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Biological evolution, sociocultural evolution, cosmological evolution: the search for links

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Abstract

This article brings together transcendental philosophy, biosemiotics and quantum mechanics to derive a unified theory of biological, sociocultural and cosmological evolution.

It is argued that all three of them are characterized by the evolution of emerging subjectivity from the objective world following a natural law of emergence.

The determined final end of causation, it is argued with Johann Gottlieb Fichte, Friedrich Willhelm Joseph von Schelling and John Archibald Wheeler, is to posit its own creation in observation.

However, it is also argued that this picture is purely *philosophical*: it is a different way of looking at the cosmos but makes no practical difference. Any attempt to utilize the theory in everyday life is an illegitimate crossover into pseudo-science.

Keywords: Entropy; information; emergence; evolution; transcendental philosophy; biosemiotics; quantum mechanics.

Introduction

In her brilliant 2006-book *The Whole Creature*, semiotician Wendy Wheeler writes that "the puzzling story […] of how many intelligent people in the humanities and social sciences […] came to ignore the theory of evolution, and believe that everything we think we know is just an effect of written or spoken language, is yet to be told […]"[1]. This bitter statement, of course, reflects the infamous "two cultures" dictum that characterizes academia and knowledge production today[2]. On the other side of the divide, reductionists and epiphenomenalists have succeeded in taking the self out of the cosmos and history in theory[3]. For the natural sciences, talking about subjective agency is like going to church; the expression of creed without scientific foundation or rational justification.

In a paper that I have published some time ago, I have attempted to show that sociocultural evolution is essentially constituted by biosemiotic scaffolding mechanisms for information flow that may result in biosemiotic emergence: trillions of microorganisms call themselves by a single name in human consciousness[4]. Likewise, the point has been made that it is the subjectivity of individual organisms that ultimately drives this process. Sociocultural evolution, it has thus been argued, is no different from biological evolution on a deep-structural level. However, there is yet a third kind of evolution that is likewise thought to be as disconnected from the other two as they are thought to be detached from one another. This, of course, is evolution on the largest scale, the evolution that by definition includes and enables the other two kinds of evolution: cosmological evolution. In this article, I seek ways to unify the third with the other two by a highly unusual technique for knowledge production in academia today: I will start from the *subject* (agent, self or observer), not from the *object* (outer, physical or material world).

Is cosmological evolution connected to subjectivity in the same fundamental way in which the other two kinds of evolution are driven by it? But how could this be, given that it seems by definition the evolution of the objective, of the physical, of the world, not the self? Is the self or subject in biology and thus in society not an insignificant coincidence within the physical realm, the object? Sociocultural evolution can only be explained on terms of biological evolution. And yet, both are part of the object, of the universe or cosmos. Therefore, both can only be explained in terms of cosmological evolution. This is certain and plain to see. But could it be the other way around also? Where are the connections?

Biological and Sociocultural Evolution

As has been argued in the afore-mentioned paper, a human being is essentially a social system[5]. One is not one, but a being made of trillions of individual beings, a myriad of creatures. Only ten percent of these are genuinely "human," i.e., eukaryotes carrying the human genome, which constitute the "upper classes" of "administrators" and the "military" that rule over the "working class" and the "cattle," meaning bacteria and fungi[6]. And yet, this vast society of individual beings calls itself by a single name in human consciousness. This consciousness is an "emergent phenomenon," an entity arising out of the sea of signals transmitted between the trillions that make it. It is not in any of

these in particular, not even in the neurons. It emerges from the tightly scaffolded flow of signals, from information exchange between a society of microorganisms.

However, it is not an epiphenomenon, it is *real*. Its subjectivity encompasses more of the objective, outer world that it is embedded in than any of the entities that make it can perceive individually. David Chalmers thus defines consciousness as the sole example for "strong emergence"[7]. The emergent, higher-order subject comprehends more and can thus base its actions–the actions of the collective it makes and is made of–on this higher-level understanding. Consequently, the increase in awareness turned into agency leads to an increase in control. The emergent, trans-individual subject is extending further into the object (the physical realm) in both its understanding (awareness) of it and in its control (agency) over it.

And yet, the higher-level subject of a new order of awareness and agency (i.e., subjectivity) that emerges from connectivity in scaffolded complexity (or "organization") of its lower-order subjects is driven in its emergence by the internal urge in matter that comes with animation. It has been advantageous individually for separate entities to integrate themselves into a common structure to the degree that their individuality was lost fully in the case of the transition from multiple procaryotic cells to the eukaryotic cell and for all practical purpose in the transition from multiple unicellular organisms to multicellularity[8]. Or they got tricked into "thinking" so in any case (obviously not implying a reflective level here)[9].

Like microorganisms and the human body, individual identities and society are bilaterally constitutive. In human society, connectivity was advantageous for our ancestors to trade and tackle challenges collectively[10]. But it is a dynamic process and today interconnectedness has grown to a degree that the individual is hardly able to support its living without a smartphone, a Facebook account and an email address[11]. To prosper in the interconnected environment, one has no choice but to further increase connectivity by collecting "friends" for social capital and by representing oneself in virtual networks and offering instant access to what used to be one's private sphere for economic capital. Cultural capital is acquired in the institutions that enable the individual to partake in symbolic and technological communication by forcing the individual into the collective. During a child's upbringing and in school, entropic behavior is transformed into controlled behavior: a semiotic scaffolding is built and internalized[12]. Perhaps we were tricked too, but there is no way back, we have increased technological and social progress to the degree that the collective controls us more than we control it ("downward causation"), to the degree that the individual can only prosper when we keep on accelerating the becoming of the collective[13]. Thus, it is subjective urge that creates subjectivity of higher orders. This driving principle of evolution to connect is behind sociocultural evolution as much as it is and has always been the law of biological evolution[14]. On the road towards the next level of emergence, all of humanity's linguistic, technological, cultural and social scaffolding mechanisms are a product of this underlying law. Connectivity always increases. The scaffolding tightens. Separate thought acts become collective knowledge production and separate deeds become collective rule administration. Sociocultural evolution is part of biological evolution.

Compulsory Logic of Cosmological Evolution

Both of them are part of cosmological evolution for a very simple and logically compulsory reason: there is nothing else they could possibly be part of. But what is cosmological evolution? On its largest scale it must be the creation of itself for a likewise very simple and logically compulsory reason: there is not nothing. Therefore, this "something that is" must come from somewhere. Considering the universe as an absolute, as a spatiotemporal totality of all that is, then, it is obvious and logically compulsory that it must come out of itself: there is nothing else it could possibly come from. Holding on to the logically compulsory axiom that everything has a cause, then, it *must* be regarded as its own cause (and thus likewise its own effect) in some mysterious way. What justification do we have to throw the laws of logic overboard if we don't have to, for there obviously is something that everything could have come from. Obviously, we need to rethink our assumptions about time and causation.

Consider the "chicken and egg" thought experiment, which has been unjustly called a "paradox." There is an egg because there is a chicken. There is a chicken because there is an egg. There is nothing paradox about it. It's just that there is obviously something wrong with our understanding of time. Thus, it is a riddle but not a paradox. Likewise with the totality of all there is, there is no reason to abandon the laws of logic by stating that it has always been without a cause or that there is something more absolute that causes it. Neither of these "explanations" satisfies logic and both of them lead into an unseemly regress (in fact, it is logically nonsensical to say that there is something more absolute than the absolute in the first place, which is like saying there is less than nothing). Actually, both "non-arguments" are very similar: to say there was a creator that started it all makes this creator eternal and thus turns out to be essentially the same argument as to say that the universe itself is eternal. Neither argument explains anything and much less why there is something rather than nothing.

The universe "is" because it caused itself. "Being" is a problematic term, of course, as nothing ever really "is" in the constant flux of becoming and fading away, but I think everyone can agree that there is not nothing in any case. However, it must be observed here that this constant negation that makes time is a mere illusion because what appears to be a negation is actually just a transformation, as the first law of thermodynamics states (it will turn out that this illusion has much to do with the second law of thermodynamics, as one would expect). The illusion of a local negation of the affirmation that we experience in fading away (actually a transformation!) must be overcome by an affirmation of the affirmation, which is logically compulsive because something is. There is no logical alternative and there is no reason to violate logic either. Thus, the "why?" is trivial. Something is because of this something that is. It is the "how?" that is much harder to answer.

A Reason for the Past and a Cause for the Future

However, let us note that the question "why?" has a binary, dichotomous internal structure, upon which another article has elaborated in more detail some time ago[15].

"Why?" is not actually one question; it is two questions. While "why" might be trivial when it comes to the object, or the universe, it is not trivial at all when it comes to the subject, to subjective being[16]. Might the answer to "how?" be found on the other side, at the other end, of "why?"

What does it mean to say that "why" is two questions? On the one hand, there is the afore-mentioned "why?" that askes for causes of the appearances that are observed and thus in consequence for the ultimate "why," the reason why there is not nothing. Nothing would make perfect sense, it has perfect symmetry: if there "is" nothing, it needs no reason why there is nothing, nor could there possibly be a reason why there should be something instead. Something, on the opposite, demands an answer to the riddle of its existence: "How come that there is not nothing?"

However, this question is asked always, by logical needs, by an observer, the subject, about the observed, the object. Let us observe here, also, that in asking this question the subject by logical needs looks at itself as an object in that it looks at itself as part of the processes of the natural world, which makes it possible to include the subject (or self) in the object (or universe) as a material, physical object. The question "how come there is not nothing?" or "how come existence?" can thus be translated into "how come that I am here?" as from my present point of observation, from my subjective frame of reference, both are equivalent in meaning. As a totality, the object or universe must include the subject by logical needs (where else would "I" be?).

There are a couple of things that must be observed for this "why" question. As has already been said, it deals with the object, the "universe" or empirical, material, physical, spatiotemporal realm that can be observed. It therefore deals with *causes* and thus with the *past*. Philosophically, it is thus theoretical reason or, more broadly speaking, it is a "why" that asks for a theory of existence, for the "how." One important consequence of these considerations is that there is no particular reason why one should actually care subjectively about this question, this "how come?". Since I am here anyway, why would I ponder over why I am here? Practically speaking, the question seems a bit moot.

However, there is the second side of "why?" which is not that easily ignored. Starting again from the present subject, the observer in its subjective frame of reference, it is easy to see that there is a second "why?". Even if I knew the answer to "how come that I am here?" this still does not tell me what to do. "Why am I here?" can therefore equally mean "what am I here for?". This second "why?" asks "what for?" and deals with the subject, with my subjective reasons to act, and is hence directed into the *future* and linked to *purpose*. It is the "why" of practical reason, in which objects are regarded as "tools" for an end, not as effects of a cause.

Just like one can transfer the quest for causes for particular phenomena into the past to the totality of being by the use of theoretical reason, then, one can look at the universe itself and ask "what is it good for?" (or "what is its purpose?") into the final future by the use of practical reason. The question "what is my existence good for?" can thus be translated into "what is existence good for?" as from my present point of observation, from my subjective frame of reference, both are equivalent in meaning.

This is so by logical compulsion: if the universe serves no purpose, my existence becomes meaningless by logical needs. This does, of course, not mean that one cannot find incentives for actions, for even an existentialist (a person who believes that there is no meaning or sense) and indeed even a genetic reductionist (a person who believes that consciousness does not exist other than as an epiphenomenon) still has to answer to the practical "why" every time she acts. And yet, all of her actions are analytically meaningless and senseless as they will ultimately lead to nothing, to the negation of the affirmation.

However, it has been displayed that an affirmation, something rather than nothing, that is not affirmed does not satisfy the laws of logic. Something as a totality, logically, can only come from two possible causes: from the negation of the negation or from the affirmation of the affirmation. As the negation of the negation, it does not make sense, for where would that negation come from if there is nothing that could negate nothingness? The negation of the negation, then, must be an affirmation of the affirmation instead. This is different from letting logic hang in the air by the insufficient argument that the universe has always been there, which affirms existence but does not deliver the affirmation of this affirmation and therefore explains nothing. It is not inventing some meta-physical principle or entity that defies reason either. The constant creative activity of evolution (cosmological as including biological as including sociocultural) is an ongoing affirmation that must somehow create the totality of this process in an affirmation of the affirmation.

Causes, Reasons and Purpose

I would thus like to dwell on the practical "why" and on its connection to purpose, sense and meaning for a bit more. Notably, there is an asymmetry of the two "whys." This asymmetry is a subjective asymmetry, which is tightly connected to why one cannot cast aside the practical "why" by reducing it to "how"[17]. I do not have to care about "how come that I am here?" because it does not change the fact that I am here in the slightest whether or not I know what caused my presence in the spatiotemporal coordinate that is present to me. In other words, there is no agency or freedom for me to "how" I am here. However, there seems to be a certain degree of freedom to "what" to do. Therefore, "how" is clearly insufficient here: explaining to me how to do something does not mean that I will do it. Even if I understand perfectly well how to do something, I can still decide not to do it. In order to decide to do something, I need to see a point or purpose in doing it. For instance, I can see that eating sustains my bodily functions by supplying my body with energy. And I can understand that there seems to be a good reason for the intake of nutrients as well. After all, the intrinsic urge in the animation of matter is to survive: "all life by definition wants to live!" Tragically, however, human beings are also aware of the second inevitable truth about being in the world, about being a subject that emerges from a highly organized local composition of matter that is part of an eternally fluctuating object: "all life by necessity has to die!" So, all aim for survival seems moot and one may as well take the shortcut to the inevitable end.

As I have argued in the second afore-mentioned article, ideology and religion may stem from this human need to justify our lives by acting for a future purpose beyond individual decay as much as from cosmological creation myths[18]. Most radically, this reversal has been executed by Friedrich Nietzsche at the dawn of modernity with his deicide of the God from the past and Zarathustra's call to create a common "purpose of earth" for a future human apotheosis: God is not something that has been, it is something that has to be created[19]!

However, "human freedom" thus seems to transcend the "freedom" of animals to choose between different courses of action: people seem to be able to base their courses of action on considerations that vastly exceed the present spatiotemporal coordinate they inhabit (immediate sensual input). However, does that mean that other animals have no "freedom" to choose between different actions? And does it mean that humans are "free"?

Compatible Freedom, Semiotic Freedom and Agency

The answer to the first question, judging from the post-anthropocentric perspective that must be taken by everyone who accepts Darwin's theory of evolution, must be "no" of course. Agency, it has been said, increases with awareness. "Awareness" is an organism's internal representation of its environment: its "umwelt"[20]. All beings navigate through this "umwelt" in the darkness inside of their skulls (or wherever their brains or more primitive centers of information processing are located). This darkness is turned into light, into a representation of what is out there, by "consciousness," which is but a different word for the subjectivity or awareness of an agent. The "freedom" of organisms thus grows with the increase in spatiotemporal awareness by the extension of organisms' "umwelten" in biological evolution (the development of more complex species that corresponds to the emergence of higher degrees of "semiotic freedom")[21].

From this well-established fact, which I believe is accepted by everyone who believes that consciousness exists more than epiphenomenally, two important conclusions can be drawn. First, awareness, and thus consciousness, is a continuum among species that probably extends at least as far as to the single eukaryotic cell, which has a double cell-membrane that sends signals to an interior cell core where these signals are represented resulting in inside-out actions. All of the eukaryote's internally scaffolded parts are remains of separate procaryotic cells that fused together in the evolutionary leap from procaryotes to eukaryotes[22]. Accordingly, species with less complex "umwelten" and thus with less "awareness" than humans also have certain, albeit more limited degrees of "freedom."

Secondly, human beings are by no means the end of this continuum. The term "consciousness," strictly speaking, signifies a totality of experiencing the world as it actually is: subjective-objective knowledge by the evolution of the subject's "umwelt" into a full and accurate representation of the organism's "environment." Humanity may be a dead end of evolution, but it is certainly not the end of evolution[23]. Accordingly, "consciousness" is extending from its spatiotemporal position (immediate sensual input) into the spatiotemporal continuum with evolution and the emergence of trans-individual "super-agents" like the complex cell, multicellularity and possibly a "super-agent" growing in sociocultural evolution. The evolutionary growth of awareness leads to a concurring increase in semiotic "freedom"[24].

Let us consider what is actually meant when we say "freedom." Traditionally, there have been two ways of interpreting this notoriously difficult term. The first interpretation, which is probably closer to how the term is understood in everyday language, is the definition of "freedom" as an action that is independent of causal determination. It needs no sophisticated line of argument to see that no degree of semiotic freedom in animals (including human beings) has this degree of freedom. A human's "choice" is not free in an absolute sense but only in a relative sense, for even when we can do what we want to do our desire to do so is still determined by our genetic (nature) and cultural (nurture) composition. Faced with this problem, a long philosophical and scientific tradition going back to at least Thomas Hobbes has thus interpreted "freedom" as what is today often called "compatible freedom:" "freedom" that is "compatible" with causal determination[25]. It has to be noted here that this weak interpretation does not explain how it is that we have an idea of "real freedom" since the reduction contradicts the traditional definition: it is not actually "freedom" that is talked about here at all because the reinterpretation of the term only deals with causally determined and thus *unfree* action (according to the original and everyday definition of "freedom"). It is thus strictly speaking not really a reinterpretation of the traditional concept but rather a substitution of one concept with a different concept. However, this does not mean that the two definitions of "freedom" cannot be connected in a process, which may explain their mysterious link in human agency and understanding: while we are clearly only free in a compatible way, and thus not free at all, we are free in an absolute sense in our immediate self-awareness as imputable agents, as already Immanuel Kant pointed out[26].

The problem with consciousness, in this context, is not so much that it is there at all. I can consciously watch a movie without having the illusion that I am acting in it. But "being me" does not feel like watching the movie of my life. The subject feels like an agent, not merely as an observer. I can thus theoretically *understand* that this is what it actually is like. But I cannot practically *feel* that way. The urge in animation that makes subjective experience will not permit it–it hungers for pattern and control. I *am* "free" in a "compatible" sense only but I *feel* a "freedom" that goes far beyond this "determined freedom" (a contradictory term, of course).

Sticking with the "compatible freedom" interpretation of "freedom" for now, it can easily be seen that "freedom" understood in this way is another term for what has been termed "agency" here: it is the "freedom" to do what the organism is naturally determined to desire (which, in the case of human beings, may well depend on ideological or religious belief structures, which are, however, ultimately also determining forces of the environment on a higher reflective level). If "freedom" means "agency," then, it is easy to see that there is an immediate connection to an agent's "awareness:" an organism's ability to control its environment, i.e., its freedom or agency, depends directly on what it knows about its environment, which is to say that it depends directly on its *umwelt*. In the course of biological (including sociocultural) evolution, then, "freedom" or "agency" increases with higher orders of "consciousness" or "awareness." Together, the awareness (consciousness) and agency (freedom) of an organism are called its *subjectivity*.

Objective-Subjective Knowledge and Absolute Freedom

Thus far, then, it has been established that there is a structural connection between "consciousness" (or "awareness")–the question "why?" directed into the past via theoretical reason that seeks causes for appearances–and "freedom" (or "agency")–the question "why?" directed into the future via practical reason that asks for reasons for actions. It has been said that awareness is a continuum at the end point of which would be a subjective experience of the objective world as it actually is: subjective-objective knowledge. This convergence of subject and object would be the equation of the subjective "umwelt" through which the organism moves in its internal representation and the objective environment in which the organism is actually located. As there is clearly a difference between the awareness that various organisms undoubtedly have to various degrees (and in various ways) and the idealized end point of the continuum that is transcendental in the truest sense of the term as something that we cannot possibly have an experience of, I will use the term "awareness" for the former and "consciousness" for the transcendental absolute of subjective-objective knowledge from now on. It is perhaps suitable to do so because "consciousness" has a somewhat "mystical" ring to it, which might stem from its connection to this transcendental idea or ideal.

Likewise, it seems reasonable to analyze evolutionarily increasing "compatible freedom" or "agency" in analogy to evolutionarily extending "awareness" that grows toward the transcendental ideal of "consciousness." From here on, I would thus like to reserve the term "freedom" for the transcendental ideal of an absolute, unconditioned freedom and use the term "agency" for "compatible freedom" (as the term "compatible freedom" is strictly speaking contradictory). There seems to be a very appealing symmetry in this structure. However, we have a pretty precise definition of "consciousness" as "subjective-objective knowledge." But do we have an equally well-developed understanding of "freedom" that goes beyond its definition merely in the negative as not caused by physical, material causation? It seems that we do not, for there obviously is no other kind of causation. Moreover, if one accepts that everything (humanity, biology, chemistry) is really physical laws at bottom, which seems logically compulsive because it all emerged from physics, there really can be no other kind of causation.

An odd thing happens now. Reflecting upon what kind of (absolute) freedom we might know of, what we know as independent from causal determination if we accept that we are not free (in an absolute sense), we clearly see that the only positive idea that we have of "freedom" is in the past, not in the future. Logically, the only unconditioned absolute is the creation of causation, which by definition is not determined by the causal law of this first creation. The affirmation of existence in creation is free, for it caused all that it determines from past to future including us. But it is not physically-materially caused or determined itself. It is cause of the laws of physics only, not caused by them. Or, less temporally speaking, it is their condition only, not conditioned by them.

However, it has been said earlier that it is not acceptable that we think of this freedom as a freedom that is entirely uncaused because this would violate the laws of logic, not merely the laws of physics. One can with some difficulty imagine a universe with different laws of physics (though this universe would probably not have subjectivity in it) but one cannot imagine a universe with different laws of logic at all! Accordingly, we can only account for the first affirmation, the reason for why there is not nothing, by logical means if this "something that is" affirms (makes) itself somehow! This now is most peculiar: we have identified the transcendental idea or ideal of "freedom" as an end point of increasing agency in animation (i.e., the subject) in the future, but found the only idea or ideal of where there could have actually ever been such a "freedom" at the beginning of our causal determination (i.e., the object) in the past! Could these "two freedoms" past and future be identical then? Could it even be that they *must* be identical by logical compulsion?

From Transcendental Philosophy to Quantum Mechanics and Back

It might be helpful to take a small excurse into the history of transcendental philosophy here. Immanuel Kant, in his attempt to synthesize materialism and idealism, distinguished between the world that we experience subjectively through our mechanisms of sense making, which he called the "phenomenon," and the underlying reality that is actually out there, which he termed the "noumenon." It is easy to recognize that the "phenomenon" is an organism's "umwelt" and the "noumenon" is the organism's "environment." For Kant, and that for ideological reasons ("religions champion in exile")[27], there was an insurmountable wall between the "thing as it appears" as "phenomenon" and the "thing itself" as "noumenon"[28]. Kant lived in the steady state of a static universe. For him, the subject is forever cut off from the object as subjectivity is eternally doomed to live in a distorted representation of the underlying noumenal reality.

However, it was not long before his less pious heir Fichte (driven out of Jena University for his atheism) created a theory of an evolutionary progress of the "phenomenon" towards the "noumenon," culminating in an "absolute reflection" of the world in itself, which thereby posits this world in the first place: the phenomenal reflection of the noumenon becomes the noumenon that posits the phenomenon[29]. In his pre-Darwinian mindset, however, Fichte knew the "what?" but was somewhat lost when it came to the "how?". He developed an ontology of subjective becoming, but he was missing the mechanism to explain it. And yet, the agenda was set: through a mysterious, progressive process of reflections of the "noumenon" (objective reality) as "phenomenon" (subjective perception), or "environment" as "umwelt," the two become steadily closer to each other until a "final reflection" is reached in which the two are identical: objective knowledge of the subject is the same as subjective knowledge of the object! Fichte writes that it is the "demand of practical reason to make all reality congruent with the I, to posit all reality absolutely through the I [es ist die Forderung der praktischen Vernunft, >>dass alles mit dem Ich übereinstimmen, alle Realität durch das Ich schlechthin gesetzt sein solle<<]" and identifies the insight that the "final reflection" of the all of reality is the same as this reality itself and thus posits it in the first place as essential for his enterprise: "knowing and freedom are indivisible. […] The free light that observes itself as being: being that rests in itself as free: – this is the point it stands on. These sentences are essential for transcendental philosophy" [Wissen

und Freiheit sind unzertrennlich vereinigt. (…) Das freie Licht, das sich erblickt, als seyendes: das seyende, das auf sich ruht, als freies: – dies ist sein Standpunct. Diese Sätze sind entscheident für die ganze Transcendentalphilosophie]"[30]. In this "final reflection," the "noumenon" or "environment" is first posited that creates the "phenomenon" or "umwelt" to build up the "final reflection." In the absolute, subject and object converge to create the all of reality.

Two daring young Fichte-enthusiasts, having discussed and argued over Fichte's philosophy many a long night in their Tübingen University dorm room "Augustinerstube" and yet more often and not always entirely clear-headed in the "Kommunität" social area next door (where, legend has it, they started their days with a "wine breakfast") and the many "Weinlokale" of Tübingen, set out to solve the riddle of the process between object and subject.[31] Having to conclude that it must be somehow through humankind that the "absolute reflection" will happen, Hegel, in an attempt to explain Fichte's philosophy that ultimately acquired a life of its own, discovered history[32]. Realizing the shortcomings in his former roommate, lifelong pen-pal, and ultimately sharpest critic's theory, Schelling saw human history as merely part of a much larger process of nature[33]. However, Hegel actually developed a mechanism in his discovery of history: his famous dialectical process that was turned into class struggle later by Marx. Schelling, on the other hand, failed to make the same discovery in his "philosophy of nature." In spite of all of his insights, Schelling's theory stepped just short of discovering the mechanism of evolution in nature[34]. Schelling's work, though difficult in many regards and not least because he seems to have changed his views rather dramatically over the course of his long life, has been rediscovered by post-reductionist philosophers of biology recently[35]. An insightful essay published recently in this journal has elaborated specifically on Schelling's attempt and, allegedly, failure to answer the old Leibni(t)z[36] question why there is something rather than nothing[37].

Schelling, according to Thomson, could not resolve the problem why an unrestrained and eternal force in nature materializes the specific state of nature that we observe. With Fichte's "final observation," however, it seems the answer is that the ultimate observation of the all of nature, of the spatiotemporal continuum or cosmos, breaks the wave function of possible states and materializes exactly the one that it observes (including the temporal dimension and thus one specific history!). It posits it in its imagination and thus in the world in the first place due to the law of identity of subject and object in the final reflection. Materialism and idealism, then, are bilaterally constitutive as the former builds up the latter to posit the former. Certainly, Schelling believed (at that time) that this "final reflection" was necessary for the first creation of nature and he uses the Fichtean term "affirmation of the affirmation" for it: "if the [causal] chain itself shall posit its eternity as real: then the chain, i.e., the affirming, must be affirmed, must become real, within [i.e., through] itself [Sollte also in dem Verbundenen selbst das Ewige als wirklich gesetzt sein: so müßte das Band, d.h. das Bejahende, in ihm selbst wieder bejaht, selbst wieder wirklich sein]"[38]. The process that builds up the "self-affirmation of the absolute copula [Selbstbejahung der absoluten Kopula]" is described in terms strongly reminiscent of biosemiotic emergence as a "*progressive development [i.e., evolution] of the organic forces [i.e., awareness and agency] in a chain* of organizations [i.e., emergence] [*fortschreitenden Entwicklung der organischen Kräfte* in der *Reihe* der Organisationen]" and as "a chain of becoming that steadily returns into itself [eine stetige, in sich selbst zurückkehrende Lebenskette]"[39]. This "return into itself," in turn, is defined as the "whole process of world creation [der ganze Prozeß der Weltschöpfung]" that affirms itself as a "process of fulfilled consciousness raising [Proceß der vollendeten Bewußtwerdung]" in the final "unity and eternity of its own self-observation [Einheit und Ewigkeit seiner Selbstanschauung]"[40].

With Schelling at the latest, thus, we have the self-creating universe through natural processes, as has been duly acknowledged by the great twentieth century physicist-philosopher John Archibald Wheeler in the footnotes to two papers on his own quantum theory of "genesis by observership," which is also known as the "participatory universe," the universe as a "self-excited circuit" or simply as "it from bit"[41]. On the latter aspect, an article has appeared recently in this journal (more on that later)[42].

Like the German idealists Fichte, Hegel and, ultimately, Schelling, however, it is precisely natural (biological and sociocultural) evolution that Wheeler does not talk about in his philosophical papers. What Wheeler does instead is to deliver an interpretation of quantum mechanics that uncannily echoes Fichte and Schelling's ontology: Wheeler's theory is a very consequent update of Kantian and Fichtean thought for the modern time (though he probably was not fully aware of this himself). In Kant, the "noumenal realm" is non-spatiotemporal. It is its distorted representation, the "phenomenal realm," that appears spatiotemporal. However, there are no two separate "realms" at all strictly speaking, since the "phenomenal realm" is an illusion, a distorted reflection, that appears through our mechanisms of perception alone. Only the "noumenal realm" is real (but not a "realm," strictly speaking). This is structurally similar to the relationship between classical mechanics (including Einstein) and quantum mechanics: classical mechanics emerges from quantum mechanics, but strictly speaking only quantum mechanics is "real" (a very complicated term, of course). This said, however, most physicists would agree with this statement and yet hold that the spatiotemporal continuum "is there" regardless of whether someone observes it or not. In Wheeler, however, there really is a very strong analogy to Kant in the sense that the spatiotemporal realm only appears from quantum mechanics through the "observer" and thus exists as appearance, as "phenomenon," merely.

Wheeler explains this by what he calls the "mutability" of natural laws[43]. His arguments ring reminiscent of Gödel's second incompleteness theorem (possibly not by coincidence as Wheeler and Gödel were colleagues and friends at Princeton): each level of physical laws can only describe what happens according to these laws and thus it is precisely these laws that hide what makes these laws on a deeper level of reality. As science climbs up the ladder of systems, at some point it must inevitably arrive at the only thing that is by logical compulsion not included in any model of the observed: the observer. For Wheeler, the observer that collapses the "wave function" of the quantum mechanical "noumenon" (not Wheeler's terminology, of course!) and thereby creates the spatiotemporal "phenomenon" is this "ultimate underpinning of the laws of physics" (the laws of the phenomenal realm including spatiotemporal causation): "Could it be that the quantum is trying to tell us the answer? Could it be that the *observership* of quantum mechanics is the ultimate underpinning of the laws of physics–and therefore of the laws of time and space themselves?"[44]. This is more than merely reminiscent of Fichte and Schelling's solution to the unanswered problem of how the Kantian "phenomenon" first appears: it is structurally equivalent in modernized language and updated science!

Registration, Observation and Destination

Fichte, Schelling and Wheeler all explicitly state that they are dealing with "how?" first and foremost. This may be, as this article has argued, because the "why?" is somewhat trivial in a "self-excited circuit." Or it may be, in Schelling's case at least, because the "why?" proved too difficult to answer, as Thomson suggests[45]. Focusing on the process in-between, however, it is certainly worthwhile to inquire into what makes an "observer." This is none else than to ask what makes a subject or subjectivity, of course. It might be a fruitful line of inquiry also because Wheeler does not deal with biological (including sociocultural) evolution in his work. Perhaps, thus, an inquiry into what may be understood by an "observation" and therefore "subjectivity" can enable us to see the link between cosmological evolution and biological (including sociocultural) evolution more clearly und thus get one step closer to "how."

As Wheeler emphasized, it is not clear if every kind of "registration" counts as an "observation" (as Heisenberg came to believe, Bohr ultimately denied this)[46]. Of course, there always is awareness involved by logical needs when we make any sort of observation in science, but that does not mean that awareness has to be involved in observations by logical needs (however, it means that we will never be able to prove the opposite). Schrödinger, likewise, did not actually believe that cats can be dead and alive at the same time when unobserved by humans (watching my cat watch me, I sometimes cannot help but wonder whether *I* would be there still should it ever stop observing me). It has already been pointed out that awareness in its most primordial form as an internal representation of the external world extends all the way down to the eukaryotic cell. Furthermore, it has been argued that even bacteria (simple procaryotic cells) are endowed with some form of "proto-awareness" and "agency" as they can make a "discrimination" between "good" and "bad" according to changes in their environment[47]. However, if we accept "proto-awareness" as sufficient for an "observation" why should not any interaction meet the criteria, regardless not merely of awareness but also of animation? Consequently, it may well be argued that all matter is endowed with "proto-subjectivity" in the same way in which all animation is endowed with "proto-awareness." This, at least, was the opinion of Heidegger, who showed that all objects are also irreducible subjects in the sense that they are always more than (meaning different from) what we take them to be[48]. In philosophy, Graham Harman's "object-orientated ontology" continued to follow this tradition[49]. Likewise, Alfred North Whitehead defined "experience" of entities as interactions with other objects: an electron, for instance, can have an "experience" because it can interact[50].

What can make "subjectivity" is equivalent to what can make an "observation" in quantum mechanics: as soon as there is a collapse of the wave function there is subjectivity and as soon as there is subjectivity there is a collapse of the wave function. If only human subjectivity can make an observation, then, Schrödinger's cat can be in a superposition of life and death. However, the first appearance of the subject-object split may also be in the onset of gravity in the early universe[51]. Because division implies spatiotemporal dimensions it is here that the "wave function" collapses and the spatiotemporal, fragmented "phenomenon" first appears (Fichte describes this appearance as a "quantization" of the final reflection or noumenon!). The first separate "objects" in time and space may then be seen as the first "proto-subjects" due to their unique spatiotemporal positions, which can be regarded as being in a *certain* state of being (thus meaning Heisenberg's "uncertainty" ends here). Things that inhabit a *certain* position in time and space have an identity, which separates them from all the rest of the spatiotemporal continuum. They have a "proto-umwelt" because they are not merely located in their environment but also "experience" (in the sense of Whitehead) this environment: "a particle proper, it can be put into words, it is a thing with a place"[52]. Thus, with matter in space, we have the first appearance of a primal sort of "subject-object split" and with interactions the first "proto-observations." With the emergence of the first "objects," relations between spatiotemporally separated "things" could get established by the elementary forces of nature (like gravity). Though there is no signification yet, there is thus a form of "proto-communication" that can increase connectivity. From this connectivity, our universe emerged: "it becomes possible for us to say that these ripples consolidate into stars and planets"[53]. Spatiotemporal identity constitutes the beginning of the evolution of the object and likewise the first onset of subjectivity-to-become as structure increases. Is it then ultimately of the subject to create this first beginning in return? The final reflection or observation is identified as the "being of light after the totalizing of identity [Lichtwesen nach Totalisierung der Identität]" by Schelling and the "resting immanent light–the eternal eye in and for itself [das ruhende immanente Licht–das ewige Auge in sich und für sich]" by Fichte[54]. The emphasis on an absolute of light without darkness, coincidentally, is to be found empirically only in the big bang, the moment of absolute light that knew no darkness.

Materializing Idealism and Idealized Materialism

For Fichte, Schelling and Wheeler, it is in the final "reflection" or "observation" that all of reality is posited in. It is only this moment, strictly speaking, that constitutes the "observation." It has to be kept in mind here that this observation is a non-spatiotemporal point: regarding consciousness to be an emergent phenomenon, it is not located in the physical realm but in a non-spatiotemporal point of awareness that emerges from connectivity of physical parts.

Thus, everything is posited within this point or moment and merely appears "retro-causal" to us–we, also, are in this moment just like we are in the material, spatiotemporal block that is posited in it! Accordingly, it is only "consciousness" (seen here as absolute awareness, as has been said) or the "absolute" that makes the observation that collapses the wave function. But from our frame of reference, it collapses it "retro-causally" to the point at which it would collapse if the interaction of matter could make an observation. So, how can we tell what actually makes the collapse and creates "reality" then, if both viewpoints come to precisely the same conclusion? What is it that constitutes an observation then? Is it the entanglement of matter, the interaction of things that are endowed with a spatiotemporal identity? Or is it only Wheeler's (and Fichte's) final observation, as Wheeler's "delayed choice" experiment suggests? In a nutshell, here is the question: was all of this decided 13.8 billion years ago? Or, if one prefers the circle to the line, has all of this happened before and will all of this happen again? These two amount to the same ultimately in terms of "my" (or, more broadly, the subject's) role in the evolution of the object: they likewise nullify it. They are very comforting excuses for anything: since one is never to blame for whatever will be, they

result in the comfortable feeling of total freedom from agency and thus from responsibility and imputability. However, things could be very different. Could it be like Schrödinger's cat? Is nothing really "decided" until I observe it? However, where exactly is my "agency" in this picture?

As Wheeler stressed, "retro-causality" as implied by the "delayed choice" experiment is not to be understood in the way that the observer can "decide" what her observation actualizes[55]. In this way, my "retro-causality" through observation mirrors my agency ("compatible freedom"): what awareness makes through the "observer effect" into the past is just as determined as what agency does into the future in the classical mechanical understanding of the world. It is obvious that this is the double structure of theoretical reason/awareness/causes-for-appearances/past and practical reason/agency/reasons-for-actions/future that has already been displayed. However, it sheds light on a paradox: "retro-causal" creation into the past happens along the arrow of time into the future by growing awareness. Extending retro-causally, it posits the first beginning only in the final future (termed "consciousness"), at which agency likewise increases to its absolute in "freedom." This, in fact, must be so by logical needs. If it is assumed that neither theory (the creation of creation by observership and the creation of observership by creation) can be disproved as they are completely equivalent in appearance, they must be *actually the same in consequence*. This demand of logic is only met when their respective absolutes "consciousness" and "freedom" describe *the same state* beyond their different linguistic terminologies. For Fichte, this was the core insight of his philosophy: as an absolute, thinking the world (consciousness) is being the world (freedom)! What is occasionally called "presentism" and "eternalism" thus converges in a single point, in "the self-conscious end of all observation (this is just the world, nature, objective being and so on) [das bewusste Ende aller Anschauung (Dies ist nun eben Welt, Natur, objectives Seyn u.s.w.)]"[56].

So here is the "why?" There is material causation because it is posited in a final "reflection" or "observation" that is build up by this material causation. Let us look more closely at the "how?" then, at the process that goes from material causation to its own affirmation. This affirmation seems to be built up by an increase in "agency" and "awareness" into their absolutes "freedom" and "consciousness" in a convergence point of the two. Observation, it must be considered, is always an act or action: an interaction of the observer with the observed. Beyond the split between the two, Fichte thus defined his "final reflection" as a "feeling," an observation in analogy to the observation I have of my own physical body's processes rather than of the physical realm outside of it. Observing or understanding thus becomes equivalent to being in this point. Understanding or awareness, as has been said, translates into agency, and at this transcendental endpoint the two converge. Furthermore, it has to be noted that if all spatiotemporal objects are defined as endowed with some degree of "subjectivity," it follows that what appears as the "object" (cosmos) to me is really a fragmented subject to become through increasing connectivity. Before "consciousness," all subjects, including human beings, are really not subjects yet but at various stages of advancement in the conversion process from object to subject (evolution). Fichte writes that only the "self-knowledge of oneness (observation of their own identity) [das sich als Eines Wissen derselben (Anschauen ihrer Identität)]" of the subject with the object will be "real consciousness [wirkliches Bewusstsein]"[57].

As Fichte and Schelling made clear in their many responses directed towards Spinozism, the process is real. Fichte writes that material causation is "a transformation of space into time, freedom, and knowledge" and that "the highest relation (between 'being' and 'knowing') ['being' meaning the object or material causality and 'knowledge' meaning the subject or observation] is not *causation* but *interdependency* [Das oberste Verhältniss beider ('Seyn' und 'Wissen') ist daher nicht *Causalität*, sondern *Wechselwirkung*]"[58]. Matter exists and it follows natural laws in its conversion from energy into entity and towards identity; a statement that has been echoed by Wheeler as well. It is wrong to think of their philosophies as panpsychism or pantheism (the "unofficial religion" of German intellectuals at the beginning of the nineteenth century, as Heinrich Heine joked)[59].

A different question is if the picture may be congruent or compatible with "panentheism," which puts a strong emphasis on the propensity to self-organization in the natural world and emergence. Perhaps this thesis is supported also by Vitali Vanchurin's recent claim that the universe does not merely resemble (a fact long known and noted by many, foreshadowed in Fichte's heir Hermann Lotze's philosophy) but actually *is* a huge brain[60]. Philip Clayton, whose "emergent panentheism" has been dealt with in an article published in this journal lately[61], knew Wheeler and cites him in his work[62]. Unsurprisingly, panentheism is influenced by German idealism also (though Fichte's work remains almost absent from discussions in the Anglophone world). Clayton and others have dealt with these matters in much detail and it goes beyond scope here to elaborate further on these discussions. It is, however, problematic to support any kind of traditional religion based on scripture this way (not claiming that panentheistic philosophers would attempt to do so!). Just like a big bang 13.8 billion years ago does not prove the creation of the cosmos in six days about 4000 years ago, a final end point of emergence cannot prove a battle between angels and devils in the apocalypse and the kingdom of heaven to come. Furthermore, the picture seems to contradict a fundamental catechism of the monotheistic faith: the immortality of the individual human soul (because it does not seem to exist).

Fichte was acutely aware of this. In fact, he was accused of "nihilism" by Jacobi and driven out of Jena for his insistence that revelation and scripture have no role in an enlightened society. Even the title of his writings, the *Doctrine or School of Science [Wissenschaftslehre]*, seems to indicate that he, contrary to Kant, was not interested in defending (traditional) religion. Quite on the contrary, Fichte's project seems to have been to provide enlightened thought and scientific inquiry with a foundation that leaves no gap for God or devil[63]. Several passages in *Wissenschaftslehre* and Fichte's (for his standards) somewhat consistent usage of the indefinite article when he speaks of "a deity [eine Gottheit]" in the final reflection indicate that he does not mean the Christian, monotheistic God but rather an end point of the law of emergence that is not to be thought of as a personalized (human-like) being[64]. Schelling, on the other hand, seems to have undergone a rather radical religious turn late in his life. However, he never finished his much-anticipated opus magnum in which he promised to reveal his insights to the public. Wheeler, though he valued a good (unitarian) sermon to "sharpen" his "moral compass," was an agnostic and remained so until the end of his life[65]. This is also exemplified by the fact that his autobiography, while introducing his own ideas of "it from bit" and the "participatory universe," also includes a long passage in which he introduces and defends the "many worlds" interpretation of his Ph.D. student Hugh Everett[66].

One must note yet another remarkable structural similarity between Wheeler and Fichte (and, in extension, Schelling and Hegel) here. Fichte's theory of a materialist

evolution that posits its own process in an idealist point of absolute consciousness makes the “noumenon,” the deepest level of reality underlying the distorted spatiotemporal appearances that we perceive according to Kant, disappear in theory (for Kant, God, the immortal human soul and freedom were located in this non-realm!). Likewise, Wheeler’s theory of an absolute observation that posits the spatiotemporal continuum makes quantum mechanical weirdness, the deepest level of reality underlying the distorted spatiotemporal appearances that we perceive, like Everett’s “many worlds” disappear in theory! As the final observation actualizes precisely one evolutionary history from the wave function of possibilities (i.e., the one that leads to this observation!), there actually is no “wave function of the universe” because this wave function is always already collapsed by the observation that posits the spatiotemporal continuum! Quantum weirdness remains mainly (only?) in the behavior of elementary particles that are isolated from their environment (and electrons around the atomic nucleus). One should note here that Wheeler came up with the “participatory universe” only *after* Everett proposed “many worlds;” a fact that is oftentimes overlooked because Everett was Wheeler’s student and it took “many worlds” a long time to become widely known, let alone generally accepted, in this universe[67].

Schelling observes that the “unrest in nature [Unruhe der Natur]” must result from things not being right[68]. If they were right, if they had “reached their final unity, they would be at rest [wenn sie ihre höchste Geschlossenheit erreicht hätten, in Ruhe sein müssten]”[69]. If all was right, nothing would happen. The ground state in which all is right and nothing has to happen, then, is what everything strives or falls toward (this is the only definition of right and wrong that does not require metaphysics!). This process to where there is no time, to where everything is as it is supposed to be, is described by Schelling as an evolution that “call[s] forth from the unconscious, from matter, consciousness [aus diesem Bewusstlosen, aus der Materie das Bewusste hervorzurufen]”[70]. Obviously, evolution seen as emergence that results in consciousness runs counter to increasing entropy that results in equilibrium; the “heat death” of the universe. Schelling explicitly acknowledges that there are two intertwined tendencies at work in the cosmos, a positive and a negative principle. So does Fichte. Obviously, they thought in terms of becoming and fading away rather than in terms of emergence and entropy. And yet, these seem to be different ways of saying the same thing. It goes beyond scope to go into the details here, which may be done in another article. A fundamental binary, however, is the difference between the objective measure of diversity and the subjective quality of information. To Schelling, Fichte and Wheeler, the only point in which becoming can rest is being, the absolute that encompasses the all of the process and thus affirms becoming and negates the negating force that is indispensable for the process[71] but overcome in the point of its completion.

Material or physical causation, however, is equally real as it leads to the positing of the universe by itself as much as it is posited in it. In Wheeler’s words: “the observer is as essential to the creation of the universe as the universe is to the creation of the observer”[72]. In Fichte’s words: “this is the opposition of determination [materialism] and freedom (of the quantization as such [meaning the positing of the spatiotemporal realm by a fragmentation of the oneness of the final reflection]) [idealism]: the first is *idealized* by the latter, the latter is *realized* by the former [es ist der Gegensatz der Gebundenheit und Freiheit (des Quantitirens nemlich, als solchen): die erstere soll idealiter von der letzteren, die letztere soll realiter von der ersteren abhängen]”[73]. The bottom line is this: one can say that all is matter because spatiotemporal interaction of objects is a sufficient criterion for an “observation” and does not entail consciousness, *and* one can say that all is consciousness because a “final observation” of full consciousness posits the entire spatiotemporal continuum in itself in Wheeler’s “delayed choice” sense. However, both absolutes by themselves “hang in the air” (a phrase Wheeler was fond of): there is no affirmation of their respective mechanisms without assuming the other one to be *real also*. Both sides of creation and observation, therefore, must be *real if one of them is real* (which the existence of something sufficiently proves no matter which side of the story one prefers). No human-level consciousness is required to break the wave function in the materialist or physical description of creation, which would violate the symmetry between materialism and idealism: both must be a perfectly consistent explanation of the universe and its evolution and only bilaterally condition each other at their transcendental end points, which Wheeler termed the “gates of time:” the affirmation of the affirmation that is the negation of the negation when agency becomes “freedom” and awareness becomes “consciousness.”

Animation, Urge And Information

The level of subjectivity in the individual (which can emerge from many lower-level individuals and subjectivities) is a measure of its awareness and of its agency. To dwell on the mysterious relation between the unfree, “compatible freedom” of human agency and “real” freedom as the independence of material causation, let us consider the degrees of freedom that can be found in the subject. A kind of “proto-subject” as defined above starts at any degree of entity starting from spatiotemporal identity. However, there is no doubt that a strong amplification emerges with the development of internal urge in matter through animation[74]. Perhaps, then, it is a good idea to start with a closer analysis of what this “urge” consists in. “Compatible freedom,” after all, means the freedom to do what one is determined to *want* to do. There thus seems to be merit in inquiring into what determines desire. This desire, in its most pure form, then, is defined by the urge in animation. It may appear as an entropic variety of different aspirations in complex, semiotic species made of a nature side of information transmission (genes, the individual side) and a nurture side of information transmission (ideas, the collective side), but all of these various desires of the self (and of various collectives through the self) undoubtedly spring from it: whatever a self (the subject) does, it does because it is animated. We obviously wouldn’t do anything if we weren’t. Once we are dead, we do nothing but decay, which is not of our doing.

What all life by definition wants to do is to live. The longing for “survival” is the essence of the urge that makes animation. However, what does “survival” actually mean in a spatiotemporal object (the physical world) characterized by the transience of structure that appears as negation to the subject (self)? For the individual unit, it can easily be seen, there is a structural symmetry of “survival” and “freedom:” as an absolute, the terms seem to be a mirage within a spatiotemporal context that inevitably dissolves the structure that my animation relies on for its emergence. As a survival that is “compatible” with mortality, viability relies heavily on its connection to freedom that is

"compatible" with determination: it is the urge in animation that determines the desires that one wants to be "free" to satisfy. This urge for survival, interestingly, consists in another dual structure of "freedom:" the "freedom to" get what one desires and the "freedom from" what one wants to avert. The primordial standoff between an early human and a tiger may serve as an example here: the sapiens can solve the pressure situation by killing the tiger ("fight") or escaping from it ("flight"). In other words, she can survive for the moment, prolong her life, if she has either the agency or *freedom to* kill the tiger or if it is within her agency to gain*freedom from* the danger it poses to her "survival" (ongoing existence). These compatible "freedoms" that make compatible "survival" (viability, vitality or ongoing existence) extend all the way to unicellular life: single cells move away from hazardous conditions ("freedom from") and towards food sources ("freedom to")[75].

Novelist Anthony Burgess once wrote on freedom: "And what is this *human freedom*? Freedom from what? Freedom to do what? A man may be free of illness as a dog may be free of fleas, but freedom as an absolute is freedom in a void"[76]. While this is true for human freedom indeed, it is not true universally. It is easy to see that "survival" would be achieved in the transcendental endpoint at which "freedom as an absolute" would be achieved also. As an absolute, this is not merely the freedom from illness or fleas. It is the freedom from the pressure situation that is to be in a world the very nature of which is to end one's subjective existence by the dissolution of the structure that the self (and, ultimately, emergence itself) runs on following the second law of thermodynamics.

Let us consider that Heidegger defined the experience of time as "worry, anxiety or concern [Sorge]"[77]. The end of the subject-object split in the absolute, therefore, is the end of time, it is the end of "Sorge." Accordingly, the urge for "survival" in the animation of matter (i.e., the subject) is likewise an urge towards "freedom."

Individual units scaffold themselves into larger structures by selection mechanisms that culminate in the semiotic emergence of super-agents of increased subjectivity (agency and awareness). Therefore, the emergence of urge in matter and the emergence of higher-order subjectivity from the scaffolded organization of lower-order subjects can likewise be seen as a natural law towards the transcendental idea or ideal of "survival" that expresses itself in the extension of compatible freedom towards absolute freedom; i.e., the extension of subjectivity (awareness and agency). It is a natural law that is not included in the known laws because it comes with emerging subjectivity, i.e., awareness and agency. These, as the thought experiment of the "philosophical zombie" that acts without subjectivity shows, are not included in the known laws: a universe according to the known laws of nature may have what would *seem* like individual agency to an observer (which, however, would not exist in such a universe), but it would not have subjectivity. Agency that is not founded on awareness is not agency at all; it is like a stone falling. One must thus note that there is a fundamental difference between compatible freedom and behaviorism.

In a universe that has compatible freedom, however, one is free to think of a process of increasing subjectivity, of increasing awareness, agency and viability towards their completion in consciousness, freedom and survival. It has been outlined how connectivity produces higher orders of subjectivity by information exchange of lower orders of subjectivity: higher-order subjectivity emerges from the exchange of *information* between lower-order subjects resulting in an increase in order and control. For biological evolution seen as driven by sign processing ("biosemiotics"), the key role of information and its direct connection to subjectivity is clearly displayed in this quote by Jesper Hoffmeyer, who is himself citing cyberneticist Norbert Wiener in the first sentence: "'Information is information, not matter or energy.' […] Instructions obviously must be *interpreted* by 'somebody' in order to have any effect and since genes cannot influence anything in this world except through cellular activity it follows that cells must somehow 'comprehend,' 'interpret' or 'understand' these 'instructions,' and this effectively brings us from the 'secure' world of traditional efficient causality into the much more open world of semiotic causality"[78]. The impossibility to speak of information at all without subjectivity, without an entity that understands, has been highlighted in several attempts to bridge the gap between the computational world of cybernetics and the semiotic, organic world of biosemiotics ("semiosis")[79]. Information would be literally non-existent if the units that transmit-encode signals and receive-decode signals were not in formation, i.e., organized in organisms, to do so.

In the scaffolding process that builds complex organisms from simpler organisms, these simpler organisms lose individual "freedom to" entropic (i.e., chaotic) behavior as they are organized into the emergent super-organism, which itself has a higher level of semiotic freedom in return. In Hoffmeyer's words, "the real difficulty for evolution was to develop […] a semiotic scaffolding mechanism that could make sure that some cell lines undertook […] somatic duties on behalf of the *common good [my italics]*, even though they themselves would thereby die as individual existents" and "multicellularity can only succeed if stable solutions are found to the challenge of 'disobedient cells' […] that have mutated to become insensitive to the signals from other cells telling them to do supportive work for the *common good [my italics]*"[80]. Altruism is neither a theoretical problem nor a paradox: the altruistic behavior of the individual is derived from its semiotic scaffolding through social systems (internally ideas and externally institutions in the case of humans). It therefore does not contradict selfishness: it essentially *is* the emerging super-agent's selfishness. Emergence of a semiotic scaffolding, as has been outlined in great detail in the article mentioned at the beginning of this paper and others, is likewise in the steady increase in connectivity that can be observed in human sociocultural evolution[81]. Information, then, is the essence of both biological and social evolution!

Wheeler's (and–before him–Fichte's!) insight in "it-from-bit" was that information is likewise the essence of cosmological evolution. As has been highlighted by some of Wheeler's followers, friends and former students, this Copernican turn in perspective may lead to a paradigm shift in physics[82]. Perhaps this shift can be understood in analogy to how biosemiotics is challenging the dominant reductionist view in mainstream biology[83]. The cosmos, to Wheeler, emerges from information, from a subjective measure that only exists when registered by a subject: "*every* physical entity, every it, derives from bits. […] The quantum, *H,* in whatever correct physics formula it appears, thus serves as lamp. It lets us see horizon area as information lost [referring to the black hole Schwarzschild radius, event horizon or "surface" here], understand wave number of light as photon momentum and think of field flux as bit-registered fringe shift. Giving us its as bits, the quantum presents us with physics as information"[84]. Wheeler's argument is radical here: on its deepest (meaning literally smallest) level, reality is a binary code. An article on Wheeler that has been published in this journal recently puts forward a "bit from bit" and, in extension, a "bit recognize bit" explanation: "When all is said and done, matter can be identified with information, and information must by necessity be the fundamental substance of reality"[85]. However, reality only becomes a binary code through observation, through the subject that

registers the object (quantum computers take advantage of this superposition outside of the realm of registration!). Without the subject, the object would be in a superposition, every bit not a 0 or 1 but both and the universe a superposition of all possible worlds!

Fichte is said to have demonstrated his theory to his students by slamming his hand against the wall of the lecture hall and yet insisting that the wall was merely *posited*. Wheeler, a hundred and fifty years later and armed with quantum theory, is claiming essentially the same. It is true that quantum systems like the universe appear classical in their web of entanglement, but this can only be so because there is a final reflection or observation that posits this web of entanglement (the only logically consistent alternative to this picture is Everett's many worlds!). For us, subjectively speaking, it is true of course that everything we know must be information, a binary code at bottom, for else we would not know it. But through the affirmation of the affirmation, information is not only essential for the observer, the subject. In a "participatory universe" it is essential for the evolution of the observed, the object, which would not exist without it: the affirmation of the affirmation, the act of observation that posits its own becoming, is a registration of the totality of the process that makes it. It is computation affirmed by observation, the crossover from becoming to being in the culmination of a conversion process from object to subject.

Freedom, at Last!

It is obvious that the two "freedoms" fall together here: if I am *free to* do everything, I am likewise free from every "Sorge [concern, fear or worry]" I could possibly have. If I am *free from* causal determination even, free from the world or object in other words, I am by logical needs free to everything in an absolute sense as well as I step into autonomy beyond the causal law. The convergence of "freedom from" and "freedom to" as an absolute means "survival." The subject's freedom becomes "free from" the spatiotemporal block (the object and its causal law) and thus likewise becomes "free to" everything. The pressure situation of being in a world that dissolves structure is dissolved! But what does that mean: to be "free to (do) everything?" Do we have any idea what such an absolute freedom would look like?

Somewhat surprisingly, we actually do! Absolute freedom, other than human freedom, is not freedom in a void. We have empirical evidence and a name for it: creation or the big bang. The ultimate "freedom to" is the absolute of all action: the unconditioned act in which all action is included, the freedom that did everything, the answer to theoretical reason's "why?" question. The ultimate reason why I am here is the creation of creation in which the entire spatiotemporal continuum or "block" is encapsulated.

Thus, the liberation of the subject from the object by logical needs entails the point at which the subject becomes the object's condition itself: it is transcendence and creation alike. Logically, the end of time in the end of the subject's subjection to the fluctuations of the object goes beyond the binary of becoming and fading away and thus beyond the ultimate binary of being and not-being: the noumenon can never be created nor fade away because it is beyond the category of being and nothing (0 and 1). Seen as transcendence ("freedom from"), it is the absolute as nothing. Seen as creation ("freedom to"), it is the absolute as everything. But seen as absolute, it is both and, therefore, neither. With Wheeler's (and Gödel's) description of how the laws of each stage of understanding veil the ones that condition (make) them, one can say that it is the final level that is not included in the binary description of reality (that we by needs always employ in our spatiotemporal understanding that Kant termed the "phenomenon"). The absolute is free from the law that underlies all empirical understanding and it is the free condition of this law alike.

What emergence does is the gradual increase of subjectivity in the object: the physical animates itself determined by its own natural laws, objectively speaking (a perfectly valid description). However, the urge that emerges in animation is (or, at least, becomes) the driving force of the physically determined process: subjectivity is actively driving its own becoming. As has been displayed in some detail above, it is the inherent urge of life to live that increases connectivity and thus leads to further stages of emergence. Freedom from pain and freedom to satisfy the physical body's desires ensure ongoing vitality. In primordial standoffs between human and tiger the freedom to kill the tiger by fight (action) or the freedom from the danger it poses by flight (escape) are the two basic options to end a pressure situation. The entire process, the law itself, can be seen as an urge to dissolve the pressure situation of being in the world ("mortality"): the urge of the emerging subject to overcome the object. The way to overcome it is to establish control over the object, to make it part of the subject. The absolute, idealized end point of this process, i.e., when the split between subject and object is dissolved in unity, is the unification of freedoms two sides: overcoming the object culminates in the ultimate *freedom from* ("transcendence" or nothing) that is likewise absolute control, the ultimate *freedom to* ("creation" or being). Freedom to everything, of course, can only be thought of as the act of creation in which every action of the spatiotemporal process is encapsulated: if everything that happens is included in this freedom, it is by logical compulsion absolute freedom, for what further freedom would there be?

The question "why?" that has been the focal point of this inquiry essentially and most fundamentally asks for the reason. It is divided twofold, as has been said: "why am I here?" asks for how come (my) existence and "why do I act?" asks for what to do. The first asks what the world did to make me and what made this world to make me. The second asks for what I should do to the world to make the world do what. One thus asks for the reason for existence and one for the reason for action. Does it not seem logically compulsory that the two questions must answer each other? Why else would they hide behind the same term in literally every language on earth?

Reason, of course, is also the machine that increases subjectivity, seen as awareness and agency, and thus may create consciousness in a transcendental end point of this process. Reason is the machine that increases freedom, seen as freedom from aversion and to action, and may create survival in a transcendental end point of this process. All life, all subjective ("self") action upon the object ("outer world") can be described as this process that works from theoretical reason to practical reason: the information the subject has about the object in awareness becomes the basis for its acting upon it in agency. Awareness in understanding the object, thus, is clearly the prerequisite for transforming it by mixing one's will with it in acting upon it. Awareness in theoretical reason ("limited consciousness") thus translates into agency in practical

reason (“compatible freedom”), which translates into ongoing viability (“limited or compatible survival”). Theoretical reason’s absolute, then, is the absolute of awareness: consciousness. Practical reason’s absolute, then, is the absolute of agency: freedom. The drivers behind further stages of emergence are thus the transcendental terms that have been introduced in this article: consciousness (derived from awareness), freedom (derived from agency’s absolute creation and escape’s absolute transcendence) and survival (derived from an absolute of viability in the end of time and emergence).

In the absolute that completes and posits becoming, a final synthesis of the two freedoms (agency for fight and flight) and of theoretical and practical reason (awareness of past and future) is established in both being and transcendence beyond the binary of phenomenal experience. Freedom thus becomes the absolute of the agency side of being human and consciousness becomes the absolute of the awareness side of being human: being and thinking (or *imagining*) fall together when thinking the world is being the world. The two “why?” questions, i.e., why is there something and why the self should act, answer one another: my actions are part of a process to affirm that there is something to make me. The process is over when it begins: getting out is positing, transcendence makes determination to transcendence. The affirmation is affirmed, becoming is accomplished in being, the negation is negated, fading away is transcended in survival.

Conclusion

This sounds promising. And yet, there are various ways in which one is urged to curb one’s enthusiasm, unfortunate facts that eventually led to romanticism’s demise after its short-lived revolution in thinking and academic knowledge production (exemplified by the fact that Fichte, Hegel and Schelling succeeded each other as presidents of Berlin’s newly founded Humboldt university, arguably the top university in the world at the time).

First and most fundamentally, both Fichte and Wheeler were well-aware of the fact that their theories only provide a new perspective of looking at the cosmos and history. Practically, however, nothing changes. If Kant was “religion’s champion in exile,” Fichte was “science’s champion in exile.” Wheeler devotes a long passage in his autobiography to debunking the “pseudo-science” that seeks to feed on his considerations based on thorough scientific reasoning. The allure of the purely philosophical picture for the gurus and the charlatans may stem from the big question that “why is not nothing?” must inevitably lead into: why is now *now*? According to Fichte and Wheeler, there is a spatiotemporal continuum and its causation ultimately posits itself in observation. In this final reflection, then, all of the block is entailed and presentism and eternalism converge: the presence of the entire spatiotemporal block to the final observer in the present moment (a non-spatiotemporal point of consciousness) is the same as this block itself (let us consider here that every point in time is now in some reference frame in the block universe just like every place is somewhere!). This does not merely sound crazy but likewise logically convincing (once one gets over the crazy part). But should that final reflection not be *now* then. Would one not have to conclude that we just cannot see the identity of presence and eternity due to our limited frame of reference? From here, it is an illegitimate but tempting road to seek salvation or “satori” in internal reflection and detachment from the objective world. Should one choose the temple over the lab or lecture hall? But if we are all bumming around in temples, who builds up the final reflection that we seek to transcend into? Some of the romantics’ attempts to reach transcendence seem rather silly from today’s perspective (though they did have a somewhat recent revival with the Hippie movement). In the spirit of Fichte and Wheeler, however, one should not let philosophy interfere with one’s practical life too much. It may, after all, all be totally different. Before retiring to the temple, one should perhaps recall that Wheeler’s interpretation of the Copenhagen interpretation is eccentric and that he was well-aware of this (though it is supported by the intellectual heavyweights Eugene Wigner and John von Neumann, who likewise thought that it was impossible to have an observer-independent reality in the Copenhagen approach)[86]. Furthermore, the Copenhagen interpretation itself has been losing its status as orthodoxy as of late while “many worlds” is gaining momentum. If worse comes to worse, “superdeterminism” (a hidden variables theory that does not abandon locality) is true and our recently reenchanted quantum wonderworld is disenchanted again. Boredom, the inevitable heat death of the universe seems to be telling us, will always win out in the end, even in theory.

In fact, this heat death is another problem, eventually also practically (but thankfully not any time soon!) but as for now primarily in theory. It has been withheld in the brief discussion of entropy in this paper that the nature of life is antithetical: the emerging will of the subject is urged to establish structure, to bring things in formation to transmit information, to bring it all together. But likewise, as a physical mechanism of the object, the subject self-undermines its vain hubris by dissipating the foundations for structure and knowledge. Entropy, in the very first, original usage of the term, signified energy made unavailable for work. This still holds true. As everyone knows, what humankind is doing most obviously and dedicatedly is to transform this little rock of ours into a pile of garbage. This is the same as to say that we are burning up what can be used to transform it into useless–micro-plastic, chemical, radioactive or other–remains. On our very limited scale, we are doing what we can to get to the end of time, the point where nothing *can* happen anymore, as fast as possible. The subject, then, is a suicide-machine. It must discover a secret to avoid its self-destruction and fulfil its urge to posit the object’s creation and causation. But nothing other than the will to emergence within us urges us to assume that such a secret exists.

Or almost nothing. The second law *does* increase complexity locally through emergence and this is perfectly permissible as long as this local reduction of entropy entails an overall increase in entropy. The secret that the subject has to tap into, then, would be an increase in *information* (in the subjective sense that has been outlined in this article) without a concurring increase in our ignorance of the universe (“Gibbs entropy”). Quantum computing may offer a potential paradox. Conventional computing always produces more ignorance than knowledge because it, like refrigeration and animation, runs on a machine that produces entropy. Any surplus in computing power is therefore directly correlated to an increase in entropy production with the latter always outrunning the former. However, it does appear at first sight that the increase in computing power by qubits could, indeed should, be able to outrun the ignorance production of the machinery the operation runs on. Could, as Wheeler and Fichte suspected all along, the quantum be the secret (Wheeler, in his later years, thought that the question “How come existence?” could be rephrased as “How come the

quantum?" and Fichte describes phenomenal appearances as a "quantization" of the "final reflection")?

However, even if there was a possibility in theory for emergence to outrun entropy, it isn't for us. In humankind's case, the subject seems to be a suicide-machine not merely in its capacity as the pinnacle of entropy-production on earth (cosmically speaking, even we cannot quite compete with black holes). More immediately, one has to let go of anthropocentrism. Regardless of whether the universe itself will emerge or fall apart, the "bottle neck" hypothesis assumes that humanity is a close miss for all we know. In our current state as chimpanzees armed with atom bombs, we were never so close to the abyss. As our ideas, ideologies and social systems struggle for supremacy, it seems less likely than ever that some "life-affirming" ideology like Nietzsche's "purpose of earth" can outsource internal struggle to cosmic challenges to all of us and thus enable us to escape suicide-extinction. Humankind is a jigsaw puzzle in which none of the parts fit together. Whatever comes after us, we will not be there to see it. Let us think less and consume more for as long as we still can.

Footnotes

[1]Wendy Wheeler, *The Whole Creature: Complexity, Biosemiotics and the Evolution of Culture* (London: Lawrence & Wishart, 2006), 24.

[2]C. P. Snow, *The Two Cultures* (Canto, Cambridge: Cambridge University Press, 1993).

[3]Daniel Dennett, *Consciousness explained* (London: Penguin, 1993); W. D. Hamilton, 'The genetical evolution of social behaviour. I',*Journal of theoretical biology*, 7/1 (1964), 1–16; W. D. Hamilton, 'The genetical evolution of social behaviour. II', *Journal of theoretical biology*, 7/1 (1964), 17–52; G. R. Price, 'Selection and covariance', *Nature*, 227/5257 (1970), 520–1; Richard Dawkins, *The Selfish Gene*, 40th anniversary edition (Oxford: Oxford University Press, 2016); Richard Dawkins,*The blind watchmaker: Why the evidence of evolution reveals a universe without design / Richard Dawkins* (New York: W.W. Norton & Company, 2015).

[4]Jan-Boje Frauen, 'The End of the I? A Biosemiotic Approach to Super-connectivity',*Cosmos and History: The Journal of Natural and Social Philosophy*, 17/1 (2021), 159–95.

[5]Ibid.

[6]Jesper Hoffmeyer, 'The Semiotic Body',*Biosemiotics*, 1/2 (2008), 169–90; Jesper Hoffmeyer, 'Introduction: Semiotic Scaffolding',*Biosemiotics*, 8/2 (2015), 153–8; Jesper Hoffmeyer, 'Semiotic Scaffolding of Multicellularity', *Biosemiotics*, 8/2 (2015), 159–71.

[7]David J. Chalmers, 'Strong and Weak Emergence', in Philip Clayton and Paul Davies (eds.),*The re-emergence of emergence. The emergentist hypothesis from science to religion / edited by Philip Clayton and Paul Davies* (Oxford: Oxford University Press, 2006), 244–56.

[8]Christian de Duve, 'The origin of eukaryotes: a reappraisal',*Nature Reviews Genetics*, 8/5 (2007), 395–403; Eric Libby and Paul B. Rainey, 'A conceptual framework for the evolutionary origins of multicellularity', *Physical biology*, 10/3 (2013), 35001–10; Tibor Vellai and Gabor Vida, 'The origin of eukaryotes: the difference between prokaryotic and eukaryotic cells', *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 266/1428 (1999), 1571–7.

[9]Walter Veit, 'Evolution of multicellularity: cheating done right',*Biol Philos*, 34/3 (2019).

[10]Jan-Boje Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution',*World Futures*, 76/4 (2020), 189–213.

[11]Frauen, 'The End of the I? A Biosemiotic Approach to Super-connectivity' (above, n. 4).

[12]Jan-Boje Frauen, 'The Compulsions of Interdependence: Norbert Elias' Civilizing Process as Evolutionary Realism',*The Review of International Affairs*, 70/1147 (2019), 5–21; Frauen, 'The End of the I? A Biosemiotic Approach to Super-connectivity' (above, n. 4).

[13]Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 10).

[14]Frauen, 'The End of the I? A Biosemiotic Approach to Super-connectivity' (above, n. 4).

[15]Jan-Boje Frauen, 'Survival, freedom, urge and the absolute: on an antinomy in the subject',*Int J Philos Relig*, 91/1 (2022), 63–85 <https://link.springer.com/article/10.1007/s11153-021-09812-z#notes>.

[16]Ibid.

[17]Ibid.

[18]Ibid.

[19]Friedrich Nietzsche, *Also sprach Zarathustra: Ein Buch für Alle und Keinen* (Insel-Taschenbuch Insel-Klassik, 4511; 1. Aufl., Berlin: Insel-Verl, 2011).

[20]Jesper Hoffmeyer, *Biosemiotics: An Examination into the Signs of Life and the Life of Signs* (Chicago: Univ. of Chicago Press, 2009); Jesper Hoffmeyer,*Signs of*

Meaning in the Universe (Bloomington: Indiana University Press, 1996).

[21]Jesper Hoffmeyer and Frederik Stjernfelt, 'The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence',*Biosemiotics*, 9/1 (2016), 7–29; Arran Gare, 'Consciousness, Mind and Spirit', *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/2 (2019), 236–64; Arran Gare, 'Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics', *Biosemiotics*, 13/3 (2020), 327–46; Stacey E. Ake, 'Consciousness', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer*(Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 75–9.

[22]Paul Cobley, 'Subjectivity', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.),*A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer*(Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 274–7; Paul Cobley and Frederik Stjernfelt, 'Scaffolding Development and the Human Condition', *Biosemiotics*, 8/2 (2015), 291–304; Gerald Ostdiek, 'Me, Myself, and Semiotic Function: Finding the "I" in Biology', *Biosemiotics*, 9/3 (2016), 435–50; Susan Petrilli, 'Semioindividuality', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer*(Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 243–7; Asuncion Lopez-Varely Azcarate, 'Emergence', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 115–8.

[23]Filip Jaroš and Timo Maran, 'Humans on Top, Humans among the Other Animals: Narratives of Anthropological Difference',*Biosemiotics*, 12/3 (2019), 381–403; Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 10).

[24]J. Scott Turner, 'Semiotics of a Superorganism',*Biosemiotics*, 9/1 (2016), 85–102; Alexei A. Sharov, Timo Maran, and Morten Tønnessen, 'Comprehending the Semiosis of Evolution', *Biosemiotics*, 9/1 (2016), 1–6; Alexei A. Sharov, 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics',*Entropy*, 12/5 (2010), 1050–70; Stuart A. Kauffman and Arran Gare, 'Beyond Descartes and Newton: Recovering life and humanity', *Progress in biophysics and molecular biology*, 119/3 (2015), 219–44; Kalevi Kull, 'Beyond Word: On the Semiotic Mechanisms', *Biosemiotics*, 7/3 (2014), 465–70.

[25]Thomas Hobbes, Richard Tuck, Raymond Geuss et al.,*Hobbes: "Leviathan"* (Cambridge Texts in the History of Political Thought; Rev. ed., Cambridge: Cambridge University Press, 1996).

[26]Immanuel Kant, *Kritik der praktischen Vernunft*, Edited by Heiner Klemme and Horst D. Brandt (Philosophische Bibliothek, Bd. 506, Hamburg: F. Meiner, 2003).

[27]Lawrence Pasternack and Courtney Fugate, 'Kant's Philosophy of Religion', 2021 <https://plato.stanford.edu/entries/kant-religion/>, accessed 11 Sep 2023.

[28]Immanuel Kant, *Kritik der reinen Vernunft*, Edited by Jens Timmermann (Philosophische Bibliothek, Bd. 505, Hamburg: F. Meiner, 1998).

[29]Johann Gottlieb Fichte, *Grundlage der gesammten Wissenschaftslehre* (1. Auflage, Berlin: Contumax; Hofenberg, 2017); Johann Gottlieb Fichte,*Darstellung der Wissenschaftslehre* (Kindle edition, Altenmünster: Jazzybee Verlag, 2012); Johann Gottlieb Fichte, *Über den Begriff der Wissenschaftslehre* (Erweiterte Ausgabe, Altenmünster: Jazzybee Verlag, 2012).

[30]Fichte, *Grundlage der gesammten Wissenschaftslehre* (above, n. 29), 188; Fichte, *Darstellung der Wissenschaftslehre* (above, n. 29), 48.

[31] An excellent collection of resources on and writings from Schelling and Hegel's student days in Tübingen and of their life-long correspondence in letters can be found here: https://hoelderlinturm.de/sonderausstellungen/hegel-hoelderlin/#freundschaften-in-briefen [German].

[32]Georg Wilhelm Friedrich Hegel, *Phänomenologie des Geistes* (3. Auflage, Hamburg: Nikol, 2019).

[33]Friedrich Wilhelm Joseph von Schelling, *Stuttgarter Privatvorlesungen* (Kindle-version: Amazon, 2018) <https://www.amazon.de/Stuttgarter-Privatvorlesungen-Friedrich-Wilhelm-Schelling-ebook/dp/B07DNMPDGT/ref=sr_1_1?__mk_de_DE=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=2644OBRYZE337&keywords=Stuttgarter+Privatvorlesungen+Schelling&qid=1668114089&s=digital-text&sprefix=stuttgarter+privatvorlesungen+schelling%2Cdigital-text%2C79&sr=1-1>; Friedrich Wilhelm Joseph von Schelling, *Über die Natur der Philosophie als Wissenschaft: Erlanger Vorträge* (Kindle-version: Amazon, 2011) <https://www.amazon.de/%C3%9Cber-die-Natur-Philosophie-Wissenschaft-ebook/dp/B0057JZB9E/ref=tmm_kin_swatch_0?_encoding=UTF8&qid=1668113006&sr=1-1>; Friedrich Wilhelm Joseph von Schelling, *Von der Weltseele: Eine Hypothese der höhern Physik zur Erklärung des allgemeinen Organismus* (1. Auflage, Berlin: Contumax; Hofenberg, 2016).

[34]Robert J. Richards, 'Did Goethe and Schelling endorse species evolution?',*Marking Time: Romanticism and Evolution*, 2017, 219–38; Tilottama Rajan, 'The Vitality of Idealism: Life and Evolution in Schelling's and Hegel's Systems', in Joel Faflak (ed.), *Marking Time* (Toronto: University of Toronto Press, 2018), 239–69.

[35]Arran Gare, 'Biosemiotics and Causation. Defending Biosemiotics through Rosen's Theoretical Biology or Integrating Biosemiotics and Anticipatory Systems Theory', *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/1 (2019), 31–62; Rafael Holmberg, 'The Indifference of Objectivity to Difference and Identity', *Cosmos and History: The Journal of Natural and Social Philosophy*, 18/2 (2022), 112–28 <https://cosmosandhistory.org/index.php/journal/article/view/1059>.

[36] It is said that Leibniz dropped the "t" from his name in protest against Newton's idea of an absolute time (probably incorrectly as the German "Zeit" is not spelled with a "t"–he should have dropped the "z" instead!).

[37]Terrence Thomson, 'The Idea of Nature as a Structure', *Cosmos and History: The Journal of Natural and Social Philosophy*, 18/2 (2022), 1–21 <https://cosmosandhistory.org/index.php/journal/article/view/1048>.

[38]Schelling, *Von der Weltseele* (above, n. 33), 21.

[39]Ibid., 186; Schelling, *Stuttgarter Privatvorlesungen* (above, n. 33), 17.

[40]Schelling, *Stuttgarter Privatvorlesungen* (above, n. 33), 17; Schelling, *Von der Weltseele* (above, n. 33), 26.

[41]John Archibald Wheeler, 'Include the Observer in the Wave Function?', in Jose Leite Lopes and Michel Paty (eds.), *Quantum Mechanics, Half a Century Later. Papers of a Colloquium on fifty Years of Quantum Mechanics, Held at the University Louis Pasteur, Strasbourg, May 2-4, 1974* (Dordrecht, Holland, Boston, USA: D. Reidel Publishing, 1974), 1–19; John Archibald Wheeler, 'The Universe as Home for Man. Puzzles attached to consciousness, the quantum principle, and how the universe came into being suggest that the greatest discoveries are yet to come', *American Scientist*, 62/6 (1974), 683–91; John Archibald Wheeler, 'Genesis and Observership', in Robert E. Butts and Jaakko Hintikka (eds.), *Foundational Problems in the Special Sciences Part two of the Proceedings of the fifth International Congress of Logic, Methodology and Philosophy of Science, London, Ontario, Canada-1975* (Dordrecht, Holland, Boston, USA: D. Reidel Publishing, 1975), 3–35; John Archibald Wheeler, 'Information, physics, quantum: The search for links', in Anthony Hey (ed.), *Feynman and Computation* (Boca Raton, Florida: CRC Press, 2018), 309–36; John Archibald Wheeler and Kenneth William Ford, *Geons, black holes, and quantum foam: A life in physics* (New York: Norton, 2000); Charles W. Misner, Kip S. Thorne, and Wojciech H. Zurek, 'John Wheeler, Relativity, and Quantum Information', *Physics Today*, 62/4 (2009), 40–6; Alexei V. Nesteruk, 'A "Participatory Universe" of J. A. Wheeler as an Intentional Correlate of Embodied Subjects and an Example of Purposiveness in Physics', *Journal of Siberian Federal University*, 6/3 (2013), 1–22.

[42]George Litchfield, 'Matter-Information Equivalence', *Cosmos and History*, 18/2 (2022), 457–66 <https://cosmosandhistory.org/index.php/journal/article/view/856>.

[43]Wheeler, 'Genesis and Observership' (above, n. 41).

[44]Ibid., 18.

[45]Thomson, 'The Idea of Nature as a Structure' (above, n. 37).

[46]Wheeler, 'Information, physics, quantum: The search for links' (above, n. 41); Wheeler, 'The Universe as Home for Man. Puzzles attached to consciousness, the quantum principle, and how the universe came into being suggest that the greatest discoveries are yet to come' (above, n. 41).

[47]Stuart Kauffman, 'Evolution beyond Newton, Darwin, and entailing law. the origin of complexity in the evolving biosphere', in C. H. Lineweaver, Paul C. W. Davies, and Michael Ruse (eds.), *Complexity and the Arrow of Time* (Cambridge: Cambridge University Press, 2013), 162–91.

[48]Martin Heidegger, *Being and Time* (Oxford: Blackwell, 1995).

[49]Graham Harman, *Object-oriented ontology: A new theory of everything / Graham Harman* (London: Pelican, 2017).

[50]Michael Epperson, *Quantum mechanics and the philosophy of Alfred North Whitehead* (American philosophy series, no. 14; 1st paperback printing, New York: Fondham University Press, 2012).

[51]Jan-Boje Frauen, 'On the subject part II: what does the subject do?', *Qeios*, 2023 <https://www.qeios.com/read/MK11DO>; Jan-Boje Frauen, *On the subject part III: what is the subject's end?* (2023).

[52]Jon Cartwright, 'Quantum of solitude', *New Scientist*, 231/3082 (2016), 30–4, 31.

[53]Hoffmeyer, *Signs of Meaning in the Universe* (above, n. 20), 3.

[54]Fichte, *Darstellung der Wissenschaftslehre* (above, n. 29), 119; Schelling, *Von der Weltseele* (above, n. 33), 24.

[55]Wheeler, 'Genesis and Observership' (above, n. 41); Wheeler, 'The Universe as Home for Man. Puzzles attached to consciousness, the quantum principle, and how the universe came into being suggest that the greatest discoveries are yet to come' (above, n. 41); Wheeler and Ford, *Geons, black holes, and quantum foam* (above, n. 41); Wheeler, 'Information, physics, quantum: The search for links' (above, n. 41).

[56]Fichte, *Darstellung der Wissenschaftslehre* (above, n. 29), 109.

[57]Ibid., 55.

[58]Ibid., 131, 137.

[59]Philip Goff, William Seager, and Sean Allen-Hermanson, *Panpsychism* (2001) <https://plato.stanford.edu/entries/panpsychism/>, accessed 14 Sep 2023.

[60]Vitaly Vanchurin, 'The world as a neural network',*Entropy*, 22/11 (2020), 1210.

[61]Brian Macallan, 'Are There Problems with Panentheism? A Critical Analysis of Philip Clayton's Response to Current Challenges',*Cosmos and History*, 18/2 (2022), 369–79 <https://cosmosandhistory.org/index.php/journal/article/view/1053>.

[62]Philip Clayton, *Mind and emergence: From quantum to consciousness* (Oxford [England], New York: Oxford University Press, 2004) <https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=5602472>, 161.

[63]Frauen, *On the subject part III: what is the subject's end?* (above, n. 51).

[64]Ibid.

[65]Wheeler and Ford, *Geons, black holes, and quantum foam* (above, n. 41).

[66]Ibid; Hugh Everett, 'The Many-Worlds Interpretation of Quantum Mechanics', Dissertation (Princeton, Princeton University, 1956); Hugh Everett,*The Many-Worlds Interpretation of Quantum Mechanics: A Fundamental Exposition by Hugh Everett, III, with Papers by J. A. Wheeler, B. S. Dewitt, L. N. Cooper and D. van Echten, and N. Graham*, Edited by Byce S. DeWitt and Neill Graham (Princeton: Princeton University Press, 1973).

[67]Everett, 'The Many-Worlds Interpretation of Quantum Mechanics' (above, n. 66).

[68]Schelling, *Stuttgarter Privatvorlesungen* (above, n. 33), 47.

[69]Ibid.

[70]Ibid., 19.

[71] No progress without struggle; a thought that would be embraced by Nietzsche later.

[72]Wheeler, 'Genesis and Observership' (above, n. 41), 27.

[73]Fichte, *Darstellung der Wissenschaftslehre* (above, n. 29), 103.

[74]Jan-Boje Frauen, 'On the subject part I: what is the subject?', *Qeios*, 2023 <https://www.qeios.com/read/KUDU3X>.

[75]Kauffman, 'Evolution beyond Newton, Darwin, and entailing law. the origin of complexity in the evolving biosphere' (above, n. 47).

[76]Anthony Burgess, *1985* (New edition with an introduction by Andrew Biswell, London: Serpent's Tail, 2013), 7.

[77]Heidegger, *Being and Time* (above, n. 48).

[78]Hoffmeyer, 'Semiotic Scaffolding of Multicellularity' (above, n. 6), 160.

[79]Sara Cannizzaro, 'Where Did Information Go? Reflections on the Logical Status of Information in a Cybernetic and Semiotic Perspective',*Biosemiotics*, 6/1 (2013), 105–23; Søren Brier, *Cybersemiotics: Why Information is not enough!* (Toronto Studies in Semiotics and Communication; Repr. in pbk, Toronto: University of Toronto Press, 2014); Gare, 'Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics' (above, n. 21); Sharov, 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics' (above, n. 24).

[80]Hoffmeyer, 'Semiotic Scaffolding of Multicellularity' (above, n. 6), 161, 165.

[81]Frauen, 'The End of the I? A Biosemiotic Approach to Super-connectivity' (above, n. 4); Jan-Boje Frauen, 'Self, Singularity, Super-Self? On Subjectivity in Super-Connectivity', *Journal of Posthuman Studies*, 5/2 (2021), 130–49; Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 10); Jan-Boje Frauen, 'The Machinery for Change. A historical Analysis of the Roots of Liberal-representative Democracy, a critical Approach towards forced Democratizations and an Outlook on the Future Evolution of the liberal Order', *European Journal of Political Science Studies*, 2/2 (2019) <https://oapub.org/soc/index.php/EJPSS/article/view/535>; Frauen, 'The Compulsions of Interdependence: Norbert Elias' Civilizing Process as Evolutionary Realism' (above, n. 12); Jan-Boje Frauen, 'From Big Brother to the Big Bang. Self, Science and Singularity in Orwell's 1984', *Utopian Studies*, 33/3 (2022), 406–23.

[82]Jacob D. Bekenstein, 'Information in the holographic universe',*Scientific American*, 289/2 (2003), 58–65; Paul C. W. Davies, 'The Physics of Downward Causation', in Philip Clayton and Paul Davies (eds.), *The re-emergence of emergence. The emergentist hypothesis from science to religion / edited by Philip Clayton and Paul Davies* (Oxford: Oxford University Press, 2006), 35–52, 45–6; Misner, Thorne and Zurek, 'John Wheeler, Relativity, and Quantum Information' (above, n. 41); Carlo Rovelli,*The order of time*, Translated by Simon Carnell and Erica Segre (UK: Penguin Books, 2019).

[83]Kalevi Kull and Ekaterina Velmezova, 'Jesper Hoffmeyer: Biosemiotics Is a Discovery',*Biosemiotics*, 12/3 (2019), 373–9; Morten Tønnessen, Alexei A. Sharov, and Timo Maran, 'Jesper Hoffmeyer's Biosemiotic Legacy', *Biosemiotics*, 12/3 (2019), 357–63; Kalevi Kull, 'Thomas A. Sebeok and biology: Building biosemiotics',*Cybernetics &*

Human Knowing, 10/1 (2003), 47–60.

[84]Wheeler, 'Information, physics, quantum: The search for links' (above, n. 41), 312–3.

[85]Litchfield, 'Matter-Information Equivalence' (above, n. 42), 466.

[86]Eugene Paul Wigner, 'Remarks on the Mind-Body Question', in Eugene Paul Wigner, Jagdish Mehra, and A. S. Wightman (eds.)*Philosophical reflections and syntheses* (New York: Springer, 1997), 247–60.

References

- Ake, Stacey E., 'Consciousness', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.),*A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer*(Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 75–9.
- Azcarate, Asuncion Lopez-Varely, 'Emergence', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.),*A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 115–8.
- Bekenstein, Jacob D., 'Information in the holographic universe',*Scientific American*, 289/2 (2003), 58–65.
- Brier, Søren, *Cybersemiotics: Why Information is not enough!*(Toronto Studies in Semiotics and Communication; Repr. in pbk, Toronto: University of Toronto Press, 2014).
- Burgess, Anthony, *1985* (New edition with an introduction by Andrew Biswell, London: Serpent's Tail, 2013).
- Cannizzaro, Sara, 'Where Did Information Go? Reflections on the Logical Status of Information in a Cybernetic and Semiotic Perspective'*Biosemiotics*, 6/1 (2013), 105–23.
- Cartwright, Jon, 'Quantum of solitude',*New Scientist*, 231/3082 (2016), 30–4.
- Chalmers, David J., 'Strong and Weak Emergence', in Philip Clayton and Paul Davies (eds.),*The re-emergence of emergence. The emergentist hypothesis from science to religion / edited by Philip Clayton and Paul Davies* (Oxford: Oxford University Press, 2006), 244–56.
- Clayton, Philip, *Mind and emergence: From quantum to consciousness*(Oxford [England], New York: Oxford University Press, 2004) <https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=5602472>.
- Clayton, Philip, and Schwartz, Andrew, *What is ecological civilization?: Crisis, hope, and the future of the planet*, John B. Cobb (Toward ecological civilization series, volume 18, Anoka, Minnesota: Process Century Press, 2019).
- Cobley, Paul, 'Subjectivity', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.),*A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer*(Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 274–7.
- Cobley, Paul, and Stjernfelt, Frederik, 'Scaffolding Development and the Human Condition',*Biosemiotics*, 8/2 (2015), 291–304.
- Dace, Ted, 'Evolution as Nature's Trajectory from Computation to Narration',*Cosmos and History*, 18/2 (2022), 175–227 <https://cosmosandhistory.org/index.php/journal/article/view/1052>.
- Davies, Paul C. W., 'The Physics of Downward Causation', in Philip Clayton and Paul Davies (eds.),*The re-emergence of emergence. The emergentist hypothesis from science to religion / edited by Philip Clayton and Paul Davies* (Oxford: Oxford University Press, 2006), 35–52.
- Dawkins, Richard, *The blind watchmaker: Why the evidence of evolution reveals a universe without design / Richard Dawkins*(New York: W.W. Norton & Company, 2015).
- ——, *The Selfish Gene*, 40th anniversary edition (Oxford: Oxford University Press, 2016).
- Dennett, Daniel, *Consciousness explained*(London: Penguin, 1993).
- Duve, Christian de, 'The origin of eukaryotes: a reappraisal',*Nature Reviews Genetics*, 8/5 (2007), 395–403.
- Epperson, Michael, *Quantum mechanics and the philosophy of Alfred North Whitehead*(American philosophy series, no. 14; 1st paperback printing, New York: Fondham University Press, 2012).
- Everett, Hugh, 'The Many-Worlds Interpretation of Quantum Mechanics', Dissertation (Princeton, Princeton University, 1956).
- ——, *The Many-Worlds Interpretation of Quantum Mechanics: A Fundamental Exposition by Hugh Everett, III, with Papers by J. A. Wheeler, B. S. Dewitt, L. N. Cooper and D. van Echten, and N. Graham*, Edited by Byce S. DeWitt and Neill Graham (Princeton: Princeton University Press, 1973).
- Fichte, Johann Gottlieb, *Darstellung der Wissenschaftslehre*(Kindle edition, Altenmünster: Jazzybee Verlag, 2012).
- ——, *Über den Begriff der Wissenschaftslehre*(Erweiterte Ausgabe, Altenmünster: Jazzybee Verlag, 2012).
- ——, *Grundlage der gesammten Wissenschaftslehre*(1. Auflage, Berlin: Contumax; Hofenberg, 2017).
- Frauen, Jan-Boje, 'The Compulsions of Interdependence: Norbert Elias' Civilizing Process as Evolutionary Realism',*The Review of International Affairs*, 70/1147 (2019), 5–21.
- ——, 'The Machinery for Change. A historical Analysis of the Roots of Liberal-representative Democracy, a critical Approach towards forced Democratizations and an Outlook on the Future Evolution of the liberal Order', *European Journal of Political Science Studies*, 2/2 (2019) <https://oapub.org/soc/index.php/EJPSS/article/view/535>.

- ——, ‘Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution’, *World Futures*, 76/4 (2020), 189–213.
- ——, ‘Self, Singularity, Super-Self? On Subjectivity in Super-Connectivity’, *Journal of Posthuman Studies*, 5/2 (2021), 130–49.
- ——, ‘The End of the I? A Biosemiotic Approach to Super-connectivity’, *Cosmos and History: The Journal of Natural and Social Philosophy*, 17/1 (2021), 159–95.
- ——, ‘From Big Brother to the Big Bang. Self, Science and Singularity in Orwell's 1984’, *Utopian Studies*, 33/3 (2022), 406–23.
- ——, ‘Survival, freedom, urge and the absolute: on an antinomy in the subject’, *Int J Philos Relig*, 91/1 (2022), 63–85 <https://link.springer.com/article/10.1007/s11153-021-09812-z#notes>.
- ——, ‘On the subject part I: what is the subject?’, *Qeios*, 2023 <https://www.qeios.com/read/KUDU3X>.
- ——, ‘On the subject part II: what does the subject do?’, *Qeios*, 2023 <https://www.qeios.com/read/MK11DO>.
- ——, *On the subject part III: what is the subject’s end?* (2023).
- Gare, Arran, ‘Biosemiotics and Causation. Defending Biosemiotics through Rosen’s Theoretical Biology or Integrating Biosemiotics and Anticipatory Systems Theory’, *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/1 (2019), 31–62.
- ——, ‘Consciousness, Mind and Spirit’, *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/2 (2019), 236–64.
- ——, ‘Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics’, *Biosemiotics*, 13/3 (2020), 327–46.
- ——, ‘Integrating Biosemiotics and Biohermeneutics in the Quest for Ecological Civilization as a Practical Utopia’, *Cosmos and History*, 18/2 (2022), 22–47 <https://cosmosandhistory.org/index.php/journal/article/view/1061>.
- Goff, Philip, Seager, William, and Allen-Hermanson, Sean, *Panpsychism* (2001) <https://plato.stanford.edu/entries/panpsychism/>, accessed 14 Sep 2023.
- Hamilton, W. D., ‘The genetical evolution of social behaviour. I’, *Journal of theoretical biology*, 7/1 (1964), 1–16.
- ——, ‘The genetical evolution of social behaviour. II’, *Journal of theoretical biology*, 7/1 (1964), 17–52.
- Harman, Graham, *Object-oriented ontology: A new theory of everything / Graham Harman* (London: Pelican, 2017).
- Hegel, Georg Wilhelm Friedrich, *Phänomenologie des Geistes* (3. Auflage, Hamburg: Nikol, 2019).
- Heidegger, Martin, *Being and Time* (Oxford: Blackwell, 1995).
- Hobbes, Thomas, Tuck, Richard, Geuss, Raymond et al., *Hobbes: "Leviathan"* (Cambridge Texts in the History of Political Thought; Rev. ed., Cambridge: Cambridge University Press, 1996).
- Hoffmeyer, Jesper, *Signs of Meaning in the Universe* (Bloomington: Indiana University Press, 1996).
- ——, ‘The Semiotic Body’, *Biosemiotics*, 1/2 (2008), 169–90.
- ——, *Biosemiotics: An Examination into the Signs of Life and the Life of Signs* (Chicago: Univ. of Chicago Press, 2009).
- ——, ‘Introduction: Semiotic Scaffolding’, *Biosemiotics*, 8/2 (2015), 153–8.
- ——, ‘Semiotic Scaffolding of Multicellularity’, *Biosemiotics*, 8/2 (2015), 159–71.
- Hoffmeyer, Jesper, and Stjernfelt, Frederik, ‘The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence’, *Biosemiotics*, 9/1 (2016), 7–29.
- Holmberg, Rafael, ‘The Indifference of Objectivity to Difference and Identity’, *Cosmos and History: The Journal of Natural and Social Philosophy*, 18/2 (2022), 112–28 <https://cosmosandhistory.org/index.php/journal/article/view/1059>.
- Jaroš, Filip, and Maran, Timo, ‘Humans on Top, Humans among the Other Animals: Narratives of Anthropological Difference’, *Biosemiotics*, 12/3 (2019), 381–403.
- Kant, Immanuel, *Kritik der reinen Vernunft*, Edited by Jens Timmermann (Philosophische Bibliothek, Bd. 505, Hamburg: F. Meiner, 1998).
- ——, *Kritik der praktischen Vernunft*, Edited by Heiner Klemme and Horst D. Brandt (Philosophische Bibliothek, Bd. 506, Hamburg: F. Meiner, 2003).
- Kauffman, Stuart, ‘Evolution beyond Newton, Darwin, and entailing law. the origin of complexity in the evolving biosphere’, in C. H. Lineweaver, Paul C. W. Davies, and Michael Ruse (eds.), *Complexity and the Arrow of Time* (Cambridge: Cambridge University Press, 2013), 162–91.
- Kauffman, Stuart A., and Gare, Arran, ‘Beyond Descartes and Newton: Recovering life and humanity’, *Progress in biophysics and molecular biology*, 119/3 (2015), 219–44.
- Kull, Kalevi, ‘Thomas A. Sebeok and biology: Building biosemiotics’, *Cybernetics & Human Knowing*, 10/1 (2003), 47–60.
- ——, ‘Beyond Word: On the Semiotic Mechanisms’, *Biosemiotics*, 7/3 (2014), 465–70.
- Kull, Kalevi, and Velmezova, Ekaterina, ‘Jesper Hoffmeyer: Biosemiotics Is a Discovery’, *Biosemiotics*, 12/3 (2019), 373–9.
- Libby, Eric, and Rainey, Paul B., ‘A conceptual framework for the evolutionary origins of multicellularity’, *Physical biology*, 10/3 (2013), 35001–10.
- Litchfield, George, ‘Matter-Information Equivalence’, *Cosmos and History*, 18/2 (2022), 457–66 <https://cosmosandhistory.org/index.php/journal/article/view/856>.
- Macallan, Brian, ‘Are There Problems with Panentheism? A Critical Analysis of Philip Clayton’s Response to Current Challenges’, *Cosmos and History*, 18/2 (2022), 369–79 <https://cosmosandhistory.org/index.php/journal/article/view/1053>.
- Misner, Charles W., Thorne, Kip S., and Zurek, Wojciech H., ‘John Wheeler, Relativity, and Quantum Information’, *Physics Today*, 62/4 (2009), 40–6.
- Nesteruk, Alexei V., ‘A "Participatory Universe" of J. A. Wheeler as an Intentional Correlate of Embodied Subjects and an Example of Purposiveness in Physics’, *Journal of Siberian Federal University*, 6/3 (2013), 1–22.
- Nietzsche, Friedrich, *Also sprach Zarathustra: Ein Buch für Alle und Keinen* (Insel-Taschenbuch Insel-Klassik, 4511; 1. Aufl., Berlin: Insel-Verl, 2011).
- Ostdiek, Gerald, ‘Me, Myself, and Semiotic Function: Finding the “I” in Biology’, *Biosemiotics*, 9/3 (2016), 435–50.

- Pasternack, Lawrence, and Fugate, Courtney, 'Kant's Philosophy of Religion', 2021 <https://plato.stanford.edu/entries/kant-religion/>, accessed 11 Sep 2023.
- Petrilli, Susan, 'Semioindividuality', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.),*A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer*(Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 243–7.
- Price, G. R., 'Selection and covariance',*Nature*, 227/5257 (1970), 520–1.
- Rajan, Tilottama, 'The Vitality of Idealism: Life and Evolution in Schelling's and Hegel's Systems', in Joel Faflak (ed.),*Marking Time* (Toronto: University of Toronto Press, 2018), 239–69.
- Richards, Robert J., 'Did Goethe and Schelling endorse species evolution?',*Marking Time: Romanticism and Evolution*, 2017, 219–38.
- Rovelli, Carlo, *The order of time*, Translated by Simon Carnell and Erica Segre (UK: Penguin Books, 2019).
- Schelling, Friedrich Wilhelm Joseph von, *Über die Natur der Philosophie als Wissenschaft. Erlanger Vorträge* (Kindle-version: Amazon, 2011) <https://www.amazon.de/%C3%9Cber-die-Natur-Philosophie-Wissenschaft-ebook/dp/B0057JZB9E/ref=tmm_kin_swatch_0?_encoding=UTF8&qid=1668113006&sr=1-1>.
- ——, *Von der Weltseele: Eine Hypothese der höhern Physik zur Erklärung des allgemeinen Organismus*(1. Auflage, Berlin: Contumax; Hofenberg, 2016).
- ——, *Stuttgarter Privatvorlesungen* (Kindle-version: Amazon, 2018) <https://www.amazon.de/Stuttgarter-Privatvorlesungen-Friedrich-Wilhelm-Schelling-ebook/dp/B07DNMPDGT/ref=sr_1_1?__mk_de_DE=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=2644OBRYZE337&keywords=Stuttgarter+Privatvorlesungen+Schelling&qid=1668114089&s=digital-text&sprefix=stuttgarter+privatvorlesungen+schelling%2Cdigital-text%2C79&sr=1-1>.
- Sharov, Alexei A., 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics',*Entropy*, 12/5 (2010), 1050–70.
- Sharov, Alexei A., Maran, Timo, and Tønnessen, Morten, 'Comprehending the Semiosis of Evolution',*Biosemiotics*, 9/1 (2016), 1–6.
- Snow, C. P., *The Two Cultures* (Canto, Cambridge: Cambridge University Press, 1993).
- Thomson, Terrence, 'The Idea of Nature as a Structure',*Cosmos and History: The Journal of Natural and Social Philosophy*, 18/2 (2022), 1–21 <https://cosmosandhistory.org/index.php/journal/article/view/1048>.
- Tønnessen, Morten, Sharov, Alexei A., and Maran, Timo, 'Jesper Hoffmeyer's Biosemiotic Legacy',*Biosemiotics*, 12/3 (2019), 357–63.
- Turner, J. Scott, 'Semiotics of a Superorganism',*Biosemiotics*, 9/1 (2016), 85–102.
- Vanchurin, Vitaly, 'The world as a neural network',*Entropy*, 22/11 (2020), 1210.
- Veit, Walter, 'Evolution of multicellularity: cheating done right',*Biol Philos*, 34/3 (2019).
- Vellai, Tibor, and Vida, Gabor, 'The origin of eukaryotes: the difference between prokaryotic and eukaryotic cells',*Proceedings of the Royal Society of London. Series B: Biological Sciences*, 266/1428 (1999), 1571–7.
- Wheeler, John Archibald, 'Include the Observer in the Wave Function?', in Jose Leite Lopes and Michel Paty (eds.),*Quantum Mechanics, Half a Century Later. Papers of a Colloquium on fifty Years of Quantum Mechanics, Held at the University Louis Pasteur, Strasbourg, May 2-4, 1974* (Dordrecht, Holland, Boston, USA: D. Reidel Publishing, 1974), 1–19.
- ——, 'The Universe as Home for Man. Puzzles attached to consciousness, the quantum principle, and how the universe came into being suggest that the greatest discoveries are yet to come', *American Scientist*, 62/6 (1974), 683–91.
- ——, 'Genesis and Observership', in Robert E. Butts and Jaakko Hintikka (eds.),*Foundational Problems in the Special Sciences Part two of the Procedings of the fifth International Congress of Logic, Methodology and Philosophy of Science, London, Ontario, Canada-1975* (Dordrecht, Holland, Boston, USA: D. Reidel Publishing, 1975), 3–35.
- ——, 'Information, physics, quantum: The search for links', in Anthony Hey (ed.),*Feynman and Computation* (Boca Raton, Florida: CRC Press, 2018), 309–36.
- Wheeler, John Archibald, and Ford, Kenneth William, *Geons, black holes, and quantum foam: A life in physics* (New York: Norton, 2000).
- Wheeler, Wendy, *The Whole Creature: Complexity, Biosemiotics and the Evolution of Culture* (London: Lawrence & Wishart, 2006).
- Wigner, Eugene Paul, 'Remarks on the Mind-Body Question', in Eugene Paul Wigner, Jagdish Mehra, and A. S. Wightman (eds.),*Philosophical reflections and syntheses* (New York: Springer, 1997), 247–60.