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HEGEL AMONG THE QUANTUM PHYSICISTS

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It is not an exaggeration to say that today Hegel only lives on through the innovations of Slavoj Žižek. Apart from Žižek's labours, Hegel would remain all but neglected in contemporary thought, relegated to a merely canonical position in the history of philosophy. On the other hand, it is clear that from a theoretical point of view, Žižek's popularity and celebrity status is as much a bane as a blessing: it prevents many theorists and philosophers from treating his work with the seriousness that it deserves. I contend that Žižek has immense theoretical significance for contemporary philosophy, and that what gives Žižek's work its stunning currency is his fidelity to Hegel's dialectical method. That is not to say that Žižek peps or spices this method up, "adapting" it to contemporary conditions or "renovating" it in any way; rather I maintain that Hegel's metaphysical system, like all genuinely universal philosophical theories, shows itself to be *directly* applicable to current philosophical and scientific issues. Hence, after elaborating what is at stake in Hegel's metaphysics, I will argue that it has *immediate relevance* for contemporary thought, and that Žižek has already gone some way in demonstrating this by productively applying the dialectical method to the philosophically problem-ridden modern science of quantum mechanics.

I

Let us begin by examining one of Žižek's more densely theoretical reflections from *The Ticklish Subject*. Regarding the transition from the metaphysical system of Kant to that of Hegel, Žižek posits that

For Hegel, Reason is not another, 'higher' capacity than that of 'abstract' Understanding; what defines Understanding is the very illusion that, beyond it, there is another domain (either of the ineffable Mystical or Reason) which eludes its discursive grasp. In short, to get from Understanding to Reason, one does not have to *add* anything, but, on the contrary, to *subtract* something: What Hegel calls 'Reason' is *Understanding itself*, bereft of the illusion that there is something beyond it... [Thus] what Kant does not see is that his Critique of Pure Reason, as the critical prolegomena to a future metaphysics, *already is* the only possible metaphysics... Hegel 'became Hegel' when he accepted that there is no Absolute *beyond* or *above* the reflexive oppositions and contradictions of the Finite – the Absolute is nothing but the movement of self-sublation of these finite determinations; it is not beyond reflection, but is absolute reflection itself. Once Hegel gained this insight, the distinction between Logic and Metaphysics had to collapse: Logic itself had to be identified with 'Metaphysics', with the philosophical science of the inherent categorical network which determines every conceivable form of reality. (Žižek 2000: 84-85)

The first thing to be noted here is that for Žižek the transition from Kant to Hegel involves a radical gesture of *subtraction*, the subtraction of the problematical existence of a positive domain of supersensible entities that reside beyond the grasp of our finite discursive cognition, the subtraction of any transcendent truth that might lie beyond the epistemological limit of our thought (Allison 1983: 65-68; Kant 2003: 271-75, 292-93, 327). Indeed, in *Tarrying With The Negative* (again grappling with the transition from Kant to Hegel), Žižek will maintain that in the light of such a gesture of subtraction, the division between epistemology and ontology has to *collapse*, since the distinction between the epistemological limit of thought (what we can cognize) and ontological reality (what actually exists) must be defined as an *intra-conceptual* distinction made *by our discursive cognition*, and thus deprived of any overarching transcendent necessity (Žižek 1993: 18-20).

However, if Hegel is unwilling to concede the existence of an impenetrable beyond barred from our cognition, he refuses to rule out the existence of the supersensible altogether (Hegel 1969: 589-91, 756, 827-28). Instead, he posits the logical categories themselves (abstract concepts like necessity, causality, essence and existence etc.) as irreducible to the empirical, as that which must be metaphysically

presupposed qua concepts in order for the world to be rationally structured (Hegel 1892: 45). As he so vividly put it in the preface to the *Philosophy of Nature*, “metaphysics is nothing else but the entire range of the universal determinations of thought as it were, the diamond net into which everything is brought and thereby first made intelligible” (Hegel 1970: 11). But significantly, this idea did not entirely originate with Hegel: it is already quite clear in Kant that the categories were irreducible to the content of the senses (Hegel 1892: 86-87; Kant 2003: 113).¹ This is how Kant framed the problem in his *Lectures on Metaphysics*:

Our concepts never arise other than upon the occasion of objects of the senses, upon which the understanding reflects. In this Aristotle is right. For if nothing is given to us, then we cannot reflect on anything. Plato says, on the contrary, that they are not borrowed from the senses, and in that he was also right, for could our senses ever bring about the concept of the necessary or the possible? In which would it lie, in smell, in taste etc.? The concepts of the understanding are nothing other than the actions of reflection. But since it is impossible to reflect if I have no object, which the senses deliver to us, the understanding would not reflect if the senses provided no stuff. Pure understanding produces concepts, but they would not occur if there was no stuff. So Plato was also right. Aristotle meant to maintain that matter, but not form, came from the senses; had he so expressed himself, and Plato in turn: the form for reflecting is what the understanding has independently of the senses, then no dispute would have arisen and both systems could easily have been united. (Kant 1997: 123-24)

Kant here resolves the contradiction between Plato and Aristotle by means of a dual gesture: a) we can only arrive at certain empirical concepts (i.e. our concepts of planets, trees, iron etc.) if we have passive, receptive access to the world by means of the senses; and b) since the categories are not “things” but abstract concepts (such as necessity, possibility etc.), they must be innately situated in the “understanding” i.e. in the “transcendental subject”. The senses give us the raw matter from which our empirical concepts are composed, the understanding the form (Kant 2003: 65-66).

And yet, as Hegel famously observed, Kant failed to take note of the *content* of the *categories themselves*; they are presupposed, taken over from classical logic as concepts self-evidently valid and comprehended (Hegel 1892: 50-52, 83; Hegel 1969: 33, 594, 789; Kant 2003: 111-13).² In contrast, Hegel’s *Science of Logic* purports to be nothing less than an exposition of the dialectical relations that constitute the immanent content of the categories. And so, while Kant posited that the categories taken on their own are empty, thoroughly devoid of content, we find Hegel claiming that, “to assert that the categories taken by themselves are empty can scarcely be right, seeing that they

have content, at all events, in the special stamp and significance which they possess. Of course, the content of the categories is not perceptible to the senses, nor is it time and space: but that is rather a merit than a defect" (Hegel 1892: 91; Kant 2003: 93).

The key to understanding Hegel's idea that the categories each have their own specific content lies in understanding what counts as a "content" for Hegel. Kant maintains that our thoughts can only have a determinate content when they are bound to an intuition which is delivered to us by the senses; whereas for Hegel, the content of a concept is first and foremost that which it must be *opposed to* in order for it to emerge in its clarity and distinctiveness, in order for it to be more than an empty name (Hegel 1892: 152; Kant 2003: 93). And so, for example, Hegel will posit that the "content" of the concept of infinitude (*Unendlichkeit*) is first and foremost everything contained in the concept of finitude (*Endlichkeit*), of which it is the negation (Hegel 1969: 143). Therein resides the essence of Hegel's "dialectical method": it is a *linguistic* method enabling Hegel to determine the *linguistic* relations underpinning the categories - a method which is moreover in deep continuity with Saussure's structuralist linguistics (Hegel 1969: 441, 831-36). As Saussure puts it in his *Course in General Linguistics*, concepts are to be "defined not positively, in terms of their [meaning], but *negatively* by contrast with other items in the same system" (Saussure 1983: 115). Regarding each category in his *Science of Logic*, Hegel does not give the kind of definition one would expect to find in a dictionary but instead elaborates the category's immanent linguistic relations with other categories (Hegel 1969: 795-800, 834-36). By demonstrating each category to be linguistically dependent upon others (necessity upon contingency, identity upon difference, being upon nothing etc.), Hegel exhibits their self-contradictory nature, and the natural productive transitions they must undertake over into one another (Hegel 1892: 149; Hegel 1969: 39, 143, 592, 826).

II

Having thus demolished the Kantian premise that the antinomic contradictions between the categories are fundamentally unproductive, and harbouring no sympathy for the arbitrary concept of a transcendent domain barred from our cognition, Hegel is able to venture a truly remarkable contention (Hegel 1892: 98-99; Hegel 1969: 831-33). Indifferent to the unphilosophical prejudice that the supersensible beyond must be devoid of contradiction, Hegel proposes that the self-contradictory logical categories

need no longer be seen to inhere innately in the transcendental subject as Kant wanted them to, but can and must be understood as those structural aspects of empirical reality that are irreducible to and in excess of the corporeal, of the content of the senses (Hegel 1892: 63, 98; Hegel 1970: 13). Hegel goes “beyond” Kant to the extent that he “relocates” the categories, such that they are no longer merely situated in the subject *but equally constitute the “noumenal” world itself* (Hegel 1892: 45-47). As Hegel puts it,

When for instance, we look at a piece of sugar, we find it is hard, white, sweet, etc. All these properties we say are united in the one object. Now it is this unity that is not found in the sensation. The same thing happens when we conceive two events to stand in the relation of cause and effect. The senses only inform us of the two occurrences which follow each other in time. But that the one is cause, the other effect (in other words, the causal nexus between the two), is not perceived by sense; it is only evident to thought. Still, though the categories, such as unity, or cause and effect, are strictly the property of thought, *it by no means follows that they must be ours merely and not also characteristics of objects.* (89-90)

Hegel here offers a fresh solution to the conflict between Plato and Aristotle that radically differs from Kant’s solution: Hegel subtracts Kant’s “primordial being with intellectual intuition” (an omnipotent omniscient God-like figure if ever there was one) so that it might be the *logical categories* that are situated beyond the finite empirical world (45; Kant 2003: 90). For Hegel the categories are on *both sides* of empirical reality, *in* the subject in the mode of pure thoughts and *beyond* the transient phenomena as the supersensible concepts which structure them from within and which must be presupposed if these phenomena are to emerge at all (on this point, see Žižek 2007: unpaginated). This, perhaps, is what Žižek is evoking when he claims that Hegel’s *Science of Logic* explicates “the inherent categorical network which determines every conceivable form of reality”: the logical categories constitute a kind of zero-level of structure to which every possible form of physical and social reality must accord.

Hegel thus suggests that the presence of the categories within our minds can only enable us to cognize reality insofar as these categories already implicitly exist within reality and so structure it (Hegel 1969: 32-33). However, if it can be said that the categories metaphysically structure reality, it is clear that they cannot and do not subsist in the material world as substantial “Things-in-themselves”, but instead merely as implicit immaterial concepts, as pure appearances perceptible only to thought and thus lacking any underlying physical reality.³ The categories are structure *as such*. In Hegel’s

example cited above, it is clear that the “unity” of a piece of sugar could not substantially subsist outside of the unified object, but it is also equally clear that the category must nevertheless metaphysically structure the object from within if it is indeed going to be unified. It might seem that the category could simply be presupposed, or taken for granted, but it is precisely this “self-evident” truth that Hegel is attempting to render problematic. As regards the presence of the categories in our minds, Hegel asserts the following:

The forms of thought are, in the first instance, displayed and stored in human language. Nowadays we cannot be too often reminded that it is *thinking* which distinguishes man from the beasts. Into all that becomes something inward for men, an image or conception as such, into all that he makes his own, language has penetrated, and everything that he has transformed into language and expresses in it *contains a category* – concealed, mixed with other forms or clearly determined as such, so much is logic his natural element, indeed his own peculiar nature. (Hegel 1969: 31-33)

Note that, for Hegel, the categories are *instinctively* and *unconsciously* applied by thought when we cognize the world: we don’t have to reflexively think about it, it is just something that thought utilizes automatically (Hegel 1969: 39). While we are quite capable of bringing the categories explicitly before consciousness (as Hegel does in his *Science of Logic*), they are predominantly active “behind the scenes”, logically structuring our thought without our awareness of the fact (Hegel 1970: 11; Kant 1997: 158).⁴

Having exhaustively elaborated the linguistic relations underpinning the categories in his *Science of Logic* via the dialectical method, and having equated the categories with both the logical structure of cognition and the noumenal structure of empirical reality, Hegel was subsequently confronted with a fresh philosophical problem: it is the properly materialist problem of determining the precise relation between the abstract categories and their actual, physical, empirical examples. To the extent that the categories must be employed in order to comprehend anything at all, nothing can be talked about that is not an example of one or the other of the categories. But conversely, it is clear that the categories’ status as pure abstract thoughts renders them deficient in relation to their concrete examples, to all the things in the physical world which are structured by them and which can be thought by means of them.⁵ Or as Kant put it, “all [the logical categories] would mean nothing if the senses delivered no objects and examples. If I explained however well what a substance was and yet did not know to

give an example, then it would be all for nothing” (Kant 1997: 124). This indexes the inherent limit of Hegel’s *Science of Logic*: precisely insofar as it remains within the abstract domain of pure thought, it is not concrete *enough* and is thus inferior in relation to the more determinate “philosophical sciences” such as those of “Nature” and “Spirit” (Hegel 1892: 91; Hegel 1896: 494).

And it is to this problematic that Žižek addresses himself throughout his work. If Hegel felt obliged to elaborate an abstract conceptual treatise in the domain of pure thought (his *Science of Logic*), Žižek evidently does not. As Rex Butler and Scott Stephens point out in the Editor’s introduction to *Interrogating the Real*, “Žižek goes further than simply finding examples for philosophical concepts, or even reducing those concepts to the level of examples. For what persists in both of these cases is the assumption of some external Truth, of which these would be the examples. In fact, Žižek’s real point is that *no* philosophical Truth can ever exist apart from its exemplification, that is, its enunciation” (Žižek 2005a: 4). However, given that Hegel was well aware of this fact (which is why the *Philosophy of Nature* and the *Philosophy of Spirit* come *after* the *Science of Logic* in Hegel’s *Encyclopedia of the Philosophical Sciences*), I claim that Žižek feels no need to elaborate an abstract metaphysical treatise like Hegel’s because *the Science of Logic has already been written* (Hegel 1892: 91). That is to say, what if the aim of the *Science of Logic* is not only to exhaustively enumerate the categories and their linguistic relations but equally to demonstrate the *deficiency* and *untruth* of the logical categories (Hegel 1969: 591-92, 841-844)? What if there is more truth in the material and social *examples* of the categories than there is in the abstract categories themselves? If this is the case, there need only be *one Science of Logic*, since, as the *true* “critique of pure reason”, it merely precedes the dialectical thinking of the material world. A monument to what thought is capable of when left to cognize itself in its own domain, the *Science of Logic* simultaneously represents the definitive devastation of every metaphysical idol which sets itself up over and against the methodical cognition of material reality (Hegel 1969: 34).

III

As we have seen, the dialectical method is the means to the cognition of the linguistic relations underpinning the categories, and the categories are the means to the cognition of empirical reality. It follows that the dialectical method must be applicable to at least

some aspect of empirical reality, namely, the dialectical aspect. Hegel discerns that this dialectical aspect can be isolated in Nature by examining not so much the secure findings of the individual sciences *as the transition between the sciences*: the transition from physics to biology, from biology to anthropology etc. (Hegel 1970: 20-21, 24-27, 443-45). To be sure, Hegel's own account of such dialectical transitions within his *Philosophy of Nature* is severely outdated, but I contend that this is less a result of any flaw in the dialectical method as it is a result of the severe limitations of the science of his day. Indeed the very fact that these sciences continue to develop today in general isolation from one another (e.g. one can be a neuroscientist without being a physicist) demonstrates that the categories being employed in each science differ radically. To use the simplest example, the category of "life" is inapplicable to the domain of objects examined in physics and chemistry, and can only be legitimately applied to the objects studied in biology (Hegel 1969: 761-66; Hegel 1970: 18-19, 270-75). The dialectical method can thus be productively employed in examining the *transition* from e.g. chemistry to biology, that is, in examining the metaphysical emergence of the category of life in physical reality. However, while dialectical transitions are ubiquitous and transparent in the abstract domain of the logical categories (since the dialectical method is, after all, a *linguistic* method), such transitions are counter-intuitive and uncanny when they take place in physical reality.

In this context, Žižek's work on quantum mechanics represents a transparent reworking of Hegel's *Philosophy of Nature*: he is reapplying Hegel's dialectical method to what one might call the zero-level dialectical transition in physical reality, namely, the quantum mechanical phenomenon of the wave function collapse. Žižek frames the problem of the wave function collapse in *The Indivisible Remainder* as follows:

It is deeply symptomatic that in an effort to specify [the collapse of the wave function], quantum physicists resort again and again to the metaphors of *language*: the 'collapse' of the wave function occurs when a quantum event 'leaves some kind of *trace*' in the observational apparatus, that is, when it is 'registered in some way'. What is crucial here is the relation to externality: an event becomes fully 'itself', realizes itself, only when its external surroundings 'take note' of it. Does not this constitutive relationship to externality prefigure the logic of 'symbolic realization', in which an x 'counts', becomes 'effective', via its inscription into the symbolic network that is external to the 'thing itself'? (Žižek 1996: 223)

It is clear from this passage that the need for quantum physicists to take refuge in the “metaphorics of language” does not in any way indicate that they are regressing from the clarity and theoretical rigour of scientific method into the ambiguous and hazy domain of linguistic constructs. In fact, as Žižek attempts to demonstrate, the opposite is the case: it is in their attempt to transpose the meaningless formulae of quantum mechanics into the metaphoric domain of everyday language that the counter-intuitive paradoxes immanent in them can be brought to light and made explicit, and thus put into a conceptual format that the dialectical method can operate on (Žižek 1996: 230).

Transposed into everyday language, the fundamental paradox of the “collapse of the wave function” concerns the transition from the spectral domain of quantum waves over into the “fully constituted” realm of elementary particles that we find so much more intuitively plausible (Joos 1996: 1-2; Nakazato Namiki Pascazio 1997: 1-6). The difficulty in dealing with the wave function collapse has traditionally resided in two things. First, the collapse seems to defy the “law” of causality: when a particle stops being observed, it branches out from its last registered position according to the wave function. The wave function enables us to determine the *probability* of the particle emerging in a particular position when it is observed again, but for *any single measurement* it is absolutely impossible to know in advance *where* the particle will materialise: each time is as random as the last, and it is only by taking the measurements cumulatively that some semblance of probabilistic “order” can be discerned therein (Joos 2000: 15; Zeh 1996: 7).

It thus seems as though contingency is directly inscribed into the immutable physical laws of reality itself. In the light of what we have already covered regarding the categories, this first problem should not be the cause of any great concern: it only *appears* to be a paradox to those who take the category of *causality* to be absolute (Hegel 1892: 156-59). That is to say, while each “world” (the world of quantum mechanics, the world of classical physics) may indeed function coherently according to entirely deterministic laws when left within its own domain, there is no reason why these two worlds cannot be mediated by a moment of utter contingency when it is a question of the dialectical transition between them. However, this was an intolerable state of affairs for Einstein, who could not come to terms with such physical contingency, which, I suggest, is why he posited the existence of “hidden variables”, of some unknown third term that would allow us to submit the collapse of the wave function to the linear determinism that is everywhere else apparent in the world of physics (Nakazato Namiki

Pascazio 1997: 66-69). By emphasizing Niel Bohr's famous response to Einstein's "God doesn't play with dice" ("Don't tell God what to do!"), Žižek exhibits an awareness of the inapplicability of the category of causality to the collapse of the wave function (Žižek 2005b: unpaginated). This is one sense in which Žižek can be understood as applying the dialectical method to the science of quantum mechanics: clarifying the categories that can be legitimately applied to quantum mechanical phenomena.

The second problem with the wave function collapse is that it upsets our natural intuitions about physical objects and their localizability in space: it would seem completely natural to assume that if a particle is in one spatial position, it cannot at the same time be in another spatial position. This intuition has been thoroughly undermined by quantum mechanics. When observed, particles never appear in more than one position at the same time; but when not observed, particles start to obey what is known as the law of "quantum superposition": a particle is in all the possible positions it could be in (i.e. "within the constraint of its wave function") *at the same time* and often interferes with itself (Nakazato Namiki Pascazio 1997: 25-28, 34; Žižek 1996: 221).

This uncanny fact of the quantum mechanical world traditionally led many physicists to doubt the physical existence of the spectral quantum objects delineated by the wave function. In accordance with the Copenhagen interpretation, such physicists restricted the wave function to its use as a mathematical tool for the calculation of probabilities, and refused to make any claim regarding its independent physical existence (Greenstein Zajonc 2006: 123-24; Zeh 1996: 7). Within this positivist framework, it is the act of measurement by an external apparatus or observer that brings about wave function collapse, and physical observables (photons, electrons, Gold atoms etc.) can be said to *exist* only after they are *measured* (Joos 2000: 4). And yet, this presupposes the macroscopic observational apparatus as an external given, and does not explain how this apparatus, being "governed by the same quantum mechanical rules that govern everything else in the universe", could emerge in the first place (Weinberg 2005: 33). In assuming "observability" and "measurability" to be prerequisites for physical existence, these physicists already presupposed too much, took too much for granted, namely, the external measurement device itself. Clearly, physical priority must be given to "an 'absolutely existing' universal wave function" over and against the macroscopic world that constitutes our everyday reality (Zeh 1996: 7; Zeh 2000: 25). In *The Parallax View*, Žižek exhibits a keen awareness of this all-important dialectical reversal:

In an initial moment, it appears as if first (ontologically, at least) there are particles interacting in the mode of waves, oscillations, and so forth [a view for which quantum superposition represents an inexplicable paradox i.e. it demonstrates that a particle can be in two places at the same time, can interfere with itself etc.]; then, in a second moment, we are forced to enact a radical shift of perspective – the primordial ontological facts are the waves themselves (trajectories, oscillations), and particles are nothing but the nodal points at which different waves intersect. (Žižek 2006: 172)

From this perspective, the true Hegelian problem is not, “How can we make sense of, for instance, the principle of quantum superposition, within the coordinates of the classical paradigm?” but rather, “How does the world of classical physics *emerge at all*?” Once the question had been philosophically reformulated in this way, it could become an authentic project for scientific investigation, and it is with this problematic that the relatively modern physical theory of quantum decoherence has attempted to grapple (Zeh 1996: 8-9). The theory of quantum decoherence maintains that the quantum wave function, which evolves deterministically according to the Schrödinger equation within all microscopic systems, “loses” its coherence on an extremely short timescale when these microscopic systems come into relation with their larger macroscopic environment, thus bringing about the classical spatiality and irreversible temporality that we take for granted in our decohered universe (Joos 2000: 1-2; Zeh 1996: 22). It is therefore the microscopic quantum system’s *interaction* with its *environment* that brings about its decoherence (this environment functioning as a “continually active position monitor”) (Joos 1996: 1-2; Zeh 1996: 25). It is in this way that “particles” (redefined as “narrow decohered wave-packets”) come into being for the first time, being understood not as the “rock-solid building blocks” from which empirical reality is composed but rather as the fragile result of systematic decoherence (Joos 2000: 15; Zeh 1996: 12).⁶ The theory of quantum decoherence thus enables us to grasp the immanent transition from the domain of spectral waves over into the domain of decohered classical “particles”.

IV

I contend that the dialectical method is *implicitly* and *instinctively* operative in this physical theory, and I suggest that in Žižek’s work on quantum mechanics he is attempting to make the dialectical aspects of quantum decoherence thoroughly *explicit*. As Žižek earlier put it, the wave function collapse demonstrates that “a [quantum] event

becomes fully 'itself', realizes itself, only when its external surroundings 'take note' of it" (Žižek 1996: 223). Simply put, this entails that the wave function is effectively *sublated* in the particle(s) which result from its systematic decoherence: the very semblance of these spatially localizable self-limited particles exerts an efficacy of its own, not just for-us but for physical reality itself (Zeh 2000: 25, 28). As Pessoa asserts, quantum decoherence enables us to understand the collapse of the wave function "as a physical process occurring independently of an observer or even of a measuring apparatus" (Pessoa Jr, 1998: 340). Here we have perhaps the first explicit *example* of the category of unity, of being-for-self, within the physical world, the category (as a metaphysical concept without any underlying physical reality) structuring these decohered particles from within (Hegel 1969: 157-160).

That is to say, the physical phenomenon of quantum decoherence explicitly replicates the logical movement from the category of "determinate being" to the category of "being-for-self" in Hegel's *Science of Logic*. Via the application of the dialectical method, Hegel discerns that at a purely *linguistic* level, the "determinateness" of a "determinate being" lies outside of itself in its "negation" i.e. in that from which it is distinct. It is only when a determinate being *internalizes* its negation that it passes over into a "being-for-self", a self-limited entity (Hegel 1969: 150, 157-59). Likewise, a microscopic quantum system relates to its environment as its negation, as an *external* limitation which will bring about its decoherence. It is only when this external limitation (interaction with its environment) is *internalized*, presupposed as a constitutive moment of its physical evolution, that a microscopic quantum system manifests itself as a "particle" (or group of particles) i.e. as a being-for-self. And it is in this sense that we can understand Žižek's claim that the wave function collapse "prefigures the logic of 'symbolic realization'": physical reality is here acting in a thoroughly *linguistic* way, the quantum mechanical domain spontaneously passing over into another qualitatively different domain (the domain of classical physics) in accordance with an uncannily *speculative* or *dialectical* logic, as though the dialectical method from Hegel's *Science of Logic* was given full reign within physical reality itself (Hegel 1969: 831-36; Žižek 1996: 223, 229-30).

And since we are no longer dealing with abstract categories but rather with "an 'absolutely existing' universal wave function", the fact that "decoherence by 'continuous measurement' seems to represent the most fundamental irreversible process in Nature" cannot but strike us as an uncannily *ideal* fact of physics (Zeh 1996: 12). Although the

linguistic transition from one category to the next in the domain of pure thought is intuitively comprehensible, it is altogether another story when it comes to such dialectical transitions in the realm of Nature. In Nature the gap between in-itself and for-itself becomes palpable, and it is no surprise that the metaphysical emergence of the category of being-for-self in the midst of the physical phenomenon of the wave function collapse was originally paradoxical for physicists unaccustomed with dialectical logic. Žižek's work on quantum mechanics thus demonstrates the immediate relevance and applicability of Hegel's dialectical method to contemporary philosophical and scientific problems: the "paradoxes" which had traditionally plagued quantum physicists simply dissolved away once the dialectical method was mobilized for their apprehension, resulting in the current physical theory of quantum decoherence.

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¹ It should be recalled that for Kant the understanding contains a mere 12 categories corresponding to the 12 forms of judgment: unity, plurality, totality, reality, negation, limitation, possibility, actuality, necessity, substance, causality, and reciprocity (Kant 2003: 113). By contrast, Hegel's *Science of Logic* can be understood as a solid reworking and expansion of Kant's list of categories. While Kant elaborates only 12 categories, Hegel expounds over 80, including such central and fundamental terms as being, essence, existence, actuality, necessity and universality (Hegel 1969: 15-22).

² In truth, Kant fell victim to the same oversight that plagued the first commentators on Hegel's *Science of Logic*: he mistook our familiarity with the categories for our comprehension of them. Such an error of course requires no great lapse in reasoning since, as Hegel puts it, "what is more familiar than just those determinations of thought which we employ on every occasion, which pass our lips in every sentence we speak" (Hegel 1969: 33).

³ As Hegel claims, one must "speak of nature as the system of unconscious thought, or, to use Schelling's expression, [as] a petrified intelligence" (Hegel 1892: 46).

⁴ As Kant starkly puts it, "Our common language already contains everything that transcendental philosophy draws out with an effort... If we posit that we had no such pure concepts of the understanding [such as "causality", "substance" etc.], then we could not think or speak at all" (Kant 1997: 158).

⁵ As Žižek puts it, "The eternal Absolute [understood as the totality of the categories elaborated in the *Science of Logic*] is the immobile point of reference around which temporal figurations circulate, their presupposition; however, precisely as such, it is *posited* by these temporal figurations, *since it does not pre-exist them...*" (Hegel 1969: 531-32; Žižek, 2007: unpaginated).

⁶ As Joos provocatively states, "usually quantum objects are considered as fragile and easy to disturb, whereas macroscopic objects are viewed as the rock-solid building blocks of empirical reality. However, the opposite is true: macroscopic objects are extremely sensitive and immediately decohered" (Joos 2000: 15).