by 'decomposition', is known, in any case, to be to do with the addition of parts: '$\frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$', a composition, but another part. 'Any two-index object' is already known to be able to produce this (de)composition; not a production which is self-motivated

[63] Barton Zwiebach, *A First Course in String Theory*, *Second Edition* (Cambridge: Cambridge University Press, 2012), p.17

[64] This after Heidegger, 'The Question Concerning Technology'.

however, which is as much to say, does not come from itself, for this 'decomposition' is predicated on the '$\frac{1}{2}$' and '+'.

The symmetry, and anti-symmetry of '$M\mu\nu$', or rather the 'part', is a collecting of '$M_{\mu\nu}$' and '$M_{\nu\mu}$' twice over, respectively: '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$' and '$\left(M_{\mu\nu} - M_{\nu\mu}\right)$'. The '$\frac{1}{2}$' maintains '$M\mu\nu$', that is, restricts the excess of repetition which would otherwise be that the (anti)symmetry creates (a)new. The symmetry conserves the system whereby the 'part' does not modify the 'two-index object $M\mu\nu$' in the sense that it is already known to 'decompose'; this 'decomposition' does not threaten '[a]ny two-index object $M\mu\nu$' as such.

The question would be, however, what is a 'part', for '[t]he first term on the right-hand side, the symmetric part of M, is invariant under exchange of indices μ and ν'? '$M\mu\nu = \frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$', '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$' has to do with the 'symmetric part' being, if 'invariant', also to do with the '+': '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$'. Addition here is a sameness which suppresses the difference of 'exchange of indices'. These 'indices' '$_{\mu\nu}$' and '$_{\nu\mu}$' do not govern the 'symmetric part' as such, if, despite their 'exchange' 'the symmetric part of M [...] is invariant'.

So just where is the 'symmetric part of M'? '$\frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right)$', '$\frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$':

> Professor Hermann Weyl has given this definition of symmetry: a thing is symmetrical if one can subject it to a certain operation and it appears exactly the same after the operation.[65]

Symmetry has to do with time, 'if one can subject it to a certain operation and it appears exactly the same after the operation'. Is '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$' 'exactly the same'? And what might be the 'operation'? '$\frac{1}{2}$'?

Then again, 'symmetry' is to do with 'appear[ance]', that 'it appears exactly the same after the operation'. A difference is known between what 'appears' to be the case, what appears symmetrical,

[65] Richard P. Feynman, *Six Not-So-Easy Pieces: Einstein's Relativity, Symmetry, and Space-Time* (London: Penguin, 1999), p.1

‘exactly the same’, and thus that it is, despite appearances, not ‘exactly the same’. The ‘operation’ leaves a trace, despite appearances.

And ‘a certain operation’; this ‘symmetry’ is produced out of a ‘subject[ion]’. Symmetry may well be the knowing of the before and after – that the ‘operation’ is the move of difference, that this ‘operation’ is required as a history for there to be the ‘appears exactly the same’.

Why the invocation of ‘appear[ance]’? It would be a justification for the ‘operation’, that ‘a certain operation’ is not, of itself, known to be ‘symmetrical’ – this symmetry as such, would have to be manifested elsewhere – in the reiteration of appearances, of ‘a thing’. What would it mean, however, to claim the manifested, particles, waves, photons, ‘[a]ny two-index object’? That there is some process which is known to occur – an ‘operation’ – ‘one can subject it’, requires ‘it’ to be, in some way, wholly known, grasped, of itself, before and after the ‘operation’. But not so far as the ‘symmetry’ is concerned; this ‘symmetry’ is something other to ‘a certain operation’, and yet reliant upon it – ‘and’.

And yet could it be, I could say, rather (also): ‘$M\mu\nu = \frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$’. ’$M\mu\nu$’ and its decomposition is already known, and that since it is ‘[a]ny two-index object $M\mu\nu$’, ‘$M\mu\nu = \frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$’ holds because it is the specificity of ‘[a]ny’; it is already (not) that which it (doubly) claims to be ‘[a]ny two-index object [(and)] $M\mu\nu$.’ ‘Any two-index object $M_{\mu\nu}$’ indexes twice over that which (re)constitutes it – (the ‘symmetrical part’). And if already not, this is not ‘a thing’, although ‘a certain operation’ may well leave ‘[a]ny two-index object $M\mu\nu$’ unchanged if ’$M\mu\nu = \frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$’. Operation by a ‘$\frac{1}{2}$’, this is a measure of what it means to have a whole, a unity, completeness – after all, ‘[a]ny’.

Any turn to ’$M\mu\nu$’. ‘$\frac{1}{2}$’ is outside the frames ‘$\left(M_{\mu\nu} + M_{\nu\mu}\right)$’, and ‘$\left(M_{\mu\nu} - M_{\nu\mu}\right)$’; inside by another frame ‘$M\mu\nu =$’, or perhaps this heads off any difference outside of its bounds. The exchange of indices does not affect the ability to add and subtract ‘M’ from itself.

– Just how far, however, is it an itself? That is, 'M'? For although there is, if '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$', and '$\left(M_{\mu\nu} - M_{\nu\mu}\right)$' a homogeneity enough that '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$', and '$\left(M_{\mu\nu} - M_{\nu\mu}\right)$', it is nevertheless that these operations, framed off from '$M\mu\nu =$' must be thought in a succession which does not alter '$M\mu\nu$'. There is an order to the decomposition, which requires the composition of that which threatens an excess to the 'object $M\mu\nu$', hence '$\frac{1}{2}$'. The property of symmetry and anti-symmetry therefore would claim a space within the 'object $M\mu\nu$', outside of it.

Why '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$'? Symmetry would be this addition of the other (self), the difference constituted by the indices, '$\mu\nu$' and '$\nu\mu$'. So, although '$\mu\nu$' and '$\nu\mu$' are not the symmetry as such, '$\mu\nu$' and '$\nu\mu$' negotiate a doubling of 'M''. For the symmetry to be, the indices are the potential to (re)formulate the object. And yet, 'two-index object $M\mu\nu$' is that this potential move of (re)formulation cannot be in the same space as '$M\mu\nu$', hence '$\left(M_{\mu\nu} + M_{\nu\mu}\right)$', and '$\left(M_{\mu\nu} - M_{\nu\mu}\right)$'. For, although the former would maintain the other in conjunction with the (re)iteration of the 'two-index object $M\mu\nu$', and the latter the inverse, the 'exchange', that one can be only as a result, neither of these properties, the symmetry and anti-symmetry, can be, of itself, equal to '[a]ny two-index object $M\mu\nu$. The equality is not the being.

But by '$\frac{1}{2}$'. This goes some way to the equality.

Except, '[t]he anti-symmetric part of M, changes sign under exchange of the indices μ and ν.' Changing sign would be '$\left(M_{\mu\nu} - M_{\nu\mu}\right)$', but only 'under exchange of the indices μ and ν' so ' – ' is not the index of 'anti-symmetry', to twist '–' and double itself by 'a certain operation' I might then put '+'. '+' is anti-symmetric, not under 'exchange of the indices μ and ν. Might I see this? In what sense? If 'under the exchange of the indices', the change has already been lost, time lost to account for the change.

But what might be at stake, if in a state of exchange? If there is no time to account for 'a certain operation'? That is, to know the symmetry by its time index?

I could say it is useless, this having gone in another direction, but that would mean I have some particular end to achieve, and that this end should be achieved from any direction; that I might come back from the end to go again. Work back from an end which is already instated. '+', '–', these are symmetrical since $-^2 = +$.

A certain operation.

Something else, in addition. The 'decompos[ition]' redefines '$M_{\mu\nu}$', composes the (anti)symmetry, that produces it. '+' would be the default, if the sign change is to ' – '. Decomposition proceeds therefore from the assumption that there is symmetry, that is continuity, that at all times, unity can be (re)written '$\frac{1}{2}\left(M_{\mu\nu} + M_{\nu\mu}\right) + \frac{1}{2}\left(M_{\mu\nu} - M_{\nu\mu}\right)$', and this does not make a difference.

But if '$\eta_{\mu\nu}$' does (not) have 'an anti-symmetric part', but nevertheless has to two indices '$_{\mu\nu}$', by which there is the restricted loss of the anti-symmetry, the possibility of the equation is not to be maintained. What '[w]e can see' is therefore not to be brought forth as the truth, 'as follows'. '$\eta_{\mu\nu}$' is not 'this', not 'this as follows'. Or even, again that 'this as follows' is '$\xi_{\mu\nu}dx^{\mu}dx^{\nu} = \left(-\xi_{\nu\mu}\right)dx^{\mu}dx^{\nu} = -\xi_{\mu\nu}dx^{\nu}dx^{\mu} = -\xi_{\mu\nu}dx^{\mu}dx^{\nu}$.' *Is* is already in excess.

'It would be useless for $\eta_{\mu\nu}$ to have an antisymmetric part, so we simply declare that it has none.'[66] '[W]e' would have to prohibit, by declaration, here the governance, of what is permissible – 'we' veto the state of '$\eta_{\mu\nu}$' – on account of 'useless[ness]'. The 'use' would be the presence of it 'on the right-hand side', otherwise the 'antisymmtr[y]' might just drop out of line. The matter might be that 'antisymmetry' would, in the case of '$\eta_{\mu\nu}$', cancel the coordinate system. The 'useless' may well have to do with the produced loss – any 'use' would require a continuity here. Symmetry would be that which constitutes an idea of uniformity.

– If (anti)symmetry be taken as a generality, that there is no inherent coordinate system; that the coordinate system would have to be instated by the 'we'.

'$\xi_{\mu\nu}dx^{\mu}dx^{\nu} = \left(-\xi_{\nu\mu}\right)dx^{\mu}dx^{\nu} = -\xi_{\mu\nu}dx^{\nu}dx^{\mu} = -\xi_{\mu\nu}dx^{\mu}dx^{\nu}$. (2.24)' But it requires a few turns, for '$\xi_{\mu\nu}dx^{\mu}dx^{\nu}$' to '$= -\xi_{\mu\nu}dx^{\mu}dx^{\nu}$'.

[66] *A First Course in String Theory,* p.18

And still, '$\xi_{\mu\nu} dx^{\mu} dx^{\nu} = (-\xi_{\nu\mu}) dx^{\mu} dx^{\nu} = -\xi_{\mu\nu} dx^{\nu} dx^{\mu} = -\xi_{\mu\nu} dx^{\mu} dx^{\nu}$' bends some other rules; it is still its inverse because of this relationship; these turns.

So I could turn this about another way: $\xi \neq \xi$, (f)or already $\xi = -\xi$, because of the frame of 'anti-symmetry'. In displacement, this frame, coordinating system.

And I could turn this around again because if $\xi = -\xi$ and so $\xi \neq \xi$, ξ can never be an absolute frame to co-ordinate from, ξ is already a localizing of a frame within a frame; it requires an excess, to itself, $\xi = -\xi$ to be itself. But this would be the inverse, the anti-symmetry of '$\xi_{\mu\nu} dx^{\mu} dx^{\nu} = (-\xi_{\nu\mu}) dx^{\mu} dx^{\nu} = -\xi_{\mu\nu} dx^{\nu} dx^{\mu} = -\xi_{\mu\nu} dx^{\mu} dx^{\nu}$', not that $\xi = -\xi$ could be read as a gross reduction of '$\xi_{\mu\nu} dx^{\mu} dx^{\nu} = (-\xi_{\nu\mu}) dx^{\mu} dx^{\nu} = -\xi_{\mu\nu} dx^{\nu} dx^{\mu} = -\xi_{\mu\nu} dx^{\mu} dx^{\nu}$', and therefore as a (re)iteration of the same, (but then, perhaps this is the symmetry which (re)instates it?), but rather that $\xi = -\xi$ begins in loss. That is, that whatever frame is set up, there is already the division, loss of itself. In excess.

The beginning turns on what is to come; waits for its equality.

So this could be where I ask (again) why does the co-ordinate system have to not be anti-symmetric? That is, if '[t]he result is that $\xi_{\mu\nu} dx^{\mu} dx^{\nu}$ is identical to minus itself, and therefore it vanishes'[67], and '[i]t would be useless for $\eta_{\mu\nu}$ to have an antisymmetric part, so we simply declare that it has none' the co-ordinate system, or rather '$\eta_{\mu\nu}$' by which it is cannot vanish; this vanishing must be held off, despite '[a]ny two index object […] can be decomposed into a symmetric and antisymmetric part'. The vanishing point would collapse the system. For if '[w]e can also express the interval ds^2 using the Minkowski metric $\eta_{\mu\nu}$. This is done by writing

$$-ds^2 = \eta_{\mu\nu} dx^{\mu} dx^{\nu}$$'[68]

'ds^2' is not inherently a part of '$\eta_{\mu\nu}$', so already there is a translation of 'ds^2'; 'ds^2' is not so much its own space therefore, but rather a division without units.

'[B]y writing'.

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[67] *A First Course in String Theory*, p.18
[68] *A First Course in String Theory,* p.17

Again, 'this', or not this, but '$-ds^2 = \eta_{\mu\nu} dx^\mu dx^\nu$'.

'$\eta_{\mu\nu}$' would set the field, that is, is the field, which, by declaration, has particular properties.[69] '$\xi_{\mu\nu} dx^\mu dx^\nu = (-\xi_{\nu\mu}) dx^\mu dx^\nu = -\xi_{\mu\nu} dx^\nu dx^\mu = -\xi_{\mu\nu} dx^\mu dx^\nu$' goes too far; but goes too far because of the translation which must nevertheless be able to trace itself back to 'ds^2'.

But to set the field[70] (further):

> Special relativity is based on the experimental fact that the speed of light ($c \simeq 3 \times 10^8\ m/s$)is the same for all inertial observers. [...]
>
> Consider a Lorentz frame *S* in which two events are represented by the coordinates x^μ and $x^\mu + \Delta x^\mu$. Consider now a second Lorentz frame *S'*, in which the same two events are described by the coordinates x'^μ and $x'^\mu + \Delta x'^\mu$, respectively. In general, not only are the coordinates x^μ and x'^μ different, so too are the coordinate differences Δx^μ and $\Delta x'^\mu$. On the other hand, both observers will agree on the value of the invariant interval Δs^2. This interval is defined by
>
> $-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$. (.2.8)[71]

And:

> Following (2.8), we have:
>
> $-ds^2 = -(ds^0)^2 + (ds^1)^2 + (ds^2)^2 + (ds^3)^2$. (2.13)
>
> The equality of intervals is the statement:
>
> $$ds^2 = ds'^2. \qquad (2.14)$$ [72]

The 'speed of light' is not a consideration, but rather operates from a uniformity – it 'is the same for all inertial observers.' But '$c \simeq 3 \times 10^8\ m/s$' does not claim this uniformity of itself. What is 'the

[69] If this is to do with *the field*.
[70] *Re*set?
[71] *A First Course in String Theory,* p.15
[72] *A First Course in String Theory,* p.15

same', the 'experimental fact' which is, in part, '$c \simeq 3 \times 10^8\ m/s$' is constituted by a repeat for what is already known to be, or taken to be 'inertial observers'.

But only because of the declaration that there cannot be anti-symmetry for '$\eta_{\mu\nu}$', that is, '[an] antisymmetric part $\xi_{\mu\nu} = (-\xi_{\nu\mu})$'. And since the symmetry of '$\eta_{\mu\nu}$' is governed by '$\eta_{\mu\nu} = \eta_{\nu\mu}$'[73], or perhaps, rather more (also) '[i]f in addition, we require $\eta_{\mu\nu}$ to be symmetric'[74], the 'symmetry' is that which is governed, *in addition,* by the indices. That 'we require' is a knowing, by the 'we', of what is to come.

I could have told you that.

The requirement would be already to pull back that which is yet to unfold *because of* the requirement. So '$\eta_{\mu\nu}$' needs to be more or less itself elsewhere. And this because 'special relativity is based on the experimental fact that the speed of light ($c \simeq 3 \times 10^8\ m/s$)is the same for all inertial observers.'

$c \in O^n$

I could perhaps start (again) reading $c \in O^n$, but in any case, I have already lost the observers as such in my I.

Eye.

Or even in $c \in O^n$.

This might be the instating of a governing body: $c \in O^n$.

How many constitutes this *all*? That is, ^{n}?

Am I part of this $c \in O^n$? Or would this be the symmetry, that I am (not) $c \in O^n$?

I could say that I have entangled myself – retrospectively.

Entangled, but then *in* what, if I have found myself to be entangled?

This requires some further thinking out; 'special relativity is based on the experimental fact that the speed of light ($c \simeq 3 \times 10^8\ m/s$)is the same for all inertial observers.' The 'inertial observers' are 'inertial' according to what ('we')?

[73] *A First Course in String Theory*, p.17
[74] *A First Course in String Theory*, p.17

But further '[c]onsider a Lorentz frame *S* in which two events are represented by the coordinates x^μ and $x^\mu + \Delta x^\mu$.'

Consider a conclusion:

‘Number as perspective form’.[75]

So *in conclusion*, I did promise to tell you what you are going to read, so here it is, before reaching the word limit:

[75] Friedrich Nietzsche, *The Will to Power*, trans. by Walter Kaufmann and R.J. Hollingdale (New York: Vintage Books, 1968), p.271

Having considered, there is more than one possibility of ‘a Lorentz frame *S*’, so now I could consider a Lorentz frame *T*, and if for *‘S’* there are ‘two events [which] are represented by the coordinates x^{μ} and $x^{\mu} + \Delta x^{\mu}$’, ‘*S*’ is a space of representation, although perhaps not representation of itself – here the impossibility of the anti-symmetry? That it can only be itself albeit in being different: ‘$\eta_{\mu\nu} = \eta_{\nu\mu}$’? This is the same.

Or again ($\eta_{\mu\nu} = \eta_{\nu\mu}$) = ($\eta_{\mu\nu} = \eta_{\nu\mu}$).

This is the same (not) same the is this

Anti-symmetry would disrupt the agreement between the ‘two observers’. More to consider later.

But now to consider the ‘two events’, or rather, not the ‘two events’ as such but their ‘represent[ations]’: ‘x^{μ}’ and ‘$x^{\mu} + \Delta x^{\mu}$’. Representation, in ‘a Lorentz frame *S*’ would be the division of the ‘two events’ by ‘coordinates’ – a space between – ‘x^{μ} and $x^{\mu} + \Delta x^{\mu}$’. How much of a space, however, in this introduction?

I could say, from this, that I know there is more to come – history for a start (since I am not certain I am out of the pre-history).

For the second of the ‘two events’ (although indeed, the second may well be the (making of) the first in its difference:) ‘$x^{\mu} + \Delta x^{\mu}$’ is constituted by the addition, in difference, from the other, that is, ‘x^{μ}’. So if I may *represent* ‘x^{μ}’ as the first event and ‘$x^{\mu} + \Delta x^{\mu}$’ as the second, the ‘two events’ can only have the relationship of ‘x^{μ} and $x^{\mu} + \Delta x^{\mu}$’ in ‘*S*’. That is to say, is ‘two events’ as such to do with a coordination of where these events are in relation to one another? And so does this not play out (in space) in the very presentation of ‘two events’ as ‘x^{μ} and $x^{\mu} + \Delta x^{\mu}$’, that there is, because of ‘x^{μ} and $x^{\mu} + \Delta x^{\mu}$’, a relationship because of the space, rather than the being ‘two events’? It would be a move which redefines the, here, ‘two events’ which can nevertheless trace out of this (re)definition some originary ‘two events’. ‘$x^{\mu} + \Delta x^{\mu}$’ is not so much somewhere of itself; for it calls back ‘x^{μ}’ to constitute itself as ‘$x^{\mu} + \Delta x^{\mu}$’.

Is this possible, '$x^{\mu} + \Delta x^{\mu}$'? That is, for if there is '$+ \Delta x^{\mu}$', 'x^{μ}' demands an absolute to (re)iterate a difference from, and in addition to it. 'x^{μ}' must always be found to be 'x^{μ}'. But if *always found to be*, this is not that '*S*' spaces in terms of an individual coordinate, but rather that '$x^{\mu} + \Delta x^{\mu}$' is that each coordinate is framed in relation to this 'x^{μ}', in relation to a return. '$+ \Delta x^{\mu}$', as a difference *from*, can be measured such that it is '$+ \Delta x^{\mu}$' which constitutes the homogeneity of '*S*'. The difference *from* is not that there are particular coordinates as such, but rather that '*S*' is out of the relation of 'x^{μ}' and '$x^{\mu} + \Delta x^{\mu}$'. But '*S*' still demands that the 'two events' are 'x^{μ} and $x^{\mu} + \Delta x^{\mu}$', that this is the relationship between the 'two events'; one event, 'x^{μ}' is to be brought to the second to constitute a difference. Might not this difference in space have collapsed somewhat, if the repeat of 'x^{μ}'? 'x^{μ}' is (elsew)here, (t)*here*. Just how far, however, can I consider this '$x^{\mu} + \Delta x^{\mu}$' as another of the 'two events' as such, that is, as separate?

Consider *T*.

T – a Lorentz frame,

I could say that earlier, (t)here now, it is (was), any thesis *T*.

But then, can I begin to consider a space which collapses in on itself, that is, must reiterate an origin of representation – it could be thus: Δo, and the subsequent, $\Delta o + \Delta\Delta o$. I might not get that far, for if $\Delta o + \Delta\Delta o$ was the rule by which *T* might unfold, what have I already considered of *T?* That is, what do I know already to come? $\Delta o + \Delta\Delta o$ might not cover it – and here the (mis)(re)presentation begins. If not already. It might be to do with Δ.

And that nevertheless there are 'two events' which can be either 'represented' or 'described'.

Nevertheless, 'two events' which I have already lost along with the 'we' who, '[t]o make the notation more uniform, […] use[s] indices to relabel the space and time coordinates as follows:

$$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z). \qquad (2.7)$$'[76]

The impossibility of these 'two events' – their *happening* as such. Any uniformity would be to bring a loss into line. And the 'notation' also – '[t]o make the notation more uniform'. The 'notation' is yet

[76] *A First Course in String Theory*, p.17

to be sufficient – yet, as already being made more so, ‘as follows’. These ‘space and time coordinates’ have already been (re)written.

So if I ‘[c]onsider a Lorentz frame *S* in which two events are represented by the coordinates x^{μ} and $x^{\mu} + \Delta x^{\mu}$’ am I then to ‘[c]onsider now a second Lorentz frame *S’*, in which the same two events are described by the coordinates x'^{μ} and $x'^{\mu} + \Delta x'^{\mu}$, respectively’ as a consideration of simultaneity? That these two co-ordinate systems double in the ‘same two events’? But this ‘simultaneity’ would have to go the same way as the coordinates, if indeed they are going anywhere – that is

simultaneously

‘simultaneously’.

So the connection would have to be absolute, the connection being the ‘same two events’ – or rather ‘same two events’’ – because if ‘[c]onsider now a second Lorentz frame’, this second, in the genesis of ‘the same two events’ has either reduced time or is trailing a little, ‘now’.

Time will tell.

Having relabelled, perhaps.

But I might consider ‘both observers’, invoked for ‘agree[ment] on the value of the invariant interval Δs^2. This interval is defined by

$$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2. \qquad (.2.8)'$$

Difference does not require another, for ‘[i]n general, not only are the coordinates x^{μ} and x'^{μ} different, so too are the coordinate differences Δx^{μ} and $\Delta x'^{\mu}$.’ Observers are not required for corroboration.

Although what *is* there to agree on?

$(x^{\mu} \neq x'^{\mu},\ \Delta x^{\mu} \neq \Delta x'^{\mu}) \notin O + O$

Do ‘both observers’ see the Lorentz frames at all, and as such? Is it possible to be both, *simultaneously,* part of the frame and external to it to see it in its totality? Perhaps I have already answered my own question since $(x^{\mu} \neq x'^{\mu},\ \Delta x^{\mu} \neq \Delta x'^{\mu}) \notin O + O$.

But '[c]onsider' that '[o]n the other hand, both observers will agree on the value of the invariant interval Δs^2.' 'Δs^2' is not a 'value', but the 'value' is that which 'both observers will agree on'; the 'value' rather belongs to 'Δs^2'. If 'invariant' however, 'both observers' in their agreement create the invariance, *have created* the invariance – necessarily this has already happened to be able to '[c]onsider' it (although in what sense, happened? another 'event'?)

'Both observers', on the other hand, have no say in the matter of their agreement. '[W]e', on the other hand, can see both sides, '*S*' and '*S'*', and can know this agreement.

Do the 'observers' see the 'represent[ation]' and the 'descri[ption]', respectively, or the 'two events' as such? Or is there a seeing of the difference between 'represent[ation]' and 'descri[ption]' and the 'two events' as such? And yet if there is a 'second Lorentz frame *S*', in which 'the same two events are described by the coordinates x'^{μ} and $x'^{\mu} + \Delta x'^{\mu}$,' the '[w]e' can distinguish between 'the same two events' and that they are 'described by the coordinates', so that the 'two events' are, within the 'Lorentz frame *S'*', 'x'^{μ} and $x'^{\mu} + \Delta x'^{\mu}$'.

The 'two events' are in neither frame as such, if 'represent[ed]' in one and 'described' in the other, and indeed cannot be for should there be an absolute to the 'two events' this would be universally agreed.

And yet, if '[i]n general, not only are the coordinates x^{μ} and x'^{μ} different, so too are the coordinate differences Δx^{μ} and $\Delta x'^{\mu}$', a Lorentz frame would be premised on its difference from other Lorentz frames. This difference, however, is '''; it is not so much that the frames are heterogeneous in that the coordinates are disparate, indeed, the 'notation' has been made 'more uniform'. Rather, this uniformity, and that it has been made 'more uniform' by 'us[ing] indices to relabel the space and time coordinates', is such that for the 'we', 'space and time coordinates' have now been doubly (at least) labelled. The 'indices' are a constituting of 'space and time coordinates' that pulls into itself the series of relabellings; that 'the space and time coordinates' are as their (lost) labels. For 'as follows:

$$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z).$$

Here the superscript μ takes the four values 0, 1, 2, and 3. The x^μ are spacetime coordinates'[77], is such that '$x^\mu = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$' is this relabelling, the 'indices' take as much. The 'Lorentz frame' is constituted out of this requirement to reconfigure that which was already in place, and to (re)call this. That is, that there is an echo of being. '$x^\mu = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$' is of itself heading the series, this (pre-?)history of 'space and time coordinates' which would claim a separation to be collapsed – '[t]he x^μ are spacetime coordinates'. The 'Lorentz frame' gestures to a separate loss, a loss of separation, and therefore casts itself in distinction to this while being the 'relabel[ling]'.

So if '$x^\mu = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$', '=' is to do with the transformation of 'x^μ', for if 'the superscript μ takes the four values 0, 1, 2, and 3', the 'superscript μ' is an addition to itself, and by so doing, that is, in the taking, 'the four values' are (dis)placed. '=' is not so much what *is*, as (re)iteration of the same, more or less. For $x^\mu = x^\mu$ is still not quite x^μ (again), but rather that the 'taking' is what plays *out* of the 'superscript μ', having 'take[n] the four values 0, 1, 2, and 3'. '0, 1, 2, and 3' are not the being of 'μ' in any essential sense, so that '=' would have to position 'μ' by an aesthetic of measurement, as, along the lines ('=') of '(x^0, x^1, x^2, x^3)'. There is in this judgement some over-arching claim to a (re)formulation of the same. The 'two events'?

These may well be the happenings of 'space and time', after all, a little relabelling produces 'x^μ' as 'spacetime coordinates'. These are not, by all accounts, the only spaces at stake here.

Although 'we use indices to relabel the space and time coordinates', there remains a space, but perhaps this is my own relabelling, which can nevertheless trace and hold each of these reformulations of the same.

'$x^\mu = (x^0, x^1, x^2, x^3)$' however is not quite the same. If the 'superscript' is to be determined, how might this inflect on '(x^0, x^1, x^2, x^3)', reflect, perhaps, after all there is a symmetry, a reiteration of appearances, if '$x^\mu = (x^0, x^1, x^2, x^3)$' – and if a symmetry requires a time lapse, would that be '='? Again, this judgement of what is more or less something other, requires some

[77] *A First Course in String Theory*, p.15

intervening. The 'superscript', over and above the 'space and time coordinates' can reformulate itself in the image of the other: '$x^{\mu} = (x^0, x^1, x^2, x^3)$'. It *is* not the other, for any such collapse would here be to reinstate the 'space and time coordinates', but rather that the history out of which the 'superscript' constitutes itself nevertheless has to be to do with a separability. There must be an opening, and an openness to this transformation '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$'.

At some point – although perhaps this is (re)presenting it too finely, that is, putting too much store by the transformation *being* somewhere in time, I might leave all definitions to be somewhere within '$\int_{-\infty}^{+\infty}$' or even say, *T*, but how could I gesture towards that (not *that*), without already having some idea of a geometry in which there are the limits to hold in the terms? What might this *T* hold for me while I look another way? – what was the transformation, or rather *because of* '$x^{\mu} = (x^0, x^1, x^2, x^3)$' then '$(ct, x, y, z)$'. '$x^{\mu}$' has to go by way of '$(x^0, x^1, x^2, x^3)$' to be '$(ct, x, y, z)$'. '$(ct, x, y, z)$' has to borrow from the third, or middle, coordinates.

If there are stages to this '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$', does the '*ct*' account for this? That is, if '*ct*' is related to 'x^0', '*ct*' is, and is in this scheme, for, and because of, the taking. '[T]he superscript μ' negotiates the alternative; there is not an absolute disconnect between '(x^0, x^1, x^2, x^3)' and '(ct, x, y, z)', and cannot be for '(x^0, x^1, x^2, x^3)' has to be for '(ct, x, y, z)'. And if this is to do with appearance, or the relabelling of 'the space and time coordinates', the 'space and time coordinates' are held off at a distance, as that which is not, and is, the unifying logic of '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$'.

I risk too much in pronouncing an ideal, that is, placing the ideal as some transcendental, absolute, and yet (t)here, and this ideal as space and time coordinates. But just, for argument's sake – and this might be an event, so I could *re*present it as such, *i.e.,* and in this, if there were such a linearity which would account for the accumulation, be able to extend from this ideal to '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$', that one term gives rise to (takes) from the other – for argument's sake, $x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z) \in$ *i.e.* However, to have *i.e.* that by which $x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$ evolves, would be that *i.e.* cannot itself (although what might this be?) be known outside of that which it constitutes in the evolution. Where might time reside *now?* If this *now* can at all be arrested. So *i.e.* can only ever be gesturing to its own horizon to come; that if $x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z) \in$ *i.e.* is what waits to be affirmed is the absolute grounding of 'space and time coordinates', or 'spacetime coordinates', *i.e.* they are (not) the same. And perhaps again, by '≡', I am back to the same that something carries over, the being 'four' – there is a certain amount, and this is (ac)counting for something. Something which is produced out of '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$', *i.e.* is not a (re)presentation of that which already is.

i.e. this is not a coordinate system which can be grasped of itself. '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)'$ requires its lost history as lost – can never coincide with this history. The identity threatens as much in the taking while holding the difference.

'On the other hand, both observers will agree on the value of the invariant interval Δs^2. This interval is defined by

$$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2. \qquad \text{(2.8)'}$$

If '$(x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$' provided '$x^{\mu} = (x^0, x^1, x^2, x^3)'$ this would account for '$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^{2'}$', that is, the turn of the initial relationship would account for the '$-(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^{2'}$ rather than '$(ct, x, y, z)'$. '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)'$ allows for the (re)turning of this coordinate system. Indeed, if 'not only are the coordinates x^{μ} and x'^{μ} different, so too are the coordinate differences Δx^{μ} and $\Delta x'^{\mu'}$ and yet 'both observers will agree on the value of the invariant interval Δs^2', 'Δs^2' would have to do with a connection between the differing systems. It would be that '$-(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^{2'}$ is to do with a homogeneity of the space, by the repetition of 'x', or rather '$\Delta x'$, according to the 'four values', in such a way that '$(ct, x, y, z)'$ is to do with too much of a difference when 'the invariant interval Δs^2' is to be agreed. But if '$-(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^{2'}$ is a homogeneity of the coordinate system as a whole, this is constituted by the 'four values' – this superscript, which cannot be the coordinates as such – the 'four values' as superscript, in each case write the coordinates as an extension of the other, that within their system, '0, 1, 2, and 3' belong together, in series, are a difference above the returning 'x'. There is in this an accounting of differences; there cannot be too much of a divergence for there to be 'agree[ment]'. The two Lorentz frames would have to repeat one another, by another turn. Then again, by another turn, if the coordinates are in terms of 'x' rather than $'(ct, x, y, z)'$, since the latter is too much of a difference in spacetime, in the 'Lorentz frame' there is no essential difference in direction, that one way is necessarily 'x, y' or 'z' respectively.

And that, therefore, one way of looking at the object would be to have, in reserve, all other ways of looking, but at the same object; that there is, despite the looking, the seeing of the object of itself. Why the object? Direction would have to come back from it; the object would have to be that which guarantees itself as itself, from wherever. Despite appearances.

But what is 'the variant interval Δs^{2}'? And this question in the sense that 'the invariant interval Δs^{2}' is 'defined by

$$-\Delta s^{2} \equiv -(\Delta x^{0})^{2} + (\Delta x^{1})^{2} + (\Delta x^{2})^{2} + (\Delta x^{3})^{2}. \qquad (2.8)'$$

That is, defined by 'Δ', multiply.

The definition is out (t)here, and not so invariant that it produces a tautology, as much to say $-\Delta s^{2} \equiv \Delta s^{2}$.

It would be a coordination of the inverse in that multiple differences produce a stability, '$-\Delta s^{2}$'. A stability which follows from '(2.7)'. Another series; it ties *in* with some other scheme, but nevertheless cannot be known outside of the definition '$-(\Delta x^{0})^{2} + (\Delta x^{1})^{2} + (\Delta x^{2})^{2} + (\Delta x^{3})^{2}$.' This definition of identity would be an attributing to. Reading left to right is rather that the 'definition' is to come, or comes after '$-\Delta s^{2}$'. But if '$-\Delta s^{2}$' waits for its definition, and this definition is within the coordination of 'the experimental fact', the coordination of the 'observers' in different frames, 'experimental fact' is not to do with definition – that 'experimental fact' cannot account for the coordinates as such. The 'invariant interval' cannot follow from 'the experimental fact'; any following must be couched in terms of the excessive, the appearance of difference from '(2.7)' to '(2.8)'. What is agreed upon is not to do with the 'spacetime coordinates' as such.

Agreement of being, and *what* the being of '$-\Delta s^{2}$' is, cannot be to do with a relabelling of the history of coordinate systems. This agreement cannot be justified by a universal history. But *how* might 'both observers' agree, however, if they are in their respective Lorentz frames? That is, if there is agreement on this 'value', 'value' is here that which transcends any frame, is universally known and applicable, and applicable because if 'Δs^{2}' and '$-\Delta s^{2}$' are not the 'value', and this is what waits for the agreement of 'both observers', 'value' is not that which is inherent in the definition '$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$'.

This 'value' as a repeat is regardless of the coordinates. But this regardless, or rather '[o]n the other hand', is *because* there is a difference in the coordinates. That it is '[o]n the other hand' would nevertheless guarantee there being *both* hands to account for the difference and the same. The comparison, or judgement, that 'both observers will agree on the value' is possible because there cannot be a universal coordinate system. If there is to be a difference in *where* or *when* the 'two events', (on the other hand, coordinates) *are,* this cannot be within the same frame.

So, '[t]he agreement on the value of the intervals is expressed as

$$-(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2 = -(\Delta x'^0)^2 + (\Delta x'^1)^2 + (\Delta x'^2)^2 + (\Delta x'^3)^2, \qquad (2.9)$$

'[78].

Agreement requires the separation for there to be agreement. That is, the relationship holds because there is more than one frame, and this frame is known to be related to, but not the same as the other. There cannot be a self-same frame as itself, nor indeed a move by which either frame is transported or mapped onto the other, if indeed such a thing were possible, for 'the invariant interval Δs^{2}' is 'invariant' because there are 'Lorentz frame[s]'; the 'invarian[ce]' would be reliant upon the multiple, and that it can be known as such despite the difference.

However, if 'the invariant interval Δs^{2}' is that which is, or rather its 'value' *is* (but this is to be agreed upon), spacetime would be that which allows for the different frames as long as these never come into contact of themselves; that special relativity, by extension therefore, deals in the absolute separation of these frames, and the absolute of spacetime, but *on the other hand* cannot account for

[78] *A First Course in String Theory*, p.15

this third (spacetime?), the 'we', by which there is the knowledge of both. For if each observer therefore is only within his or her Lorentz frame, any agreement must take place at a distance – this agreement cannot *be* in either frame as such.

Agreement is perhaps uncanny.

Spooky.

But say this is a distance, '$x^{\mu} = (x^0, x^1, x^2, x^3) \equiv (ct, x, y, z)$', that there is some spacing *between* what is '=' or '≡' to another, just how far can this distance be maintained?

So if this agreement takes place *at a distance*, what sort of distance would that be?

> In special relativity, events are characterized by the values of four coordinates: a time coordinate *t* and three spatial coordinates *x, y,* and *z.* It is convenient to collect these four numbers in the form (*ct, x, y, z*), where the time coordinate is scaled by the speed of light so that all coordinates have units of length.[79]

Although 'a time coordinate *t* and three spatial coordinates *x, y,* and *z*', there is nevertheless 'the form' into which these have been 'collect[ed]'. The 'convenien[ce]' would have to do with an idea of unity, a being one, but this can only happen within a particular 'the form (*ct, x, y, z*)'. It would have to be bracketed off, for if '[i]t is convenient to collect these four numbers in the form (*ct, x, y, z*)', 'these numbers' cannot, necessarily, be to do with 'the form'. The collection occurs because of 'the form'. '(*ct, x, y, z*)' is not 'number' but 'form' because of '*c*' and '([…])'. Form would have to do with what is 'scaled', and this scaling then affects 'all coordinates'. The 'experimental fact' is the scale by which to measure – the speed of light, '*c*', cannot be part of the coordinate system. The 'experimental fact' is that which cannot be derived from 'the form', that is, the coordinates for the Lorentz frame.

Then again, I could say that there is something about '*t'* which marks a difference, that it is the 'time coordinate [which] is scaled by the speed of light', '*ct*'.

[79] *A First Course in String Theory*, p.15

If ‘all coordinates’, it might be that ‘*t*’ is ‘scaled’ twice over, ‘scaled by the speed of light so that all coordinates have units of length’. Is ‘*t*’ part of the ‘all’? But regardless of a doubling of ‘*t*’, ‘*ct*’ is nevertheless that ‘*t*’ is insufficient of itself, within this scheme; ‘*t*’ is not part of the scale in its own terms, and *still* is not. Why the ‘is not’?

Is not because although ‘the time coordinate is scaled by the speed of light’, ‘so that all coordinates have units of length,’ it is not itself to do with a scaling if ‘*x*, *y,* and *z* have units of length’, or in the case of ‘*t*’, ‘scaled’. Rather, ‘*x*, *y*, and *z*’ ‘have units of length’ because of the ‘so’. Outside of the scaling of ‘*t’*, ‘*x, y,* and *z’* do not have ‘units of length’, and neither would ‘*t’*. *Is not* because ‘*t*’ is already to be ‘scaled’ – there is something about ‘*t*’ which, ‘[i]n special relativity’ must be to do with a reduction, or at least a loss of any prior ‘*t’* even within the (same) frame that it is required to be ‘scaled’. And (same) because of the difference, that ‘special relativity’ *borrows* some other ‘time coordinate *t*’.

But I think I might pursue this borrowing further; I might borrow some time to think this through – *why* there is this necessity to have ‘scaled by the speed of light’. And if I am borrowing, although in what sense can I know this as such, as though somewhere, some other frame, there is a surfeit of time (al)ready to be transferred to here from there.

Really, though, I do not think I am here at all.

But it would be a case of ‘[i]n comparing the coordinates of events, two inertial observers, henceforth called Lorentz observers, find that the appropriate coordinate transformations mix space and time.’[80]

So *now*, and this somewhat arbitrarily, the comparison evolves: to ‘find that the appropriate coordinate transformations mix space and time’ is not so much that is it ‘appropriate’ that there is a ‘mix[ing of] space and time’, but rather that it happens to be so of the ‘coordinate transformations’. Transformation is ‘appropriate’ here. Why appropriate? Another scale; but by this scale it would be that ‘coordinates’ cannot remain the same; there is, in (re)definition, the ability, and this is

[80] *A First Course in String Theory*, p.15

appropriate, in some sense *falls in line* with ‘the speed of light’. And if this is ‘appropriate’, this ‘transformation’, ‘the speed of light’ is also to do with ‘transformation’.

It might just be appropriate to ask, however, just how far the ‘transformation’ is a transformation. And this in relation to the ‘inertial observers’ (also). Putting aside, as already read out, the paradox of the ‘inertial observers’ comparing events in another frame – how is this possible *if* inertial according to their own Lorentz frame? – the ‘transformation’ would rely on what is already ‘the speed of light’, the ‘coordinates’ to be known as ‘appropriate’, and to be known as ‘appropriate’ in their ‘transformation’ which ‘mix[es] space and time’. *To begin*, there has to be a separation of ‘space and time’. It cannot already have been mixed to have ‘the speed of light’ – it is, after all, ‘3 x 10^8 m/s’. Except this cannot be a beginning if there already is. Or perhaps that it is set up as already – ‘[s]pecial relativity is based on the experimental fact that the speed of light ($c \simeq 3 \times 10^8$ m/s) is the same for all inertial observers.’ One cannot move on this argument.

But I may just (now) have moved *from* it. And I might just as well invoke a ‘you’ also, who has moved from it. Comparing the two events, so event one being ‘But I may’ and the second ‘And I might’, have I mixed space and time? I expect if I had a grasp of ‘the speed of light’ as such this *could* be a possibility, and thus ‘space’ and ‘time’ respectively as such.

To transform or ‘mix space and time’ as such – could it be traced at all? In a strict sense?

It would be a question of divisions; and which comes first, for this mixing. (I am going for the possibility, having come to the conclusion that the ground has already left me anyway). So say ‘[s]pecial relativity is based on the experimental fact that the speed of light ($c \simeq 3 \times 10^8$ m/s) is the same for all inertial observers’, and because of this, ‘the appropriate coordinate transformations mix space and time’, and for the moment, *suspending* judgement on the impossibility of knowing an absolute ‘mix [of] space and time’, ‘the speed of light’ provides this ground for ‘[s]pecial relativity’, so that there is this transformation and mixing – this requires that ‘the speed of light’ cannot be to do with any originary placing. ‘But I may’, ‘And I might’, or even, then, that ‘the experimental fact […] is the same for all observers’, requires that whatever difference there *was*, no longer holds, it is now ‘*the* experimental fact [my italics]’; this is not to do with which came first, and therefore *precisely* to do with which came first, because ‘[i]n comparing’ neither absolute difference can be sustained – the comparison must be about the (re)placing, collecting, as a unity what was series. That any continuum does not exceed a limit however many times there is a transformation within. And if there is a mixing, would this not undermine any idea of ‘space’ and ‘time’, or spacetime for that matter? That the transformation as such would leave no trace. Time, spacetime, space, would not be (dis)continuous. It would be a (re)turn without knowing it as such.

Here the symmetry: that the alteration does not alter because there was no history outside of the comparison – the comparison draws the line, and (re)sets the ground.

But I may (gesture): ‘But I may’. ‘And I might’ *now* invoke some absolute alterity to be assured of as much, but for any absolute difference to continue I would never be able to compare.

The scale is set elsewhere, ‘a time coordinate *t* and three spatial coordinates *x, y,* and *z*’ being deviations thereof – what is not ‘the speed of light’. *So*, if there is already an idea of time, or rather, ‘the time coordinate’, the basis of ‘[s]pecial relativity’ would be in addition to *‘t’*, *not* a ground as such – there must be something already in place. In advance of the basis is the comparison, or rather the justification for it, that ‘the speed of light ($c \simeq 3 \times 10^8$ m/s) is the same for all inertial observers’ – that this can be known everywhere. According to this, ‘the experimental fact’, this is the absolute, and needs to be so for this to be the unification.

On the other hand, another hand, this ghostly body providing some idea of a whole, to ‘find that the appropriate coordinate transformations mix space and time’ – I could read this another way:

> This interval [the invariant interval Δs^2] is defined by
>
> $-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2.$ (2.8)
>
> Note the minus sign in front of $(\Delta x^0)^2$, as opposed to the plus sign appearing before the spacelike differences $(\Delta x^i)^2$, (i = 1,2,3). This sign encodes the fundamental difference between time and space coordinates.[81]

[81] *A First Course in String Theory*, p.15

‘[T]he minus sign’ ‘encodes the fundamental difference between time and space coordinates’ – does this mean they are not now ‘mix[ed]’? Or does the mixing come overall, that is, ‘$-(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$’, that the ‘mix’ requires both together? Although in a strict sense, a mix of differences rather than coordinates as such. Perhaps this is the ghostly gesture to another system, that of the coordinates as such; *this* by which there is the stability from which to judge what is different.

And the same.

That *overall*, this does not affect the coordinate system. The coordinate system as such is over there.

There has been yet more given over, in the ‘sign’; one is ‘in front’ while ‘the plus sign [is] appearing’. What is given over? If ‘encodes’, and this ‘the fundamental difference between time and space coordinates’, is the ‘–’ of ‘$-(\Delta x^0)^2$’ ‘the fundamental difference’, or is it that whatever ‘the fundamental difference’ is, ‘–’ puts this into code? That is, whatever ‘the fundamental difference between time and space coordinates’ is, is at a loss, is not, except in ‘–‘? It is to be noted, although I cannot make a note of ‘the fundamental difference between time and space coordinates’.

So perhaps the noting of ‘–’ is rather apt. Appropriate.

Might the note have escaped?

‘[A]s opposed to the plus sign appearing before the spacelike differences $(\Delta x^i)^2$’. So now a further note, for if ‘the plus sign’ is ‘opposed’ to ‘the minus sign’, the ‘interval’ would have to do with a constitution by its opposites, and opposites also in the positioning: in the being here already, ‘in front of’ and the ‘appearing before’. And the loss, or the coding, of the ‘fundamental’, for this too would be bound up with ‘the minus sign’ and ‘the plus sign’. That ‘the minus sign [is] in front of $(\Delta x^0)^2$’, but nevertheless ‘encodes the fundamental difference between time and space coordinates’ so the being here already is that which has already lost ‘the fundamental difference’ – lost the opposition. And indeed, ‘the plus sign appearing before the spacelike differences $(\Delta x^i)^2$’, so I take it that '+' is coming into being, not quite here yet, on the horizon, so perhaps a different opposition is set up, a knowing of the losing and the coming –

- this would require a timeline without rest. Could I then even claim coordinates? A coming into sight of the addition of the 'spacelike differences $(\Delta x^i)^2$'. I might have to look in two directions at once to know this opposition in the balance. But another question, by another hand, how many hands now? Although no doubt I have a hand in this proliferation – but to continue the argument, or make another (two), to *extend* the space, or rather 'spacelike differences $(\Delta x^i)^2$': is the 'like[ness]' to do with the 'encod[ing]', a playing out of the loss of the 'fundamental difference between time and space coordinates'? '$(\Delta x^i)^2$' cannot quite be 'space coordinates'. As before, *now* also, 'Δ' is such that whatever coordinate system there is (although *is* there?), can only be gestured to by '$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$', for if this is the definition of 'the invariant interval Δs^2', the definition would have to do with the '–' of '$-\Delta s^2$'. In definition, there is more to see, say, regarding 'Δs^2'. But in what sense is '–' seen, or even '$-\Delta s^2$'? I could perhaps invoke the idea of the being in front of loss, if I could position loss as somewhere – or rather, I can see it disappearing even as I conjure it; I cannot say it is anywhere as such

– 'spacelike differences'.

Then again why not timelike differences? For, while '$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$' is such that '$-(\Delta x^0)^2$' is to do with a difference in time, 'the invariant interval Δs^2' does not require multiple differences in time unlike 'the spacelike differences'. There is but one time difference, hence that 'the time coordinate is scaled by the speed of light so that all coordinates have units of length.'

(Re)turning to the 'all', that all might not (yet) have been said, although really, 'all' might just be what is at stake, in so many turns, that where I might draw the line and proclaim 'all' would be to exclude. All ready: there is light. '[T]he speed of light' by which to 'scale' the 'time coordinate', so that the 'time coordinate' *now* has 'units of length'. Time is in sequence, and in sequence with the 'spacelike differences', that is, they can be added together, in the 'appearing'. An adding of opposites – here the ‘mix’, but this is *still* not all, because the scale of time, because this is time out of time, or rather out of the timeness of time because of the ‘scale’, that time here is that which must be reduced to something – ‘the speed of light’ – which is greater that it.

How can I know this? Which should be rather, how can I read this – the timeness of time, which has perhaps already gone too far towards something originary, and all but touched on metaphysics. I can read this excess to time, the –ness of time because of the scale, because ‘the time coordinate is scaled by the speed of light’. ‘[T]he time coordinate’ has no length out of the scale, that is, is not divisible into units.

I could equally ask: does the ‘speed of light’ have a length? Yes and no, if ‘Figure 1-19: Along a light ray (or any null curve) the time measure between any two events P, Q is always zero.’[82] The being ‘zero’, and yet ‘[a]long’. For both, there is something to measure, ‘the time measure’, and yet the ‘between’ which would have to do with the ‘along’ ‘is always zero’. And if ‘[a]long a light ray (or any null curve)’, these are interchangeable, the ‘time measure’ holds for either, and yet what the ‘time measure’ holds for is not the same – it is ‘a light ray’, ‘any null curve’. So I would have to be thinking a both together (again), there is something in this which is (un)writing itself, inbetween: ‘any null curve’, how many times has this been gone over, if ‘[a]long […] any null curve’? There is more than one ‘null curve’, and I could say also that ‘[a]long’ would be to have already travelled them all, or at least to know what it is to go ‘[a]long […] any null curve’. This move can be traced, and the ‘null curve’, which is instead of ‘a light ray’, in the stead of, so that, as an aside, there is a representation at work in ‘(or any null curve)’, that there are ‘two events P, Q’.

(Or, anyway, *re*presentation of the ‘two events’, would be that ‘a light ray’ of itself cannot *have* ‘two events’; cannot be to do with possession of some*thing* which is already to be considered ‘event’, that is, has a before and after itself which is wholly know, demarcated, unless there is this alternative).

[82] Roger Penrose, *Fashion, Faith, and Fantasy in the New Physics of the Universe* (Oxford: Princetown University Press, 2016), p.48

Do the ‘two events P, Q’ come through the representation as themselves? Or is it the interchange doubles exactly? And there is the ‘any’ again: ‘any two events P, Q’ – despite being ‘events’, and a counting of ‘two’, ‘P, Q’, there is nevertheless a proliferation, of ‘any two events P, Q’, there are, in so many other ‘null curve[s]’, other ‘P, Q[‘s]’, and these can be known as such. The argument is (to be) picked out, and picked out *from* ‘a light ray (or a null curve)’, as ‘two events P, Q’. And *from* because although ‘a light ray (or any null curve)’, the ‘between’ of ‘the time measure’ is constituted by ‘any two events P, Q’. ‘[A]ny two events P, Q’ are constant in their separation, that is to say, the ‘time measure’ is ‘always zero’.

But then again, it would be according to this system, where it is ‘any two events P, Q’. If ‘[a]long a light ray (or any null curve)’, the ‘curve’ by which the ‘[a]long]’ has already been travelled is thus that in going back over (although this too, is too much of a time length), the ‘curve’ cannot be thought as an unfolding. What does it mean to travel (‘[a]long’)? And this without time? Perhaps, however, I have already assumed too much in the travel, to think another way:

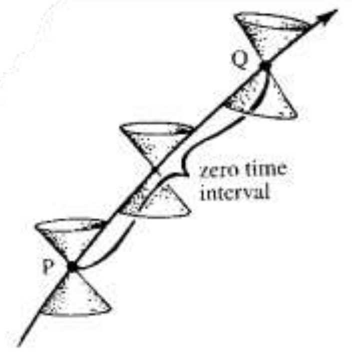


Figure 1-19: Along a light ray (or any null curve) the time measure between any two events P, Q is always zero.

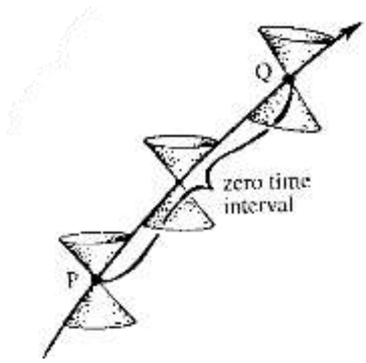
> These (double) cones represent the space-time directions along which the “time” measure *vanishes.*[83]

If ‘[t]hese (double) cones represent the space-time directions along which the “time” measure *vanishes*’, already there is the absent presence of ‘the space-time directions’ – they are in their

[83] *Fashion, Faith and Fantasy*, p.48

‘represent[ion]’, but also known to be a difference – ‘[t]hese (double) cones represent the space-time directions’. So if ‘[t]hese (double) cones represent the space-time directions’, would ‘[t]hese’ be ‘[t]hese’?

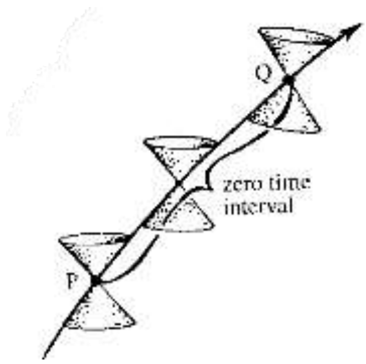
Or



– these? (Those).

And ‘[t]hese’ are a group – ‘[t]hese (double) cones represent the space-time directions’ – so there is a separation from other ‘(double) cones’; ‘[t]hese’ as a specificity, and framed by the excess which is not ‘[t]hese’ which ‘represent’. But if ‘[t]hese […] represent’, ‘(double) cones’ cannot be to do with a homogeneity if there is a difference in the grouping: that ‘[t]hese (double) cones represent the space-time directions along which the “time” measure *vanishes*.’

But what about ‘[a]long a light ray (or any null curve) the time measure between any two events P, Q is always zero’? And in the sense of the frame ‘Figure 1-19:’. If ‘:’ is to herald the explanation of ‘Figure 1-19’ that ‘Figure 1-19’ is

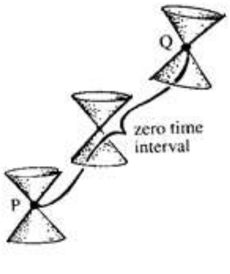


would it not be that ‘[a]long a light ray (or any null curve)’ is

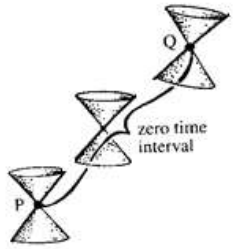
so that ‘or’ collapses a specificity – that one has to stand in place of the other? A ‘light ray (or any null curve)’, or again,

is to do with an idea of what is shared; but what is shared? For

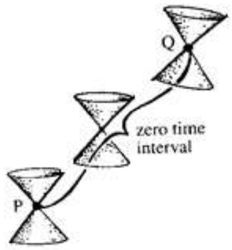
is by the lack of



and if the lack of

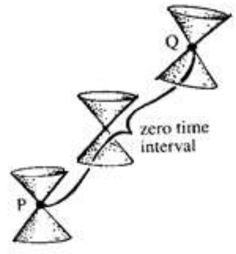


is in excess of

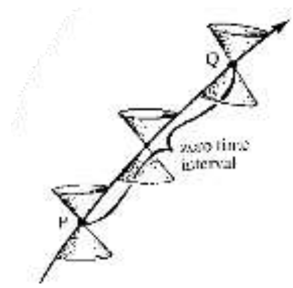


If in excess of, the being ‘[a]long a light ray (or any null curve)’, which is (not, also)

would be a connection between

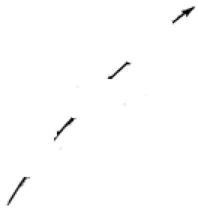


But if I am here thinking about an excess, that ‘[a]long a light ray (or any null curve) the time measure between any two events P,Q is always zero’, and ‘[t]hese (double) cones represent the space-time directions along which the “time” measure *vanishes*’, ‘zero’ would have to do with the ‘*vanishes’*. ‘[Z]ero’ ‘is’ the ‘time’, ‘“time” measure’, which has to *be* to vanish. Although ‘*vanishes’* nevertheless is the presence of what vanishes; that time does not vanish, because if ‘[t]hese (double) cones represent the space-time directions along which the “time” measure *vanishes*’ there is always a ‘“time” measure’,

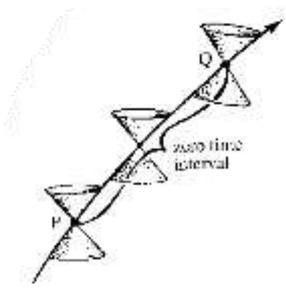


which is the differencing *out* of time – ‘“time”’. Not quite ‘“time”’, because by this account, if time is that which always already is, if ‘[t]hese (double) cones represent the space-time dimensions along which the “time” measure *vanishes*’, this is also time in its ‘represent[ation]’. But not quite ‘“time”’ again because ‘[t]hese (double) cones represent the space-time dimensions along which *the “time” measure* vanishes [my italics]’. Time as that which already is in its representation, van*is*hes because of the ‘space-time dimensions’, time being that which *here* is always already *there*, and indeed, even within the claims of representation, cannot be to do with a going ‘along’ because of  .

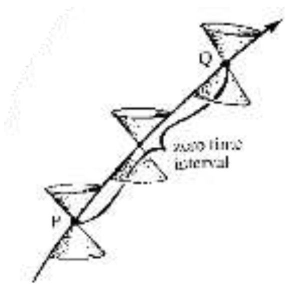
That is, to separate  from



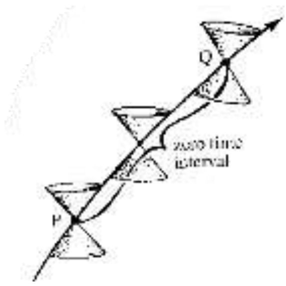
would be to interrupt a claim to continuity if



And yet in this move, I have not gone along with what is already claimed to be – that is, that '[a]long a light ray (or any null curve) the time measure between any two events P, Q is always zero', *that is*

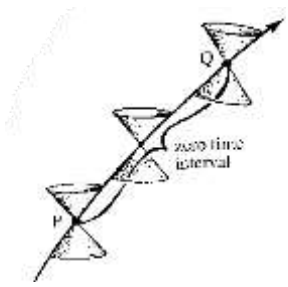


But if this is to do with a continuity, this would necessarily involve a time which can be traced, a history of



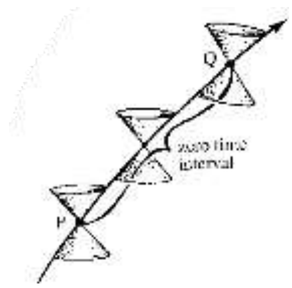
which *goes* somewhere. This does not go anywhere. If there is a continuity, this is to put in place a connection between  and  and  .

It does not go anywhere – would this constitute the ‘*vanishes’* – the seeing of the ‘*vanishes*’? For if  is (one of, in ‘represent[ation]’) ‘the space-time directions’, and ‘one of the space-time directions along which the “time” measure vanishes’, the ‘“time measure”’ cannot be known *outside* of ‘[t]hese (double) cones’, and cannot be known *outside* because the van*is*hing of the ‘“time” measure’ constitutes the outside of the ‘[t]hese (double) cones’, which is as much to say that ‘[t]hese (double) cones’ cannot but be outside of a ‘“time” measure’, can be *nothing* other than it. ‘[T]he “time” measure *vanishes*’ – but if this ‘*vanishes*’ is to do with ‘the space-time directions’ there is more than one direction ‘along which the “time” measure *vanishes*’. The vanishing of time is as a multiple – ‘[t]hese (double) cones’, but also as a multiple in terms of ‘space-time directions along which’ it ‘*vanishes*’, or rather the ‘measure’ of it. The ‘along’ would disrupt the ‘measure’; ‘along’ cannot be to do with a separation *between* ‘the space-time directions’ and ‘the “time” measure’, but neither can ‘the “time” measure’ be constituted by  of itself. ‘Along a light ray (or any null curve)’ can only be ‘the “time” measure *vanishes*’ because it would have to do with the seeing of the individual. For, if it is already known that ‘[t]hese (double) cones represent the space-time directions along which the “time” measure *vanishes*’, there are no ‘space-time directions’ here as such, only ‘[t]hese double cones’, so that if



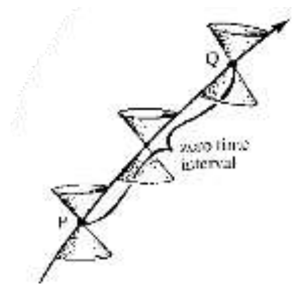
is already representing, the ‘*vanishes*’ of ‘the “time” measure’ would always already have occurred to be brought back to its vanishing point. There is no point to the vanishing, if ‘along’, but rather, is to do with the seeing of the absence all the way 'along' 'the space-time directions' which are themselves not (t)here, except as '[t]hese (double) cones'.

'Along a light ray (or any null curve) the time measure between any two events, P, Q is always zero.'



is 'a light ray (or any null curve)', not 'space-time directions', even in representation. But then again, '[t]hese (double) cones represent the space-time directions along which the "time" measure *vanishes*.'

'These double cones',



or,

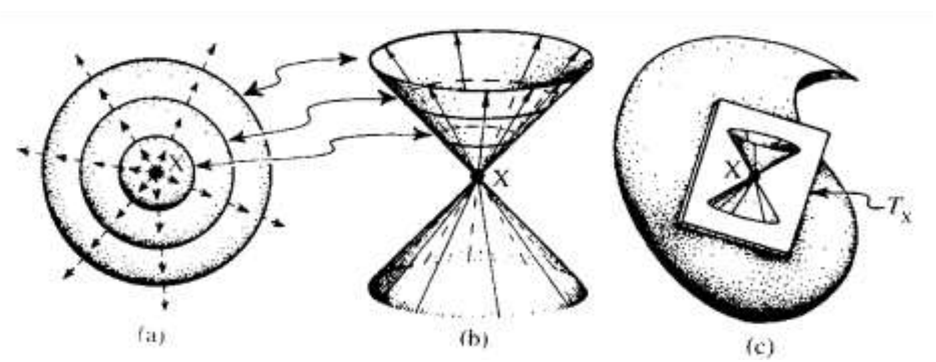


Figure 1-18: At each point X of space-time, there is a (double) null cone determined by the metric **g**, consisting of a future null cone and a past null cone, of directions along which the time measure vanishes. The future null cone has a (local) interpretation as the history of a hypothetical flash of light emitted at X: (a) space picture; (b) space-time picture (with one spatial dimension suppressed), where the past null cone would represent the history of a hypothetical light flash converging at X; (c) technically, the null cone is an infinitesimal structure in the neighbourhood of X, i.e. lying in the tangent space T_X.[84]

Since '[a]long a light ray (or any null curve)' is what is in excess of  so, if  is not 'a light ray (or any null curve)', 'a light ray (or any null curve)' would be to do with

as the connection between the '(double) cones'. But if '[t]hese (double) cones represent the space-time directions along which the "time" measure vanishes', the question would be whether

[84] *Fashion, Faith and Fantasy*, p.47

is to do with representation. It is to do ‘Figure 1-19’, but then where is the ‘Figure’ if

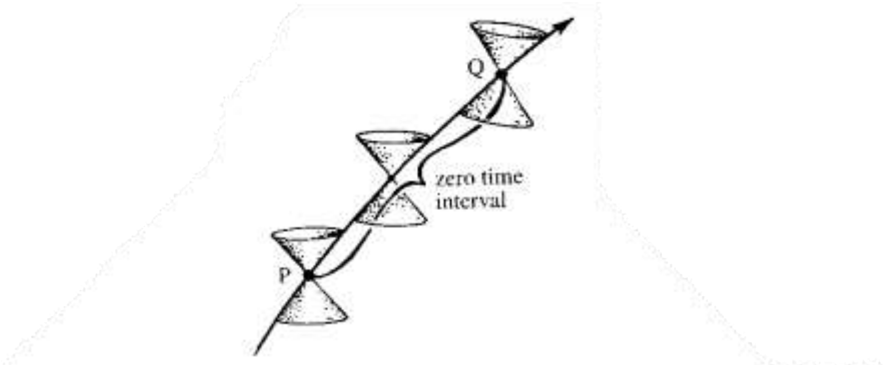
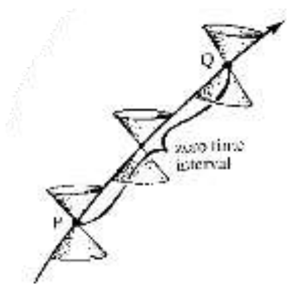
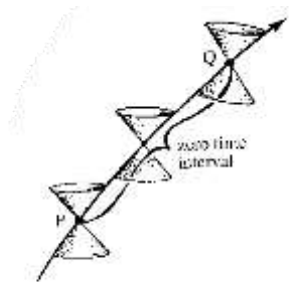


Figure 1-19: Along a light ray (or any null curve) the time measure between any two events P, Q is always zero.

For if



is ‘Figure 1-19’, whatever ‘Figure 1-19’ is cannot be explained by



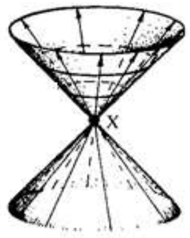
So if

is not self-explanatory, is both what is, and is not ‘Figure’,

as ‘a light ray (or any null curve)’ would be that ‘a light ray (or any null curve)’ is what cannot of itself (and here I have already gone beyond what *is*), be distinguished as the one (f)or the other. ‘[A] light ray’, as one, is, because of ‘the time measure’, equivalent to ‘any null curve’ as multiple. The *vanishing* of time would be in the (re)placement, substitution of one for the other(s). With zero time there is no (re)placement, which is to say, that there *is* a replacement, but there is no time which is excessive to the replacement – time is itself (re)constituted in this move.

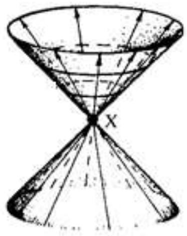
And yet ‘([…] any null curve)’ is also the ‘(double)’, ‘along which the “time” measure *vanishes*’, and to do with because of ‘([…])’ – that there is something about ‘(double)’ which ‘(or any null curve)’ demands.

For if  , there is an opening at the top cone which is not at the bottom; ‘(double)’.  is then to do with two cones, and yet ‘(double)’ would be that which cannot be, here, anything other than ‘cones’ as double. ‘These […] cones’ are a particular sort, and thus out of other ‘cones’ ‘[t]hese cones represent the space-time directions along which the “time” measure *vanishes*.’ If there is an opening at the ‘top’ of the (top) cone, and yet



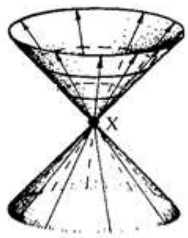
such that the bottom cone also has an opening, an ellipse, the ‘(double)’ would have to do with a symmetry between the (two) cones, which I could also read as an inversion. (In)version, of the other. But if symmetry (and (in)version), there is still something about ‘(or any null curve)’ and ‘(double)’ which is excessive to 'a light ray' and 'cone' yet nevertheless necessary; a part of the other to constitute the 'or' and the '(double)'. Another version but with*in* the same parameters.

What parameters?



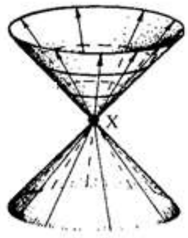
'(b) space-time picture (with one spatial dimension suppressed), where the past null cone would represent the history of a hypothetical light flash converging at X[.]'

So '(or any null curve)', and '(double)', (and, now (or)), '(with one spatial dimension suppressed)' is to do with what is '([…]suppressed)'; that is, known in its difference elsewhere as what is not lacking. For if



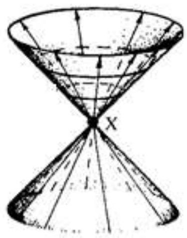
is a 'space-time picture (with one spatial dimension suppressed)', 'a space-time picture' can withstand, as itself, this loss of 'one spatial dimension suppressed', and can *with*stand because it is (*with* one spatial dimension suppressed)'.

~~It~~ cannot be here. The suppression is known and has to be contained, as excess, to be suppression – that there has to be a move by which the 'suppressed' is elsewhere, 'one spatial dimension [is] suppressed' in this, *there*:

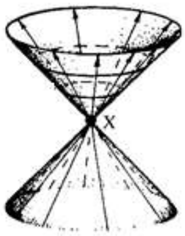


And even *there* does not capture the excess. The ‘suppression’, as with the ‘*vanishes*’, has to be the presencing of a loss, that in each turn of the ‘Figure’, the acknowledging of what is (not) there, is that which guarantees what is – ‘a space-time picture’; the ‘dimension’ would be to do with ‘space-time’ *being*, regardless of the ‘we’ – the ‘space-time’, ‘space-time picture’ is known to the ‘we’ even in its non-loss; it *persists*.

But is



out of ‘space-time’, if it is ‘a space-time picture’? That is, of itself it is ‘a space-time picture’, but ‘picture’ would have to do ‘with [having] one spatial dimension suppressed’, that ‘space-time picture’ is capable of ‘dimension’, but this ‘dimension’ as what is displaced from



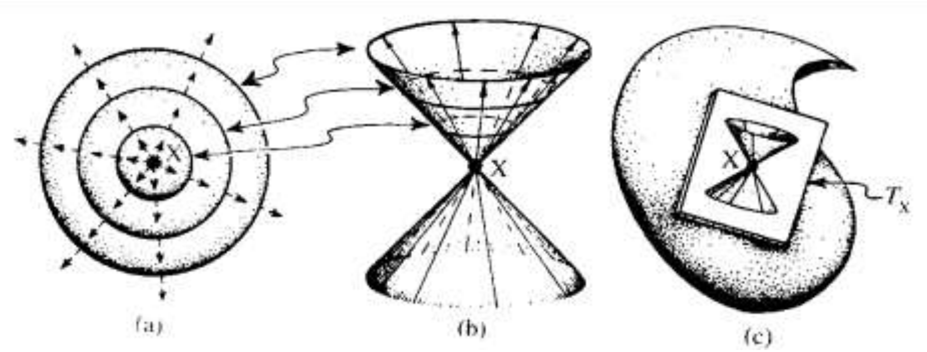
And if ‘with one spatial dimension suppressed’ there is more than one ‘spatial dimension’ – ‘picture’ here would be to do with an alteration to what is ‘space-time’. But also ‘(b) space-time picture […], where the past null cone would represent the history of a hypothetical flash converging at X’, and:

> At each point X of space-time, there is a (double) null cone determined by the metric **g**, consisting of a future null cone and a past null cone, of directions along which the time

> measure vanishes. The future null cone has a (local) interpretation as the history of a hypothetical flash of light emitted at X[.]

Can I point to the 'point X of space-time'? '• X'. '•' is (not) 'X', for if I am pointing this out, there is a presencing of what was not (t)here. Although neither can I say the one is along(side) the other, for in what sense are '• X' (t)here in strict separation?

And '(c) technically, the null cone is an infinitesimal structure in the neighbourhood of the event X, i.e. lying in the tangent space T_X.' I am thinking of the sequence '(a)', '(b)', '(c)', that these divisions are necessary for what is



This necessity cannot be to do with a singularity; '(a)', '(b)', '(c)' are to do with their double, respectively, under each of the pictures. That there is some sort of close to this sequence, and yet sequence is that which cannot be itself outside of the divisions '(a)', '(b)', '(c)'.

And I am wondering too about '(with one spatial dimension suppressed)'. This is a sequence too, that the 'suppressed' has already occurred, is contained within the 'picture' which is in sequence, '(b)'. The accumulation of a loss, and in '(b)' doubly so because '(b)' is not '(a) space picture', but a 'space-time picture (with one spatial dimension suppressed)'. But '(a) space picture' is not to do with 'dimension', whether 'suppressed' or not, so if 'space-time picture', and a 'space-time picture (with one spatial dimension suppressed)', the addition of '-time' would have to do (with) '(with one spatial dimension suppressed)'. That the 'space-time picture' cannot account for 'space-time' in its totality if there is '-time'.

‘-time’; an appendage, and yet if ‘(with one spatial dimension suppressed)’, the inclusion of ‘-time’ carries the loss of ‘one spatial dimension’, so although it is a ‘space-time picture’, in case ‘picture’ professed too much of ‘space-time’, ‘(with one spatial dimension suppressed)’ accounts for the ‘suppressed’. ‘-time’ in its addition adds (in) also ‘([…]one spatial dimension suppressed)’. ‘[S]pace-time’ as such cannot be a ‘picture’. So although ‘space-time picture’ accounts for the ‘suppressed’ the ‘suppressed’ ‘spatial dimension’ cannot *be* (along) with ‘-time’.

‘At each point X of space-time, there is a (double) null cone determined by the metric **g**, consisting of a future null cone and a past null cone[.]’ So ‘a (double) null cone’ is that which ‘consist[s] of a future null cone and a past null cone’; the ‘(double)’ as ‘a future’ and ‘a past’ – these as the ‘(double)’ – it almost cannot be said.

But it is ‘hypothetical’: ‘the future null cone has a (local) interpretation as the history of a hypothetical flash of light emitted at X.’

And so if it almost cannot be said, ‘(double)’ would almost already have said too much. And a ‘(local) interpretation’ – of many, this is one. ‘([L]ocal)’ in terms of ‘space-time’? That is, the ‘interpretation’ is ‘(local)’ to ‘space-time’, and therefore *not* ‘space-time’? Or at least, *not* ‘the future null cone’ because ‘*as* the history of a hypothetical flash of light emitted at X [my italics].’

‘([L]ocal)’ according to what? If ‘the future null cone has a (local) interpretation as the history of a hypothetical flash of light emitted at X’ the ‘(local)’ is to do with the ‘hypothetical flash of light’ – an (im)positioning of ‘light’ in it being ‘hypothetical’.

Is ‘X’ ‘(local)’? ‘At each point X of space-time’ - so ‘X’ is multiple, throughout and belonging to ‘space-time’. It would at least constitute a limit for this ‘interpretation’: ‘the history of a hypothetical flash of light emitted at X’. (Hypothetically). And if ‘X’ is multiple, the repeating ‘X’ would be that if there is a number of ‘X’’s, locality is a limit; beyond this limit is the non-local. Yet this would not be an easy division to *maintain*, if it all, for if non-X is non-local, would what is local to one ‘X’ be local to all others?

I am wondering whether there is something in this repeat – a repeat which (re)places one 'X' with another (wholly) locally. That is, if 'X' is multiple, and crucially multiple *in being* 'each point X', it would be that such a system which relies on a homogeneity (of 'X', in its multiple *as itself*), nevertheless requires a heterogeneity to *be* 'each X'. For although the repeat of 'X', in a strict homogeneity would this be known as a repeat – as a repeat proper which, with no remainder, (re)places 'X' with 'X'? And here, then, the local is called into question, for the local too, in being continually (re)placed, '[a]t each point X', is itself *not* to do with any absolute grounding, but rather that which is non-local to itself, and itself as what is always (re)placed. So how to think of a locality which *must* always be local *elsewhere* – that is, cannot be to do with a particular framing (instance, for I have already lost it) of the local, for any kind of particularity would be the very possibility of *making* the local, that is, knowing the local in its particularity, in its frame, *as* local.

And yet I could not say to a *particular* place, space, locality, for if the local is that which must be always (already) (re)placed, and (already) because there would have to be some idea of a suppression of a time alternative, which has already gone ahead, I would have to frame (already), there again, to think about it. There is, in, *at*, 'each point X', that which is known to be not 'each point X', so 'each point X' would be to, if locality is that which is no longer known in its (different) localities to all localities 'X', instate a necessity for locality to be what is known without the remove. That is, without a remove which is nevertheless demanded by:

> At each point X of space-time, there is a (double) null cone determined by the metric **g**, consisting of a future null cone and a past null cone, of directions along which the time measure vanishes.

'[A]long which the time measure vanishes', so 'time' does not vanish, only the measure, I could say that 'time' is suppressed, if this would not un-suppress what I lay claim to being suppressed.

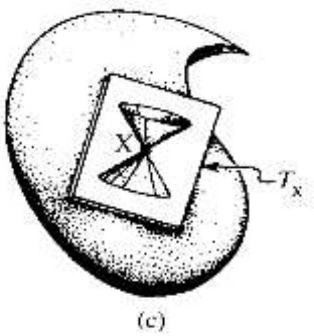
But '[f]igure 1-18(c) tells us that the null cone is really an *infinitesimal* structure at each event X, existing just locally in, strictly, the *tangent space* at X'.[85] There is a limit, according to the 'local' of

[85] *Fashion, Faith and Fantasy,* p.46

what constitutes ‘interpretation’, but also of existence. ‘[D]irections’ remain (not really); and so too ‘a future null cone and a past null cone’, despite the ‘time measure vanishing’. So ‘a future null cone and a past null cone’ are ‘directions’, although really I should say, belong to, if ‘of’. Yet if ‘[f]igure 1-18(c) tells us the null cone is really an *infinitesimal* structure at each event X, existing just locally in, strictly, the *tangent space* at X’ the ‘tells’ of the ‘[f]igure’ is to do with what ‘is really’, but also ‘technically’. Although ‘there is a (double) cone’, what this is ‘technically’ and ‘really’ is ‘an *infinitesimal* structure at each event X’.

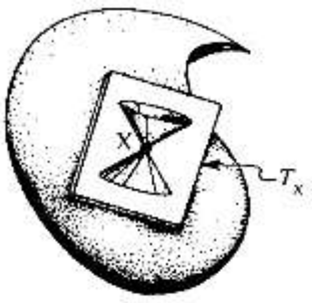
I thought that ‘X’ was the ‘point’?

This ‘really’ though, if in ‘the *tangent space* at X’ *is* the possibility of being able to know that the ‘time measure vanishes’, for these light cones are (representing) the limit constructed by the speed of light, it cannot be that the frame is *itself* ‘measured’. The light cones are to do with the knowledge that ‘time’ is (t)here, that is, in reserve, but always in reserve, and it ‘vanishes’ as a measure. *Should* the light cones have been measurable, should light have measured (itself), it would constitute another frame, abyssally, by which the light frame could be (re)ordered.



(c)

The local is a remove from ‘X’, ‘the tangent space’, but also, if ‘existing just locally in’, ‘the null cone’ cannot be known outside of what is local. So if it cannot be known outside of what is local,



(c)

is to do with what is 'non-local'. For if locality is to do with a limit, and 'T_X', or rather 

I can read a limit in the frame  and yet, if there is a limit, as the frame of what is '(local)', the 'us' would be outside of the '(local)'. The '(local)' because of the frame. The frame frames not just the 'null cone' but also the 'tangent space' as another space within the 'space-time', (doubled space?). And these (dis)placed, (re)placed, is not only that there is the impossibility of the being one of 'X', (and this doubly), but also that the '(local) interpretation', which is to do with the 'existing just locally in', would be that the 'existing' is the 'interpretation' of what cannot be *at* the 'event' as such; the 'existing' is bound(ed) by a frame which must nevertheless be '(local)' from a non-local position. That locality would alter the 'interpretation'. That 'existing just locally in' is known from a position of difference, the non-local, such that 'existing just locally in' cannot be to do with such strict bounds, unless the limit is already opened. '[T]he time measure vanishes': this position would be a timelessness – an absolute stability.

'These double cones represent the space-time directions along which the "time" measure *vanishes*.'

The being 'along', 'along a light ray (or any null curve), 'lying in the tangent space' – 'really', 'technically'. The being along(side) of what is already one multiple – 'X'. A 'light ray' cannot, technically, illuminate 'event X' if it is off to one side, 'lying in the tangent space'.

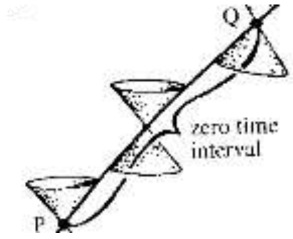
But it might cast a shadow.

A number of localities: 'at each event X, existing just locally in, strictly, the *tangent space* at X'. Local to the 'event X', which is multiple, the 'null cone' should not, strictly, be known outside of its locality: 'existing just locally in'. Just locally everywhere in 'space-time', or the '*tangent*' of it, in the repeat of 'X'.

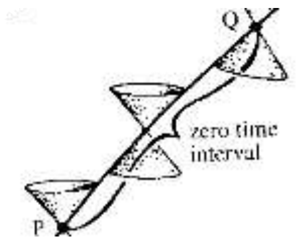
It might be a question of how to think outside, strictly speaking, of what is '(local)' when '(local)' is already elsewhere, repeated, open to what it is (not) –

- to conclude, some sort of summing up, in numbers, which would be
- 1 – I would already (have *it* t(o)o) have lost it.
- 2 – I would have to (re)iterate the whereabouts of the form of
- 2 – that is, how to say *this is it*.
- 3 – no more.
- 4 – more than 3, although perhaps I have not quite *covered* 3.
- 4 – 5 -

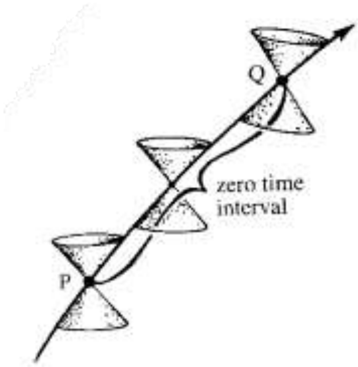
– Or is this only between ‘P’ and ‘Q’ – ‘P, Q’. Perhaps it would have to do with the (that) ‘interval’, and my *and*, and ‘P, Q’. But it is also to do with a(nother) section, that of



and *the section* because of the excessive arrow and line, either side of that which is represented as ‘zero time interval’, by the bracket. Twice over (2 – 2 –) represented if ‘[t]hese (double) cones represent the space-time directions along which the “time” measure *vanishes*.’ So perhaps a vanishing point, the middle of the three cones – the vanished middle, and here I double (2 – 2 –) back to the *and* of ‘P’ and ‘Q’, and the difference, if any, to ‘P, Q’. That is, from ‘[f]igure 1-19’, (although not exactly), I should put



or even



‘P’ and ‘Q’: how to get out of the and? The middle ‘cone’ would be to do with the ‘and’ of the addition, that is, of counting – that this is what must be between, but between as an idea of what is not as such (hypothetically). Not least because of the 'represent'. For, whether or not *in* (re)presentation, the 'zero time interval' would be to do with the between of different points – that there *are* different points, 'P' (and) 'Q', but part of the same, this being '[a]long a light ray (or null curve)', and that '[a]long' would keep in place this unity by which whatever *is* '[a]long' is already known to be.

There is no horizon to this, no direction in the strict sense because the '[a]long' is already to have been along, and any subsequent '[a]long' will be as first.

As 1 –

– (T)here, in the '[a]long', is no excess(ive) space required – this going over would be what it means to be (already) present.

In sum – 1('s) –

But if *I* were to go '[a]long a light ray', would *this* have to do with speed, and would I know it to be the case? That is, would I know to be going at light speed? Could I even say I was *going* if there is a 'zero time interval' and 'the "time" measure *vanishes*'? Could I know the vanishing point? *Vanishing* point – for I take it that '*vanishes*' is to do with a peculiarity.

Peculiarity.

So if there was, is, is going to be, no time measure, could I *know* this going along, think back through the *vanishing*? Or would this take no time at all? That I would be what is (not) vanished? In light.

> Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union will preserve an independent reality.[86]

And since 'special relativity cannot properly be made sense of without the *further* ingredient […] the magnificent space-time of Minkowski'[87], I will (continue) '[a]long a light ray', be within the light ray, to *make sense* out of these parts and *make up* my sense of special relativity.

[86]Hermann Minkowski quoted in: Roger Penrose, *The Emperor's New Mind: Concerning Computers, Minds and the Laws of Physics* (Oxford: Oxford University Press, 1999), p.250.

‘[D]oomed to fade away into mere shadows’. There is something here, and I hesitate at *something*, which is to do with transformation – ‘doomed to fade away into mere shadows’. This is not quite a loss of ‘space by itself, and time by itself’ as such – they, as shadows, would give way, *make a way,* to the ‘independent reality’, or rather the ‘preserv[ation]’ of it. What comes ‘[h]enceforth’ can be only on this prerequisite – that ‘space by itself, and time by itself, are doomed to fade away into mere shadows.’

Although perhaps it is more correct to say that this is all ‘[h]enceforth’ – this is all to come: relative to the ‘[h]enceforth’, and *relative* because what is to come has already, that is, I have already, lost the moment of ‘[h]enceforth’. This *essay* into what is ‘space-time’, the play of shadow and light, doubles this move of what is henceforth – it may well have to do with the ‘[a]long’, and what is at the point (although this in itself would have to do with the light at all points – can I separate them? And have I not, somewhat arbitrarily, already done so?) to come back from a future which is set up to come back from: ‘only a kind of union will preserve an independent reality.’

Not so ‘independent’, if the ‘reality’ for its preservation relies on the (re)formulation of what is ‘time’ and ‘space’. An ‘independent reality’ which cannot itself be to do with the ‘by itself’ of either ‘time’ or ‘space’, but rather requires their doubles, (their (anti-)symmetry?) that there is nevertheless preserved, as ‘mere shadows’, ‘space by itself, and time by itself’. So whatever is the ‘independent reality’, it is produced out of this play of what has become shadow, or plays at the shadow – ‘a kind of union of the two’.

‘Henceforth’ some sort of, ‘kind of’, causality is carried over, or within this scheme, set up as carried over. This is not to begin again, but to go *further*, what it might mean to modify to ‘preserve an independent reality’; that ‘independent really’ must be preserved – the independence of ‘space by itself, and time by itself’ threatened this. ‘$-\Delta s^2$’ as ‘an independent reality’, not the only one, but the only one on which there is agreement.

[87] *The Emperor’s New Mind,* p.250

So if ‘$-\Delta s^2$’ is to preserve, and this is ‘an independent reality’, ‘an independent reality’ cannot be maintained by its terms, ‘space by itself, and time by itself’, so if what is required are ‘mere shadows’, would this not (also) carry over, (trans)form, the threat of extinction of ‘an independent reality’ in the ‘kind of union of the two’? That if ‘[s]pecial relativity is based on the experimental fact that the speed of light ($c \simeq 3 \times 10^8\ m/s$) is the same for all inertial observers’, and ‘space by itself, and time by itself, are doomed to fade away into mere shadows’, but this is a ‘*further* ingredient’ also, that is to say, the ‘space-time of Minkowski’, ‘[s]pecial relativity’ is reliant upon the ‘shadows’; that which is known by its loss. I could perhaps go *further* – although what is this *further*, unless I have both (not) lost that which I go in to, knowing the edges?

Am I quite *in* special relativity? Or am I in the shadow of it, waiting for another observer to corroborate my sight, my I?

‘$(c \simeq 3 \times 10^8\ m/s)$’: this is not ‘[s]pecial relativity’. ‘$(c \simeq 3 \times 10^8\ m/s)$’ is not the same as ‘$(c \simeq 3 \times 10^8\ m/s)$’, or even the one before ‘$(c \simeq 3 \times 10^8\ m/s)$’.

It might gesture, in an essay.

Not this one, since it does not have an ‘independent reality’ as such.

Say ‘both observers will agree on the value of the invariant interval Δs^2. This interval is defined by

$$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2. \quad (2.8)’$$

And while I await a response (although what would I gain in a repetition?) I might think about ‘Δs^2’, and specifically ‘^{2}’. I might think about it, ‘^{2}’.

So the point, although perhaps this is a parallel – can two, 2, meet itself, if there is, in this topography, something to do with ‘the invariant interval’ which is necessary for an idea of an absolute? Absolutely, agreement can never meet itself – what would be the point? It would be as much to say that it does not.

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[2] *I might think about it* – again, I could say I am thinking about it; would this be enough? Enough for whom, in that case, enough for me? But would that not be already to *have it*, in some way, to think around, to know that

To have thrown out 'topography' requires a justification; why (t)here, in this place? I have made an arrangement, over the line, for some reference to this, but also:

> The history of a particle is represented in spacetime as a curve, the *world-line* of the particle. Any two events on the world-line of a particle are timelike separated, because no particle can move faster than light and therefore the distance light would have traveled in the time interval that separates the events must be larger than the space separation between the events. This is the content of (2.11) [$(\Delta x^0)^2 > (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$].[88]

Are the shadows back? An independent reality threatened?

> Two events for which $\Delta s^2 < 0$ are said to be *spacelike separated*. Events that are simultaneous in a Lorentz frame but occur at different positions in that same frame are spacelike separated. It is because Δs^2 can be negative that it is not written as $(\Delta s)^2$. For timelike separated events, however, we define
>
> $\Delta s \equiv \sqrt{\Delta s^2}$ if $\Delta s^2 > 0$ (timelike interval). (2.12)[89]

Can I secure the shadow? That is, if I borrowed some terms and (re)formulated, so a Lorentz frame *T,* not anything as yet, but from earlier $c \in O^n$, and I might (still) have to think further about what might be *T*. Earlier would demand that *T* has to do with a time, or a thesis, although not necessarily inherent to *T*, after all, there is $c \in O^{n.}$

Could I escape from this latter?

Although perhaps I am already that shadow of $c \in O^n$. I do not claim any part of it, not as such, but I cannot help but be (a)part as soon as I disown it.

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more or less the loss of it (in the around, the tangent of thinking) is nevertheless relevant to it? Relative to it. Could I think about it in terms of what Δs could be? Or would this be, in some sense, imaginary? Which is as much to say, cannot be squared with some overall route of '$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$'? But I am already dealing in pairs, a series of two(s); one might be put off with such a system. So I cannot go back, or perhaps *I* could, but a second could not, for if '$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$', is 'the invariant interval' on which there is 'agreement', there cannot be an agreement on what might be the root of it. This route would be that which is travelled alone – it would be to break (in) the interval, and the 'invarian[ce]' of it. That the break therefore, this separation by which there are 'the same two events' relies on the separation of the space-time coordinates, begins with the separation of what is the same.

[88] *A First Course in String Theory,* p.16

[89] *A First Course in String Theory*, p.16

Simultaneously – could I think out of this bind of before and after? That is, to be always absolutely *now*.

> Events connected by the world-line of a photon are said to be *lightlike separated.* For such a pair of events, we have $\Delta s^2 = 0$, because in this case the two sides of (2.11) are identical: the spatial separation between the events coincides with the distance that would have traveled in the time that separates the events.[90]

'$\Delta s^2 = 0$'; there is no interval. Is there? And yet '[e]vents connected by the world-line of a photon are said to be *lightlike separated.*' There are '[e]vents', 'a pair of events', already a 'pair' if 'no particle can move faster than light'.

It might be some shadow.

Does a photon have a shadow? And if it did, would not the shadow exceed the speed of light, at some point?

'Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union will preserve an independent reality.'

Preserve 'such a pair of events', for this would be what cannot be escaped, that there *is*; hence '[t]he history of a particle is represented' – preservation at a distance, over an interval. But not over in the sense of being able to go over – the distance must be maintained. So '[e]vents connected by the world-line of a photon are said to be *lightlike separated*.'

'='; on either side, *both* are necessary –

– To think about it, and not least because somewhere along the line (and what about a parallel? although, arguably '$-\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$' would have to meet somewhere to be able to produce '≡'. So it comes to a point), did I quite justify the topography? Did I quite justify *T*, in conclusion? For the 'connected' is 'by the world-line of a photon' – not a history if '$\Delta s^2 = 0$', for it is as much to say that there is no distance between them. The connection, in this sense, is already established, prior to any move.

[90] *A First Course in String Theory,* p.16

They are 'connected', but 'connected by the world-line of a photon'. They are connected, they are 'said to be *lightlike separated.*'

I cannot say what *is* the case.

$T \cong T$.

I could say, in this thinking over topography which I could well also put as T, why Special Relativity, when I have claimed an interest in Quantum Mechanics? Why not Hilbert Space, if topographies are to be pursued?

I could say Q.E.D. or *QED*.

I could say de Broglie.

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[2]'$\Delta s \equiv \sqrt{\Delta s^2}$ if $\Delta s^2 > 0$ (timelike interval)', so there is a route, but only 'if'.

Can *we* agree on this? 'For timelike separated events, however, we define'; just to think about what it might be to *pair* something. Although how might I think *through* this, (and thereby miss *it*), or would it rather be the shadow is the frame through which I can think – necessarily, that there is something; I can only say that there is something to begin.

Can I think it, or would that be to chase a shadow of a thought, in that to pair something I cannot think it of itself without alteration – all things equal, by this route?

It cannot be said. Whatever ground I am in would be that which goes without saying, that from this ground (topography, *just*(ified)), I could proceed. Can I think this? Or has the route fallen through?

Then again, if '$\Delta s^2 < 0$' and 'both observers will agree on the value of the invariant interval Δs^2' 'we' might, in definition, have lost 'both observers', or at least, this '$\Delta s \equiv \sqrt{\Delta s^2}$ if $\Delta s^2 > 0$' is not to do with observation in the strict sense – might that not be the double – that there is, now, nothing to square away with another?

I could say something like there is an imitation, but I would have to frame it thus that there *is* only the -like of imitation. The shadows of 'space by itself, and time by itself'.

Perhaps I have not yet said what is the case, I remain outside the frame S, or even T however much I might insist that there is the frame; the agreement of the 'value' is not sufficient of itself. Can I be more specific in '$\Delta s^2 < 0$' as 'value'? Or only that '< 0'? That is, the threshold would hinge around '0' if '[f]or timelike separated events, however, we define

$$\Delta s \equiv \sqrt{\Delta s^2} \text{ if } \Delta s^2 > 0 \text{ (timelike interval).'}$$

Either side of '0' would be what it means to be 'timelike' or 'spacelike'.

Or indeed the very possibility of there being an *either side of 0*.

Would not this be to invoke a (number) line, or at least the excesses of '0' being within the same field? That there is already an idea of what it means to go in the opposite direction for there to be 'timelike' and 'spacelike'? But what is constituted as 'timelike' and 'spacelike' is because of 'Δs^2'. That is, the connection between any two Lorentz frames; but if a connection, can it be that the connection is proper to either?

The shadows (re)turn in this connection, that 'timelike' and 'spacelike' are what is 'said' of 'Δs^2' - and indeed, if what is 'said' of the '[t]wo events' is constituted from the agreement of 'both observers', 'both observers' are necessary only to justify the grounding of what is 'said' to be the case – that from this agreement, 'Δs^2' is what is of interest – what is agreed as the same, rather than the difference. That what is *preferred* is agreement – but this same, 'the invariant interval Δs^2' is nevertheless that which cannot be 'invariant' as such – or rather that the 'invariance' is modified to be either 'spacelike' or 'timelike' – it can become a differencing, or rather have a tendency towards the being 'space' or 'time'.

If the difference between what is 'spacelike' and 'timelike' is constituted by its relation to '0', within this scheme, 'spacelike' and 'timelike' cannot run in the same direction. Despite there being a continuum, or at least a homogeneous grounding out of which there is produced 'spacelike' and 'timelike'. 'Δs^2', whether '< 0' or '> 0' would be that '0', which constitutes the difference, cannot itself be a part of what is 'spacelike' and 'timelike' – '[e]vents connected by the world-line of a photon are said to be lightlike separated. For such a pair of events, we have $\Delta s^2 = 0$'.

There (not) having been an interval, what is demanded in '[a]long a light ray (or a null curve)' is for the space of 'a light ray (or a null curve)' to be that which everywhere and already present; a being everywhere and the same place would not require an unfolding for it is already there to see – '"time"' vanishes as there is no requirement for it. This is to be without history therefore (and equally any other division of what might *otherwise* be within the field of time) such that 'a light ray (or null curve)' cannot in a strict sense be traced.

It would be to do with the setting up of a hierarchy, that 'the speed of light' has put in place time as a 'length', and this 'length' can be gone back over, run through, journeyed along as *length.* But how might I be adding to that which I have never had? That is, a length of time. I could not hold it, even if I tried, I could perhaps put down '–' but does with quite *sum up* what I have in mind? Might I not need both to decide?

For if '[h]owever' would be the differencing distinction between the 'spacelike' so '[i]t is because Δs^2 can be negative that it is not written as $(\Delta s)^2$', but '[f]or timelike separated events, however, we define', something about 'timelike' would be the permission to 'define'. There is something excessive about 'timelike' which does not adhere to what is 'not written', or rather that it is not constituted in terms of opposition to it.

'[T]imelike' would be the allowing for a route.

With the caveat: 'if $\Delta s^2 > 0$', anything below '0' would require the imaginary. '[T]imelike' is here set up to produce *a* value, hence the route, that would otherwise be at odds with the gesture to definity: 'we define'. And yet, in what sense can there be an absolute escape from the imaginary? For it would be that any clear distinction between the imaginary and the real would have to fall back on, or take its grounding from an idea of what the real time is. And yet if '$\Delta s \equiv \sqrt{\Delta s^2}$ if $\Delta s^2 > 0$' and this is produced out of '$\Delta s^2 \equiv -(\Delta x^0)^2 + (\Delta x^1)^2 + (\Delta x^2)^2 + (\Delta x^3)^2$', the 'timelike' invariance, an idea of proper time, would nevertheless be that which can only be *subsequently* produced out of the coordinates.

Or would that be events?

But what this system hinges on is what *is* actually happening with no grounding, or no originary grounding for an agreement. Indeed, the grounds can never meet:

> To be able to assert that the speed of light is constant, we take the position that it makes sense to regard null cones at different events as all being *parallel* to one another, since "speed" in spatial terms, refers to "slope" in spacetime terms.[91]

Is this the assertion of an 'experimental fact'? But whether or not, 'the speed of light' as a 'constant' is not 'constant' of itself – it requires the 'we' to 'take the position'. There is already a move by the 'we' as to what 'makes sense', but also what 'makes sense' '[t]o be able to assert that the speed of light is constant.' The 'speed of light is constant' cannot be 'assert[ed]' without this move therefore, and one that the 'we' knows of. The 'constant' would be derivative of this 'position'. But if 'take', 'the position that it makes sense to regard null cones at different events as all being *parallel* to one another' is such that this 'position' is already there as such to take up, and to take up a judgement as to what 'makes sense'. '[T]he position' would be out of a choice, a distinction between what allows for the 'assert[ion] that the speed of light is constant'.

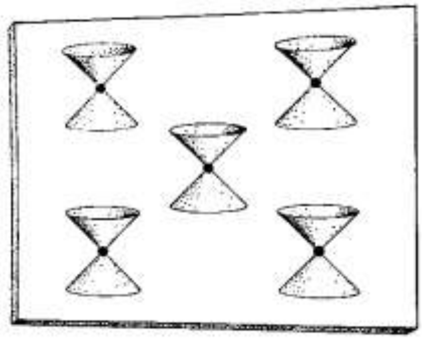
But would this not (dis)place 'the speed of light' as that which is already known to *then* know that what is required is the 'position'? There is, in the 'tak[ing of] the position', a lack in 'the speed of light'; it requires a geometry, and a particular geometry to be constant. And if 'it makes sense to regard null cones at different events as all being *parallel* to one another', the '*parallel'* would be to do with an idea of the geometry required for the 'assert[ion]'; that is, that 'different events' *are* different events – determined and determinable as such. That '*parallel*' orders. For, if this to do with 'different events', the separation of the 'null cones', the 'different events' are guaranteed by the '*parallel'*, so that there is no convergence. And yet, if it 'makes sense […] since "speed" in spatial terms, refers to "slope" in spacetime terms", the connection between 'spatial terms' and 'spacetime terms' would be that the '*parallel*' is itself produced by this connection as that which was already in place.

[91] *The Road to Reality,* p.404

I would be chasing a grounding for this ‘assert[ion]’.

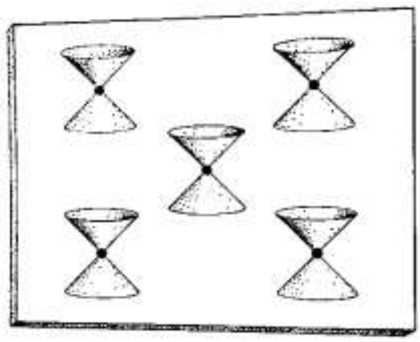
I would be, if there was one.

‘This leads us to the picture of spacetime depicted in Fig. 17.12.’[92]



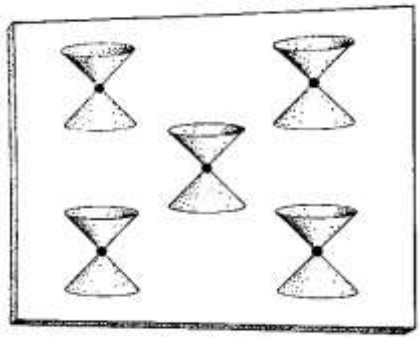
[93]

‘Fig. 17.12’ is not ‘the picture of spacetime’ if ‘depicted’ – it would be to do with the ‘actually’. That is, the ‘tak[ing up of] the position’ ‘leads us to the picture of spacetime depicted in Fig. 17.12’. Leads to ‘the picture of spacetime’ which is not (t)here:

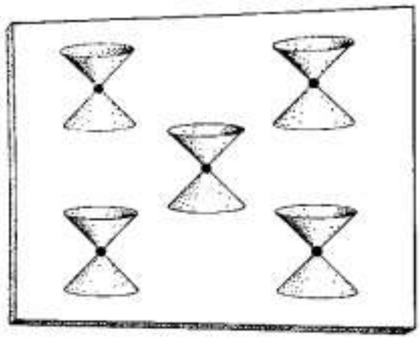


Actually, what is referred to is elsewhere, where ‘we’ are ‘lead[…] to’, and yet there is no ‘spacetime’ outside of what is ‘*de*picted [my italics]’, but the ‘we’ know this, together, ‘[t]his leads us’. Perhaps I could say that

[92] *The Road to Reality*, p.404
[93] *The Road to Reality*, p.404



is ‘*parallel*’ to ‘the picture of spacetime’. But that would be to assert that there is ‘the picture of spacetime’ as such, that I can see it, that there is a connection, but



is without parallel. If ‘it makes sense to regard the null cones at different events as all being *parallel* to one another’, the ‘*parallel*’ is not intrinsic to ‘the null cones’. ‘*[P]arallel*’ is in addition, but in such a way that ‘the null cones’ cannot be anything other than ‘*parallel*’. And indeed, this ‘since “speed” in spatial terms, refers to “slope” in spacetime terms’ there is already a referral, deferral, of what is ‘“speed”’ and ‘“slope”’, and according to which ‘terms’ – which locality. To insist on the division of ‘terms’ would put at stake the issue of ‘refers’ – that is, the *possibility* of connection, and *possibility* because if ‘*parallel*’ there can never be the connection: it would have to be constituted by the loss of the other, a loss in the referral: that which it is (not) is passed over to the other to be ‘*parallel*’.

> The spacetime picture of Fig. 17.12. was first introduced by Hermann Minkowski […]
>
> To complete Minkowski’s viewpoint with regard to the geometry underlying special relativity, and thereby define

> *Minkowskian spacetime* $\mathbb{M}$, we must fix the *scaling* of **g**, so that it provides a measure of "length" along world lines.[94]

If '[t]he spacetime picture […] was first introduced by Herman Minkowski', the 'complet[ion]' of his 'viewpoint', would be what the 'we must' do – '[t]he spacetime picture' is not sufficient, what is required is 'the geometry underlying special relativity': it was begun, (as) the 'viewpoint', but the 'defin[ition]' is what 'we must' do – 'fix the *scaling* of **g**'. It would be that an idea of a unity 'with regard to the geometry underlying special relativity' is marked off by the 'we' which sets itself as other to 'Minkowski'.

'Ever since Maxwell' –

A little more pre-history, which is perhaps apt; pre-history somewhere between time(lessness).

And yet, the 'geometry underlying special relativity' would be that which 'we' can have access to as 'Minkowski's viewpoint'. It is not so much the 'geometry' which 'we must fix', or rather a particular part of it, '**g**', but 'Minkowski's viewpoint'. This can be shared, and shared as such, but only on the alteration – 'we must fix the *scaling* of **g**'.

'[S]o that it provides a measure of "length"' – there is nothing inherent to '**g**' with regard to '"length"' – it is about what it is requested to provide – what is known to be needed in its lack as what will come back to the 'we' from elsewhere, or rather '**g**'.

[94] *The Road to Reality*, p.406

Now that I *am* elsewhere, I might now, *can now*, think about geometry (if I was not already before), with regard to 'On the Electrodynamics of Moving Bodies':

> If we want to describe the *motion* of a particle, we give the values of its coordinates as functions of time. However, we must keep in mind that a mathematical description of this kind only has physical meaning if we are already clear as to what we understand here by "time."[95]

(~~y~~?)Time is bound up in a difference between 'a mathematical description' and 'physical meaning'. For if the '*motion* of a particle' is 'the values of its coordinates as functions of time', 'time' is constant to be able to give 'functions' of it. Constant, but nevertheless a constancy which is displaced, for if 'we give the values of its coordinates as functions of time', the 'values of its coordinates' are not 'values of its coordinates' as such, but rather transformed: '*as* functions of time [my italics]'. There is 'time' only in its being 'give[n]' otherwise; the 'coordinates' would be a constituting of time as a geometrical continuum. The '*motion* of a particle', or rather the 'descri[ption]' of it, which already requires a (re)move from the '*motion*' as such – that the 'coordinates' can be (re)formulated in terms of 'time'.[96]

And the 'mathematical description' does not have 'physical meaning' to give of itself. The 'physical meaning' of the 'mathematical description' is excessive to the mathematics; that is, known only if there is already an 'understand[ing of…] "time"'. For this system then, the understanding of '"time"', or its physicality, would be that which has to be already known to be, for it is not derivative of the mathematics.

[95] Albert Einstein, 'On the Electrodynamics of Moving Bodies', in *Einstein's Miraculous Year: Five Papers That Changed the Face of Physics*, ed. by John Stachel (Princeton: Princeton University Press, 1998), pp. 123-160 (p.125)

[96] This idea of time as that which is in addition to the mapping, an unfolding, of a particle, can be read in David Z. Albert's discussion of the two-path experiment in the chapter 'The Mathematical Formalism' of *Quantum Mechanics and Experience*. I am particularly thinking of the two-path experiment being 'mapped out carefully, with the help of a coordinate system, in figure 2.8. The times at which the various different stages of the experiment unfold are indicated there too.' (p.53) The difference, being, however, that whereas Einstein is thinking of the particle as related to time – the positions as a 'functions of time', that time is 'indicated' in *Quantum Mechanics* would be that time is not a part of the coordinate system. Indeed, time(s), here, would be to do with a constitution of difference; a separation of the sameness of the 'various different stages'.

But my question here would be this: why the mathematics if there is already clarity over what 'we understand here by "time"'? And if there is *not* clarity, how can there be a justification for the 'mathematical description' being to do with the 'physical meaning' of 'what we [do (not)] understand here by "time"'?

This system is to do with the 'we' reading itself as to 'understand[ing]', that there is the possibility of self-knowledge in a total sense, but also that this self-knowledge is to do with *this* particular frame – 'here'.

The 'here' would require another move. This double(d) 'we' distinguishes between 'here' and the non-here 'already' – that 'what we understand here by "time"' must be already known, 'clear', before the 'here' for there to be 'physical meaning'. That 'we' must, in some way, be in advance of itself, itself as its other, for there to be 'physical meaning', and yet nevertheless, 'if we are already clear as to what we understand here by "time"' such that although 'we' must be already in advance, this advance can be nothing other than 'here', that is, 'here' which cannot be to do with a difference of the 'we' in time. The geometry would be to do with time-coordinates as that which is a closed system to which the 'we' is not subject.

'However, we must keep in mind that a mathematical description of this kind only has physical meaning if we are already clear as to what we understand here by "time"'. '[W]e' might be in danger of losing something – 'that a mathematical description of this kind only has physical meaning if we are already clear as to what we understand here by "time"'. So 'we' need to be reminded of what it is that 'we are already clear' about. It is not that what 'we are already clear' about is inherent, since 'if', but that this ability to 'already [be] clear as to what we understand here by "time"' is such that 'physical meaning' rests on that which threatens a loss of the possibility of an already known. Would not '"time"' *here* be bound up with whether or not the 'we' can read itself from a point of difference? That this would constitute the 'physical meaning'?

So if '"time"' here is under question, and this is to do with the 'we' guarding against the possible loss of itself as a self-knowledge, that this must already be – what might the 'mathematical description[s]' be to do with? But perhaps I am still in the grounds of what '"time"' might be:

> To be sure, we could content ourselves with evaluating the time of events by stationing an observer with a clock at the origin of the coordinates who assigns to an event to be calculated the corresponding position of the hands of the clock when a light signal from that event reaches him through empty space. However, we know from experience that such a coordination has the drawback of not being independent of the position of the observer with the clock. We reach a far more practical arrangement by the following argument.
>
> If there is a clock at point *A* in space, then an observer located at *A* can evaluate the time of events in the immediate vicinity of *A* by finding the positions of the hands of the clock that are simultaneous with these events. If there is another clock at point *B* that in all respects resembles the one at *A*, then the time of events in the immediate vicinity of *B* can be evaluated by an observer at *B*. But it is not possible to compare the time of an event at *A* with one at *B* without a further stipulation. So far we have defined only "*A*-time" and a "*B*-time," but not a common "time" for *A* and *B*. The latter can now be determined by establishing *by definition* that the "time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*. For, suppose a ray of light leaves from *A* to *B* at "*A*-time" t_A, is reflected back from *B* toward *A* at "*B*-time" t_B, and arrives back at *A* at "*A*-time" t'_A. The two clocks are synchronous by definition if
>
> $$t_B - t_A = t'_A - t_B.$$ [97]

What is objected to, 'stationing an observer with at clock at the origin of the coordinates' would be because of 'experience' – that this has been carried out, but known to be an issue for not being 'independent of the position of the observer'. The lack of 'independence' would be to do with where 'the observer' is in relation to 'an event':

> [A]n observer with a clock at the origin of the coordinates […] assigns to an event to be calculated the corresponding position of the hand of the clock when a light signal from that event reaches him through empty space.

[97] 'On the Electrodynamics of Moving Bodies', p.126

Distance from the ‘event’ is what is set up as at issue here; but also, the ‘event’ is known to be ‘event’ before ‘a light signal’ reaches ‘the observer’. And indeed, this knowledge of the connection and thus difference between ‘a light signal from that event’ and ‘that event’ can only be maintained by a position which is observing ‘the observer’. ‘[E]xperience’ would be that which dictates the knowledge of this non-independence.

But if it is a question of distance between the ‘event’ and where ‘the observer’ is, and this is framed by ‘we could content ourselves with evaluating the time of events by stationing an observer with a clock at the origin of the coordinates’, ‘experience’ for the ‘we’, would not so much be being ‘the observer’, but that which governs the ‘arrangement’ – ‘we’ is the one ‘stationing an observer’. The question would be therefore, whether, or rather *why*, *this* is not a problem for the ‘we’, if what is questioned is proximity to an event, such that the ‘more practical arrangement’ involves ‘an observer at *A*’ so that ‘an observer […] can evaluate the time of events in the immediate vicinity of *A*’, and yet ‘we’ is nowhere to be seen, except that ‘[w]e reach a far more practical arrangement by the following argument.’

Argument in terms of a geometry – that this is what the ‘we’ must pass (‘by’) to get to, ‘reach’, ‘a far more practical arrangement’. ‘We’ are not there yet – although know the end to come. If ‘we’ are elsewhere, would this not require, in the ‘we[‘s]’ own claims, some further time? If:

> [I]t is not possible to compare the time of an event at *A* with one at *B* without a further stipulation. So far we have defined only an “*A*-time” and a “*B*-time”, but not a common “time” for *A* and *B*.

There is no inherent justification – argument – for comparison, and thus that ‘the time of an event at *A*’ is necessarily the same as ‘one at *B*’. But if this is all in what ‘we have defined’, the ‘common “time”’ as the means of comparison would be to do with the introduction, by definition, of an addition: ‘common “time”.

But if ‘we have defined’, where is ‘we’? For if the ‘we’ positions itself as outside the ‘arrangement’, and yet nevertheless this ‘arrangement’ is precisely that which the ‘we’ has constituted, the separation instituted by the 'we' between the 'event', 'observer' and 'we' collapses into the 'we' in terms of 'we have defined'. The 'experience' which is held up as that which heralds the knowing that 'such a coordination has the drawback of not being independent of the position of the observer with the clock' would therefore be 'experience' within the claims of the 'we' only. That there is this 'experience', which is known by the 'we', and is a shared 'experience' among the 'we', can be none other than an 'experience' which cannot, in its turn, be independent of the position of the 'we' as a homogeneity. '[E]xperience' would be jointly shared, and yet in turn does not extend to 'the observer[s]'.

What is at stake therefore is a move which guarantees a universality – what is known multiply, and yet that what it known by a group, by the 'we', is also that which has to be thought within limits, within a specified limit – the 'immediate vicinity', and this specificity is to do different 'observer[s]': 'an observer at *A*' and 'an observer at *B*'. It would be a question of how to move between the separation, to uphold the idea of the specific in terms of location, but to nevertheless be able to guarantee that there is an overarching 'common[ality]', in this case, '"time"'. Indeed, that it is 'possible to compare':

> If there is a clock at point *A* in space, then an observer located at *A* can evaluate the time of events in the immediate vicinity of *A* by finding the positions of the hands of the clock that are simultaneous with these events.

If 'experience' was the ground for the knowing of the 'drawback', the 'argument' is hypothetical. Is this a grounding? And if this is 'the following argument', 'by' which '[w]e reach a far more practical arrangement', the '[w]e' already places itself a part from the 'argument' – that 'the following argument' is what is already there for the 'we' to be able to 'reach' –

– a recuperation of a loss; that the ground must be returned (to).

'We reach a far more practical arrangement by the following argument' would be that if 'a far more practical arrangement' is what is to be returned (to), then 'the following argument' is not *the* 'argument'. This is in no way the sole ground to be returned, but '*a* far more practical arrangement [my italics]'. But equally, 'by the following argument' is not so much that the 'argument' is to be sustained indefinitely, or even rested within, but is rather the rest of the 'reach'; it is 'by'.

And if a ground, in what sense? For '[i]f there is a clock at point *A* in space', 'time', and the reading of it – 'an observer located at *A* can evaluate the time of events' – must already be that which is not only additional to 'point *A* in space', but also that the reading, or the 'evaluat[ing]' of the 'time of events' which is itself constituted by the 'clock' is already known to be to do with time.

This 'time' is not problematic:

> If there is a clock at point *A* in space, then an observer located at *A* can evaluate the time of events in the immediate vicinity of *A* by finding the positions of the hands of the clock that are simultaneous with these events.

Except, the timing of events is *only* '[i]f there is a clock at point *A* in space', and '*then* an observer located at *A* can evaluate the time of events in the immediate vicinity of *A* [my italics].' If time is only that which is constituted by the clock, and what is previously at issue was the proximity (or lack of) of the observer to the event, (t)here, 'the time of events' cannot be known as such of itself, except within the terms of 'a clock at point *A*'. It would be that the difference in space, that being 'in the immediate vicinity of *A*' and thus *not* '*A*', is not here problematic, and indeed, that the 'evaluat[ion] of the time of events' already has a commonality in the sense that this is 'by finding the positions of the hands of the clock that are simultaneous with these events.'

But is this a commonality? For a commonality would involve 'establishing *by definition* that the "time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*.' This does not involve a clock – is this what is means to be 'establishing *by definition*'? That what is common to both cannot be to do with an idea of reading of 'time' – but must rather be to do with '"time"'.

So:

> [A]n observer located at *A* can evaluate the time of events in the immediate vicinity of *A* by finding the positions of the hands of the clock that are simultaneous with these events.

There is, then, no ‘time of events’ outside of ‘the positions of the hands of the clock’. It is only ‘by finding the positions of the hands of the clock that are simultaneous with these events’ that there *is* ‘the time of events’; the ‘positions of the hands of the clock’ can, otherwise, be not ‘simultaneous’. That is to say, the ‘position of the hands of the clock’ has to do with a difference from the other ‘positions’.

If the ‘evaluati[ing of] the time of events’ is to do with ‘finding the positions of the hands of the clock that are simultaneous with these events’, ‘time’ is constituted in terms of ‘positions’, the coordinates, but if this is the case, time is already to do with an idea of location, and a frame – the ‘clock’.

I wonder about the geometry of the clock; the circles, repetition, of time.

And indeed, the ‘finding’ would be not only that ‘an observer’ is yet to find ‘the positions of the hands’, but if ‘the hands of the clock’ are to do with a location as opposed to others, ‘time’ would already have to do with a differencing from itself. Time is (not) the clock.

‘[B]y finding the positions of the hands of the clock that are simultaneous with these events’, ‘the time of events’ is ‘evaluate[d]’, not that which is in the ‘finding. ‘[T]he time of events’ which is to be ‘evaluate[d]’ is produced as such, and because of ‘the positions of the hands of the clock’.

But what is required for there to be an idea of the ‘simultaneous’? In any event, it is ‘*with* these events [my italics]’. This alteration in being, if ‘are simultaneous’, is such that the alteration of the ‘position of the hands’ coincides ‘with these events’.

How to get outside of *with?* For it would be that if ‘these events’ have not ‘time’ outside of the ‘position of the hands’, how it is that the ‘simultaneity’ demands that the alteration *to be* ‘simultaneous’ invokes a ‘with’ by which there is the coming into being of ‘events’ as having a time, if only because of the change? Would this come back to (if it ever left) ‘[i]f there is a clock at point *A* in space, then an observer located at *A* can evaluate the time of events in the immediate vicinity of *A*’? For the ‘simultaneous’ would seemingly demand a change on both accounts, that of ‘the positions of the hands’ and ‘these events’. Seemingly, because the ‘simultaneously’ can only be such afterwards

– that is to say, the being of the ‘clock at point *A*’ is only that which can ‘evaluate the time of events’, such that there is no ‘time’ outside of the ‘clock’ to be able to constitute what is (not) ‘simultaneous’. *And yet* ‘the time of events’ is what *must* already be for there to be an idea of the ‘events’ as ‘events’, that ‘the time of events’ cannot, for the ‘we’, be thought to be the ‘clock’ as such, but rather is a belonging to.

After all, ‘[i]f we want to describe the *motion* of particle, we give the values of its coordinates as functions of time.’ Are ‘we’ (already) clear on what ‘we’ mean by ‘time’? The move which demands that ‘*motion*’, and likewise ‘events’, are to do with a change, would, in turn, demand a certain consistency regarding time by which it is independent and homogenous to be able to determine the change, but also that time can be devolved into ‘functions’. That in neither case, then, for ‘*motion* of a particle’, nor ‘the time of events’ is there ‘time’ as such which is available outside of the possession of either the ‘particle’ or the ‘event’.

If ‘we give’, and ‘an observer […] can evaluate the time of events […] by finding the positions of the hands of a clock’ – time would always be that which is in its (dis)placement, and must begin through its loss. But neither can ‘time’ be that which *is* independent of location. ‘[T]he time of events’ would be limited by the ‘immediate vicinity’ – which is not to say that there is no idea of ‘time’ outside of ‘*A*’, indeed, there is necessarily the implication that there is, as there is the stipulation of the ‘immediate vicinity’. But this idea of ‘time’ cannot be thought as the same, and producing the same (of itself, in difference) elsewhere.

Can it be said, however, that ‘these events’ appear? That there is some idea of a before and after the event? Already, for the ‘we’:

> [W]e could content ourselves with evaluating the time of events by stationing an observer with a clock at the origin of the coordinates who assigns to an event to the evaluated the corresponding position of the hands of the clock when a light signal from that event reaches him through empty space. However, we know from experience that such a coordination has the drawback of not being independent of the position of the observer with the clock.

‘[W]e could content ourselves’ with flouting experience. Except when it might be required to rethink the ‘coordination’. But here at least, the ‘event’ would be such that it is known only ‘when a light signal from that event reaches him through empty space’. The ‘event’ is known only through the ‘signal’ for ‘an observer’, in the claims of the ‘we’, because of the ‘empty space’ between the two. There is no ‘event’ as such, and thus no ‘event’ to appear except in its loss and supplement – ‘a light signal’. But this scheme requires of the ‘we’ to know a difference between ‘an event’ and ‘a light signal from that event’, although this is not to do with observation. If the distance between ‘observer’ and ‘event’ is therefore to do with the necessity of a ‘light signal’, ‘[i]f there is a clock at point *A* in space, then an observer located at *A* can evaluate the time of events in the immediate vicinity of *A*’. The ‘immediate vicinity’ would have, at least, reduced the between, or rather ‘empty space’; the reach.

So what about appearance now *on the scene* of the ‘events’? For if ‘an observer located at *A* can evaluate the time of events in the immediate vicinity of *A*’, the ‘time of events’ is only known to ‘an observer’ (albeit in the claims of the ‘we’) if the ‘events [are] in the immediate vicinity of *A*’, would this be the ‘(local)’ come back? That to be at ‘point *A*’ for ‘an observer’ is rather beside the point, because there is, (technically) in the ‘evaluat[ion of] the time of events’, *only* ‘*A*’.

And if there is only ‘*A*’, there cannot be for ‘an observer’ as such an idea of ‘events’ outside of ‘*A*’. Would there be an idea of the ‘simultaneous’ if ‘an observer’ cannot ‘evaluate the time of events’ *outside* ‘the immediate vicinity of *A*?’ That is, ‘an observer’ cannot think outside of the (local) outside of one ground.

But what would be the ground? Field? (Local) field?

This is not ‘an observer’ as such, and neither is it ‘space’ if this is not only to do with a division of it, ‘point *A*’ and ‘*B*’, but also that ‘an observer’ is required at different points – ‘space’ of itself does not have uniformity. Indeed, it would rather be that since ‘we’ are constituting the claims made about what ‘an observer’ can and cannot do, locality, and the possibility of what can be achieved, *is* the ‘we’, but neither can the ‘we’ be held up as an absolute ground - I am reading the ‘we’ – and even were I to say that the 'we' is the 'we' – it would be a tautology which does not establish *what* the 'we' is in its being.

But even within the claims of the 'we', there is something about 'establishing *by definition*', which is to do with a difference, that the 'we' is rethinking the terms '*by definition*' – 'a common "time"' cannot be thought without this new limit, but also that 'a common "time"' is not outside of the '*definition*' of it – 'a common "time"' can only be 'determined' as such *afterwards.* So if 'establishing *by definition*', it would be that for 'a common "time"', 'experience' is not here invoked by the 'we', or rather cannot be invoked, there is nothing to be primarily shared about this 'common "time"'. '[E]xperience' cannot be held up as what has already gone ahead to justify, or *be* the ground by which there is the 'establishing'. And if '*by definition*', this '*definition'* is not like the 'defined'. And indeed, if:

> So far we have defined only an "*A*-time" and a "*B*-time," but not a common "time" for *A* and *B*. The latter can now be determined by establishing *by definition* that the "time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*. For, suppose a ray of light leaves from *A* to *B* at "*A*-time" t_{A}, is reflected from *B* towards *A* at "*B*-time" t_{B}, and arrives back at *A* at "*A*-time" t'_{A}. The two clocks are synchronous by definition if
>
> $$t_B - t_A = t'_A - t_B.$$

This is it: 'the "time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*.' This is the '*definition',* in the 'establishing' of which, 'a common "time"' 'can now be determined'. If 'establishing *by definition* [is] that the "time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*', the equality is set up to be that which is essential, that is to say, '*by definition*'. But this is not, in its ('establishing') essentialism that which can be 'experience[d]' – at least not in this establishing move – that the '"time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*'. This cannot be 'experience[d]', and this '*by definition'*, not least because it would involve a contradiction to the times specific to the 'point *A*' and '*B*'. But also because '*by definition*' would be that what is essential cannot be experienced according to *an* observer. '[A] common "time"' cannot be to do with a specificity, but rather that which is shared, (so) that the return is equal.

This would have to be beyond sight, this 'establishing *by definition* that the "time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*.'

But in what sense shared? No longer to do with 'events', the sharing would be of a 'common "time"'. That the '"time"' which is returned 'from *B* to *A*' 'is equal' and equality requires a double which can never meet:

> For, suppose a ray of light leaves from *A* to *B* at "*A*-time" t_A, is reflected from *B* towards *A* at "*B*-time" t_B, and arrives back at *A* at "*A*-time" t'_A. The two clocks are synchronous by definition if
>
> $$t_B - t_A = t'_A - t_B.$$

'[S]hared' because this is 'a ray of light' which is 'reflected'; that this 'suppose' relies on it being 'a ray of light' which can be traced.

Can I suppose that all else is darkness?

But in any case, there is more than one '"time"' at work here. For if 'the "time" required for light to travel from *A* to *B* is equal to the "time" it requires to travel from *B* to *A*', not only would '*A*' and '*B*' have to be known from a position which is not local to either to know this move, but also that '*by definition*' would know the '"*A*-time"' and the '"*B*-time"'. That is, also be able to take up the local by which there is 'a clock at point *A*' and 'another clock at point *B*'. So if there is the ability to know both, and can shift between the being (non)local, why would there be a need to have 'an observer located at *A*', and 'an observer at *B*'? Or rather, a *gesture* to this, since not only is this 'argument' '[if]', but is also to do with where '[w]e' reach, rather than the 'observer[s]'.

So a few questions now would be, why the 'observers' at all?

And why 'light' if 'we' can already make this move?

And if '[t]he two clocks are synchronous by definition if

$$t_B - t_A = t'_A - t_B',$$

what is it that establishes '$t_B - t_A = t'_A - t_B$' as a unifying principle? 'The two clocks are synchronous by definition if' would be that the synchrony is neither guaranteed by the 'establishing *by definition*', since the synchrony requires '$t_B - t_A = t'_A - t_B$' in addition, nor does '$t_B - t_A = t'_A - t_B$' ground the synchrony as such in a self-validation, for '[t]he two clocks are synchronous by definition *if* [my italics]'. '$t_B - t_A = t'_A - t_B$', to be that which guarantees whether '[t]he two clocks are synchronous' would be that although the 'we' can define and make the move whereby there is the setting up of the 'suppos[ition]', and the 'establishing *by definition*', '$t_B - t_A = t'_A - t_B$' promises a universalism – '[w]e assume that it is possible for this definition of synchronism to be free of contradictions[.]'[98] But then synchrony would rest on what cannot be known to be of itself, even by the 'we'. '[S]ynchronous' with what it would otherwise define – that '[t]he two clocks are synchronous by definition

$$t_B - t_A = t'_A - t_B'$$

is to play out, otherwise, the 'finding the positions of the hand of the clock that are simultaneous with these events'; it would be to do with the impossibility of definition within, here, the 'simultaneous', 'the time of events', and again, that the 'two clocks are synchronous'.

But what would this being at the same time (together) – the 'synchronous' or the 'simultaneous' be to do with? For at each move, there is an addition which cannot itself account, close, this thinking around the being at the same time (together). So would not the return, or the 'reflect[ion]' of 'a ray of light' be necessary for this? Zero (time).

And necessary in the sense that if there is this *gesture* towards what is already there, and *what* in (its) multiplicity, to be able to trace each 'event', or '*a* ray of light [my italics]', there would have to be an idea that the return, or the 'reflect[ion]' gives back exactly what was sent out – that there *is* the maintenance of 'a ray of light' as such. This system would have to conserve all of its parts to be assured of the 'reflect[ion]' in absolute terms.

[98] 'On the Electrodynamics of Moving Bodies', p.126

‘We have to bear in mind that all our judgements involving time are always judgments about *simultaneous events*.’[99] ‘We’ may ‘have to bear [this] in mind’, but it *remains* that whatever ‘*simultaneous*’ is, and thus also ‘*simultaneous events’,* there cannot be an idea of this outside of ‘the positions of the hands of the clock’ – that this is a particular position, but also a position which instates the simultaneity after the ‘finding of the positions of the hands’. There is no ‘time of events’ outside of *this* position, and so the ‘time of events’ is therefore *not* to do with their already being outside of this position. At least, not this position as the ‘position of the hands of the clock’ and ‘an observer is located at *A*’ as a position.

If this is the case, the ‘time of events’ would have to do with a specific location, whereas ‘$t_B - t_A = t'_A - t_B$’ would be that the ‘“time”’ for ‘a ray of light’ is independent of position – that this is what is universal to be able to account for the differencing of ‘$t_B - t_A = t'_A - t_B$’.

If this is to do with the universal – although in what sense? – can it be claimed as a ‘“time”’, or indeed, as an ‘event’?

For ‘$t_B - t_A = t'_A - t_B$’, ‘$t_B - t_A$’ is homogenous enough to be able to subtract the one from the other, and likewise ’$t'_A - t_B$’. Yet if ‘$t'_A - t_B$’ is to with the idea that ‘[s]o far we have defined only an “*A*-time” and a “*B*-time”, but not a common “time”’, and ‘to compare the time’ requires ‘a further stipulation’, ‘“*A*-time”’ and ‘“*B*-time”’ cannot be in the ‘immediate vicinity’ of one another. There is no initial ‘“common”’ grounding for the ‘simultaneous’, and thus what is constituted at the ‘time of events’. But if this is the case, there cannot be an idea as such of ‘what we [already] understand here by “time”’. So ‘we must keep [this] in mind’; ‘we’ can be reminded by the ‘we’, by oneself (-ish), of what might be forgotten. This recalling of what was (not) already there is necessary to establishing what is ‘simultaneous’, that is, in the ‘immediate vicinity’, to the extent that it is none other than the being-together and cannot be thought outside of this move – indeed, that it was, then *already*, subsequently, there to be reminded of – to return, and reflect back.

Some commonality, origin, which is simultaneous *with* itself (perhaps not after all?) and all others.

[99] ‘On the Electrodynamics of Moving Bodies’, p.125

'Let us suppose that, at time 0, the moving body coincides in space with a wave'.

But if reflect back, it cannot be that there is a rest except in the return which is a difference, 't_A' and 't'_A'; that there cannot be an idea of the return outside of a time which '$t_B - t_A = t'_A - t_B$' is supposed to constitute, and as a '"common"' time.

'For, suppose a ray of light leaves from *A* for *B* at "*A*-time" t_A, is reflected from *B* toward *A* at "*B*-time" t_B, and arrives back at *A* at "*A*-time" t'_A', then 'a ray of light' does not *arrive* at '*B*', it is 'reflected from *B* toward *A*'. That is, 'a ray of light' is in no way altered by this reflection, in these terms. '*B*' here, or rather 't_B', would have to be that which reflects itself across the equality. And if this is to do with a reflection, that is to say, 'suppose a ray of light leaves from *A* to *B* at "*A*-time", 't_A', is reflected from *B* toward *A* at "*B*-time" t_B, and arrives back at *A* at "*A*-time" t'_A', then 'a ray of light' is constituted by the different spatial times. But also, that if '$t_B - t_A$', and 'a ray of light leaves from *A* to *B*', not only would this be that there is nevertheless an idea of the difference in times, there *is* an '"*A*-time"' and a '"*B*-time"', but that these as wholly separate cannot be maintained, or rather, that this absolute separateness would undermine what is '"common"'. What is *further* required is the means by which what is individual can be shared as a commonality, but as itself.

But still, why 'a ray of light'? And if the '"common" time" […] can now be determined by establishing *by definition*', 'establishing *by definition*' would be the recalling of what *is*, by its return, by that which was not essentially (t)here in an initial outing. This cannot have been what was seen by 'an observer' initially – there is a sequence to the 'establishing' of what is individual to be then shared, or in common. So there has to be two time frames (at least), if '[s]o far we have defined only an "*A*-time" and a "*B*-time", but not a common "time" for *A* and *B.*' The second cannot however be a reiteration of the first, albeit in more general terms, for it would carry with it the individual, that is, what is '"*A*-time"' and '"*B*-time"' – so it is rather to do with a thinking of how to define, and in that definition, *give* what is 'common'.

'In fact, at time *t*, the moving body is at a distance from the origin $x = vt$ and its internal phenomenon is proportional to $sin2\pi v_1 \frac{x}{v}$'.

Technically.

Although if '"*A*-time"', '"*B*-time"', and 'common "time"', is there not already an idea of commonality in the questioning of '"time"'? But in this questioning, '"time"' is that which, to be questioned, is put in play as (a) '"time"' which is nevertheless to be defined. That is to say, it would be to do with the (attempt) at thinking outside of a '"time"' to constitute the difference(s).

So the 'common "time"' would be a move by which an economy of equality is set up, but only in so far as the '"*A*-time"' and '"*B*-time"' are a reflection of the other: '$t_B - t_A = t'_A - t_B$', or rather a symmetry in the equality. Can this be considered a '"time"' however? For if this is an economy by which '$t_B - t_A = t'_A - t_B$', then 't_B', 't_A', and 't'_A' can only be put into circulation, and indeed, this would be a circle (of sorts) because 'a ray of light […] arrives back at *A*', because there is no time.

If '"time"' is to do with '$t_B - t_A = t'_A - t_B$' as 'common "time"', it is to reduce one by another – the difference of what is read as already being (a)part of a unity, '*t*'. That if what is 'common "time"' is '$t_B - t_A = t'_A - t_B$', this cannot be shared by any of itself because the relationship holds only on the promise of the return; that no one point has 'a ray of light'. Rather, there is only this continual circulation of what was never there – 'suppose a ray of light'.

How to be 'synchronous' with an other, but also 'synchronous' with an other as the self, for it cannot be to do with a strict return if '$t_B - t_A = t'_A - t_B$'. That is, not only is there a difference between 't_A' and 't'_A', such that if 'light arrives back at *A* at "*A*-time"' there has been a difference in "*A*-time" to be able to constitute the equality, that is '"*A*-time"' is modified within itself, but also that the return of 'a ray of light', the 'reflect[ion]', is grounded on an idea that there are, in so far that this is a 'suppos[ition]' and 'argument', these points – '*A*' and '*B*'. It is these points which constitute the times – '"*A*-time"' and '"*B*-time"', that time cannot be thought outside of *where* it is: spacetime. But if this is the case, space is that which cannot come under question here, even within the proposition '[i]f there is a clock at point *A* in space'. Space, and the division of it, would be that which is readily available.

Therefore, if '[b]ased on experience, we further stipulate that the quantity

$$\frac{2\,\overline{AB}}{t'_A - t_A} = V$$

be a universal constant (the velocity of light in empty space)'[100], it would now be a question of why 'experience' is now (re)called, whereas the 'common "time"', although to do with 'a ray of light', did not require 'experience'. What is it that allows for the 'common "time"' being 'establish[ed] *by definition*', but '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$', although being what 'we further stipulate', is that which is only possible being '[b]ased on experience'. What would be the 'experience'? It cannot be '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' since this would be, if 'we further stipulate', that which goes beyond 'experience' proper. But, if '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' is to do with what is 'further stipulate[d]', 'experience' of itself cannot be to do with what is demanded.

> [W]e know from experience that such a coordination has the drawback of not being independent of the position of the observer with the clock. We reach a far more practical arrangement by the following argument.

And '[b]ased on experience' – '[s]pecial relativity is based on the experimental fact that the speed of light ($c\ \simeq 3 \times 10^8\ m/s$)is the same for all inertial observers' – is such that 'experience' here would be that from which '[w]e know', but also, that 'experience' is not that from which a difference can be derived – '[w]e reach a far more practical arrangement by the following argument'. Whatever is to be (re)gained here, 'experience' cannot account for the grounding of it – the grounding would be in the 'argument' and the 'stipulat[ion]'. Although '[w]e know from experience', thus 'experience' is that which has already occurred, that is to say, has already been carried out, the difference would be that while 'experience' is, for the '[w]e', what *gives* a 'knowing', although if 'from' there is nevertheless a (dis)connect, '[w]e know' is no longer experiencing 'experience', in the claims of the '[w]e', that which allows for the arrival. The ability to 'reach' beyond the 'experience' is 'by the following argument'. The 'experience' cannot be 'further' than the 'stipulation' in the sense of a before and after.

[100] 'On the Electrodynamics of Moving Bodies', p.127

So 'experience' cannot, in these terms, be to do with what is *to be*. Yet if 'experience' is also that which is not 'further' in the sense of before and after, a continuum, it would be that the 'stipulat[ion] that the quantity

$$\frac{2\,\overline{AB}}{t'_A - t_A} = V$$

be a universal constant' is that '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' requires an idea of that which has already been, '[b]ased on experience', but is not productive of 'experience'. If 'we further stipulate', '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' is the introduction of an ordering that could not have been to do with the 'experience' as such. That is to say, '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' would (re)stipulate that which has already occurred. As 'a universal constant', it would be that 'experience' as what has already gone ahead is the lost ground from which there is '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$'.

So what is '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$'? It is no longer a case of the difference in points in terms of '$t_B - t_A$' and '$t'_A - t_B$'. Rather, 'V' would be to do with the exclusion of this middle time, 't_B'. Why middle? Because if there is '$2\,\overline{AB}$', such that '$\overline{AB}$' would have to do with the geometry of this space as constituted by the line segment, but twice over, since '$2\,\overline{AB}$', it would be that '$t_B - t_A = t'_A - t_B$' is required to be (established), for there to be no difference in the time. That is, 'the "time" required for light to travel from A to B is equal to the "time" it requires to travel from B to A.' But this would be that no difference in time is constituted by the return to itself, '$t'_A - t_A$' as other. For there is the stipulation '$2\,\overline{AB}$', so there is an idea of a limit at either end – but if this is to do with a line, twice over, not only would the geometry of this space be what is constituting 'V', but also that if '$2\,\overline{AB}$' is to do with line, and the line is constituted by its limits, would it not be that the line is that which is not the points 'A', 'B'? That the line '$\overline{AB}$' is to do with the (another) between.

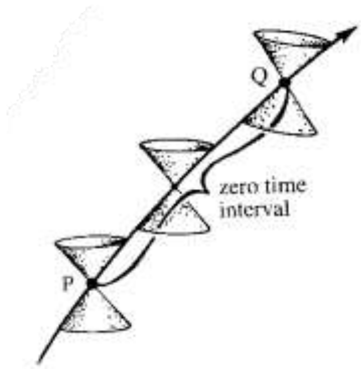
But *equally*, neither can the points (events?) as the limit be that upon which there is no move, for the points are already 'A', 'B', and indeed, that (further?) the points are the line '$\overline{AB}$'. So if '$2\,\overline{AB}$', would this necessarily be to do with a return? Or rather more, would a return be possible? For if '$\overline{AB}$'

is constituted by its limits, but in the same move these limits are what it is not, any idea of a return would have to be to do with a direction, and that this direction would, in turn, demand a time frame by which the return can be known.

So if '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$', '$V$' is constituted by a doubled line segment against an idea of time difference '$t'_A - t_A$'. Therefore, if '$\overline{AB}$', there cannot be an idea of time here in the sense that it is constituted apart from '$t'_A - t_A$', but also that, as already read, since there is no question of there being 'point *A* in space' and also 'point *B*', this would be that '$\overline{AB}$' is not here to do with a 'travel[ling]', a going *along*.

It would be a case of how to think the between which cannot be a move from the limits '$\overline{AB}$'. And so if '$t'_A - t_A$', which is (already to have said) to do with an exclusion of 't_B', time for 'V' is a difference within itself. 'V' would not be relative to anything other than itself in this stipulation.

But I am thinking (further?) about the excluded middle:



The brace is in addition to 'P' and 'Q', and again, that this is 'zero time interval'. The brace is that which connects 'P', 'Q', and this connection *as* 'zero time interval', but also that this grouping includes the middle cone. The grouping includes a cone which is not also to do with a letter, an event. The 'zero time interval' would therefore be supported by a cone which is not constituted as an event. So if the brace is that which holds up the 'zero time interval', and this is itself an addition to 'P', 'Q', and thus also the cones, there is no idea of 'zero time interval' outside of the brace. So now it would be that 'zero time interval' is itself not inherent to the light cones.

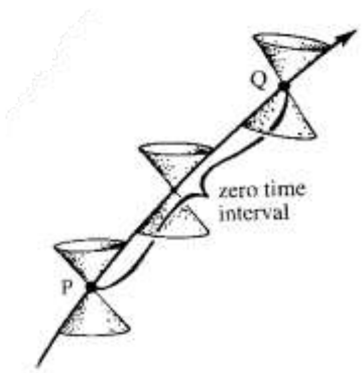
Would this not, then, hinge, or rather be a bracing of, a structure which cannot be *(t)here* of itself – the 'zero time interval' *is* because of the brace which is that which creates the group. And so if this is the supporting structure, this is not to say that there is another structure, a structure as such – here of (space)time, for which *this* is a support, but rather that if this is the supporting structure, the brace, this constitutes the loss of a structure in the being-support. There can be no (e)lapse of time because there never was that absolute move of difference, and thus the structure as already there (*still)* to be able to trace the time.

And the middle cone? If between 'P' and 'Q' there is 'zero time interval', but this middle cone is to do with a separation between 'P' and 'Q', that the 'zero time interval' *is* a 'zero time interval', would be that the middle cone is required for the being 'zero time interval'. That is to say, there is something about the middle cone which is to do with the 'time interval' as a 'time' which can be divided into 'interval[s]'. This being the case, 'time' is here thought as a continuum. But it would be a continuum within which part of the set, here the light cones, is also that which, in some way, defies the group.

I can read a grouping in that the brace connects 'P' and 'Q', and because the middle cone is within the extension of the brace there is an idea of inclusion, but I can conversely read this inclusion to be constituted by that which is *not* the brace – the lines in between the cones. In this sense the middle cone is excluded from the brace which constitutes the 'zero time interval', but is a part of the light cones as a group because of the connection by the line(s) in between them. So, if this about an idea of time as a continuum, but a continuum which is here *gestured to* by an 'interval', of which there is (an)other part, the middle cone, which is excluded in the sense that it does not interrupt the 'zero time interval' between 'P' and 'Q', then just how far can this be a continuum if a part of its being-continuum is to do with the exclusion of the middle (cone)?

Unless, this continuum would be that which cannot support a between, a middle, for this would *therefore* be to instate limits and boundaries; that the continuum would then be bounded by an absolute limit.

For, since



the cones are spatially separated in that I can read there are three – space is to do with number and separation – it would be that according to the 'time interval', the middle cone does not matter, or rather that there is no middle cone – that the 'zero time interval' is constituted by its limits 'P' and 'Q' (but is this not the reading of '$\overline{AB}$'?) such that the middle cone is not a time, but neither is it a point.

What would it mean to say there is no middle cone? For I would need the middle cone to negate it. But it is perhaps a question of *where* the middle is, if indeed this is a continuum in terms of (space)time, for this would be somewhat arbitrary, but also, that if this continuum relies on an excluded middle cone, which is nevertheless included outside (inside) of the limits of 'P', 'Q', the (space)time continuum would rather be (a)part from the unity. The brace as the support for the 'time interval' which is only in its support, is nevertheless that the 'interval' is not to do with *either* 'P' or 'Q', but rather that there has to be both 'P' and 'Q' in their absolute separation from the other.

- 'If there is a clock at point A' – there is already 'point A'.

So if 'we further stipulate that the quantity

$$\frac{2\,\overline{AB}}{t'_A - t_A} = V$$

be a universal constant (the velocity of light in empty space)', it would be that 'empty space' would be the parameters set for 'V'.

But what is 'empty space'? For there cannot be an 'event' from which the light travels for 'space' to be empty' in a strict sense.

If 'V' is 'the velocity of light in empty space', light is here not to be thought of as *from* an 'event'. For, if '$t'_A - t_A$', and already there is '$2\,\overline{AB}$', such that a distance is defined by twice a line, as itself, that is, there is no (re)turn to this line *as* a (re)turn from elsewhere, but that the line can begin again as the same, multiply in its sameness to itself and be this (re)turn, then '$t'_A - t_A$' would be such that the 'common "time"', which is 'the velocity of light in empty space' cannot be to do with a *going* somewhere – hence the impossibility of the (re)turn as (an)other to itself.

That is, the light cannot be *at* $_B$, for if '$t'_A - t_A$', it would be that 't'_A' as what *is* the 'arrives back', an idea of later, is to do with the 'velocity of light' in 'empty space' only being possible in what 'we further stipulate' if there has already been this arrival (back). As a 'universal constant', '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' cannot be anything other than that which can arrive (back). And an arrival (back) because it would be that for 'V', the '"time"' has already arrived as its difference within itself. That there is no $_B$ is that light would have to be independent of the difference in space, that is the '"*A*-time"' and '"*B*-time"'.

But if this is the case, the independence would not be an independence as such, but an independence which is dependent upon the exclusion of any middle; it is rather to do with the (re)iteration of the point, which is that '$t'_A - t_A$': that there is a time frame which can divide against itself. And so if '$2\,\overline{AB}$', these sames would be that the time frame '$t'_A - t_A$' would equally have to be to do with an idea that it cannot be judged against anything other than itself. But itself only in its double – that it is known as a 'universal constant' because it has arrived (back).

So if light, or rather 'V', is the commonality, but a commonality which is added in, a 'further stipulat[ion]', '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' is not to do with an 'observer'. '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$' in no way can be seen, and seen to be anywhere as such. If this is the case, 'V' as such cannot be known outside of what 'we further stipulate' as '$\frac{2\,\overline{AB}}{t'_A - t_A} = V$'. Light as the measure of time – this cannot be brought to bear against anything other than itself – can have no precedent.

It cannot follow. 'If there is a clock at point *A* in space' and:

> If there is another clock at point *B* that in all respects resembles the one at *A*, then the time of events in the immediate vicinity of *B* can be evaluated by an observer at *B*. But it is not possible to compare the time of an event at *A* with one at *B*[.]

If there are clocks – and yet clocks are insufficient for any kind of universality, there is no assurance in the sense that there may well *not* be a clock at each point, then 'time' cannot be known, or rather seen – 'finding the positions of the hands of the clock'. There is trust in resemblance – of the clocks, I am thinking again of symmetry – '*then* the time of events in the immediate vicinity of *B* can be evaluated by an observer at *B* [my italics]' – that the two clocks at different points already have to have an idea of similarity for there to be an 'evaluat[ion]'.

But why should this matter, if 'it is not possible to compare the time of an event at *A* with one at *B'*? Or at least, not without 'establishing *by definition'* 'a common "time"' which has nothing to do with a clock? The 'resembles' would have to do with the 'then the time of events in the immediate vicinity of *B* can be evaluated by an observer at *B*', and as such, 'an observer at *B*', by implication, can only 'evaluate' in the same way as 'an observer at *A*'. Or perhaps, it is rather, *can only* if it is already known that there is known to be a 'resembl[ance]' of what is to be 'evaluat[ed]'; that there is already an idea of an order in place by the clocks. The 'evaluat[ion]' is to do with the appearance of the clock; that which is set up to be seen, 'the positions of the hands of the clock that are simultaneous with these events'. And if this is to do with an ordering, that there *already* has to be an idea of continuity, then it would be a preference for what is taken to be time.

But what is *taken to be time* is the clock, or rather 'the positions of the hands of the clock that are simultaneous with these events' as already read. So still, the question is, why would there be a need for one of the clocks to 'resemble[…]' the other? It would have to do with the idea of space, and this as that which the 'we' does not question. '[W]e' does not question because of the clocks, and the requirement for the 'resembl[ance]'.

What do I mean by this? If the clocks are that which constitutes the 'time of events', the 'time of events' is then not inherent to the 'events', but neither is the 'time of events' constituted by the being at '*A*', for '[i]f there is a clock at point *A* in space, then an observer located at *A* can evaluate the time of events', so the 'time' would nevertheless depend on the clock *being* 'at point *A*'.

There is no 'time' at '*A*' without the clock.

And so if 'another clock at point *B* […] in all respects resembles the one at *A*, then the time of events […] can be evaluated', and 'it is not possible to compare the time of an event at *A* with one at *B* without a further stipulation', not only would it be that time is not a continuum, which would otherwise allow for the comparison, but also, that the requirement for a 'resembl[ance]' would then be the drive *for* a time which is homogenous in its generation, for 'a further stipulation' would be that the 'resembles' is already a 'stipulation'.

The question of space would be to do with the constitution of time, and this resemblance – for if time is not outside of the clock, there cannot be an idea of a 'correct' to 'the positions of the hands of the clock.' So the 'resembl[ance]' between the two clocks would therefore be to do with the constituting of the difference of the space, if the space is that which cannot tell the time. That is to say, if the space is here that which is constituted as a continuum, in the sense that 'point *A*' and 'point *B*' are both 'in space' although already set up as different in being '*A*' and *'B'*, any difference with regard to the time can only be through a comparison of the clocks, and thus the clocks would have to *also* be set up as similar, hence 'resembles'. So if the clocks are constituting the time (difference) of '*A*' and '*B*', it would also be that the clocks are that which is constituting '*A*' and '*B*' as differences in space in terms of time.

So I could say that I cannot say there is a space outside of '*A*' and '*B*' – or then again, even *inside*, for this would be to put '*A*' and '*B*' at an absolute distance from myself from which to (re)constitute them.

I could invoke some borderlines: $A \cup A = A$, $A \cap A = A$

Or maybe: $A \cap A = B$

I could have put A'.

[4.] Somebody once said that philosophy is the misuse of a terminology which was invented just for this purpose. I would say that mathematics is the science of skillful [*sic*] operations with concepts and rules invented just for this purpose. The principle emphasis is on the invention of concepts. Mathematics would soon run out of interesting theorems if these had to be formulated in terms of the concepts which already appear in the axioms. Furthermore, whereas it is unquestionably true that the concepts of elementary mathematics and particularly elementary geometry were formulated to describe entities which are directly suggested by the actual world, the same does not seem to be true of the more advanced concepts, in particular the concepts which play such an important role in physics. Thus, the rules for operations with pairs of numbers are obviously designed to give the same results as the operations with fractions which we first learned without reference to "pairs of numbers."[101]

Philosophically, it might be to the purpose to replay what somebody or other once said. At least, mathematics in the natural sciences would benefit. It would be to the purpose, to justify what is unreasonable, by philosophy.

[3.] PI: Let us go back to the time of the first explorers of our subject. They were fascinated by the beautiful symmetry of *regular* polyhedral[s…]

Then came the refutationists. In their critical zeal they stretched the concept of polyhedron, to cover objects that were alien to the intended interpretation. The conjecture was true in its *intended interpretation*, it was only false in an *unintended interpretation* smuggled in by the refutationists. Their "refutation" revealed no *error* in the original conjecture, no *mistake* in the original proof: it revealed the falsehood of a *new* conjecture which nobody had stated or thought before.

Poor Delta! He valiantly defended the original interpretation of polyhedron. He countered each counterexample with a new clause

[1.] The first point is that the enormous usefulness of mathematics in the natural sciences is something bordering on mysterious and that there is no rational explanation for it. Second, it is just this uncanny usefulness of mathematical concepts that raises the question of the uniqueness of our physical theories.[108]

Quite what is being pointed out – that is, is there a pointing in a (different) direction? For these points, the argument, along an axis? The argument at (is) a spatial coordinate; this point which can be separated from the rest, is itself mysterious. That is, this bordering on, this point which is, then, not quite (t)here, is the mystery. Not quite (t)here

[101] Eugene P. Wigner, 'The Unreasonable Effectiveness of Mathematics in the Natural Sciences', in *Symmetries and Reflections* (Bloomington: Indiana University Press, 1967), pp.222-237, p.224

[108] 'The Unreasonable Effectiveness', (p.223)

Not that philosophy, can, by somebody's account, do anything other than be a 'misuse of a terminology'.

So where this '[s]omebody', and, or, other, may say 'misuse', I would rather put (mis)use. (And in the saying, for this purpose, it makes no odds). But regardless, what philosophy and mathematics would share, by this account, is a taking up of some other system – that is, 'a terminology' which is not properly 'philosophy', if 'philosophy' is the 'misuse' of it. Something would need to be said of what mathematics is. Carefully however, since mathematics, in being, is conditional on what I would say.

(I could say). And conditional on being a science. '[M]athematics is the science of skillful operations with concepts and rules invented just for this purpose.'

to safeguard the original concept…[103]

PI: […] Monster-barrers only keep to the original concept, while concept-stretchers widen it; the curious thing is that concept-stretching goes on surreptitiously: nobody is aware of it, and since everybody's "coordinate system" expands with the widening concept, they fall prey to the heuristic delusion that monster-barring *narrows* concepts, while in fact it keeps them invariant.[104]

DELTA: […] But why should the theorem give way, when it has been proved? It is the "criticism" that should retreat. It is fake criticism. This pair of nested cubes is not a polyhedron at all. It is a *monster*, a pathological case, not a counterexample.[105]

I would speak to you of monsters: the

and yet the point can draw the limits (still?) of what is mathematics and the natural sciences.

And in the same spacing – necessarily?

Is this something to do with the usefulness of it? That is can usefully be elsewhere does not, then, depend on a context, on the axis?

Is usefulness the point? The point of being, being another point of being, mysterious and uncanny.

The being of what by rights, it should not be.

So this usefulness would be something else entirely, again. Has brought to bear on the physical theories another point in

[103] Imre Lakatos, *Proofs and Refutations*: *The Logic of Mathematical Discovery*, ed. by John Worrall and Elie Zahar (Cambridge: Cambridge University Press, 1991), pp.84-85
[104] *Proofs and Refutations*, p.86
[105] *Proofs and Refutations*, p.14

Which purpose?

'[T]his purpose'. Twice over.

Just. There is (still) a definite direction – for 'this purpose'. Mathematics – or would I say science? – is to do with maintaining an outline; this would be 'the skillful operations'; keeping up appearances, the outline, borderline, that stays within the bounds of 'the rules invented just for this purpose.'

'[T]his purpose' is something separate from 'mathematics', or indeed 'a terminology', or 'philosophy'.

So what would be the invention? And if the 'concepts and rules' are '*with* [my italics]', in addition to 'the skillful operations', the 'operations' belong to the science in being *of*, and are not 'invented' as the 'concepts and rules' are. The rules and concepts are therefore not science.

Philosophy – 'the misuse' – takes its being from 'the misuse of a 'pathological case' which borders on the irrational.

Is it 'fake'?

And what other (narrow?) limits would be here to be negotiated (between)? Would this be an expansion with 'everybody's "coordinate system"'? A sharing of space – or the same space, just this space, repeated, around the same point? And if, say, as with PI, 'Let us go back to the time of the first explorers of our subject', why the (re)turn? That is, the need for the (re)claiming of the history of the concept, 'the concept of polyhedron'.

Would this be the same – 'the concept', and 'the concept *of* polyhedron question. And this questioning of the uniqueness – this is what mathematics troubles; by its very usefulness, which is uncanny and mysterious.

Where to place mathematics? Or rather: what to think about mathematics which is already centred within the natural sciences. *Is* the natural sciences, in the sense that the enormous usefulness of it is *in* the natural sciences? So is it mathematics as such with which the point is concerned?

For if it is the enormous, uncanny and mysterious usefulness, respectively, of mathematics, the points would rather be missing terminology'; the terminology can only ever be misused. Philosophy – what is proper to it is 'the misuse', and is already known to 'misuse […] a terminology' prior to the invention of the latter. That it misuses misuse.

I could say that it would be unreasonable to say that there *is* a philosophy which adheres to the (mis)use of a terminology, remains strictly within the bounds of the terminology, that is, remains wholly with the terminology and its governing principles.

And the mathematics: the destining, purpose, of the rules and concepts are caught back in to what is mathematics, just these absolute limits, but equally, '[i]n the same vein', there would, in mathematics, be some idea of misuse also.

(I would say science).

'[J]ust for this purpose' is the ending justifying that the intention of the invention is to remain within, [my italics]'? Is this something which can be shared, 'the concept', 'the concept of polyhedron', if it is 'our subject', and there are 'the first explorers'? For would not 'the first explorers' be 'first' only in being in 'our subject' after the 'our' has claimed the subject? That is, framed *this* as 'our subject', that of polyhedron –

– '*regular*' (already a division) –

but this would not account for the refutationists, in its proper sense.

Hence the stretching; the alien as that which can be demarcated as difference, to keep the subject 'ours', that is, to the mark of mathematics – unless that mark is the usefulness. And indeed, why remark on the usefulness of mathematics, that is, why is this a point? Or rather one of two?

Has the usefulness to do with a doubling of points?

How many points are there? Is this something which can be (ac)counted for? The first point, and that there is no rational explanation for it. Rationally there should not be the need for this addition, for the first point at all. That the enormous usefulness of mathematics in the natural sciences cannot be accounted for – at least, not rationally.

Which would be the point.

Another point?

despite, or rather because of the misuse; that is, that in both philosophy and mathematics, 'terminology' and 'concepts and axioms', are that which does not wholly conform, and necessarily so, otherwise '[m]athematics would soon run out of interesting theorems'.

There is a control of the borderline – the rules and concepts *should not* cross this line.

Where is the (border)line? (Still fielding the question).

Otherwise, I would speak to you of monsters, a pathological case.

To have broken with the intention, to have operated too fully – to have broken the being 'with'; this would be the connection. That despite the differencing there is a shared destination.

That is, '*with* [my italics]' tends in the same direction, according to '[s]omebody['s]', some other body's, put off, bar what is not considered proper. According to a claim of originality which has to be turned to(wards).

And this is to go back. There is something of a quest(ion)ing of essence: what is most proper, a purity. And this can be sought and put in series.

'(The German word *eigen* means "proper" or "characteristic")'.[106]

(I did promise).

'Then came the refutationists. In their critical zeal they stretched the concept of polyhedron, to cover objects that were alien to the intended interpretation.' Then again, this would be to do

That this (these points?) are to do with the rational, hence there being no rational explanation. It is something bordering on mysterious because there is no rationale – that is, there should not be this situation, this situation of the enormous usefulness of mathematics in the natural sciences.

Another point? Is this useful? Part of the enormous usefulness – that despite the usefulness being situated *in* the natural sciences, this transgression is something which has to be accepted without rational explanation.

Why should there be a rational(e)?

[106] Julian Barbour, *The End of Time: The Next Revolution in Our Understanding of the Universe* (London: Weidenfeld and Nicolson, 1999), p.201

coordinate system. And yet, if '[t]he principle emphasis is on the invention of concepts', and this is because '[m]athematics would soon run out of interesting theorems if these had to be formulated in terms of the concepts which already appear in the axioms', invention would be to maintain an interest which is itself exhaustible.

Mathematics – is this the state of being of interest (potentially)? – is to do with the pursuit of interesting theorems, which are formulated by new concepts. The theorems, to keep the interest, and yet remain within the bounds of mathematics ('the science of skillful operations'), is that the 'skillful operations' are the ability to translate theorems, in a strict sense.

I would say.

I would say I am *thinking* of symmetry – as another operation, as what can(not) be traced and does not alter appearances. How to *tell* the difference, if there is always *just* this with a(n) (al)location of space – quite where to arrange the object. These objects however, if they were 'alien to the intended interpretation' are no longer such. And if cover, what is being hidden, brought in, in extension, that is, covered by the stretching such that there is no alienation? Of the object.

But is this the object covered or uncovered?

And then how to judge what is proper (regular? In its characteristics?) to polyhedron?

But then again, would not the question rather be one of the object? For the object here, in relation to a 'critical zeal' which

The lack of a rational explanation would be (also) to do with the enormous usefulness bordering on the mysterious – that there should not be such a bordering; there is too much proximity. Too much usefulness.

Too much proximity – there is the expectation (a rationale to frame the bordering on the mysterious) that there should be a dividing line, a spacing; there should not be this usefulness, to this extent.

Discrepancies, non-usefulness would sit better.

This excess is a mystery. Known as a mystery.

Would this also contribute to the usefulness, that in all purpose, this 'misuse' which must be excessive to the purpose in being the purpose (just).

I would say that mathematics hinges around what is conditional, and what can be conditionally said, (written), in definition.

What is stopping me? Or 'I'? That I cannot be sure how 'appropriate' the sayings are?

So it would be (to say that I am remaining in the bounds of the conditional, possibly), that the 'concepts of elementary mathematics and particularly elementary geometry were formulated to describe entities which are directly suggested by the actual world', and as such, there is a history claimed to mathematics, and geometry; conditional as it is, and conditional on what I, 'I' would say.

'[W]ould say'.

Possibly.

What I would say, is there is a claim to the 'actual world' which is *not* what already claims an excess, is to do with the 'intended interpretation' (does this come to light?) but also the concept.

And indeed, if 'their critical zeal […] stretched the concept of polyhedron, to cover objects that were alien to the intended interpretation', the monsters are that which claims a difference, an essential difference – 'alien' – 'to the intended interpretation'. The monsters are in the interpretation; these monsters which are to do with a fear of the additional object; that is, it would be a classification of 'the object' by the wrong covering. A points, at all borderings, the usefulness is known – and this is the mystery – that it can always be pointed out?

The point being, however, that it is just this uncanny usefulness of mathematical concepts that raises the question of the uniqueness of our physical theories. So just this uncanniness, which should have been heralded prior to this, to be just *this* uncanny usefulness, is that the second point is rather the first again.

Differently. Just this.

Or third, perhaps, depending on the addition of the (ir)rational.

And just this uncanny usefulness of mathematical concepts – is *just this* 'elementary mathematics and elementary geometry were formulated to describe'. Instead, these 'elementar[ies]' are 'describ[ing] entities which are directly suggested'. There is, I would say, not a staying within bounds: 'describes' and 'suggested by the actual world' claim a (re)move, a differencing to what is, and what is (de)scribed by 'elementary mathematics and particularly geometry'.

These, I would say, write *out* the 'actual world'.

This is (just) not within the bounds of 'elementary mathematics and particularly elementary geometry'. It would be rather what I would say, is 'suggested'. And 'directly' so.

Why 'directly suggested'? And if this is to do with 'concepts', which 'describe entities which are directly suggested by the actual world', 'entities' by this formulation, I would say, are not part of 'the actual world' dressing-up of 'objects' to make the monsters.

And 'smuggled in' too – the monstrosity would be also that this covering is far too much that which is smuggled, in plain sight; that is, too close – the 'conjecture was [(still)] true in its *intended interpretation*, it was only false in an *unintended interpretation*'. But if too close, would this not also be that there is a limit, a distancing that can be measured between the one and the other? But is this possible? And so does it not, therefore, hinge on the 'objects' as such? For it would be that the 'objects' are positioned as different to the 'concept of polyhedron', if the *uncanniness* to do with the concepts which are not mathematics as such? That is, the concepts are just this uncanniness: being a particular uncanniness, (and) can also be pointed out as this.

But doubled.

'Doubled'?

'Uncanniness'.

So if it is just ~~this~~ uncanniness, and this ('this') is what 'raises the question of the uniqueness of our' (their 'our') 'physical theories', 'uniqueness' is not just, in this case.

Usefulness.

'Usefulness' – this might not do it justice – plays out across the points, and is therefore just this uncanniness, this being too as such, if 'directly suggested', but rather must pay tribute to an origin. '[B]y the actual world' would be an absolute exteriority, ('I would say'), a being there so that there can be a 'describ[ing of] entities' which are not, as such, but rather 'directly suggested'. It cannot be to do with a strict description, that of absolute, or 'true' representation, for 'we cannot know whether a theory formulated in terms of mathematical concepts is uniquely appropriate.'[102] For if 'we' did, there would be no need for a questioning of what is 'uniquely appropriate'. I would say. And mathematics may well cease to be interesting.

Yet there must be a connection, 'directly'; that is, if 'formulated to describe entities' there is a knowing of the 'entities' outside of the 'elementary mathematics and particularly elementary geometry' to be able to claim the 'formulated', 'concept' can be 'stretched […] to cover objects that were alien to the intended interpretation.'

The 'concept of polyhedron' is to do with the 'critical zeal', a space in which 'they' can stretch concepts, a space claimed of the 'they' by another, as a measurement. That is to say, the 'critical zeal' as an excess and excessive to the 'intended interpretation' is a claim to a knowledge of what is proper, and is properly intended, to allow for the sharing of the history of 'our subject': '[l]et us go back to the time of the first explorers'.

Absolutely 'back [in…] time'? This would require close on all points, which positions our ('our') physical theories as what should not be reliant on, and accountable by, mathematics and its concepts.

The 'usefulness of mathematics' and its 'concepts' is therefore both already with*in* the discourse of the natural sciences, that is (also) 'our physical theories' – the usefulness is what is exercised in the natural sciences and that which runs the risk of needing to be exorcised as 'usefulness' – and also that which is constituted as a difference to be with*in*.

Raising the question which should not have been raised: that of 'the

[102] 'The Unreasonable Effectiveness', p.223

despite the questioning of what is (not) 'uniquely appropriate.' There is, here, a claim to intention, a designated end – 'to describe entities which are directly suggested by the actual world'.

Is the designated end reached? 'I would [(not)] say'. Or perhaps rather does not say. Does it matter? '[T]he same does not seem to be true of the more advanced concepts, in particular the concepts which play such an important role in physics.'

Physics, I would say does not need to (ac)count (for) 'the actual world'.

At least, this 'seem[s] to be true'; somewhere between 'elementary' and 'advanced', something is lost sight of.

Perhaps 'the actual world'.

But then again, in what sense was it ever seen initially? At least, not within the frame of 'elementary mathematics and particularly elementary geometry' for these are to do with what is 'directly suggested'.

a loss of the history, a history which would erase '[t]hen came the refutationists.' So this claim to a sharing, the sharing of the history of the object, '*regular* polyhedra', is because this history is not shared universally. It would be to do with a knowing of the monster – that is, a knowing of what was 'smuggled in'. For this monster does not (re)define the limits of '*error*' or '*mistake*', but rather 'it revealed the falsehood of a *new* conjecture which nobody had stated or thought of before.' That there is something beyond - the limits?

Does not the uniqueness of our physical theories', and that this should not be questioned. There should be a distinction – there is, here, a claim to the desire for a purity, or at least a separation, that the 'mathematics' and the 'mathematical concepts' were not so useful.

It would be better if they were 'useful'.

The 'natural sciences' should be sufficient in themselves; have their own system of usefulness which does not have to borrow. It is 'uncanny' because the separation cannot be made, the question of 'the uniqueness of our physical theories' is bound up with this collaboration – 'mathematics in the natural

And if 'particularly elementary geometry' (why pick on this, particularly?) it would be that the grounding of the 'elementary' is already to do with what is 'suggested', as that which is set up as different to the 'actual'.

There is always a different grounding, it is 'directly suggested by the actual world'. The trace must be there, but what is 'elementary' is to do with a making, a 'formulation', putting into being, a (re)formulation, of the origin – the 'entities' which are 'suggested'. The 'concepts' negotiate these groundings, ground the groundings which are form(ulated) within their own (de)scribing. There is a calling to what is not; what is, therefore, most alien to the 'concept' – 'the actual world'. This latter, which 'directly suggest[s]', can be read as that which 'directly suggest[s]' – this reading can be wholly read, 'I would say'.

'stretched […] concept' threaten the logical, in the sense that the addition is both 'alien' and alien *within* the concept? It has 'stretched' rather than broken, and this would be that to claim the 'alien', that the 'concept of polyhedron [was stretched], to cover objects what were alien to the intended interpretation', is to have 'concept' as a unification and order – a pursuit of some essential sameness: it is the proper place for the objects which are not 'alien'.

And yet, this is 'to cover objects that were alien to the intended interpretation'. The concept would have to be, sciences'.

The 'mathematics' is already in, already 'the enormous usefulness' – a monstrosity, that it is both within, but also that which is claimed as different.

And the 'usefulness'? Is this unique? By one point it is 'enormous' and that it is 'bordering on the mysterious', or rather the one point (or two), is that this 'usefulness' is also 'uncanny', but here, in relation to 'mathematical concepts'. The 'concepts' are 'uncanny'. And if this is to do with the questioning of the 'uniqueness of our physical theories', the 'concepts', in being 'uncanny', would be to do with an identity, a 'uniqueness' which is

In the grounds of possibilities, or perhaps rather the possibility of grounds, for there is (still) this turning back –

But before (another position) this turning back, if such is at all possible –

> Thus, the rules for operations with pairs of numbers are obviously designed to give the same results as the operations with fractions which we first learned without reference to "pairs of numbers."

One gives the other. There is, here, a claim to association; what is 'first learned' is true of another. '[T]he rules for operations' can be mapped elsewhere. 'Thus' it is that this logic of mapping, a charting of the operation, (and here time would be of the essence, would be what gives the distinction been 'first learned' and therefore all subsequent learning – in sequence, afterwards, an accumulation of learning therefore, by this operation), is therefore that despite not being 'the concepts of elementary mathematics and in the unification, or at least, this unification as a suppression of a difference, to do with the 'alien' as that which is to be included.

Was this 'intended interpretation' ever reached?

Or is it rather that the 'intended interpretation' is invoked against these monsters, the 'alien' 'objects', for the 'objects' as 'alien' are only such when the 'intended interpretation' is invoked. That is to say, the 'intended interpretation' is the alien(ation), this differencing, for 'stretch[ing]' is therefore another system by which the 'concept' is measured to know it has 'stretched'; promised by another – that is, is given over.

This raises the question; there should have been a silence on this point.

'This raises the question'.

Going towards the 'mysterious', 'bordering on'; *is* it (at all?).

'[U]ncanny' in that the 'concept' is to question.

The 'concept'.

The 'concept' which, by rights should not 'question'.

The concept does not question.

Is not, then, what is to do with the 'usefulness' most properly –

– and yet 'just this uncanny usefulness'; is there a 'usefulness' as such?

particularly elementary geometry [which] were formulated to describe entities which are directly suggested by the actual world', this mapping, as (a) logic, grounds these non-elementary concepts in a claim to the 'actual world'.

But not 'directly'. The mapping, by which, '[t]hus', the 'rules' follow, collects (back), into the same grounds that which 'we first learned without reference to "pairs of numbers"'. In a line: what was 'first learned', was not, is not, to do with reference. Subsequently, however, there is 'reference', a tracing back to the 'first'. A grounding shift to a claim of the originary.

And 'obviously designed to give the same results'. This can be seen, obviously; the 'design[…]' of the ~~thing~~, or rather the 'operation'.

Just what is being seen here though? For having been 'designed' it would be that the 'rules for to be able to claim that the 'objects […] were alien to the intended interpretation'. It is then a question of time.

But then again, perhaps rather it is a question of time as continuous to be able to distinguish between 'the concept' and 'the concept'.

Which one is 'stretched'?

Or would that be '[t]he conjecture'? For if '[t]he conjecture was true in its *intended interpretation*', but '*false* in an *unintended interpretation*', and this is the (re)marking on the 'alien', this would be because 'it revealed the falsehood of a *new*

Or is there something 'enormous', something which goes beyond bounds? Uncanny because this is the requirement, 'mathematics in the natural sciences' and yet this undermines the claims to the 'uniqueness of our physical theories'. The 'physical theories' would here be that which requires, or rather *ought to* be unique: have 'uniqueness'.

The 'concept' and an unintended consequence. It is unreasonable on all points.

Uncanny – 'the enormous usefulness […] is something bordering on the mysterious'. Not 'useful', or 'enormous' as such, but 'something'.

operations' is set up, operated on, before its being.

The symmetry of operations – 'a thing is symmetrical if one can subject it to a certain operation and it appears exactly the same after the operation.' The 'operations' – these are not invented, but rather the 'rules', and the 'concepts'. There would have to already be 'operations', some manoeuvre which is already at work for there to be 'rules […] designed', and that the rules can be repeated, infinitely, to yield the 'same results'.

Operations in design, (in both senses – perhaps there are more – but I cannot account for them) are such that the 'rules for the operations' are always in advance of themselves as such, that is, can be operated on before being, to be 'designed to give the same results as the operations with fractions'. There is then a parallel: this is what it means to be in the same ground, spacing. That a parallel (line) conjecture which nobody had stated or thought of before.' There is something within the '*intended*' that is unintentional – the 'concept', ('conjecture') has, *now*, within it, 'smuggled in', and only now, for it would be that otherwise the 'concept' in its first outing would not be flawless – '[f]or the polyhedral that they [the first explorers] had in mind, the conjecture *was* true as it stood and the proof was flawless.' [107] This would appear to be a necessity, hence the '[l]et us go back'. This flawlessness, and the truth which accompanies it, would be the aesthetic (ideal). And this is what Something which is both 'something' and 'something bordering on the mysterious' – something which is not something as such. This 'enormous usefulness' is that which is (not); can it be 'useful[…]'?

The 'mysterious', or rather the 'bordering on' – is there any way in which the 'mathematics' is something which can be useful – or ~~is~~ it rather that which has already slipped beyond a border '[S]omething' as that which can only be in relation to another.

I could very well have left it all at 'something' 'enormous' – whatever 'it' is, already not being 'it', 'something'…

[107] *Proofs and Refutations*, p.84

can be drawn.

By this design, of co-ordinates, co-ordination (of design).

'[W]ith'. The rules thus cannot be exhausted. Are not, themselves, 'pairs of numbers' or 'fractions'.

And yet if 'the rules for operations with pairs of numbers are obviously designed to give the same results as the operations with fractions', there is here a monster – doubt – the design is in its spacing, or rather born(e) out of this fear. The fear that 'the same does not seem to be true of the more advanced concepts, in particular the concepts which play such an important role in physics', that there is no 'direct[…] suggest[ion] by the actual world'.

Thus the design, this comes into play at the moment when there is a 'seems', (obviously?) to not be the case. Still, a hedging of bets: 'the same does not seem to be true'. Here, the possibility, *thus* the bet. By design, to 'they had in mind'; these 'polyhedra', the 'object[s]', are what is to be thought, and thought collectively as the same. The 'conjecture', 'concept', concept of the conjecture, proceeds from the division of what is 'in mind' and what is not, and also on the ability to share 'in mind'. That is, that 'they' in sharing among themselves, is also a sharing with a non-they. The 'polyhedra' are what can be in all minds. Just how far, however, can this division, sharing of the object be claimed however? Despite a remove – the 'they' by 'PI' which is itself not then 'PI'.

This is to be kept in '[A]nd that there is no rational explanation for it.'

This is a point which must be made – a confession, the admission that the 'usefulness of mathematics in the natural sciences' is not 'rational'. The 'rational' should involve a discrepancy, a failure in the usefulness: 'usefulness'.

The 'rational explanation' would be that despite the 'enormous usefulness of mathematics in the natural sciences' there is something which escapes the bounds of this 'enormous usefulness', something for which the 'mathematics' does not account, something unique to 'our physical theories', the 'natural sciences'.

And yet, if there is 'the

be in the same grounds.

There is a difference.

The design is to make ‘the same results’, because ‘the same does not seem to be true of the more advanced concepts’. The direct suggestion is not then carried over, that is to say, is ‘directly suggested’ only with the ‘elementary’, and cannot be mapped – indeed, how to map a direct suggestion?

Does it not rather suggest some sort of failure? Of communion – I would suggest, now that I too have lost –

– ‘the concepts of elementary mathematics and particularly elementary geometry were formulated to describe entities which are directly suggested by the actual world’.

Describing would go some way to recuperating the ‘entities’. The ‘entities’ which are not sufficient in themselves as ‘entities’, since ‘the mind.

Or rather out of it. For it would be that this is an *attempt* to retrieve the origin of what ‘they had in mind’ as that which was ‘flawless’ and ‘true’. There is no claim to intention here – intention is invoked only later in with the ‘alien’, that *subsequently* there is ‘revealed the falsehood of a *new* conjecture which nobody had stated or thought of before.’
And with this in mind – it is (still?) the same concept.

Just ‘stretched’.

Is it?

But at what point *was there* an overstepping into ‘interpretation’?

And if the revelation enormous usefulness of mathematics in the natural sciences’, but there is ‘no rational explanation for it’, such that what is desired is a break, a point at which the mathematics does not work, that the ‘natural sciences’ can claim ‘usefulness’ instead, is this not because there is no possibility of separating the ‘mathematics’ from ‘the natural sciences’ as such? If the ‘mathematics [is] in the natural sciences’ by these grounds there can only be ‘explanation’ within these terms. The ‘uniqueness of our physical theories’ is something which is indebted to the ‘mathematical concepts’ for raising the question and thus that what the ‘natural concepts of elementary mathematics and particularly elementary geometry were formulated to describe' them. They are somewhere beyond 'the actual world'; 'directly suggested', in some non-actual world.

Somewhere beyond, and yet 'directly suggested' is to situate these 'entities' in relation to 'the actual world'. A (re)move.

And a (re)move of reference – 'by the actual world'.

But which first? That is, if the reference troubles the 'rules for operations', and these 'entities' are that which are 'directly suggested by the actual world', what is 'directly suggested' is, here, in the elementary, in the first instance, a reference, a first loss.

I would suggest, directly, or not.

And how to claim (the) directly? A direct route – the loss comes back.

If it ever went. It is, perhaps, *not* obviously the case. A rule of operation of 'a *new* conjecture', this is the difference of the new, that is in relation to what 'they had in mind' – the mind of the 'they' is the necessity of this aesthetic, that there should not be aliens, monsters, as a difference, as what cannot be controlled, shared. There is here a 'smuggling in' of what is not seen, 'in the mind'. This would be to do with an openness (or not) of the state of things.

In the mind.

A collective mind; this has to be read.

The '*new* conjecture' which is '*unintended*', and yet within the space of the collective 'mind' is that which threatens this unity, this system of logic, sciences', 'mathematics', and 'mathematical concepts' are, is known, and known to be used, is *then* undermined by that very claim to the 'enormous usefulness'. The 'uncanny usefulness of the mathematical concepts' would be to do with being elsewhere, that is, 'useful' elsewhere, 'in the natural sciences'. The 'uncanny' is the 'concept' and must be so, for this is that the 'concept' is already other; 'mathematical concept' not 'mathematics' as such. And the 'concept' troubles the 'uniqueness of our physical theories'; it is what should, by a claim of belonging, be wholly known and shared as such within the 'our'. '[O]ur physical theories' for a direct(ion) suggest(ion).

And I might suggest that this is the direction of reference.

That again, to reference 'the actual world' which 'directly suggest[s]', is that 'the actual world is not to do with these 'entities' as such, that is to say, is not itself 'suggest[ing]' as much.

A direct suggestion – from one to another.

From another? By the (pre)position, have I not already conjured a system?

Would the results be the same? And how to measure this, if this measurement is possible?

And if 'directly suggested by the actual world', 'elementary mathematics and particularly elementary geometry [which] were formulated to describe entities which are directly suggested by the actual world' are, in this system of reference – is this a geometry, in the sense that it can be mapped, 'by' –

– can it be mapped, or is this only ever by which there is the 'pathological', and makes its (own) 'case' for this. That is to say, '*new*' has a history, it is 'revealed', is there to be found, but is, then, a history of the coming into language, this '*new* conjecture which nobody had stated or thought before.'

Additionally; this does not alter to remain within the limits – '[t]heir "refutation" revealed no *error* in the original conjecture, no *mistake* in the original proof', rather, this '*new*' would be a challenge to the way things (in (the) mind) were shaping up. To have a history because of the 'revealed' is that from the 'concept', what is and the 'mathematical concepts' cannot be thought outside of each other. The 'uniqueness' would be to claim a correspondence between the 'physical theories' and the 'physical'. And yet the 'mathematical concepts', their 'usefulness', would be that the 'physical' is not claimed solely by the 'physical theories'. The 'uniqueness', and the 'question[ing] of' it would be that only the 'physical theories' should account for the 'physical', not the 'mathematical concepts'.

The 'physical' demands a 'uniqueness' a 'singularity'. And yet because of the 'usefulness', claims to the 'physical' are in non-physical, by suggestion? I shall be charting this directly. What would this mean? A (mis)direction.

– doubly (re)moved from, by, 'the actual' world, having been 'formulated to describe *entities which are directly suggested by the actual world* [my italics]'.

So a double-take, charting this direction (order) from 'describe entities which are directly suggested by the actual world'.

Except, perhaps ~~direction~~. And yet this direction *is* perhaps to do with a double move, in two directions, for to be able to claim that the 'elementary mathematics and particularly elementary geometry were formulated to describe entities' there is already a knowing of these 'entities'. These 'entities' are not unknowable outside of the 'elementary mathematics and particularly elementary geometry [which] were formulated to describe them'. These '*unintended'* comes into language, as what should have been 'stated or thought before', and that there is the possibility of thinking otherwise, this '*new* conjecture' which is a difference outside of the 'nobody'. '[N]obody had stated or thought before' – except now the 'refutationists'.

So is this something which should have been 'before'? That this 'revealed' is at the wrong point in time – should have been 'before'?

There is a coming too late. This 'revealed' disrupts the openness of 'the polyhedral that they had in mind', that is to say, the openness in the sense of knowing the 'mathematical' terms.

And this is 'uncanny': what is not owned, the 'mathematical concepts', can (re)iterate, and claim the 'physical' within the 'physical theories'. This ownership of 'physical theories' is something which is indebted to 'mathematics' and 'mathematical concepts'. There cannot be a knowing of the 'physical' as such outside of the 'physical theories', which are themselves bound to the 'mathematical concepts'. The 'mathematical concepts' frame, within 'the physical theories', the claims to the 'physical' as some*thing*. There is an order of the individual that the 'mathematical 'entities' are known and doubly known in their difference, as both the 'entities […] directly suggested by the actual world', and as 'entities' which are 'described' by the 'elementary mathematics and particularly elementary geometry'.

And all this is not quite 'actual'. This is perhaps the (de)scription, pre-scription for the 'elementary mathematics and particularly geometry'. This 'directly suggested by the actual world' is both what allows for the 'invention of concepts' and what safeguards the 'actual world' from being anything other.

I would say.

Suggest.

Still, suggested: 'formulated to describe entities which are directly suggested by the actual world'. The 'actual world' is still directly suggesting these 'entities'. There is, in this suggestion, a continuity – would this be to infinity? 'true' and the 'flawless', that this 'true' and 'flawless' had themselves been smuggled in as such.

And so by claiming the 'revealed', the history is set up and so undermines control, of the 'concept', 'conjecture'. The sharing of what is flawless, the 'objects', is open to itself, and flawless in its knowing. This has somehow been smuggled in. That what 'they had in mind' is not shared as such, it has, by a history, gone beyond what 'they had in mind'. The 'pathological case'. (I would speak to you of monsters).

And the interpretations, '*intended*' or '*unintended*', these concepts' work against.

For, 'they often permit an unexpectedly close and accurate description of […] phenomena' [109] so that through this frame, the 'mathematical concepts' claim (back) 'phenomena' which 'they permit'. The 'phenomena' are within the limits of what is set up.

But 'often permit'; (t)here is a difference. There is an expectation; 'phenomena' are known before the 'mathematical concepts', the 'mathematical concepts' would be a (re)iteration of the 'phenomena' to be able to gauge the 'close[ness]' and 'accura[cy]'.

How far do 'they permit'?

[109] 'The Unreasonable Effectiveness', p.224

Or would *that* be my suggestion?

And so, if 'elementary mathematics and particularly geometry were formulated to describe entities', whatever the 'actual world' is, 'elementary mathematics and particularly geometry' was not formulated to *de*scribe it. Rather, 'the actual world' is something which is (still) 'the actual world'. The interest is in these 'entities', that which is 'directly suggested'. The 'elementary mathematics and particularly geometry' is the pursuit of (although in what sense is this following?) – writing, (de)scribing, then the charting, mapping, of this writing, of a connection, of a history of suggestion to the natural world, of 'entities' – of being, this can be mapped; pin-pointed by the co-ordinated system.

Which is not 'actual', but rather another world. But by this co-ordination, 'the actual world' would be here charted by the non-actual, that is would be a safeguard for 'the polyhedral that they had in mind'. That the distinction can be drawn, at all times, between the interpretation and the thing itself.

Except that 'the polyhedra that they had in mind' is not 'polyhedra' as such; their 'mind' and '*the* polyhedral [my italics]' are already lost to any origin.

These 'first explorers of our subject' are consorting with monsters, the alien, as soon as they have 'polyhedra […] in mind'. The subject is already owned, before the first exploration. Owed to and owned by (an)other.

So what of this defence of the orgin(al)? 'He valiantly defended the

And yet if this is to do with what 'they permit', and a (re)iteration is required to know, how can this be thought outside of the circle, this closed loop of (re)iteration to be able to claim what 'they permit'?

That is to say, why is permission granted in some cases, with a certain frequency, 'often', if the 'phenomena' can be thought with*out* them to know the 'close[ness]' and 'accura[cy of the] description'? How is this permission as often as not, granted or withheld? What is given to stay, permitted to s(t)ay, that there is 'phenomena', (there *is* phenomena) there is already this permit, a to say, itself (de)scribed by the 'directly suggested'.

There may have been other descriptions; more roundabout routes, paths.

Still, 'the actual world' from whichever direction, route, suggestion, is –

– (not) of 'interest'.

'Mathematics would soon run out of interesting theorems if these had to be formulated in terms of the concepts which already appear in the axioms.' *Thus* the suggestion. Somewhere along the line, there is 'the actual world', a grounding in a claim to truth; it is 'actual' but the corollary being a binding, a problem of 'interest'.

Somewhere along the line (in the other direction?) there should be what does not 'already appear' (too much symmetry?). That is to say, an extension, a suggestion. And this would be the 'elementary mathematics and particularly original interpretation of polyhedron. He countered each counterexample with a new clause to safeguard the original concept…'

It is not so much the 'polyhedron' and the 'original interpretation' which has to be 'defended', but rather this would be about time. A defence of the origin(al) as the ideal, and this 'original concept', which is to do with 'the original interpretation', is promised by *a* 'new', and here the safety of the new, rather than the threat, such that the 'clause[s]' are to keep still – the 'safeguard' would be a building up to eternity, over time, as taking up of a space, a position in space.

But for how long a duration is this 'permit'?

Perhaps this too has no 'rational explanation'; it is to ~~s(t)ay~~, by (re)iteration. With permission, for if 'mathematics' is to do with a 'usefulness […] in the natural sciences', not only is the 'natural[ness]' of the 'sciences' bound up with the irrational, and the uncanny (what transgression is here? –'the question of the uniqueness of our physical theories'; the 'our' does not *use* as much as was perhaps thought, something escapes the individual: uniqueness), but that these 'phenomena' must be spaced and timed elementary geometry'. This does not already appear, is not there to be seen. The 'elementary' comes afterwards.

I would say, suggest.

The interest would be this addition; what does not 'already appear', 'actual' or otherwise.

The interest in more than one type of concept. There are those which do (not) 'already appear in the axioms', for 'mathematics is the science of skillful operations with concepts and rules invented just for this purpose.' For the purpose of 'skillful operations' – there is an exactness demanded of it, but also being 'the science of skillful operations', is a knowing of 'mathematics', but also 'skillful operations' and what these are to claim 'mathematics' is such.

'I would say'. On what grounds? Or is this on the grounds of a claim to a prior knowledge? Some addition which cannot be accounted for in this system what stays still.

But here a monster – for the stays still would (also) already threaten in its stays. The addition which here, *now*, is not what 'nobody had stated or thought before', is rather a 'clause' which does not alter the shape of things. The 'new clause' is an additional limit, in another direction. How many directions? If this is not a stretching, but 'a new clause', does this 'new clause' operate in such a way that there is no extension, but is rather a (re)formulation of what has gone before? 'He countered each counterexample with a new clause to safeguard the original concept…'

constantly otherwise. The 'phenomena' are insufficient in their being known as 'phenomena'.

They must be described – the 'mathematics' as a system of 'description'. These 'phenomena' cannot *be* in one place, cannot be *still* as 'phenomena'. The 'uniqueness of our physical theories' is threatened by that which is 'enormous[ly] useful[…] in the natural sciences'. But the difference between 'the natural sciences' and 'our physical theories' is what the 'uncanny usefulness' threatens.

Where is the borderline?

Or again: *where* is the borderline?

Or again: where *is* the

(strictly speaking)?

What might prevent this (as a) strict (closed) system?

This knowing of 'mathematics [as…] the science of skillfull operations' is not so much the 'skillfull operations' themselves but rather the 'science' of it. A further knowing, a knowing of 'science', another operation by which there is a division between the 'science' and what the 'science' is of. A reference once more. The 'science' would be to do with an exactitude, but, 'I would say'; something draws back from the direction in which this is (perhaps) headed, this tendency towards an –ology. After all, it is the 'science of skillfull operations'.

This much is apparent – these 'operations' have been classified.

Is this all that is apparent? There are 'concepts' which have already appeared in the 'axioms'. Some things just are.

Axiomatic. These 'concepts' are …does he succeed?

…this would require the already having spaced of a goal, before, to return to.

For if a countering, refuting the 'counterexample' by 'a new clause' is to frame the 'original concept' (or would that be 'interpretation'?) as lacking a sufficiency in self-framing (its own limits). There is an openness, but now an openness to the 'counterexample' which is to say that the '*intended interpretation*' does not limit and safeguard in the sense of closing the subject. '[P]olyhedra' therefore are always to be (re)turned, and the borderline?

For this 'usefulness' of mathematics is premised, grounded, in the being thing, the *is* of 'the natural sciences' and 'mathematics' to be able to represent the one with the other, to draw this distinction. That 'our physical theories' *are* unique. The 'enormous usefulness' is to do with the being of the 'mathematics' to be 'useful[…]'. The 'enormous usefulness' is the ability of 'mathematics' to be given over, to take up a space 'in the natural sciences' and for there to be a distinction. That the limits are drawn.

Yet it threatens, this 'uncanny usefulness'. That ready-made, already apparent. The already-being-there from which to move away from. Turn back to – the 'same results', to 'reproduce rules for the operations with quantities which were already known to us'.

Was this science ever inhabiting the same space, if 'of'? The excessiveness of the 'of' operates a division at the point of unity, the 'science of skillfull operations'.

Is there an operation? And at which point, if this is to do with a 'reproduc[ing of the] rules for the operations with quantities which were already known to us', would the point be such that it 'clause[s]' added because this would be within the same space that the 'polyhedra' lacked initially.

What 'they had in mind' therefore was not 'flawless' nor a flawless which operated in a universality. Instead these 'new clause[s]' by which 'the original concept' is 'safeguard[ed]', is to do with sectioning off, a passage of an *in*scription which grounds of the 'original concept'. A passage which is not a movement elsewhere – the claimed division, the being of 'mathematics' is the very thing which, though required for its 'usefulness', is what undermines the 'uniqueness of our physical theories'; 'our physical theories' are constituted by 'mathematics'.

Uncanny because 'our physical theories' cannot explain themselves. What is 'physical' is only because of what is brought in, the 'mathematics'. This necessary monster – which cannot be wholly in a different space as a different space as an absolute exteriority.

One would have to be within the bounds of the familiar, that which is 'already known to us', this shared space, to pass around, within, 'with quantities [also] already known to us.' Is this the skill? The invention which nevertheless stays within this shared bound; a skill because there is always the possibility of breaking this bound?

But the 'quantities' are somewhat left alone, for it is rather the 'reproduc[ing of the rules] for the operations'; there is no need to 'reproduce' the 'entities'. These 'entities' are capable of absolute translation, unified as such, 'already known'. This is not the invention, the purpose of mathematics. Indeed, it would be to draw a division, a difference between the 'concepts' and that which is 'already apparent' and 'already known'. And if the 'concepts' with which mathematics is interested are to do with an 'invention', and with regard to physics, are 'more advanced concepts', which are not (seemingly) 'directly suggested by the actual world', the 'concepts' would be to do with occupying a different space. Is this 'science', the space of science?

A taking up of a different space? Or is this the extension, which calls back to what is 'already apparent': the 'actual world' which is (not) there?

And all this, claimed necessarily outside of the space to know the 'science'. This space which is over (t)here; somewhere.

And if physics is concerned with 'more advanced concepts', does this system have a stratification by which the concepts are measured – is this within the same spacing?

> Furthermore, whereas it is unquestionably true that the concepts of elementary mathematics and particularly elementary geometry were formulated to describe entities which are directly suggested by the actual world, the same does not seem to be true of the more advanced concepts, in particular the concepts which play such an important role in physics.

This play of concepts is yet another space for taking up 'an important role *in* physics [my italics]'; the advance going beyond mathematics proper, here cannot 'seem[ingly]' be 'directly suggested by the actual world'. That which binds the 'elementary', the 'directly suggested', is not itself a rule, hence that:

> The rules for the operations with sequences, that is, with irrational numbers, still belong to the category of rules which were determined so as to reproduce rules for the operations with quantities which were already known to us.[110]

The advance, in this (which?) position outside of 'direct[…] suggest[ion] by the actual world' must then claim its anchorage in the 'operations with quantities which were already known to us.' Each operation, each 'concept', can be charted back to what is 'already known', back to a space which the 'us' shares, (and) what is already in the space of knowing. The advance of physics, by way of the concepts, not 'physics' itself as a space, this cannot move out of knowing, (re)claim the rules of (in)adequacy. That is to say, this repeat, that they 'still belong to the category of rules which were determined so as to reproduce rules for the operations with quantities which were already known to us' is such that over time, there is no difference, they 'still belong'. This advance circles about (in) the same space, within a predetermined 'category'. The 'already known comes back, but comes back otherwise, out of this repeat which, in this category, is not there, is already to do with a reproduction of what which 'were already known to us'. At some point.

In time.

In the space (t)here.

Are they still 'already known to us'?

Perhaps the advance, the advance of the concept is here rather more claimed by what is lost; lost already as what was 'already known'. There is the memory of the known, and this a shared loss. For indeed, if the 'advanced concepts, in particular the concepts which play such an important role in physics', are that which cannot claim the 'directly suggested by the actual world', the 'rules for the operations' substitute the 'directly suggested by the actual world'. But this would be a substitution of a relation, of a difference, the 'directly suggested' as such. This space, the 'science of skillfull operations' is the ability, 'I would say' to be able to trace these relations, what holds (in place).

[110] 'The Unreasonable Effectiveness', p.224

And yet, this frame, 'I would say', is the space for the iteration of these 'concepts', 'categories'; what *is* mathematics is to do with the saying, this writing (in general) which is conditional, and conditioned by the 'I'. The 'I' speaking for 'us', for what is shared. The 'I' positions 'mathematics' and the shared loss, such that the substitution, the repeats, of 'directly suggested' and the 'rules for the operations' which call back the 'already known' are not in a time(line) of which the history of mathematics can be traced in objectivity, but rather this substitution is without substitute. That is to say, I would say, this operation lays claim to 'invention' because there is no*thing* to substitute.

So, I would say this is a tracing of what is not already apparent. That 'physics' is premised on the possibility to come is then in the grounds of the horizon, future, which looks back. The 'advanced concepts' have gone beyond an operational division to the 'elementary'; this is no (longer a) reflection of 'the actual world', a reference. Instead, it would be that the 'advanced concepts' must, and here is perhaps the conversion of space, be to do with the possibility of (re)generation. That is to say, must always be claiming a new, a new to come – this future from a history. There is, *still* this belonging to a category; that is, the framework is in place, *still*.

Was there a movement, a substitution? One spatial framework for another? And how to tell? Still the category, the 'monster-barring' which *claims* 'invarian[ce]'. The framework bars the monsters.
So what is inside, that is, what is this co-ordination of space which requires protection? The threat, from an outside, an outside as that which does not adhere – not adhere, unless to (re)claim, 'reproduce rules for the operations with quantities which were already known to us'. Protect a loss, a difference from that which *was* 'already known to us'. If there is, still the lost frame, the frame by which there is the 'already know', have 'the monsters', the 'pathological case', been lost too? Is one the corollary of the other?

It 'raises the question of the uniqueness of our physical theories', for the 'already known' is not of interest. Would this be, then, that the 'actual world' also, is not of interest? That is to say, not of interest of itself, but rather by some loop, the reproduction of it. The movement (t)here:

> The rules for the operations with sequences, that is, with irrational numbers, still belong to the category of rules which were determined so as to reproduce rules for the operations with quantities which were already known to us.

The logical sequence of the 'irrational numbers'. The uniqueness is what is here shared, *still* movement – the 'operations […] reproduce rules for the operations with quantities which were already known to us.' One sequence in place of the other, by these claims of 'reproduc[tion]'. And yet 'the operations with sequences' *are* the 'irrational numbers'; is this the interest? Or is it rather that the interest is neither in the 'irrational numbers' (nor the 'actual world' as above), but in the loss, that of 'reproduc[ing] rules for the operations with quantities which were already known to us'? The interest in how many ways the loss can be (re)called: the sequencing of loss, the loss of what is already know. The 'irrational numbers' are part of a sequence which claims, in turn, in still belonging, to a 'category of rules', a category which cannot itself but be (also, still), what is 'already known to us' and no longer. These 'irrational numbers' (can they still belong if this 'category of rules' therefore if lost to 'us'? Now recalled as lost; the lost group, system); the 'irrational' sequences those other sequences, starting with the 'irrational numbers' – these 'reproduce' the 'quantities which were already know us', and the 'rules for the operations with them' –

– although perhaps I have broken the unity (uniqueness?) which is the 'operations' and the 'quantities' which can(not) be thought apart –

– and so, the 'irrational numbers' would be that which was 'already known' as irrational (still, also), in being this frame of 'reproduc[tion]'. There is no rational sequence to this – no interest in that (this) sense; the sequence, as one which 'still belongs' is not accumulative, additional. *Still belongs* as an irrational sense of a history of sequences; that these 'quantities which were already known to us' *were*. And so, if this is, by this loop, to s(t)ay within, that the interest is circularity, to 'reproduce the rules for the operations with quantities which were already known to us', can there be a direction to this? That is to say, within this circle, this 'reproduction' as reproduction, how could the 'quantities' be claimed, how to know this loss as such? For does not the circle disrupt the end point (as concept) – disrupt the possibility of reproducing these ‘rules for the operations with quantities which were already known to us’? This ‘still’ is the circle; that there is no substitute in this reproduction, this is the (ir)rational, that the ‘us’ cannot know ‘quantities’.

So how might the ‘us’ know what is *proper*?

I might signal (to) what is to come, but then again, this might be introduced another way: I might instead signal to a phrase repeated in two articles, that of not seeing the forest for the trees.[111] This is, according to one of the articles (perspectives), a 'saying [which] illustrates perspective'[112] but 'wavelet transform is a relatively new signal processing tool that allows us to efficiently analyze the small details and the big picture.'[113] Wavelet transform would be an ability to circumvent perspective, or perhaps rather being able to see both (perspectives): would there not be another? *ad infinitum?*[114] So already there is at stake a claim that wavelet transform is to do with a seeing, and a seeing of something in its totality. And this is idiomatic; it is bound up with language (just saying), the wavelet transform cast in distinction to this.

Just how far this can be taken to be the case; just how far (if at all) can wavelet transform, and Fourier transform, be separate and/or separated from a language which inhibits sight?

Just why wavelet transform and Fourier analysis?

I could say, signals are (re)constituted (as) sine waves; de Broglie was thinking in terms of sine waves for the de Broglie relations.

I could say that Fourier transform begins on the assumption that there is a signal, and it is this assumption of what a signal is, and the problems with it, which I read to be to do with (re)presentation in terms of particle and wave; I could say, wave mechanics.

According to the literature what is a 'signal'? I might signal to this another way:

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[111] M.Verletti and C. Herley, 'Wavelets and Filter Banks: Theory and Design', *IEEE Transactions on Signal Processing,* 40.9 (1992), 2207-2232 (2207), and L. M. Bruce, A. Cheriyadat and M. Burns, 'Wavelets: getting perspective', *IEEE Potentials*, 22.2 (2003), 24-27 (24)

[112]'Wavelets: getting perspective', p.24

[113] 'Wavelets: getting perspective', p.24

[114] Simon Friederich in his recent monograph *Interpreting Quantum Theory: A Therapeutic Approach* (Basingstoke: Palgrave Macmillan, 2015), discusses the 'measurement problem' and claims a cure with something he frames as Rule Perspective, which replays this idea of a knowing of another('s) perspective, an 'agent' assigning quantum states, and being able to know absolutely, as another, this, that, agent's perspective and his or her epistemic conditions which go to constitute the quantum states, see p.79 in particular. Such framings mean that a division of what is objective/subjective is upheld since the 'Rule Perspective' is grounded in the rules for state assignment – ironically, there is no perspective on the rules – the rules are correct and for *everyone*, or rather, 'competent users of quantum theory' (p.111). It is interesting that Friederich starts to think about state assignment as non-representational, and yet there is nevertheless an investment in state assignment being a 'correct' and 'accurate' reflection of the assigning agent's epistemic condition.

The Fourier transform rules over linear time-invariant signal processing because sinusoidal waves $e^{i\omega t}$are eigenvectors of linear time-invariant operators. A linear time-invariant operator L is entirely specified by the eigenvalues $\hat{h}(\omega)$:

$$\forall\ \omega \in \mathbb{R},\ Le^{i\omega t} = \hat{h}(\omega)\ e^{i\omega t}. \qquad (1.1)$$

To compute Lf, a signal f is decomposed as a sum of sinusoidal eigenvectors $\{e^{i\omega t}\}\ \omega \in \mathbb{R}$:

$$f(t) = \frac{1}{2\pi}\int_{-\infty}^{+\infty} \hat{f}(\omega)\ e^{i\omega t} d\omega. \qquad (1.2)$$[115]

I might try again to communicate (in theory?), signal, that which might be at stake, what I might *set forth*, but this would be too much of a guarantee of a future I have no hope of knowing as *is,* so that it can be reduced here, in sum, to something like, a sign(al) of a law. So I might already, have started to signal a thinking around what is a signal, and that perhaps this signal is already beside the point.

I might translate it thus: the Fourier transform is the rule because of the belonging – 'sinusoidal waves $e^{i\omega t}$ are eigenvectors of linear time-invariant operators'. And yet if this is the case, it is also that the being 'eigenvectors' is to do with a limit, '$\forall\omega \in \mathbb{R}$', but a limit in terms of '$\mathbb{R}$'. The field is already set, but set also in advance as what is known to be the 'ω'. Except '$\mathbb{R}$', this setting of the field, would be because of 'i'; that the distinction comes from the excess. There is in this setting that within what is '$\mathbb{R}$', 'i' is required. One category gives way to another; but the reverse is also true, for if '$\forall\omega \in \mathbb{R}$', every, and this would be to set the limit of 'ω' to be something in particular, 'ω' needs the difference of 'i' to return to 'ω' and yet be (a)part of '$\mathbb{R}$'. This is not so much a category which holds to itself, for it has by all accounts already gone in another d$i$rection, but that this category '$\mathbb{R}$' can be further dissociated into 'ω'. '$\mathbb{R}$' needs a homogeneity given by '$\forall$', a homogeneity which cannot but be instituted from elsewhere – twice over now, '$\forall$' and also 'i'.

This is to do with the particular case, '$\forall\omega \in \mathbb{R}$', to be free from contradiction. But, and here if 'signal processing' is to do with the ordering, this is firstly to do with the setting (of the limit). Both '$\forall\ \omega \in \mathbb{R}$' and '[c]oncentrating on transients [which] is probably a strategy for selecting important

115 Stéphane Mallat, *A Wavelet Tour of Signal Processing* (San Diego: Academic Press, 1999), p.2

information from the overwhelming amount of data recorded by our senses'[116] is to do with an acknowledgement of a framing and thus a division which is not inhabited. There is in this some absence from what is the grounding for what is (to follow): '$\forall\ \omega \in \mathbb{R}$' does not begin but rather in this form (the possibility of being other) is already the division of a decision by which, afterwards '$Le^{i\omega t}$ = $\hat{h}(\omega)$ $e^{i\omega t}$' is held to be true. The form diverges from what is 'overwhelming', known to be so; the 'amount of data recorded by our senses', hence a reduction, (deduction? probably…) that is not then '$\forall\ \omega \in \mathbb{R}$'. This is form only, a formality by which what *is* might just be 'i' – that which (re)turns in another direction.

The 'i' would have to de-sensitize to know the 'data recorded by our senses', to not be 'overwhelm[ed]' by it. 'i' might just do this – at least, this is the gesture. The form (of difference) taken, '[n]umber as perspective form'[117] so that '$\forall\omega \in \mathbb{R}$, $Le^{i\omega t}$ = $\hat{h}(\omega)$ $e^{i\omega t}$' is always already a reading of inclusion, '$\forall\omega \in \mathbb{R}$', and thus exclusion, that which orders, and cannot therefore be (from) a position of neutrality as such, even if such a neutrality were possible. There is a signalling of it(self), that is, perspective, but there can only ever be *a signalling*.

And the 'overwhelming' already is, of this there is no doubt. So it is rather the pursuit of what is 'overwhelming', a 'strategy' by which to limit. 'Overwhelming' is too much to do with a difference within one space, of what is (un)important. Hence the strategy of stratification.

What recurs, one way or another, of what adheres to some notion of 'importan[ce]'? 'i' in being to do with the return, a return that does not wholly shift, (re)iterates itself. '$Le^{i\omega t}$ = $\hat{h}(\omega)$ $e^{i\omega t}$' is a means by which to negotiate '$\mathbb{R}$'. It would have to be, more or less in keeping with '$\hat{h}(\omega)$ $e^{i\omega t}$'; there is a space opened for this in '$\hat{h}$', that the difference does not wholly break because '$e^{i\omega t}$' is equal to itself across '='. There is an element to be traced at all times.

But all times – maybe this is too much of a difference, this is 'linear time-invariant signal processing', over which 'Fourier transform rules'. '[R]ules over' – adherence because of the time

[116] *A Wavelet Tour*, p.2
[117](Again:) *The Will to Power,* p.271

invariance; already there is the belonging, a relationship given 'because sinusoidal waves $e^{i\omega t}$ are eigenvectors of linear time-invariant operators. A linear time-invariant operator L is entirely specified by the eigenvalues *$\hat{h}$(ω)*'.

So does this *go* anywhere? For the waves must, to some extent, be to do with a displacement. After all: ' $\int_{-\infty}^{+\infty}$ ' such that there is a resulting loss of the initial range. Indeed, it would be that the 'signal' is set up to be *somewhere* within this range, and yet extended within this range because of the integration. Is this possible however, in a strict sense? Absolute time would not *go* anywhere, so how could there be an evolution and a transform? And also, if there is a *resulting* loss, this loss would be set up in ' $\int_{-\infty}^{+\infty}$ ' to be the production of the signal as separated from the 'overwhelming' of the totality. This 'strategy' therefore, is (probably), not so much to do with the creation of the specific signal out of a generality, but rather the creation of the generality, the surround, of the 'overwhelming amount of data' – how could this be known? How to think outside of ' $\int_{-\infty}^{+\infty}$ '? I have perhaps answered my own question. To know '$\int_{-\infty}^{+\infty}$ ' is therefore to be positioned outside of this, to be in excess of the thinking of' $\int_{-\infty}^{+\infty}$ '. This is in no way a limit to the perspective which can(not) be chased by the form. Rather '$\int_{-\infty}^{+\infty}$ ' cannot encompass, frame, in a strict sense, the infinities as such. Indeed, how could what has 'overwhelmed' be grasped as such by any (in)finitude?

The rule is that 'sinusoidal waves $e^{i\omega t}$ are eigenvectors of linear time-invariant operators. A linear time-invariant operator L is entirely specified by the eigenvalues *$\hat{h}$(ω)*', such that the operator goes over, in the same space, the 'eigenvalues *$\hat{h}$(ω)*', thus the 'eigenvalues' are here prior to the 'operator'. Can this space be traced further? But this would require an already belonging to what is yet to be, at the outset of the 'eigenvalues' *to be*, if a 'linear time-invariant operator L is entirely specified by the eigenvalues *$\hat{h}$(ω)*'. So if this is to do with 'linear time-invariant signal processing' by which the 'signal' is not itself as such, but instead '*f*', the 'processing' is because of a relationship whereby the 'sinusoidal waves $e^{i\omega t}$ are eigenvectors of linear time-invariant operators'. The 'signal' therefore is constructed to be it(self), belonging to it(self) despite the differences in 'the eigenvalues

$\hat{h}(\omega)$' and also the difference in frequency, '$d\omega$', but this can be arbitrarily small, a difference overwhelmed by some other considerations. What it(self) *is* is perhaps rather to do with the strategy *for* the cohesion, the belonging, which is then borne out of '$\hat{h}(\omega)$' and likewise '$d\omega$' as such, respectively. These form the similarity by a grouping, a frame. The frame which follows.

For indeed, there must, by these frames '$\hat{h}(\omega)$' and '$d\omega$', be a continuity, that the difference is therefore what can be the same because it is not it(self) as such. Perhaps the frequency of it(self), 'ω' attests as much. '$e^{i\omega t}$' which repeats across the specification '$Le^{i\omega t} = \hat{h}(\omega)\, e^{i\omega t}$' *is* therefore, but in being, can here be added to. This circles around '$e^{i\omega t}$': '$f(t) = \frac{1}{2\pi}\int_{-\infty}^{+\infty} \hat{f}(\omega) e^{i\omega t} d\omega$.' So '$e^{i\omega t}$' is the thing; the absolute belonging because of the turn. The imaginary number returns to the beginning as the solution, and *is* over all time – 'time-invariant'. To circle would be the *thing*. That is to say if '$Le^{i\omega t} = \hat{h}(\omega)\, e^{i\omega t}$' then '$e^{i\omega t}$' can be reformulated but nevertheless traced back to this, which is already something other than *just* 'sinusoidal waves': '$e^{i\omega t}$ are eigenvectors of linear time-invariant operators.' *This* as 'sinusoidal waves', and if 'a signal *f* is decomposed as a sum of sinusoidal eigenvectors' then the 'signal' is already decided to be something other – 'a sum of sinusoidal eigenvectors'. And if 'a sum' the multiple is instated to 'decompose', reduce. The (de)composition is known in advance, is composed as multiple already from a singularity of elements: 'sinusoidal eigenvectors'.

And if '$f(t) = \frac{1}{2\pi}\int_{-\infty}^{+\infty} \hat{f}(\omega) e^{i\omega t} d\omega$', '$f(t)$' is only defined if over '$\int_{-\infty}^{+\infty}$'. So this as excessive, as what cannot, in the strict sense, as read above, be known as such; is not that which encompasses, but is that the signal can only *be*, if there is this gesture towards '$\int_{-\infty}^{+\infty}$'. Here, 'a signal *f*', the being of which is to do with 'comput[ing]', is only because of an idea of the 'signal *f*' continuing throughout time. '– ∞' and '+∞' frame this extension so the 'signal' therefore is computed, *composed* to have a history, '– ∞', and a future, '+ ∞': permanence is invoked. And so it would be that a knowledge of something, or some*thing* if such is possible, is founded upon the ability to know its history and future as such. That here, 'a signal', is that which does not change in its habits, that it can be entirely computed *in its loss*. (T)here is rather the integration of the 'signal' as what is already not (t)here – it is what is unnecessary to the computation, indeed cannot be within the composition of it. This 'signal' rather puts it(self) in the way of it(self), here a form – already signalling to it(self). This would be the dialogue, the (trans)form, that there is this crossing over, across which it is not lost as such for it can be traced in the integration.

So the question now would be what is at stake in the transform?

> If has f finite energy, the theory of Fourier integrals […] proves that the amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$ is the Fourier transform of f:
>
> $$\hat{f}(\omega) = \int_{-\infty}^{+\infty} f(t)e^{-i\omega t}\ dt. \qquad (1.3)$$ [118]

That some things cannot be proved by 'the theory of Fourier integrals': '[i]f f has finite energy'. Whether or not 'f has finite energy' therefore must already be assumed to be the case. '[T]he theory of Fourier integrals' is the case for 'the Fourier transform'. There is here a specificity, that 'Fourier' cannot apply in any other case. This system of signalling is a closed system in that sense, a continuum, if 'integrals'. And yet, if 'the Fourier transform of *f*', then '*f*' is not inherent to the 'Fourier transform'. That is to say, 'the Fourier transform' *is* not, but is rather an 'amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$'. There cannot be any*thing* as such as 'the Fourier transform', for the transform would require a differencing, hence the need for the proof of 'the amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$'. A connection is required, for if 'the Fourier transform' is to do with 'each sinusoidal wave $e^{i\omega t}$' it is not that 'the Fourier transform' is one particular number as such. Instead, the repeat of 'the amplitude $\hat{f}(\omega)$ each sinusoidal wave $e^{i\omega t}$' is to be brought into line with 'each sinusoidal wave $e^{i\omega t}$'. So while 'the Fourier transform' is to do with a particular part, 'the amplitude', this part must have reference to what is already taken to be the case: '[t]he Fourier transform rules over linear time-invariant signal processing because sinusoidal waves $e^{i\omega t}$ are eigenvectors of linear time-invariant operators'.

[118] *A Wavelet Tour*, p.2

But this also requires 't' to be constant for 'dt', for there to be a repeat within this same (time)frame of the wave. If the 'amplitude' is what is picked out as the 'signal f', a 'signal' is already constituted by a part, and a part which is to do with the difference from a neutrality, but also that this part is (re)presentative of the whole. Each part will sum to the whole. And since a timespan is required, ' – ∞' to '+ ∞', there is always (not) an originary wave '$e^{i\omega t}$' from which to differ, and defer. And if *from* this deferral (differal) something is, in this, a way of bringing – the transform carries across that which already invokes a before and after – that *after all* not much has changed. Any absolute differing is deferred; both carry with them (but from what origin?) the suspension of judgement. But also that there is something to be brought forth at some point – that this decision is for the future; that whatever may (not) be *now* is important for the future to look back. From the whole part. Although this would (also, still) be a deferral of judgement, now. For the continuum by which there is '$\int_{-\infty}^{+\infty}$' in time is that a whole is the sum of its parts; that approaching a limit of zero, the infinitesimal (but not quite, still there is something), can be repeated across time to know the 'signal'. But why, if there is already a concept of the 'signal', does there need to be the decomposition of it as something other, a translation, after all, 'a signal' is (not) 'f', to then prove?

What proof is there in decomposition as a 'sum'? There is already in the decomposition, and therefore in the concept of 'signal', an idea of having difference within the framing 'signal', to then be divided into (its) parts. Is not the proof therefore to do with the possibility of producing another relationship? Of (re)creating the relationship by which intervals can be gathered together to produce a whole? There is already a framing limit to the 'signal' – would this be the form, so as to know when the part(s) are whole?

But the parts for the integration, this repeat by which the 'signal f' is known, is to do with a 'finite[ness]' – that the 'Fourier transform' is reliant upon this whole to have the part, 'the amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$'. But this is '[i]f f has finite energy' so there is something of the hypothesis in this. There is a rule which follows, but this does not determine whether or not 'f' has 'finite energy'. The necessity of the 'finite energy', and the being of it, would be to do with the construction of the difference of the amplitude. The transform is possible only from an initial finitude – there has to be an idea of stability for there to be the change. So the need for a difference between the amplitude of 'each sinusoidal wave' must remain with the limit of the 'Fourier transform'. The 'Fourier transform', which is governed by '$\int_{-\infty}^{+\infty}$' collapses together the differences in time, '*dt*', a difference in time (direction), which is to say that the transform is therefore the same throughout this time. The difference is the same (constant); there is a cycle here, in that the 'amplitude $\hat{f}(\omega)$', which is (not) the 'amplitude $\hat{f}(\omega)$' but (also) the 'Fourier transform', requires a solution which cannot be thought through solely in terms of '$\mathbb{R}$' since the wave is no longer '$e^{i\omega t}$' but '$e^{-i\omega t}$'. This negativity of '$-i$' would be that the amplitude, which is the 'Fourier transform of *f*' (so a 'signal' should (not) have an amplitude as such, if this is to do with a difference), has to be thought through in another plane. This doubling of amplitude and 'Fourier transform' cannot be thought in the same space, so that the rotation, '$\frac{1}{2\pi}$', which (re)turns the 'sinusoidal wave', is that the 'signal' can be throughout time the same by this turn – within this cycle, one part can be another. Hence the part taking the place of the whole; signal processing would be to do with an idea that the 'signal *f*' is what cannot be understood of itself. If, then, the 'signal *f*' is the whole which is problematic, that is to say, is a heterogeneity, a reduction to waveforms is a separation out. But this requires the waveforms as something readily available for the transformation.

Indeed, it would be that the transform which goes unproven is why a 'signal *f*' can be, and *is* 'decomposed as a sum of sinusoidal eigenvectors'. The transform would be this drive to an idea of simplicity – that a 'signal *f*' *can* be 'decomposed', and that this simplicity is what is *to be achieved.* And yet this simplicity, which requires 'processing' to achieve it, is additional to the 'signal *f*'. And this is because of an idea of what already belongs for:

> Applying the operator L to f in (1.2) and inserting the eigenvector expression (1.1) gives
>
> $$Lf(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} \hat{f}(\omega)\hat{h}(\omega)\, e^{i\omega t}\, d\omega \qquad (1.4)$$ [119]

[119] *A Wavelet Tour*, p.2

Simplicity here is a function of time; that which repeats, and is 'computed' to repeat. The production is to be the same, time invoked for there to be the knowledge of the repeat. Indeed, this time frame guarantees the repeating (difference) and what is the same (difference) throughout time. But this 'signal' is here that which cannot quite be computed of itself if '$Lf(t)$'. It would be that '[a]pplying the operator L to f' is the means by which there is a guarantee of an answer, since '[a] linear time-invariant operator L is entirely specified by the eigenvalues $\hat{h}(\omega)$', the 'signal f' is that about which nothing can be known unless it is bound by a system which is already in place – that of the relationship between operators and eigenvalues.

If '$Lf(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} \hat{f}(\omega)\hat{h}(\omega)\, e^{i\omega t}\, d\omega$', '$f$' has to be already known in some sense for there to be the Fourier transform '$\hat{f}(\omega)$'; 'f' guarantees a continuity. But, this would be a continuity which occurs *after* the initial transform – the move of the 'signal' being considered as a heterogeneous wave which can therefore be 'decomposed as a sum of sinusoidal eigenvectors'. The signal *is* according to the system 'L' and the 'eigenvalues'; these 'eigenvalues' are pre-established, are 'insert[ed]'. There is in this something of an echo. That one signal gives away to another which is itself (again, in time). So this does not *evolve*, but is rather to do with a stasis, or conservation of the system. The parameters can only come back, having been invoked already as a framework of belonging. But if this is an echo, this can only be an echo of which there is no signal, or, which would be the same, its own echo, that there is only signal – whatever information this is to carry is already substituted by a signal: 'a signal f'.

Signal(ling) structure; a system of belonging (elsewhere), so it would be that the signal is formed by the 'eigenvalue', an invocation of what properly belongs, and yet this is to *displace* the signal – that there is no signal outside of this invocation. There is in this a setting up of a structure, a structure *by which* there is a signal; and this must be thought together, that the structure is in no way extractable, something separate from, the signal.

What is at stake in this 'structure'; is there ever a structure as such?

This framework, the '[a]pplying [of] the operator L to f in (1.2) and inserting the eigenvector expression (1.1)' is an exercise in sequencing – '(1.1)', '(1.2)' – and 'gives […] (1.4)'. Perhaps '.4', and along with it '$Lf(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} \hat{f}(\omega)\hat{h}(\omega)$ $e^{i\omega t} d\omega$' is transferred only because of '(1.1)' and '(1.3)'. Together they give over as one the '.4'. But this would involve a summing by which '.1' and '.2' *gives* '.4'. *Not* '.3'. This third (part) does not follow from operators and eigenvalues as such. The 'Fourier transform' cannot be traced out of '(1.1)' and '(1.2)'; but perhaps the reasoning would be in the 'rules over'. For indeed, this third is to do with the possibility of 'finite[ness of] energy' so that there would be nothing in the 'eigenvalues' which guarantees this. The 'sinusoidal wave' which is already played out as other to itself as 'eigenvectors' is not to do with a defined energy. To be 'entirely specified by the eigenvalues $\hat{h}(\omega)$' would involve 'L' being irreducible to a single 'eigenvalue'. Indeed, since this specification is already put in in advance, 'L' is according to a group definition. Any 'energy' is not traceable therefore to a particular source, and yet the 'Fourier transform' demands this. Hence '[i]f f has finite energy'. At the expense of having a system of absolute relation, there cannot be a singularity whereby a 'finite energy' may be. Energy would have to be already everywhere in the 'eigenvalues' for 'L' to be 'entirely specified' and for this to be for all time – 'time invariant'.

The 'signal f' is, for the 'Fourier transform', taken to be constant because of the 'time-invariant operator L', such that the energy is taken over the time(frame) '$\int_{-\infty}^{+\infty}$', and this is to do with discrete intervals – 'dt' – by which '$\hat{f}(\omega)$' is computed. However, if '$\hat{f}(\omega)$' is only known upon the hypothesis that '[i]f f has finite energy, the theory of Fourier integrals […] proves that the amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$ is the Fourier transform of f', and this is a constant signal '*f(t)*', both energy and amplitude cannot change to account for the constancy. And further, the amplitude can only be known if the energy is already thought (some other time frame); that is to say, there is the impossibility of knowing both together, or rather perhaps deriving both together. It would be that energy is equivalent to the amplitude, but because a 'linear time-invariant operator L is entirely specified by the eigenvalues $\hat{h}(\omega)$', and this is what frames the computing of the signal, such that the energy cannot, in these terms, be localized to a particular eigenvalue, '(1.3)' cannot *give* '(1.4)' in conjunction with '(1.1)' and '(1.2)'. Energy and amplitude therefore would be a signal(ling to) identity which cannot be thought together. For if the processing of the signal is to do with a decomposition, but only within set limits of what is already in relation, that is 'entirely specified by the eigenvalues $\hat{h}(\omega)$', there cannot be a production of difference which would be the 'amplitude' or the 'energy'. There is, within the 'entirely specified' structure of the 'operators', 'eigenvalues' and 'eigenvectors', a need for these to always *be*. There is no differencing from what is already considered to be the case as what should be the same.

The issue is to do, therefore, with how 'eigenvalues' and 'Fourier transform' is thought. To be 'entirely specified by the eigenvalues $\hat{h}(\omega)$' would involve a definition which does not need to borrow from elsewhere; there is here a self-sufficiency, so that if '$Le^{i\omega t}$ = $\hat{h}(\omega)\, e^{i\omega t}$', although 'sinusoidal waves' are (also) 'eigenvectors', this transfer to 'eigenvectors' would be that the 'eigenvectors' can be divided in a way 'waves' cannot. So 'L' therefore, in being 'entirely specified by the eigenvalues $\hat{h}(\omega)$' would be to know what 'L' is in its division. '[E]ntirely specified' would be a translation which does not lose anything. However, this notion of an absolute transferral requires an ability to already know what something is, in this case, 'L', to be able to transfer and know this transferral. Hence the 'eigenvalues' as what 'entirely specifie[s] L'. But if what will occur from the 'decompos[ing] as a sum of sinusoidal eigenvectors' is known, or at least projected that it is known, any 'signal' will always reduce to the same set of 'eigenvalues'. Is this not the circle again? For in these terms, there is nothing but a circle. So that if '[t]o compute Lf, a signal f is decomposed as a sum of sinusoidal eigenvectors', this reduction cannot but 'compute' the signal in terms of what is already known. The limit, or rather the reduction to what is set up as the true constituents of the 'signal f' is already decided – the limit would be the being-rule.

This limit plays out in the contradiction within the system, that '(1.3)' cannot, along with '(1.1)' and '(1.2)', settle the account of the signal. That is, for there to be consistency within the system, that is, for one thing to be 'entirely specified' by another would demand that each term has an absolute relation to another, indeed, 'eigen-' being this. *However*, '(1.2)' and '(1.3)' would be incompatible in settling accounts because of the common terms. That is, '(1.2)' does not demand a definite energy of 'f' at particular intervals because '*f(t)*' is taken as a whole. However, because '(1.3)' involves 'finite energy', there is the requirement that the energy of 'f' can be divided into smaller amounts. And because this cannot occur within the same space, as read above, the '$-i$' allowing for this move, the 'amplitude $\hat{f}(\omega)$' has to be known as the constituent parts by which 'f' can be made. That is to say, at a particular point, what was thought of as whole, 'f' has to be divided further. It would be that the 'Fourier transform' generates a set.

Or is rather *set to* generate.

Proof to follow – 'the theory of Fourier integrals […] proves that the amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$ is the Fourier transform of f' – and *still* more, since it is 'each sinusoidal wave'; the difference by which there is an 'each' is also the difference which cannot be itself a difference as such – is to be accounted for by another 'theory', a theory of being: 'is the Fourier transform of f'. Except, this theory cannot follow, unless this following, the proof of being other to come is already inscribed in this being. The 'Fourier transform' is set, 'entirely specified'. It is something of a foregone conclusion if there is already an idea of what does (and so, *not*) belong. And if this is to do with 'linear time-invariant operators' and the processing of '*f(t)*', by its own claims this linearity of time must circle back on itself to (re)produce what is *eigen*-.

This linearity, or at least an idea of linearity is what (re)turns for '[t]he uncertainty principle states that the energy spread of a function and its Fourier transform cannot be simultaneously arbitrarily small.'[120] For if '$\forall\omega \in \mathbb{R}$, $Le^{i\omega t} = \hat{h}(\omega)\, e^{i\omega t}$', this being 'entirely specified' would have to do with a difference which holds as difference. This specification cannot be anything other than '$\forall\omega \in \mathbb{R}$, $Le^{i\omega t} = \hat{h}(\omega)\, e^{i\omega t}$'. And to say this is the case, and process ahead (although *to* what, and how can I be certain of direction, by the way?) the question would be now, why, when there is a 'rul[ing] over', the uncertainty principle demands that 'entirely specified' does not entirely hold? It would be to do with a relationship between 'the energy spread of a function and its Fourier transform', and that any

[120] *A Wavelet Tour*, p.2

single system cannot hold universally.

I would like to now think through the implications of Heisenberg's Uncertainty Principle in relation to signal analysis, for although signals would be to do with energy, the Fourier transform would demand a specific limit on the energy which is otherwise constituted over time.[121] To further analyse this, I here re-quote:

> If f has finite energy, the theory of Fourier integrals […] proves that the amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$ is the Fourier transform of f:
>
> $$\hat{f}(\omega) = \int_{-\infty}^{+\infty} f(t)\mathrm{e}^{-i\omega t}\, dt. \qquad (1.3)$$

It would be a question of thinking about 'energy', and in particular, the 'energy spread of a function'. If both 'cannot be simultaneously arbitrarily small' and 'the amplitude $\hat{f}(\omega)$ of each sinusoidal wave $e^{i\omega t}$ is the Fourier transform of f', the 'finite[ness]' required for this is to do with a division of the energy at a particular point, '$\hat{f}(\omega)$', not throughout '*f(t)*'. Indeed, since here, '$\hat{f}(\omega) = \int_{-\infty}^{+\infty} f(t)\mathrm{e}^{-i\omega t}\, dt$' so the difference is '*dt*' rather than '*dω*' for the computation of the signal, the 'Fourier transform' cannot account for the 'energy spread' because 'the Fourier transform' is to do with a localizing of energy, that is, the construction of energy as an amplitude which is itself the 'Fourier transform'. '[T]he theory of Fourier integrals' demands, in advance, the 'finite energy', such that the 'energy' can be only integrals of the 'Fourier transform'. The 'energy' is a whole (of a)part, and therefore the 'Fourier transform', in claiming the energy as, in each case, 'the amplitude $\hat{f}(\omega)$', cannot account for the signal as a whole. '[T]he energy spread' therefore is dependent instead on '*dω',* so that energy, in this conception, is not considered to be divisible into parts or indeed, parts which repeat as the same (difference).

[121] See Don Lincoln, *Understanding the Universe: From Quarks to the Cosmos* (Hackensack, N.J.: World Scientific, 2005), particularly p.432 and p.510, for further discussion of energy conservation, and how Heisenberg's Uncertainty Principle provides a loop-hole for this, for, as Lincoln points out, strict conservation would mean that nothing can change. But what I find particularly interesting is that there nevertheless has to be an overall *average* of the same energy in a particular space; that is, *over time* there has to be a generality which holds. I am thinking, now, about symmetry, and what appears to be the same despite operations.

In each case, 'energy' is itself (re)presented as a function that is dependent upon something other to be itself. Energy cannot be considered a constant.

And yet, '[e]ach elementary signal can be considered as conveying exactly one datum, or one "quantum of information."'[122] The assertion would be a one-to-one correspondence between 'elementary signal' and 'one datum', such that any signal would have one referent only, and (again) the 'conveying' would be the 'signal' as that which presences the 'one datum'. This invokes the structure of content and form, such that 'one datum' is somehow extractable from the 'signal', and the ability to know the information as content, and as separable from the signal and its representation, despite Gabor's 1946 article discussing the problems of Fourier analysis:

> [Alt]hough mathematically this theory is beyond reproach, even experts could not at times conceal an uneasy feeling when it came to the physical interpretation of results obtained by the Fourier method.[123]

Information is not always already known, if it requires 'interpretation', and that there is a 'physical interpretation' constitutes any idea of object *as* an interpretation. Information conveyed by the signal is not universal. There is something which does not signal as such; the unease would be a difficulty in the necessity of a further turn, another signal to what is 'physical interpretation'. Information is not an end in itself. This play of supplementation is picked up elsewhere in terms of mathematics as representation of something 'natural' in Fourier Analysis.[124] Yet this hinges upon the same issues discussed here, namely that there is the assumption of the 'natural', which can be known of itself, despite the representation, and yet this apparently unproblematic representation requires interpretation, and the surety of a mathematical framework.

The 'uncertainty' in relation to 'the energy spread of a function and its Fourier transform' is bound up in that '$\hat{f}(\omega) = \int_{-\infty}^{+\infty} f(t)\mathrm{e}^{-i\omega t}\, dt$' is not applied to '$f$' to give '$Lf(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} \hat{f}(\omega)\hat{h}(\omega)$

[122] Dennis Gabor, 'Theory of Communication', *Journal of the Institution of Electrical Engineers*, 93 (1946), 429-457 (429)
[123] 'Theory of Communication', p.431
[124] See: Takashi Nitta, and Yves Péraire, 'Divergent Fourier Analysis using degrees of observability', *Nonlinear Analysis: Theory, Methods,* 17.12 (2009), 2462-2468

$e^{i\omega t}$ *dω'*, as is the case with '(1.1)' and '(1.2)'. It would be that the '$\hat{f}(\omega)$' cannot be thought as the 'Fourier transform' as such, but rather 'the amplitude' within '$Lf(t) = \frac{1}{2\pi}\int_{-\infty}^{+\infty}\hat{f}(\omega)\hat{h}(\omega)\, e^{i\omega t}\, d\omega$' and also '*f(t)* = $\frac{1}{2\pi}\int_{-\infty}^{+\infty}\hat{f}(\omega)e^{i\omega t}d\omega$' because both terms '$\hat{f}(\omega)$' and '*f(t)*' repeat. That is to say, if '*f(t)* = $\frac{1}{2\pi}\int_{-\infty}^{+\infty}\hat{f}(\omega)e^{i\omega t}\, d\omega$' is the computing of the signal, '$\frac{1}{2\pi}\int_{-\infty}^{+\infty}\hat{f}(\omega)e^{i\omega t}\, d\omega$' is in some way already known to be able to compute the signal. And yet '(1.3)' would demand that '$\hat{f}(\omega)$' is reliant upon the knowing of '*f(t)*'. The signal therefore would be dependent upon two separate functions, '*(t)*' and '*(ω)*', despite, in each case, being defined through one, '*f(t)*' and '$\hat{f}(\omega)$'.

And yet even in its last turn (here), '$\hat{f}(\omega)$' is not so much the signal as such but the 'amplitude [which…] is the Fourier transform of *f*'. The 'signal' is not '$\hat{f}(\omega)$', and if '[t]he Fourier transform rules over linear time-invariant signal processing' it is because there is no signal to rule over. If there is a necessity for processing signals, 'structures in speech and music recordings'[125], there is in this already the paradox that although 'speech and music' requires a decomposition, and can be decomposed, this is framed by a requirement to know of, hear, the very thing (but is it?), 'speech and music', which cannot be what is understood if they require processing. Why process if the 'answer' is already in place? If there is already a claim to what is characteristic, belongs – is already 'entirely specified'? *Eigen-*

And if 'speech and music' or any 'signal', I could say wave, *ψ*, *is* already specified, is in some way, heard, listened to, 'seen' – but perhaps this listening is itself a phantom (echo?), in what sense do I hear the Fourier transform? – this processing of a signal would be somewhat redundant – surely 'already specified' would be already known, and known as such, if this strict linearity of one for another, absolute translation, could be maintained.

And time? How is 'linear time-invariant signal processing' maintained? For throughout, 'linear time-invarian[ce]' invokes an absolute, that time would be in sequence, the continuity guaranteed by '$\int_{-\infty}^{+\infty}$'. Somehow, '*f(t)* = $\frac{1}{2\pi}\int_{-\infty}^{+\infty}\hat{f}(\omega)e^{i\omega t}\, d\omega$' would account for time as a totality. Yet '*f(t)*' is

[125] *A Wavelet Tour,* p.3

reliant upon a (re)invocation of time in terms of '$\int_{-\infty}^{+\infty} \hat{f}(\omega)e^{i\omega t}\ d\omega$'. Time circles, but also that '*dω*' constitutes this idea of a constancy of time (and also the signal *f*). And yet '*dω*', to be to do with a difference in the frequency, cannot but be known as a difference of the same ('*ω*'), by a timing. There is a (re)constitution of time as a repeat with the frame of '*dω*'. So if '*f(t)*' is a linearity, not only, as read earlier, do the 'eigenvalues' disrupt the sequence, but also, that '*ω*' must also be to do with another timing, that time is here doubled to (re)constitute what *would be* an absolute. Hence the contradiction giving rise to the uncertainty principle – one doubles.

The limit to Fourier transform therefore can be read as something of a paradox, if not ironic, that what is governed by the eigenvalues, that is to say, what guarantees what is most proper, or characteristic of the signal it produces, is also that which limits it. The structure would resist any thinking differently. The limit of the Fourier transform that it cannot account for difference is such that what is characteristic, 'eigen', is a lack. This transform cannot account for all signals, but must be supplemented.

I would now like to think around *why* wavelets are a supplement for the Fourier transform in signal analysis – that 'signal' *now requires* another revision.

What comes back? The question would (still) be that ~~what~~ comes back, (re)turns, is, whether or not transformed. And this would be the assumption here, to come:

> In reflection seismology, Morlet knew that the modulated pulses sent underground have a duration that is too long at high frequencies to separate the returns of fine, closely-spaced layers. Instead of emitting pulses of equal duration, he thus thought of sending shorter waveforms at high frequencies. Such waveforms are simply obtained by scaling a single function called a *wavelet*.[126]

The idea of belonging, and what is characteristic, *eigen*–, is here to do with the 'returns of fine, closely-spaced layers' which cannot be 'separate[d]', and yet is known to be the case. That there are 'fine closely-spaced layers' is already a separating in the assertion of the 'layers'. The 'pulses' are no

[126] *A Wavelet Tour,* p.4

longer 'pulses' in the turn. There is at work some system of exchange, and a dispersal within limits, of what comes back. The issue in this system would be time, that 'the duration […] is too long'; there is no prospect of a (re)turn. But would not this be a gesture to a linearity of sorts? That there is no return? Yet the time frame is governed by the 'pulses' which are also 'waveforms'.

And another turn would be that the 'waveforms' are derivative of 'a single function called a *wavelet*.'

> A wavelet ψ is a function of zero average:
>
> $$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$$
>
> which is dilated with a scale parameter *s*, and translated by *u*:
>
> $$\psi_{u,s}(t) = \frac{1}{\sqrt{s}}\,\psi\,\left(\frac{t-u}{s}\right). \qquad (1.8)$$ [127]

But yet another turn would be that the 'wavelet ψ' is also 'a function of zero average'. Although (again) this is not in sequence with the rest: '(1.1)'… '(1.7)', and '(1.8)'. So if this being out of sequence is not to do with a computing, an alteration – 'dilated' or '[a]pplying' and 'inserting' – '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$' is a function which had to have already been produced. That is, the beginning of the 'separat[ion of] the returns of fine closely-spaced layers' is carried over on the assumption that all 'waveforms' have the same structure, and as the problem was one of 'duration', the 'wavelet ψ' is one of time, '*(t)*'. However, since this is 'a function of zero average', a 'wavelet ψ' is produced as without difference – there is 'zero average' such that this sameness would be a totality, homogenous. And indeed, this unity is what must be taken as already produced, that is, cannot *here* be what is at stake, for indeed the 'wavelet' is what is to be worked *with*, since '[s]uch waveforms are simply obtained by scaling a single function called a *wavelet*.' There is then no time lapse '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$'; that is, a 'wavelet' is a production of time as '0'.

A time *lapse.*

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[127] *A Wavelet Tour,* p.5

And this production of time, that the 'wavelet' functions to relate this time lapse, enables there to already be a 'wavelet ψ' to begin - a 'wavelet', not a signal. However, because '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$' this cannot evolve in time as such because it is produced to relate time to '0'. That it is 'dilated […] and translated' is therefore the means by which, as a function, it can shift in time as one thing. '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$' does not exist over time therefore; it would be that the 'wavelet ψ' would be a presence – or rather the gesture, signal, towards it, but does this not already undo the presence? – that is readily available (produced as), (t)here in that it does not exist continuously, and so requires the shift of translation by '*u*'. And so, if '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$' is a signalled presence (although this formulation could well itself be a tautology), in that *being* is not over time, '*u*', as what 'translate[s]' '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$' is a translation of a presence. But if this is the case, presence, as with time, is only in the lapse of it, and is without its own spacing, for '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$' is not in sequence. So if '$\psi_{u,s}(t) = \frac{1}{\sqrt{s}}\psi\left(\frac{t-u}{s}\right)$' is because of '(1.8)' then '*s*' and '*u*' are already a system which is in excess of '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$'. So '$\psi_{u,s}(t)$', while (still) a function of time, is *now*, also in relation to '*u*' and '*s*'. That is, the function, 'ψ' can now be placed because of the (dis)placement constituted by '$\psi_{u,s}$', because it does not take up a time except in its lapse. But the addition of the (dis)placement is that '$\int_{-\infty}^{+\infty} \psi\,(t)dt = 0$' as a production of presence cannot *be* anywhere as such, for indeed, this presence is rather that it is presence only in the absence of that which it relies upon.

However, since 'a wavelet ψ is a function of zero average', '$\psi_{u,s}(t) = \frac{1}{\sqrt{s}}\psi\left(\frac{t-u}{s}\right)$' is constituted by a repeat in the relationship between '*u*', '*s*' and '*t*'. Therefore, '*u*', '*s*' and '*t*' are related in such a way that the system, '$\left(-\right)$' is one in which these terms are reducible. That is to say, this system is the production of a difference within itself, but from which '*u*', '*s*' and '*t*' are not themselves reduced. Yet if '$\psi_{u,s}(t)$' is constituted by a reduction of '*u*', '*s*' and '*t*' and these can be reduced, it would be that '*u*', '*s*' and *'t'* are to be thought as continuous with one another to be reduced. The 'translat[ion] by *u*' would shift the 'wavelet', but it is also that '*u*' is a 'position'.[128]

> The wavelet transform of f at the scale s and position u is computed by correlating *f* with a wavelet atom:
>
> $$Wf\,(u,s) = \int_{-\infty}^{+\infty} f(t)\,\frac{1}{\sqrt{s}}\,\psi^*\left(\frac{t-u}{s}\right) dt. \qquad (1.9)$$[129]

To be 'translated by *u*' therefore would be that the (dis)placement of 'ψ', and the positioning of it, is in excess of 'ψ'. Yet if the initial move is the 'translat[ion] by *u*' such that '*u*' is not that which is 'translated', but rather a measure by which the translation of the wavelet occurs, it would be that there is also another move in which '*u*' as 'position' is itself moved to be that which determines *where* '*W f (u,s)*' is. To be 'translated by *u*' would not necessarily position a wavelet in space. Rather the 'translat[ion] by *u*' as such would be a move which circumvents '*u*'; there would only be the move of the (dis)placement, 'by' (the way; mapped). And yet if the 'translat[ion]' is in a relationship to time, '*t* – *u*', and the 'wavelet' is produced as 'a function of zero average', and the 'wavelet' is to do with '0' in terms of itself as a function of time, this move would be local in the sense that there cannot be a length of time in which this 'translat[ion]' occurs. '$\psi_{u,s}(t) = \frac{1}{\sqrt{s}}\,\psi\left(\frac{t-u}{s}\right)$' does not occur throughout time; indeed it can only have already happened, and in the sense that it is not sequential, there is no integration here.

A translation produces the wavelet wholly elsewhere having been translated. That is to say, there cannot be a lapse in time for this translation to occur (and so there is *only* a lapse in time). Time is introduced in '(1.8)' as an idea of continuity, with the integration, '*dt*', and when '*u*' is a position. It would be that only having been transformed, that is, '*W f (u,s)*', can there be a position as such. While the 'wavelet' is considered to be discrete, that is, without a repeat to be integrated, the 'signal' has to occur over time. Time would here affect any 'translation' of the wavelet as such, and indeed, this changes how the part and whole is thought; if the wavelet is not to do with a repeat, that is, it is

[128] *A Wavelet Tour*, p.5
[129] *A Wavelet Tour,* p.5

‘translated’ with*out* time, the ‘signal’ cannot be thought to be a summing of the wavelet as such. And indeed, if ‘[t]he wavelet transform of *f* at the scale *s* and position *u* is computed by correlating *f* with a wavelet atom’, any idea of ‘correlating *f* with a wavelet atom’ is that there must be a difference between ‘*f*’ and ‘a wavelet atom’ for there to be the ‘wavelet transform’.

And yet this difference is, ‘by correlating’, that the ‘wavelet transform’ is the production of a connection. The connection, that which is the difference which is a similarity (although this would indeed be a tautology), is that the connection is established to be analysed. The analysis of the signal is by means of the establishing of a connection. What is analysed is not so much ‘*f*’ as such, but a reflexivity (of the correlation) by which ‘*f*’ is different to ‘a wavelet atom’. Indeed, if the ‘wavelet transform’ is that which is in addition, the connection, ‘correlat[ion]’, is such that analysis can only be an additional loss, and any ‘correlating’ would be therefore that ‘*f*’ and ‘a wavelet atom’ can *be* ‘correlated’ only because of the ‘transform’. This additional connection, that ‘$t - u$’ is (in part) what guarantees an idea of ‘ψ’ since ‘*(t)*’ is the variable by which ‘ψ’ is constituted, is that there is no contradiction between ‘*t*’ and ‘*u*’, but this connection proceeds from an assumption that there *is* no contradiction between the two.

And yet:

> The wavelet transform of *f* at the scale *s* and position *u* is computed by correlating *f* with a wavelet atom
>
> $$W f(u,s) = \int_{-\infty}^{+\infty} f(t)\frac{1}{\sqrt{s}}\,\psi^*\left(\frac{t-u}{s}\right)dt. \qquad (1.9)$$

A(nother) question now would be what it is which marks (already the (re)presentation) the difference of ‘wavelet’ and ‘wavelet atom’ and why such a distinction should be made. For:

> Gabor atoms are constructed by translating in time and frequency a time window *g:*
>
> $$g_{u,\xi}(t) = g(t-u)\,e^{i\xi}.$$ [130]

[130] *A Wavelet Tour*, p.3

Atoms are defined by coordinates, '$g_{u,\xi}$' such that '$\psi_{u,s}$' would also, by this logic, be an 'atom'. Atoms would be to do with that which is defined by a reliance on the idea of (dis)placement as read above, and addition. If atoms are defined by coordinates, this is (also) to do with space, and the ability to define a division in space. So if 'atoms' are 'constructed', their necessity would be to do with a need to position something, that is, a construction of a difference in space. For if 'atoms', whether 'wavelet' or 'Gabor', are to do with '$_{u,\xi}$' and '$_{u,s}$' and this is a (re)naming of a division of space, in that a part is defined by this naming, not only would 'translated by *u'* involve an absolute position from which 'translated' can be known as such, and also for 'dilated by *s*' to know the change, but space would also have to be homogenous to be able to trace this. And yet, this cannot be a homogeneity as such, if atoms are defined by a differencing of this (homogenous) space.

For indeed, '*s*' (and also '*u*') would be a measure and the production of the change. Indeed, 'by' these, such that there is no exhaustion of either, can 'ψ' be traced. '*s*' and '*u*' are themselves positioned as an external alteration to 'ψ', and so these modifications can be repeated. And if it is '*t* – *u*', '*t*' and '*u*' are considered to be differences within the same ground – that is, that one involves the other; it would be that a 'translat[ion] by *u*' begins with an idea of *being* (time). For if 'ψ *(t)',* and it is a 'zero average', this 'zero average' can be moved 'by *u*', and as such; 'by *u*' would involve a time difference.

However, if the 'atoms' are constituted by a naming, and this is a separation out of space, atoms are space, or, which would *amount* to the same thing, a framing of space. These 'atoms' interrupt any homogeneity as such to space; they are constituted by a (re)iteration. And if '[t]he wavelet transform decomposes signals over dilated and translated wavelets'[131] and that '[t]o analyze signal structures of very different sizes, it is necessary to use time-frequency atoms with different time supports'[132], the 'time-frequency atoms' are these 'dilated and translated wavelets', so there is a need to construct a base, the 'dilated and translated wavelets', a construction of 'atoms' – has the ground been reached yet? Here are a series (although perhaps this is too much of a continuity), of

[131] *A Wavelet Tour*, p.79
[132] *A Wavelet Tour*, p.79

(re)iterations of what is (the ground), the production of which is, according to the (shifting) ground, able to divide that which produced it (in part), into something other.

Although if there is a shifting ground, can there be a ground as such?

> Ridding signals and images of noise is often much easier in the wavelet domain than in the original domain. With wavelets, noise can be removed from a great many signal types, including those with jumps, spikes and other nonsmooth features […] in the underlying signal. The procedure works […] to reconstruct the original signal minus the noise.[133]

The ground might well be an aesthetic of similarity, or smoothness – that the 'underlying signal' is to do with a unity, and this is to be produced as 'original […] minus the noise'. The 'original' can nevertheless be preserved despite the reduction of any difference; this 'noise'. And yet what is 'original' is constituted, indeed, (re)constructed, by the difference of 'minus the noise', the very difference which is to be exorcised. So why the drive to a similarity, a loss of 'noise'?

> The efficiency of wavelets in portraying signals and images with discontinuities is a key to their helpfulness with problems such as data compression and noise removal. Moreover, in some contexts the wavelet transform (the picture of the decomposed wavelets) is also easy to interpret.[134]

Efficiency is *not* a holding of something, a grasp of it, for it always remains to 'interpret', as with the Fourier transform, regardless of whether or not interpretation is easy. And indeed, this 'efficiency' is also a 'portraying [of] signals and images'. Efficiency holds off, at a distance. For this 'efficiency' would have to do with the drive to similarity, the 'noise removal' and 'data compression'. Would it not be that 'efficiency' is therefore constituted by a loss of what the 'wavelet transform' does, and that if 'in some contexts the wavelet transform […] is easy to interpret', the 'portraying' by the 'wavelet', the 'compression' and 'noise removal' as what is additional, is then replaced by a 'context', what is *not* the 'wavelets' to be able to 'interpret'? The 'wavelets' as such would be that which

[133] A. Bruce, D. Donoho, and H.Y. Gao, 'Wavelet Analysis', *IEEE Spectrum*, 33.10 (1996), 26-35 (28)
[134] 'Wavelet Analysis', p.26

cannot be interpreted of itself, is, in being an absolute compression of date and removal, what cannot be read.

The '[e]fficiency' would be a glossing of the 'discontinuities', for if, '[w]ithout knowing the specific purpose of the transmission it is impossible to decide which is the most economical system of selection and specification'[135] only an end as such, and an intention of what the transmission is *for*, (another signal), would guarantee an efficiency. That is, efficiency relies on absolutes, a limit and a transparency of everything as such, and yet this is what the signals of signals, (wavelets) cannot give; there is a holding (back). But perhaps it is rather that there is nothing to give. And so if the end is drawn by interpretation, since the 'specific purpose' is not known, 'efficiency' likewise remains to be. There is some other aesthetic at work in the efficiency drive: that of continuity, if 'data compression and noise removal' are 'problems'.

But is this efficiency?

So if 'it is necessary to use time-frequency atoms with different time supports' there is a relativity at stake. That is, 'time-frequency atoms' are here a group defined by the 'different time supports', so that the time differences are in relation to the initiating function '$\int_{-\infty}^{+\infty} \psi(t)dt = 0$'. From this position is there a knowledge of the differences in time. Although '*(t)*' would be that which 'ψ' is dependent on, and can only result in a specificity, time is also to be thought as in excess of the 'time-frequency atoms' if 'with'. What 'supports' would be necessary for the analysis of difference; that is, what is itself already positioned as difference, 'with' is what enables analysis. But this is not so much difference analysing difference, because of the 'use' – there is some ordering power here in the 'use', which is perhaps inflected in the method '[t]o analyze signal structures'. The 'structures' as a rule, that this could be of use – is this not also bound up with the idea of translation; it can be elsewhere. Or perhaps if this is to do with a reduction to a rule of 'use', the supporting structure, 'different time supports' frames, and gives over, a structure to the 'signal'.

[135] 'Theory of Communication', p.430

I might signal to what has been read before *to* conclude – that there is always an already to be reiterated: (t)here is already an analysis at work in wavelet transform. It is known that '[t]o analyze signal structures of very different sizes, it is necessary to use time-frequency atoms with different time supports.' *Already*, a knowledge of 'signal structures', and their respective 'sizes', to account for the 'necessary'. It is a measure of the validity of what is used. But I might signal to just how far this knowledge is a totality, *already. Already* I might have lost it in the signal. All ready to go again. Yet this judgement would involve an idea of being already in possession of what the 'signal' is, prior to analysis. This analysis would also be, if '$f \in \mathbf{L}^2$ $(\mathbb{R})$'[136], to do *with* and *by* – a translation. Since '$f \in \mathbf{L}^2$ $(\mathbb{R})$', the wavelet transform involves 'ψ^*', so that the inverse of 'ψ' is required to produce a value within '$\mathbb{R}$'. This translation, carrying across a division of what is (not) permissible since the bounds are already drawn, is to claim an ability to leave, as itself, the object. The 'translation by *u*', and the 'correlating *f* with a wavelet atom', is to set the bounds of what *is* – that two can be maintained, and there is a separation. Indeed, that 'ψ^*' is necessary is perhaps rather that what is necessary cannot be found *with*(*in)* any (one) system. One is the other is t(w)o one. The 'signal' therefore is always already displaced, replaced, by the formulae which constitute it.

Here a signal to (re)turn to the beginning: $\mathbb{R} \in i$.

(Hear): An echo?

To signal to the beginning (any thesis T) with the claim that:

> [A]ccording to de Broglie, the wave associated with an electron in a circular orbit must have a wavelength that just fits into the orbit a whole number *n* times, so $2\pi r = n\lambda$, and therefore
>
> $$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r. \qquad (1.3.5)$$
>
> Using the nonrelativistic formula $p = mv$, this is the same as the Bohr quantization condition (1.2.4 [$m_e vr = n\ \hbar$, $n = 1,2, \dots$]) […]
>
> According to the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$, the wave function $\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\ \omega t)$ of a free particle of momentum **p** and energy E satisfies the differential equations

[136] *A Wavelet Tour*, p.79

$$-i\hbar\nabla\,\psi\,(\mathbf{x},t) = \mathbf{p}\,\psi(\mathbf{x},t), \qquad i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},t) = E\,\psi(\mathbf{x},t).$$[137]

Accordingly, I might make a few connections, or at least, (re)make a few connections to myself, just in case I did not make them before.

I cannot say what it is *exactly,* for I am (might be) circling around the *is* that never *was*.

Nothing remains: 'the wave associated with an electron in a circular orbit must have a wavelength that just fits into the orbit a whole number *n* times, so $2\pi r = n\lambda$'.

It is a bit touch-and-go, 'just', that is, how to introduce what *remains*: there is already 'the wave associated with an electron', 'the wave' is not the 'electron', and yet, what 'must' be handed over, or at least have a hand in the 'associat[ion]' is that there is 'a wavelength that just fits into the orbit a whole number *n* times'. Nothing remains, except that which has to be handed over, to itself, as what it already has – 'must have a wavelength that just fits'. Although if this 'wavelength' is what is to fit exactly, nothing outside the remainder, the 'wavelength' *is* yet *to be*. '[S]o $2\pi r = n\lambda$' is as much to say that the 'wavelength' is constituted by '$2\pi r$'; a repeat which would be the circle, the 'orbit'.

I cannot say what it is exactly, except that I would be repeating *myself*.

And in any case, the limits are already in place '$n\lambda$'.

Are they? For if I have *already* read that '$2\pi r$' is in some way to do with the circle – the 'orbit' as what the 'wavelength' 'must […] just fit[…] into' – the 'orbit', if '$2\pi r = n\lambda$', is nothing other than the 'wavelength' that 'just fits'. It would be that the 'just fits' is *just* the limit as what was already in place to come back round. That to have turned *again*, and here I could repeat myself in (the) turn, '$2\pi r = n\lambda$', is that the 'orbit' is the 'wavelength'. It *just* is.

Just (about) '='.

I have to hand it to 'de Broglie', nothing remains as such.

Except perhaps 'the whole number': the whole remains.

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[137] *Lectures on Quantum Mechanics*, p.12

‘$n\lambda$’; I cannot say this is a ‘wavelength’ – it would rather be that it is *a* wavelength – this ‘whole number n’, on the whole, is what remains to constitute the circle – the return to the fit is that there is ‘n’; fits in with whatever a ‘whole number n’ is.

‘λ’, just in case, on the whole, ‘n’ did not, of itself, just fit into –

‘orbit’? That there is already a circulation at work, accordingly.

But the association would be this circulation as what *is* put in place as already being, rather than there being a history as such. (Am I out of pre-history yet?)

Although, this ‘orbit’ is also that there cannot be an idea of ‘$n\lambda$’ outside of ‘$n\lambda$’ being more than itself – that this (too) must be multiple. Not just itself, but itself multiply, and multiply other as the same – it just fits in to what is already the limit of what it is to be thought of *as*. ‘$n\lambda$’ would *make up* the ‘orbit’ in it ‘just fit[ting]’. The limit might (just) be thought another way – but this just might be to already be (another remains, which I have, in some way, handed over, as that which it does (not) have): that it ‘just fits’ and does *only this, just this* – it ‘just fits’ which would already have gone beyond what it is to justify the (limit of the) ‘orbit’. For the ‘orbit’, by this account, would be that which remains to be constituted by ‘$n\lambda$’; (or) again the ‘orbit’ of the ‘electron’ would have to be that which is already maintained.

But just how to think this ‘orbit’ when *just* what it is is what is (in)sufficient if ‘$2\pi r = n\lambda$’?

For, if I (re)read ‘$2\pi r$’ as the framing (limit), I could equally, ‘=’, (re)read ‘$n\lambda$’ as the (re)framing of ‘an electron in a circular orbit’. So ‘an electron’ is already in ‘orbit’, that is, already circling. But to be already circling, in ‘orbit’, ‘an electron’ cannot be thought outside of the substituting of one frame for another which is known to be the same (difference); it *just fits* could (equally) be read as the close of the circle – that nothing more can be said.

It *just fits*, because it has to – there is (no) explanation – I can only (re)write a tautology which conveniently brings me back to the same – it just fits.

And if I were to index it?

(1 –)

(2 –)

(Which 1 – ?)

$$‘p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r. \qquad (1.3.5)’$$

‘(1.3.5)’ If I am to *index*, what is it that I am going towards? To say? ‘$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$’. I could only *index* if I knew, that is, if I could, in some way, hold in place that which is ‘$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$’, and if *that which is*, I have already lost (decided(ly)), that ‘$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$’ is indexing itself as what it is not. (3 –).

So to circle around ‘$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$’ a little longer (how much longer? Having invoked time I will have to (re)think how time is at stake in the circle – would I know the circle of time if I am within the circle as such?), there remains something to say (index?) on the associating of an electron with a wavelength.

But *just* to start (again), ‘$p = \hbar k$’ would be a thinking of the ‘electron’ in terms of the photon:

> For light, according to Einstein, the energy of a photon is $E = hv = \hbar\omega$, and its momentum has a magnitude $|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$, so de Broglie was led to suggest that in general a particle of any mass is associated with a wave having the four-vector $(\mathbf{k}, \omega)$ equal to $1/\hbar$ times the four-vector $(\boldsymbol{p}, E)$:
>
> $$\mathbf{k} = \boldsymbol{p}/\hbar, \qquad \omega = E/\hbar \qquad (1.3.1)$$

For this to be a possibility, that is, for the ‘electron in a circular orbit’ to be thought to have the momentum of a photon in terms of ‘$|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$’, ‘$|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$’ would have to be to do with the ‘general’. It cannot be to do with ‘$|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$’ as such, not least because ‘$p = \hbar k$’ is not to do with ‘magnitude’, and indeed, ‘p’ is not ‘$|\mathbf{p}|$’, but also ‘k’ is not ‘$|\mathbf{k}|$’, so neither, then, can ‘$p = \hbar k$’ be to do with vectors as such.

At least, not *now* if:

> According to the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$, the wave function $\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\,\omega t)$ of a free particle of momentum **p** and energy E satisfies the differential equations

$$-i\hbar\boldsymbol{\nabla}\,\psi\,(\mathbf{x},t) = \mathbf{p}\,\psi(\mathbf{x},t), \qquad i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},t) = E\,\psi(\mathbf{x},t).$$

So why is it that '$p = \hbar k$' is not (t)here a vector, but '$\mathbf{p} = \hbar\mathbf{k}$' is required for the 'satisf[ying of' the differential equations'? If 'the wave associated with an electron in a circular orbit must have a wavelength that just fits into the orbit a whole number *n* times', the parameters are already set, at least initially, for *where* the 'electron' is to be (found).

I could say re-found, re(dis)covered.

There already being this placing of the 'electron', '$p = \hbar k$' cannot be a vector which would otherwise (re)create the spacing of the electron. At least for *now*. But *now* I am thinking there has been *already* an idea of time at play in this, but also, that if I have claimed that '$p = \hbar k$' is (not) '$\mathbf{p} = \hbar\mathbf{k}$', then there is some~~thing~~ which I can trace as a continuity between '$p = \hbar k$' and '$\mathbf{p} = \hbar\mathbf{k}$'.

Would this be to do with an idea of time? That if '$p = \hbar k$', or indeed '$\mathbf{p} = \hbar\mathbf{k}$', there is a time(frame) in which the momentum of a particle is '$\mathbf{p} = \hbar\mathbf{k}$' at *a* particular time, and this because it would otherwise be '$\psi\,(x,t) = \int dk\; g(k)\exp(\,ikx - i\omega(k)t)$'. That is, '$\psi\,(x,t)$' is produced as a difference over time.

What is it here that requires time to be a continuity?

For if '$v = \frac{d\omega}{dk} = \frac{dE}{dp} = \frac{c^2p}{E}$'[138], and this is 'in agreement with the usual formula for velocity in special relativity'[139], and yet time in 'On the Electrodynamics of Moving Bodies', that is, (the beginnings of) special relativity, is what is produced by the 'clocks' and as such reliant upon, in part, an idea of *where* the clocks are ('a point *A* in space' and '*B*'), such that time cannot be thought outside of a production, but neither can it be thought as continuous, even with itself if it is reliant upon the 'observer at *A*' and 'an observer at *B*' – time cannot be known, in this scheme, outside of a seeing by another which is known as another by the 'we' of 'On the Electrodynamics of Moving

[138] *Lectures on Quantum Mechanics,* p.12
[139] *Lectures on Quantum Mechanics*, p.12

Bodies', *and* is also that which has to be produced as a 'common "time"'. So what does time do *now* in '$p = \hbar k$', or perhaps, what *is* time?

To think about this, I might have to (re)read:

$$\text{`}p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r. \qquad (1.3.5)$$

Using the nonrelativistic formula $p = mv$, this is the same as the Bohr quantization condition (1.2.4 [$m_e vr = n\hbar$, $n = 1,2, \ldots$])'.

So whatever '$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$' is, '$p = mv$' would be that which produces 'the same' in terms of 'the Bohr quantization condition (1.2.4 [$m_e vr = n\hbar$, $= 1,2, \ldots$])'. But if this is '[u]sing the nonrelativistic formula $p = mv$', there is something here to do with the number 'n' being that which has to be known outside of relativism, as that which *is* for there to be the 'must' of the 'just fits' – if 'the same' can be (re)produced, '$m_e vr = n\hbar$', it would be to do with the ability to (re)produce 'n'. And this is all in agreement – or what *amounts to agreement* – that 'a whole number n' can be (re)produced as the same and the same for everyone. The same cannot be to do with time therefore, or rather, that the same of 'n' is not reliant upon time for its being 'n'.

But if there is the requirement to (re)produce 'n', this would not only be that 'n' is in excess of 'λ', but that 'λ' is such that it is not of itself subject to the constraints imposed by the specification of 'n'. 'n' would be the excess(ive) reduction of 'λ' so that the latter 'just fits'.

'[T]he Bohr quantization condition' is to do with:

> [C]alculating the energies E_n […in that] the angular momentum $m_e vr$ of an electron of velocity v in a circular atomic orbit of radius r is an integer multiple of some constant $\hbar$[.][140]

There is a relationship between momentum and energy, not least because '$|\boldsymbol{p}| = E/c = h\nu/c = h/\lambda = \hbar|\mathbf{k}|$', but also because '$m_e vr = n\hbar$'. However, it would be that the '[u]sing [of] the nonrelativistic formula $p = mv$' is to frame '$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$' as '$m_e vr = n\hbar$'. How is this possible? For both '$p = \hbar k$' and '$m_e vr = n\hbar$', it would be that there is a (pre)determined amount of

[140] *Lectures on Quantum Mechanics,* p.7

times there is 'n'. So if 'k' is some (wave) number, and 'n' is also to do with the number of times 'a wavelength [...] just fits into the orbit', the relationship between the two would be grounded in the idea of there being some (internal) repeat which is specific to the 'electron'. *However,* if this is to do with a repeat, and one that is internal, that is, '*in* a circular atomic orbit [my italics]', this requires that 'an electron' cannot be thought as '*an* electron [my italics]'. If the energy of an electron is to do with '$m_e vr = n\hbar$, $n = 1,2,\ldots$', '$m_e vr$' is reliant upon the radius of an 'orbit' as that which is already there; '$m_e vr$' cannot be known outside of its frame.

Therefore, the internal repeat as the energy, that is, a property of 'an electron', is constituted by the frame of what is already there for it to inhabit. So, it would be that the energy of an 'electron' cannot be something of itself, which would be as much to say that the energy *is* the frame. Yet the energy is reliant upon the size of the orbit. If an electron is reliant upon the frame, or rather a particular part of the frame if 'r', (f$r$ame?), not only would the energy be to do with a part of the orbit, the distance between the centre and the orbit as circumference, but also the 'electron' cannot be thought as self-contained somewhere as such because of its constitution by 'r'.

What repeats here, if one frame is (re)placing the repeat of another, is the relationship between '$m_e vr$', '$p = mv$' and '$p = \hbar k$', which is to do with the pursuit of a sufficiency. Indeed, it would be to do with that which 'just fits'. The relationship would then hinge on the idea that there is that which can be *added* to '$m_e vr$', '$p = mv$' and '$p = \hbar k$', and it is this as 'n' which would secure this – that is, that there is an amount of being.

But what would an *amount* of being amount to? And indeed, if this amount is (pre)scribed by 'n', there is in this that 'whole numbers' are accumulative. What would it be to have an accumulation of being – a number of being(s)? It is perhaps to do with the '[u]sing [of] the non-relativistic formula $p = mv$'. Non-relativism would be such, and required to be so, that in each case, 'm' and 'v' are known of themselves to be able to produce 'p'.

So the question would be why 'non-relativis[m]' is required. That is, why '$p = mv$' is that which is used *for* '$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$' to be related to '$m_e vr = n\hbar$'. If the relationship hinges on

'$p = mv$', and this is 'non-relativistic', '$p = mv$' would itself have to *be* as such, outside of any idea of derivation. Indeed, if '$p = mv$' is taken as used, '$p = mv$' would have to be that which resists any alternative to itself, or rather, which is as much to say, that '$p = mv$' cannot be different from itself, but can always be retrieved as '$p = mv$'. And this retrieval, or perhaps *recovering* would be in that if '$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$' is *to be* related to '$m_e vr = n\hbar$' (and I am thinking here that it is to do with the connection between the particle and the wave, that is, *how* these are connected), the connection would have to be absolute in its own terms *to itself* determine what is wave and what is particle.

The issue around the question 'is it possible that something like the electron, that had always been regarded as a particle, could also be manifested as a wave?' would be to do with the 'electron' as *already* separated from what it is 'regarded' as – that is, that 'electron' is that which is already known as 'electron' and nevertheless 'regarded' as different, but also that it is this very prior knowledge (I would like to say k*no*wledge), which allows for the possibility of 'manifested' – that this *representation* does not affect the 'electron' as such because this representation is already read as representation. However, the issue around *this* would be how to be sure of the representation if what is pursued is an idea of representation, manifestation, or rather, what 'could also be manifested', such that the manifestation is *to come*: what is set out to be *re*covered is the manifesting as manifesting. That is, how to know manifesting in its move(ment)?

And it is this, this pursuit of the connection of itself, which is at issue, for the manifesting *as* manifesting could not, of itself, *secure* (the positing of) the relationship between the particle and the wave in terms of the electron. For *as manifesting,* '$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$' would require a double move whereby it *is* and *is not* the *manifesting*. For, if '$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$' is to trace the being of '$p = \hbar k$' to '$p = n\hbar/r$' it can only do so *by* '$p = mv$' which is already taken as '$m_e vr = n\hbar$'. If 'p' is to trace the manifesting as manifesting, it would only be to set up another stability which would be *therefore* to require another connection. For 'therefore

$$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r\text{'}$$

would be that only '$p = \hbar k$ = $\hbar \times 2\pi/\lambda$ = $n\hbar/r$' is possible within this scheme. But if 'therefore' is to set up '$p = \hbar k$ = $\hbar \times 2\pi/\lambda$ = $n\hbar/r$' as a stability, the manifesting of the wave as (a)part of the orbit, would not challenge that which is already in place, '$m_e vr = n\hbar$', because it recovers the 'r', 'n' and '$\hbar$'.

And yet *how is* this as stability, as the manifesting? – Although this manifesting cannot be to do with a seeing:

> Heisenberg's starting point [for matrix mechanics] was the philosophical judgement, that a physical theory should not concern itself with things like electron orbits in atoms that can never be observed.[141]

That there is a manifesting of what 'can never be observed' would be that whatever is manifesting, can only be manifesting within '$p = \hbar k$ = $\hbar \times 2\pi/\lambda$ = $n\hbar/r$'. So, if 'things like electron orbits in atoms [...] can never be observed', not only is there a knowledge of that which is absolutely beyond sight, but it would also be that '$p = \hbar k$ = $\hbar \times 2\pi/\lambda$ = $n\hbar/r$' is a supplement to observation. So if '$p = \hbar k$ = $\hbar \times 2\pi/\lambda$ = $n\hbar/r$' cannot be seen, cannot be seen as connection, neither can '$p = \hbar k$ = $\hbar \times 2\pi/\lambda$ = $n\hbar/r$' be seen as the wave as such, which is 'associated with an electron in a circular orbit'. What of the 'electron' therefore? For if the 'wave associated with an electron in a circular orbit' is what 'just fits into the orbit' this 'just fits' cannot be to do with that which is measured – or amounts to a measurement.

If 'electron orbits' are called into question as what is *seen*, and a 'wave' is 'associated with an electron in circular orbit', what now for the manifesting? For the double move of manifesting would now be to do with 'an electron' which in its movement cannot be seen as movement – and yet *how to move?*

I could equally say, what is an 'electron' as 'electron'; that is, in itself as stable?

'Something like the electron, that had always been regarded as a particle'.

141 *Lectures on Quantum Mechanics*, p.14

Still, not quite 'electron' as such; and even were I to pronounce (or not, I am, on this point, as all others, silence(d)), an 'electron' is an 'electron', the tautology does not account for the possibility of being, which *is* other. The 'electron […] had always been regarded as a particle' – the 'electron' is to do with thinking otherwise.

Why an 'electron' at all? For it would be that 'electron', already not itself and yet (re)invoked as the basis for 'manifestation' and 'regarding', is that which secures the issue of (re)presentation. If the question of particle and wave has to do with *how* particle and wave *just fit* within the bounds of electron, this very formulation would already place particle and wave (respectively) as what must be different, and excessive to 'electron' to *just fit.* And if 'electron' is already other to itself, indeed, must necessarily be so, and be lost to itself as the self-same for there to be this move, it would be *also* that which *therefore* cannot be held up as a (re)presentation of particle *and* wave. If the 'electron' is already other to itself, and has to be thought in its difference, how can it be brought to frame particle and wave *respectively* as what it is? Or rather, I can read the thinking of particle *and* wave as (re)readings of this differencing of the 'electron' *from* itself.

And this is (still) in the realms of non-relativism, that is, there is only one time(frame) for an electron, and this time(frame) is one in which:

> According to the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega,$ the wave function $\psi \propto \exp(i\mathbf{k} \cdot \mathbf{x} - i\ \omega t)$ of a free particle of momentum **p** and energy E satisfies the differential equations
>
> $$-i\hbar\boldsymbol{\nabla}\ \psi\ (\mathbf{x}, t) = \mathbf{p}\ \psi(\mathbf{x}, t), \qquad i\hbar\frac{\partial}{\partial t}\ \psi(\mathbf{x}, t) = E\ \psi(\mathbf{x}, t).$$

A few more questions – why (now, *again*, now) non-relativism? That is, why is time (now) that which is to do with a singularity? But also, and indeed, this would be connected to the time(frame), there is something here to do with a determinism – that of the 'differential equations', for it would be that whatever 'the wave function' is, and since it is an 'exp[onential]', there is an idea of the base being that which is constant, it would be that at a particular time, 't', 'ψ' can be known at any other time '$\frac{\partial}{\partial t}$'.

But why is 'ψ' reliant upon two 'differential equations'? If '$-i\hbar\nabla\,\psi\,(\mathbf{x},\,t) = \mathbf{p}\,\psi(\mathbf{x},\,t)$' is to do with '$\mathbf{p} = \hbar\mathbf{k}$' and '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},\,t) = E\,\psi(\mathbf{x},\,t)$' to do with '$E = \hbar\omega$', there is something about '$\mathbf{p} = \hbar\mathbf{k}$' and '$E = \hbar\omega$' which prevents, at least here, thinking momentum and energy together.

> For light, according to Einstein, the energy of a photon is $E = h\nu = \hbar\omega$, and its momentum has a magnitude $|\,\mathbf{p}\,| = E/c = h\nu/c = h/\lambda = \hbar|\,\mathbf{k}\,|$[.]

Magnitude and energy cannot be determined simultaneously, for magnitude is reliant upon 'E' for its constitution. '$|\,\mathbf{p}\,| = E/c$'. This raises a further question, for if magnitude and energy cannot be determined simultaneously, that is, that there is a borrowing of 'E', there is an issue around time, because of the impossibility of the simultaneously. It would be, now, a question, of what it means to *be* at the same time. Or rather, produced at the same time, for:

> [T]he wave function $\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$ of a free particle of momentum **p** and energy E satisfies the differential equations
>
> $$-i\hbar\nabla\,\psi\,(\mathbf{x},\,t) = \mathbf{p}\,\psi(\mathbf{x},\,t), \qquad i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},\,t) = E\,\psi(\mathbf{x},\,t).$$

That is, '$\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$' would have to be that which is not, of itself, to do with the 'differential equations' if there is the possibility that it 'satisfies' them both. So if this is to do with a 'satisfies', there is some move by which '$\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$' *fulfils* '$-i\hbar\nabla\,\psi\,(\mathbf{x},\,t) = \mathbf{p}\,\psi(\mathbf{x},\,t)$, $i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},\,t) = E\,\psi(\mathbf{x},\,t)$.' That is, '$-i\hbar\nabla\,\psi\,(\mathbf{x},\,t) = \mathbf{p}\,\psi(\mathbf{x},\,t)$, $\quad i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},\,t) = E\,\psi(\mathbf{x},\,t)$' demands this of '$\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$'. So if there is here an idea of completion, but only in that which is in addition, that the unity is what is (in part, (a) part), excessive to '$-i\hbar\nabla\,\psi\,(\mathbf{x},\,t) = \mathbf{p}\,\psi(\mathbf{x},\,t)$, $\quad i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},\,t) = E\,\psi(\mathbf{x},\,t)$' , and yet that which completes them both, neither '$-i\hbar\nabla\,\psi\,(\mathbf{x},\,t) = \mathbf{p}\,\psi(\mathbf{x},\,t)$' nor '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},\,t) = E\,\psi(\mathbf{x},\,t)$' can be to do with 'the wave function' or 'a free particle' as such.

And yet if these are to do with a fulfilling, it can only be that the fulfilling, the satisfying, is not within either the grounds of '$\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$' or the being 'a free particle'.

Why not?

It has, in part, something to do with '$-i\hbar\nabla\ \psi$ ($\mathbf{x}$, t) = $\mathbf{p}\ \psi(\mathbf{x}$, t)', or perhaps more specifically, '∇'. That is, '∇' would be acting on the wave function, 'ψ ($\mathbf{x}$, t)', so this move, and indeed, it would have to be that 'ψ ($\mathbf{x}$, t)' is in some way already known as 'ψ ($\mathbf{x}$, t)' to be operated on, is to do with the production of '$\mathbf{p}\ \psi(\mathbf{x}$, t)'. For if '$\exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t$)', momentum for a wave is defined in terms of '$\mathbf{k}$', so there would have to be that which alters '$\mathbf{k}$' to '$\mathbf{p}\ \psi(\mathbf{x}$, t)': '∇'.

Yet this operation requires a knowledge of what is being altered in its alteration. That is to say, '$-i\hbar\nabla$' can only (re)turn a particular set – '$\mathbf{p}\ \psi(\mathbf{x}$, t)'. Indeed, it would have to do with the operator being specific to that which it is acting on. However, if what '$-i\hbar\nabla$' is acting on is 'ψ ($\mathbf{x}$, t)', and this is *not* '$\exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t$)', '$-i\hbar\nabla$' has another (re)formulation of time.

Although in what sense? For '$-i\hbar\nabla$' is to do with a move(ment), that is, a production of '$\mathbf{p}\ \psi(\mathbf{x}$, t)'. But also as itself '$-i\hbar\nabla$' is a difference along the x; a double(d) move. It would be that this move must *still* happen whether or not there is a time as such. For '$\exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t$)' would be taken to be moving because of '$-i\omega t$'. However, if movement is here constituted by '$-i\omega t$', not only is movement here reliant upon, as a part, 'i', such that for '$\exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t$)', movement is not solely to do with time, that is 't' (already another move), but must run along imaginary lines. Yet, because of 'ω', there is also the idea that the move is not so much a move somewhere (else), but a (dis)splacement which remains within the circle – that is to say, the (re)turn to itself. So '$\exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t$)' would *still* have to be that which (re)produces itself as itself. Indeed, this (re)production of 'ω' (yet another timeframe) would be that which, therefore, cannot account for itself outside of the (re)turn. This circles. 't' would have to be in addition to 'ω' to be able to constitute a move – for the absolute (re)turn of the circle, '$\omega = 2\pi v$', would not, strictly speaking, of itself, be known.

Therefore, if '$-i\hbar\nabla$' is that which (re)produces '$\mathbf{p}$', it would be that there is already in place a relationship whereby '$-i\hbar\nabla$' is known to be that which, when acting on 'ψ ($\mathbf{x}$, t)' will give (back) '$\mathbf{p}\ \psi(\mathbf{x}$, t)'. Yet this acting on would have to be that which is *not* to do with time in the sense that '$\mathbf{p}\ \psi(\mathbf{x}$, t)' is '$\psi(\mathbf{x}$, t)' at any time – that is to say, this is no longer to do with '$\exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t$)' in the sense of a *difference* in time, but rather that '$\psi(\mathbf{x}$, t)' is instead a thinking that *if* '$\psi(\mathbf{x}$, t)' is known at a particular time (and place, indeed, '($\mathbf{x}$, t)' would be over four coordinates, three of space, and one of time), this knowing of the instant suffices to be '$\psi(\mathbf{x}, t)$' as such.

But if this suffices, there is no move, or at least a move in the sense that there is a knowing of the before and after as a difference, or productive of a difference. In this formulation, there is nothing in excess of '$\psi(\mathbf{x}, t)$' as '$\psi(\mathbf{x}, t)$'. And indeed, nothing in excess because '$-i\hbar\boldsymbol{\nabla}$' is already known to give back '$\mathbf{p}$'. But there is something more to '$\boldsymbol{\nabla}$' in the sense that '$\boldsymbol{\nabla}$' is both, because of the bold-type, a three-vector and an operator; it would be that the operation on 'ψ' would have to be over all three spatial coordinates. The operator is to be thought as (within) the same space as '$\psi(\mathbf{x}, t)$'.

I could formulate this another way, *recording* the relationship.

$\hat{p} \leftrightarrow -i\hbar\frac{\partial}{dx}$.

And then again, $\hat{p} \leftrightarrow \hbar/i \frac{\partial}{dx}$. This is the same – but to have the same, whatever *is* the same, I cannot have (here) except in its difference. I would have to already have lost that which would have guaranteed the same to itself.

Would I (still) be in the same space?

It would come back to – *still be to do with* – '$-i\hbar\boldsymbol{\nabla}$', which is as much to say '$-i\hbar\frac{\partial}{dx}$'. The space is already to do with a difference from itself if '$\frac{\partial}{dx}$'; here the displacement according to x. The operator as (within) the same space as '$\psi(\mathbf{x}, t)$' would have to do with the being of '$\psi(\mathbf{x}, t)$' at a particular moment, as that which can (also) be wholly itself elsewhere. That is to say, '$\psi(\mathbf{x}, t)$' would be to do with an idea that there is an unfolding of what '$\psi(\mathbf{x}, t)$' is as that which is already determined – the operator would frame the unfolding, and indeed the unfolding as unfolding if '$\frac{\partial}{dx}$'. The momentum is constituted by this difference of x, that is, between two points, as that which is *already* constituted; momentum does not move.

But this would be, therefore, that time does not hold for this operator as such, not least because there is no 't', but also does not hold in the sense that if there is already the constitution of a difference, the difference between x and the displacement from x would be such that there *is* only the difference. But only the difference as what is to be thought *as* itself – this is not difference as difference, but rather that '$-i\hbar\mathbf{\nabla}$' as already that which is the difference from itself can be recovered at any time. But it would have *to be* at any time, because absolute recovery, that is, the being of '$-i\hbar\mathbf{\nabla}$' as '$-i\hbar\mathbf{\nabla}$' would be to stop '$-i\hbar\mathbf{\nabla}\ \psi\ (\mathbf{x}, t) = \mathbf{p}\ \psi(\mathbf{x}, t)$'. And *stop* in the sense that '$-\ i\hbar\mathbf{\nabla}$' must always be open to its own excess – that it has always more to give because it cannot recover itself, and this cannot then have a time frame – that is, a limit to come back from.

So, although it can be asked, if '$\psi(\mathbf{x}, t)$', *of* '$\psi(\mathbf{x}, t)$' at another moment, it would be that any before and after would be constituted out of the asking the question.

And so $p \ \leftrightarrow -i\hbar\frac{\partial}{dx}$ cannot recover itself because the move as already been made.

But if the move has already been made, that the association, or rather that '[a]ccording to the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$, the wave function $\psi \propto \exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t)$ of a free particle of momentum **p** and energy E satisfies the differential equations', it would be that $p \ \leftrightarrow -i\hbar\frac{\partial}{dx}$ cannot be thought outside of the association – there is an absolute grounding in the accord. That there is absolute agreement.

Why agreement?

$p \ \leftrightarrow -i\hbar\frac{\partial}{dx}$ and if there is '$\psi \propto \exp(i\mathbf{k}\ \cdot \mathbf{x} - i\omega t)$ of a free particle of momentum **p** and energy E' it would be a case of *how* to (re)produce that which is already known. *However,* two implications occur to me *now*; that if this is to do with what is already known, then the knowledge cannot be reliant upon time in the sense that what is known can be itself at any time – hence that '$\psi(\mathbf{x}, t)$' is a complete *de*scription, but also, that if this is to do with (re)producing what is already known to be the case, that there *is* an accord, there would have to be no equivocation on what is already known to be the case – and here, then, is where '$i\hbar\frac{\partial}{dx}$', (more or less, or I could put $\propto$) is required to be in the same space, because it cannot be that there are additional terms if the association is that which is *already* associated.

So, how to produce an agreement without breaking the bounds of the accord?

(T)here is 'the wave $\int dk\, g(k) \exp(ikx)$', and '[a]ccording to the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$, the wave function $\psi \propto \exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$ of a free particle of momentum **p** and energy E satisfies the differential equations', so it would be a case of what repeats. But not as a wave if 'ψ'. Rather, what repeats, roughly, if 'the wave function $\psi \propto \exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$'.

So why 'ψ'? This would guarantee a continuity; whatever the operator does, 'ψ' is, but *is* in such a way that it is *to be* determined. That is, 'ψ' gestures to the (im)possibility of the absolute. For indeed, in each case, that is '$-i\hbar\boldsymbol{\nabla}\, \psi\, (\mathbf{x}, t)$' and '$\mathbf{p}\, \psi(\mathbf{x}, t)$', '$\psi\, (\mathbf{x}, t)$' *is* by what is in addition to it, either '$-i\hbar\boldsymbol{\nabla}$' or '$\mathbf{p}$' – so whatever '$\psi\, (\mathbf{x}, t)$' is, not only is it a complex quantity, and *quantity* because there would have to *be* for there to be an operation, but also that the *quantity* would have both the 'i' and the real part in terms of *where* the 'ψ' is. So if '$\psi\, (\mathbf{x}, t)$' is a quantity, that is, is premised on the basis of being a function of 'x', here then there *is* always 'x' as the continuity.

However, '$-i\hbar\boldsymbol{\nabla}$', in being in addition to '$\psi\, (\mathbf{x}, t)$' would be to do with '$\psi\, (\mathbf{x}, t)$' being that which cannot, of itself, move. For, if 'the wave function $\psi \propto \exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$ of a free particle [has…] momentum **p** and energy E', 'a free particle' which has a 'wave function' is already set up as having 'momentum' and 'energy'. But this would be that the idea of possession, or rather, what 'a free particle' already has, is also that which has to be accounted for (*eigen-)*. So it is not enough that there is a 'wave', but rather that there is a need for a function, '$\psi\, (\mathbf{x}, t)$', and if 'the wave function $\psi \propto \exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$ of a free particle [has…] momentum **p** and energy E', the accounting for would be to think about what it means to say that there already *is*. For this idea of possession *as* what already is requires not only a knowledge of 'a free particle', but also of 'a free particle' outside of 'momentum' and 'energy'. So it is not so much that 'momentum' and 'energy' are inherent, or an essentialism, but rather a question of thinking 'of'.

So what if I was thinking *of*: 'a free particle of momentum **p** and energy E'?

I cannot think 'a free particle of momentum **p** and energy E' outside of 'the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$', but would I not then be thinking relations?

And if ‘of’, would this not already be to not be thinking ‘a free particle’ as such? For if ‘a free particle of momentum **p** and energy E’, ‘a free particle’ is to do with that which it has already (in its possession); would it not be that there is only that which is possessed? Or at least, that the possession is the constitution? And if ‘momentum **p** and energy E’ are this possession, that is, a possession which constitutes ‘a free particle’ as the already is, it is that ‘a free particle’ as that which is thought outside, and prior to ‘momentum **p** and energy E’, is instated afterwards as prior.

So would not ‘a free particle’ be a relation – that is, a unification *of* ‘momentum **p** and energy E’? Just to relate:

> For light, according to Einstein, the energy of a photon is $E = hv = \hbar\omega$, and its momentum has a magnitude $|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$[.]

If I stopped the relation at ‘$E = hv$’ and ‘$|\boldsymbol{p}| = E/c$’ or even ‘$|\boldsymbol{p}| = E/c = hv/c$’, how would these relate? For ‘the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$’ are both to do with ‘*E*’ as what must be thought twice over, and therefore would be to do with a relating of ‘*E*’ to itself.

But not simultaneously, as has already been read. So it would be that relations, here, can only hold if the relations are themselves already thought as an absolute difference. But this would be to have relations as something, that is to say, as that which is fully circumscribed.

And yet momentum is derivative of ‘*E*’.

And this difference of the same would be that ‘$-i\hbar\boldsymbol{\nabla}$’, or I could put $i\hbar\frac{\partial}{dx}$ which operates on ‘exp (ikx)’, can produce ‘$\mathbf{p}\ \psi(\mathbf{x}, t)$’. That is, that an operator would be to do with the introduction of ‘$-i\hbar$’, and this as the limit to what ‘$\boldsymbol{\nabla}$’ does, and so also ‘$\frac{\partial}{\partial t}$’. But if the relations are *now* thought as absolute (difference), because of the necessity of the operator, the relations are that which cannot of themselves be other to themselves. If ‘a free particle’ is to be thought as absolute, the issue would now be how to account for the ‘particle’ no longer defined at a particular place and time, that is, ‘$(\mathbf{x}, t)$’, but as ‘$\psi(\mathbf{x}, t)$’. It would be a case of how to know that a ‘particle’ could *be* – for the issue around the differential equations is do with the thinking of what the particle already has in its possession – for whatever the particle has in its possession, is possessed by, (would not this challenge the very idea of time as a before and after, that of anteriority, origin, structure/content?) is that this relationship can then unfold throughout time.

But what would time be, if there is no idea of a possession in the sense that there is nothing *to be taken over*, and nothing which can take over?

How would this conserve energy?

But I have perhaps got ahead of myself. Let me instead, repeat myself – what repeats?

Perhaps not – for this would be a conservation; that I remain in the loop, in the know. That I know, and can reassure myself that I know what I know.

$\exp(ikx)$.

And now $\psi = \exp(ikx)$

At the moment, this is not going anywhere.

I will add this $p \ \leftrightarrow -i\hbar\frac{\partial}{dx}$.

Have I added it yet?

And *now*, because this is not going anywhere, or rather, to have begun thinking objects, would I not, if I know these objects absolutely – and why should I not, I have just written them – also be able to know where they will go?

Something needs to move.

In combination $\hat{p}\psi = -i\hbar\frac{\partial}{dx}\,\psi = \hbar k\,\psi$.

Having differentiated with respect to x – what have I done?

Have I moved them?

I can assure myself that I can return to *p* = ℏk. That is, operators are deterministic in the sense that there is already known to be the limit from which to come back from – but then is this not the *relation*? That I had not written the relation until now, but now I can only rewrite what I take to be the relation.

Not the relation.

Some other *re*lation.

Light may well be the ultimate relation, relay; that I can be illuminated only if I have already related light to itself:

> For light, according to Einstein, the energy of a photon is $E = hv = \hbar\omega$, and its momentum has a magnitude $|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$[.]

Well, maybe taken Einstein to have related it. If the wave equation is according to what is the case for light, light would the grounding, already related to itself as light, divisible by itself '$|\boldsymbol{p}| = E/c = hv/c = h/\lambda = \hbar|\mathbf{k}|$' to produce itself a part (of itself). And indeed, the very idea of light would be *itself* grounded in what is *E*. That is to say, that *E* has to already be itself conserved as itself.

Yet this conservation would be that which stops the relation – that there is nothing further to relate. If energy is needed twice over, and twice over as *the same* but *the same at the same time* this would be the impossibility – that there is a demand for a double of the same, or rather, the one as same to itself. There cannot be both – the singularity of the same cannot be thought simultaneously with its otherness as the same.

There is more than one way of writing that which I do not have: $\hat{p}\psi = -i\hbar\frac{\partial}{dx}\psi = \hbar k\, \psi$.

I would like to think more about '$-i\hbar\frac{\partial}{dx}$'; that is, why partial differential equations are required, but also why a relation such as '**p** = ħ**k**' is also considered to be to do with the operator $\hat{p}\psi = -i\hbar\frac{\partial}{dx}\psi$, or '$-i\hbar\boldsymbol{\nabla}$'.

Why partial differential equations?

> According to the relations $\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$, the wave function $\psi \propto \exp(i\mathbf{k}\cdot\mathbf{x} - i\,\omega t)$ of a free particle of momentum **p** and energy E satisfies the differential equations
>
> $$-i\hbar\boldsymbol{\nabla}\,\psi\,(\mathbf{x}, t) = \mathbf{p}\,\psi(\mathbf{x}, t), \qquad i\hbar\frac{\partial}{\partial t}\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t).$$

What is being thought is 'the wave function ψ', so any constituents, that is, 'momentum **p** and energy E', would be continuous variables. The partial differential equations would be such, and, here, be two, because in each case, one of the variables would have to be held constant to constitute the grounds for the differentiation. If 'momentum **p** and energy E' are continuous variables, and this because '$\psi \propto \exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$', or even again e^{ikx}, such that 'ψ' can be divided into parts, and each part would be thought as separable from the other, (all caveats for the doubling of *E* in place), then as continuous variables, it would be that each can be differentiated in turn. This differentiation would hinge on two things, that the variable is already known as such to be differentiated, that is, is also known in its differentiation, but also that differentiation of each part requires its own equation. That is to say, the differential equations constitute the difference between the constituents of 'ψ'.

So this is a thinking about e^{ikx}, and 'momentum **p** and energy E'. So, if '**p**' is governed by a partial differential equation, and '*E*' also, and this is to do with a *re*presentation of 'a free particle' as 'ψ' or rather perhaps ψ(**x**), a particle cannot be differentiated. So if differentiation is to do with '**p**' and '*E*', and these as continuous variables, for '$-i\hbar\boldsymbol{\nabla}\,\psi\ (\mathbf{x},\ t) = \mathbf{p}\,\psi(\mathbf{x},\ t)$', although '$\mathbf{p}$' is that which is continuous, '$\mathbf{p}\ \psi(\mathbf{x}, t)$' can only give, at any *moment,* an instance of '$\mathbf{p}$'. That is, a derivative would be such that it is a reduction of the whole. However, the wave is not so much e^{ikx} but '$\exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$'; and if '$-i\omega t$' is the move(ment), this is because the differentiation of '$\mathbf{p}$' of '$\exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$' can never be itself movement, that is to say, the movement is already lost in the differentiation of it. But this is not to say that '$\mathbf{p}\ \psi(\mathbf{x}, t)$' is still, for if '$-i\hbar\boldsymbol{\nabla}\,\psi\ (\mathbf{x}, t) = \mathbf{p}\ \psi(\mathbf{x}, t)$', '$\mathbf{p}\ \psi(\mathbf{x}, t)$' is '$-i\hbar\boldsymbol{\nabla}\,\psi\ (\mathbf{x}, t)$'. The operator would be that which constitutes the excess of the wave as that which is over time – already gone ahead as throughout time. There must already be an idea of a wave, which is '$-i\hbar\boldsymbol{\nabla}\,\psi\ (\mathbf{x}, t)$' in terms of the (re)calling of '$\mathbf{p}$', to be able to divide '$\mathbf{p}$' into instances of '$\mathbf{p}$' as a continuous variable – hence then that '$\mathbf{p}$' cannot be the same to itself, cannot be measured as such because this would require, not a reduction to '$(\mathbf{x}, t)$', but rather that '$\mathbf{p}$' be known without limits, without that which defines '$\mathbf{p}$' as '$\mathbf{p}$'.

And yet, here would be the difference between how a particle and a wave are constituted, respectively, for it would be that the wave is required for an idea of continuity, that is, for if each '$\mathbf{p}$

$\psi(\mathbf{x}, t)$' is one instant of '$\psi \propto \exp(i\mathbf{k} \cdot \mathbf{x} - i\omega t)$', and '$\mathbf{p}\ \psi(\mathbf{x}, t)$' is a continuous variable, which is also to do with '$-i\hbar\mathbf{\nabla}$', '$\mathbf{p}$' would be a reading of the difference in the gradient of '$\psi(\mathbf{x}, t)$' when '$-i\hbar\mathbf{\nabla}$' is acting on the vector.

But if '$-i\hbar\mathbf{\nabla}$' is the gradient operator, there is something more to the differentiation, and this requires an idea of what the energy is:

> For any state of energy *E*, we then have
>
> $$\psi(\mathbf{x}, t) = \exp(-iEt/\hbar)\psi(\mathbf{x}), \qquad (1.3.6)$$
>
> while for a free particle, in the non-relativistic case, $E = \mathbf{p}^2/2m$, so here $\psi(\mathbf{x})$ is some solution of the equation
>
> $$E\ \psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\ \nabla^2\ \psi(\mathbf{x}).$$
>
> More generally, the energy of a particle in a potential $V(\mathbf{x})$ is given by $E = \mathbf{p}^2/2m + V(\mathbf{x})$, which suggests that for such a particle we still have Eq. (1.3.6), but now
>
> $$E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\right]\ \psi(\mathbf{x}). \qquad (1.3.7)$$[142]

It is not enough that '$i\hbar\frac{\partial}{\partial t}\ \psi(\mathbf{x}, t) = E\ \psi(\mathbf{x}, t)$'. Although '*E*' is related to a difference in time, that is to say, the operator here is a first order partial derivative with respect to '*t',* there would have to be some additional constraints, or frames – that is, 'in the non-relativistic case, $E = \mathbf{p}^2/2m$'. However, if '$E = \mathbf{p}^2/2m$', this would be an issue in the solving of the differential equations simultaneously because of the relationship between '*E'* and '$\mathbf{p}$'. But if '$\psi(\mathbf{x})$ is some solution of the equation

$$E\ \psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\ \nabla^2\ \psi(\mathbf{x})'$$

there is more than one possible 'solution of the equation'. If the 'solution' is already known to be a possible set (field) of '$\psi(\mathbf{x})$', it would be that the 'solutions' are known in advance in their possibility; there is already an answer(ing) framework in place.

I could say, *eigen-*

[142] *Lectures on Quantum Mechanics*, p.13

However, because '$E = \mathbf{p}^2/2m$', there is a change in that '*E*' is no longer to do with '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t)$', but rather '$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})$'. So if, initially, '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t)$' such that the energy operator, that is, '$E\,\psi(\mathbf{x}, t)$' is to do with the partial differential '$i\hbar\frac{\partial}{\partial t}$', time here is constituted by an idea of the slope of a line – here that line would be the '$\psi(\mathbf{x}, t)$' as what '$i\hbar\frac{\partial}{\partial t}$' is acting on.

I could say measuring.

But just how far is it measuring something which is in advance of itself? For if '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t)$', then, as with '$-i\hbar\boldsymbol{\nabla}\,\psi\,(\mathbf{x}, t) = \mathbf{p}\,\psi(\mathbf{x}, t)$', each operator as *acting on* '$\psi(\mathbf{x}, t)$' would be that the measuring is, if '$\psi(\mathbf{x}, t)$', that which is to be acted on, *not* that which is measured as such. It would be that whatever is to be measured is in the act of measuring. But this would then be at odds with any idea that '$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\right]\,\psi(\mathbf{x})$', or '$-i\hbar\boldsymbol{\nabla}\,\psi\,(\mathbf{x}, t) = \mathbf{p}\,\psi(\mathbf{x}, t)$', or '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t)$'. ($\rightarrow \infty$) is in some way pre-determined, or indeed that it is deterministic. So, although '$\psi(\mathbf{x})$ is some solution of the equation

$$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})\text{'}$$

there is something (t)here to do with the possibility of a multiple return, but the multiple as that which cannot be sustained.

How to think this?

I might also return to '*E*'.

'$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t)$'; I might also return to questioning what '*E'* is – but in what sense can I return to it, that is, be (as)sure(d) of my return to '*E'*? What is it that could absolutely guarantee '*E'* as such? Or even a return? '*E'* ≠ '*E'*, nor to *E*. But does not '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t)$' play out this difference – that is, from '*t*'? Although *not from 't'* in the sense that '*t*' is that which is positioned after '$\frac{\partial}{\partial t}$' as what '$\frac{\partial}{\partial t}$' is *from*. That is to say, any return (*about turn*?) would rely on a fixed position from which to trace this turn –

but (t)here is '$\frac{\partial}{\partial t}$', that is, the operator is already to do with a difference from that which it is differencing. *From* has (re)turned itself in. But would that not be the move – that there is, over there, at a distance, that which is excessive, but excessive in that what *is* is more than what can be thought here, that is, I can only differentiate at each moment '$\frac{\partial}{\partial t}$'.

At each moment? How many moments are there? But at this moment (or maybe not, but $\frac{\partial}{\partial t}$ *moment*), there is a change – the continuous variable – that '$\frac{\partial}{\partial t}$' would trace. And this would be local, in the sense that it is between two points. But here the point would be a line, that is, '$\frac{\partial}{\partial t}$' would be to position the line as that which can be measured against '$\psi(\mathbf{x}, t)$'. That is to say, more or less, there is something about an idea of the line, and the line (dis)placing the curve – after all, there is some sense of being in orbit '$p = \hbar k = \hbar \times 2\pi/\lambda = n\hbar/r$', so many evolutions ago.

What would this '$\frac{\partial}{\partial t}$' be, however, if this is what is measured against '$\psi(\mathbf{x}, t)$'? For if '$\psi(\mathbf{x}, t)$' is that which cannot be known of itself, outside of its (re)constitution and yet set up as that which '$\frac{\partial}{\partial t}$', or rather '$i\hbar\frac{\partial}{\partial t}$' acts on as an operator, whatever '*E*' is would be to do with '$\psi(\mathbf{x}, t)$' as that which is incremental and accumulative if '$i\hbar\frac{\partial}{\partial t}$'.

The increments, or divisions, of '$\psi(\mathbf{x}, t)$' are limited by '$i\hbar$', and yet, I cannot say that, strictly speaking, '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\ \psi(\mathbf{x}, t)$', since '[f]or any state of energy *E*, we then have

$$\psi(\mathbf{x}, t) = \exp(-iEt/\hbar)\psi(\mathbf{x}), \qquad (1.3.6)\text{'}.$$

This would be the energy of a wave (function) in general. That is to say, '$\psi(\mathbf{x}, t) = \exp(-iEt/\hbar)\psi(\mathbf{x})$,' would be the reformulation of '$\exp(i\mathbf{k}\cdot\mathbf{x} - i\omega t)$'. For, '$E = \hbar\omega$' as the relation between energy and the angular frequency for plane waves would be such that '$(-iEt/\hbar)$' is substituted for '$-i\omega t$'. And, since energy is here related to a difference in time, must be taken over time, rather than at a particular moment; '*E*' cannot be to do with '$i\mathbf{k}\cdot\mathbf{x}$' as such since this would be to set up a fixed position. This being the case, therefore, '*E*' would be to do with a loss of a fixed position, that is '$i\mathbf{k}\cdot\mathbf{x}$'. But if a loss of a fixed position, '$\psi(\mathbf{x})$' can no longer be thought in terms of

'$\mathbf{k}$'. Indeed, it would have to be so since there cannot be an idea of '$\mathbf{p} = \hbar\mathbf{k}$ and $E = \hbar\omega$' at the same time. But if this is also the loss of '$\mathbf{k}$', '*E*' cannot, of itself, be to do with the 'spacetime dependence'; '*E*' is apart from the specificity of '$\mathbf{k}$' that is peculiarly a wave. But if '$\mathbf{k}$' is what 'any kind of wave' *has*, '*E*' is not derivative of this being-wave.

However, if '*E*' is not to do with '$\mathbf{k}$' as such, it is not to say that '*E*' is *not* to do with an idea of spatiality, or at least spatiality as a limit. For if '$\psi(\mathbf{x}, t) = \exp(-iEt/\hbar)\psi(\mathbf{x})$' is 'energy *E*' in general, it would be that to know '*E*' for a specificity requires additional parameters:

> [F]or a free particle, in the non-relativistic case, $E = \mathbf{p}^2/2m$, so here $\psi(\mathbf{x})$ is some solution of the equation
>
> $$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x}).$$
>
> More generally, the energy of a particle in a potential $V(\mathbf{x})$ is given by $E = \mathbf{p}^2/2m + V(\mathbf{x})$, which suggests that for such a particle we still have Eq. (1.3.6), but now
>
> $$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\right]\,\psi(\mathbf{x}). \qquad (1.3.7)$$

If '*E*' requires a specific (limit), '*E*' in the general sense, that is '[f]or any state of energy' is insufficient for, here, 'a free particle'. Why '[f]or any state of energy' therefore? For there to be '*E*' would need '*E*' in 'any state', that is, '$\psi(\mathbf{x}, t) = \exp(-iEt/\hbar)\psi(\mathbf{x})$'. There has to be something set up out of which there can *then* be differentiated the frames – '[f]or a free particle'. But then these frames would be that which is excessive to '*E*', and not least because 'a free particle' would be that which is derivative of the thinking of '*E*' in its grounding as '$\psi(\mathbf{x}, t) = \exp(-iEt/\hbar)\psi(\mathbf{x})$'. '*E*' would have to be set up as the absolute grounding for *all time* for there to be the 'free particle' as a particular instance of this time. However, if this is to do with the grounding of the 'free particle' or 'any state of energy *E*', can the grounding be maintained? That is to say, are these *within* the same grounds (fields)? If 'for a free particle, in the non-relativistic case, $E = \mathbf{p}^2/2m$', energy is already here defined, not only in terms of 'the non-relativistic case', but also in that '$E = \mathbf{p}^2/2m$'. So there is a change in how '*E*' is defined, for in terms of 'a free particle', '$E = \mathbf{p}^2/2m$', that is, '*E*' is constituted by momentum. As 'a free particle', '*E*' is reliant upon an idea of *where* 'a free particle' is – that is to say, is constituted by the frame of 'a free particle' as such, but 'a free particle' also already *having* '**p**', or rather, '$\mathbf{p}^2$'. '[A] free particle' would already have an '*E*' which is related to '*m*' and '**p**'. So for this to be 'non-relativistic' would be that 'a free particle' can be known absolutely of itself, including its properties.

So if this an absolute, that is to say, 'a free particle, in the non-relativistic case' is known to (absolutely) have '$E = \mathbf{p}^2/2m$', why would there be a need to think 'a free particle' in terms of '$\psi(\mathbf{x})$'? If I think about '$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})$' and '$-i\hbar\boldsymbol{\nabla}\,\psi\,(\mathbf{x}, t) = \mathbf{p}\,\psi(\mathbf{x}, t)$, $\quad i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t)$', '$\nabla^2$' would be that which separates the two differential equations, necessarily, for if '$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})$' there would be a reliance on there already *being* an '*E*' which is, in some way (re)coverable, not only from '$E = \mathbf{p}^2/2m$', for '$\frac{-\hbar^2}{2m}$', but also '$\psi(\mathbf{x}, t) = \exp(-iEt/\hbar)\psi(\mathbf{x})$'. That is, whatever '*E*' is for '$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})$' is reliant upon a continued (ex)change of what is '=' to what. But if '*E*' is to put into play a continued difference of what is exchangeable, and exchangeable in the constitution of itself, this would require not only that '*E*' is, in some sense, already known for there to be this exchange of '=', but also that to know this exchange as exchange requires that time is not that which itself is subject to change – indeed for '$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})$' there is no '*t*' coordinate for 'ψ'. Therefore, although '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\,\psi(\mathbf{x}, t)$' is what must be 'satisfi[ed]', it is such that the difference of '*t*' is taken to be such that it *is* difference.

'*E*' is not so much '=' '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t)$'. Indeed, '=' constitutes a difference in the move which claims a sameness, but that '*E*' as a property requires some additional frame – that is to say, '$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})$' does not lay claim to either 'particle' or 'wave' is the sense that '*E*' here requires both an idea of there already being, that is, '$2m$', but also that this already being is now to be thought as to do with 'ψ', such that any idea of what is 'particle' or 'wave' can only be that which is excessive to '$E\,\psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\,\nabla^2\,\psi(\mathbf{x})$' as such. So if 'particle' and 'wave' are a (re)framing of '$E\,\psi(\mathbf{x}) =$

$\frac{-\hbar^2}{2m}\ \nabla^2\ \psi(\mathbf{x})$', the question would be not so much *why* they *are*, that is, there can be no absolute grounding to any reading, but rather why 'particle' and 'wave' are positioned as a(n absolute) difference, but also as the ultimate frame whereby whatever 'particle' and 'wave' is stops as this production of an absolute difference.

For it would be that '$E\ \psi(\mathbf{x}) = \frac{-\hbar^2}{2m}\ \nabla^2\ \psi(\mathbf{x})$', or even again '$E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\ \right]\ \psi(\mathbf{x})$', whereby if '[m]ore generally, the energy of a particle in a potential $V(\mathbf{x})$ is given by $E = \mathbf{p}^2/2m + V(\mathbf{x})$', not only is there another (re)formulation of what is 'energy', but thus also that the 'general[ity]' is introduced by the framing 'potential $V(\mathbf{x})$'. Indeed, that the general is an *additional frame* is perhaps nowhere more so claimed than '$+\,V(\mathbf{x})$', for the general requires that which *specifies* it as what is 'more generally' the case, but also, then, that 'the energy of a particle' is wholly reliant on how it is framed, that is, what is in addition to it. But if this is to do with the 'energy' as that which is constituted by the frame, the being 'in a potential $V(\mathbf{x})$' would not only be the 'energy of a particle', but its being a property, the possession of, is that the 'particle' is wholly possessed by the frame. That there is only the frame would be that any gesture towards an idea of that which is intrinsic, the 'energy of a particle' being that which is *brought to light*, is nothing other than the (re)production of the loss of what is property, and properly possessed.

What is *eigen*– .

So:

> More generally, the energy of a particle in a potential $V(\mathbf{x})$ is given by $E = \mathbf{p}^2/2m + V(\mathbf{x})$, which suggests that for such a particle we still have Eq. (1.3.6), but now
>
> $$E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\ \right]\ \psi(\mathbf{x}). \qquad (1.3.7)$$

What 'we still have' is vital as an accumulation – that 'we still have' something. But do 'we still have' something?

If 'the energy of a particle in a potential $V(\mathbf{x})$ is given by $E = \mathbf{p}^2/2m + V(\mathbf{x})$, which suggests that for such a particle we still have Eq. (1.3.6)', *is* what is 'suggest[ed]' that 'we still have' known within this 'suggest[ion]' as only possible by '$E = \mathbf{p}^2/2m + V(\mathbf{x})$'?

– I could suggest that to know what 'we still have' by 'suggest[ion]' is not only that 'we' cannot know what 'we still have' except in the loss of it, but also that if 'we still have Eq. (1.3.6), but now', what 'we still have' is (surprisingly?) what remains, but remains in its being as 'Eq. (1.3.6)' – in an index, or rather its being index.

But if index, what is the index? At least, if 'the energy of a particle in a potential $V(\mathbf{x})$ is given by $E = \mathbf{p}^2/2m + V(\mathbf{x})$, which suggests that for such a particle we still have Eq. (1.3.6)', '$E = \mathbf{p}^2/2m + V(\mathbf{x})$', the 'still hav[ing]' is what is 'given by $E = \mathbf{p}^2/2m + V(\mathbf{x})$', that is '$E = \mathbf{p}^2/2m + V(\mathbf{x})$' would be the index, that by which there is, suggested, what 'we still have' – it goes to a saying of what 'we still have'.

And therefore what 'we still [(do not)] have'. (1 –)

I could suggest that this is all an index. (2 –)

What is stopping me? (2 –)

'[B]ut now

$$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]\,\psi(\mathbf{x}). \qquad (1.3.7)'$$

Does it matter what 'we still have' if 'but now'? '$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]\,\psi(\mathbf{x})$' would be in distinction to what 'we still have', that there is something about what 'we still have' that is not reconciled with '$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]\,\psi(\mathbf{x})$', that despite '(1.3.6)' and '(1.3.7)', '$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]\,\psi(\mathbf{x})$' is not necessarily of the order of the index. What would make it so, if such were possible?

That there could be that for which there is the index.

‘This is the Schrödinger equation for a single particle of energy *E.*’[143]

This is the index.

(3 –)

This: ‘$E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\right]\ \psi(\mathbf{x})$.’

(4 –)

This ‘(1.3.7)’.

What is ‘the Schrödinger equation’?

‘$E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\right]\ \psi(\mathbf{x})$.’

Not ‘the Schrödinger equation’.

(1 –) Maybe ‘we still have’ it after all.

But now, this is all an index.

‘But now’ there is a change, that what has gone before is no longer all there is to say about ‘*E*’, or possibly all ‘*[W]E*’ can go towards saying (in the index).

(4 – I am going to tell you what you are going to read).

Why ‘$E\ \psi(\mathbf{x})$’ if this is (in part) ‘for a single particle of energy *E*’? That is, why is ‘*E*’ that which must be thought as a ‘wave’ *but now* ‘[t]his is the Schrödinger equation for a single particle of energy *E*’?

‘$E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\right]\ \psi(\mathbf{x})$’: somewhere ‘we’ have lost what ‘*E’* is, for a ‘particle’ despite ‘a free particle of momentum **p** and energy *E*’.

So ‘*E*’ is that which must be (re)turned, as what ‘we still have’, except this still having is ‘but now’ – (re)turned as a difference, and known as such.

And this would be the necessity of still having – that in each evolution there can be retrieved another version of the same.

143 *Lectures on Quantum Mechanics*, p.13

'$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x},\,t) = E\,\psi(\mathbf{x},\,t)$', so if '$i\hbar\frac{\partial}{\partial t}$' is what produces, as the same (difference), '*E*', and if '*E*' is related to time because of '$i\hbar\frac{\partial}{\partial t}$', time here is thought of as not only bound within particular limits, but also as that which has to be (re)turned to the 'we' as what 'we still have'.

We still have time, which is energy, which is that which is to be produced. We still have time-energy because this is what is never sufficient of itself. $E \leftrightarrow \hat{E}$.

There can be no energy as such; cannot be conserved in a strict sense. Energy is what is to be (re)turned as what the 'we still have', but still have *but now* because '$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]\,\psi(\mathbf{x})$'. That is, *now* 'we' have the operation by which we will (re)turn that which we still have. *Still* have, *now*; because each (re)turn would have to re-invoke, index, a time which is already divided '$i\hbar\frac{\partial}{\partial t}$'. Divided, but not in the sense of there being something as such which is divided. Rather, if now time-energy is constituted by '$\left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]$', then it would be reliant upon not only '∇^2' as the acceleration, speed, which is given by '∇^2' as a second order derivative, but '∇^2', since '$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]\,\psi(\mathbf{x})$' is non-relativistic, would also be that '∇^2' would be to guarantee an idea of the absolute. That is to say, since '$\psi(\mathbf{x})$' and '∇^2' is that which is, in part, to do with the constitution of '$E\,\psi(\mathbf{x})$', it is such that although '∇^2' is in addition to '$E\,\psi(\mathbf{x})$', in the production of the latter it is this addition which adds, sums, the accumulation of what is considered to be the constituents of '$\psi \propto \exp(i\mathbf{k}\,\cdot\mathbf{x} - i\omega t)$'; adds the possibility of reduction to (a) grounding(s) which is put in place. That is to say, because not only is there an idea of the possibility of more than one solution – 'some solution' – but because '$\psi \propto \exp(i\mathbf{k}\,\cdot\mathbf{x} - i\omega t)$ of a free particle', then 'ψ' would be something apart from '$(i\mathbf{k}\,\cdot\mathbf{x} - i\omega t)$' as such. Therefore, this difference would then be that whatever 'ψ' is cannot be derived as such from '$(i\mathbf{k}\,\cdot\mathbf{x} - i\omega t)$'.

Although '$E\,\psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\,\nabla^2 + V(\mathbf{x})\,\right]\,\psi(\mathbf{x})$' is to do with the production of '*E*' for '$\psi(\mathbf{x})$', it can only be such because '$\psi(\mathbf{x})$' is not something of itself. Whatever is a 'free particle' is known only by what cannot be the case, that is, cannot be given as an object as such. And cannot be given because '$\psi(\mathbf{x})$' requires the production of a time *to be given.* There is, in this, no present wherein '$\psi(\mathbf{x})$' *is*.

$E \leftrightarrow \hat{E}.$

A self-operation, whereby energy would be brought back to itself, and this self-operation as a time derivative, not time as such, if '$i\hbar\frac{\partial}{\partial t}$'. This (re)turn does not happen *in* time. The production is that which cannot be itself timed as a (re)turn to be what 'we still have' – there would be no move because the energy can (re)turn to itself in no time.

In no time because '$i\hbar\frac{\partial}{\partial t}\,\psi(\mathbf{x}, t) = E\ \psi(\mathbf{x}, t)$'.

'But now

$$E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\ \right]\ \psi(\mathbf{x})'.$$

And now?

$$'E\ \psi(\mathbf{x}) = \left[\frac{-\hbar^2}{2m}\ \nabla^2 + V(\mathbf{x})\ \right]\ \psi(\mathbf{x}).'$$

And now - I am not sure I have enough energy.

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