'At the head of potency of the king, He engraved engravings in luster on high. A spark of impenetrable darkness flashed within the concealed of the concealed, from the head of Infinity – a cluster of vapor forming in formlessness …

*… concealed within the concealed of the mystery of Ein Sof.'**

The Zohar

*'He called to ... hier hebr… (ayin), nothingness, ... hier hebr… (ve-nivqa), and it was split, to ... hier hebr… (yesh), something, and it was thrust/(making an impact).'***

Keter Malkhut

∗ The Zohar (transl. and comm. by Daniel C. Matt), vol.I, Stanford California 2004, pp 107/108

∗∗ Solomon ibn Gabirol, Keter Malkhut, 9:101, I follow the translation by Daniel C. Matt, in: The Zohar (transl. and comm. by Daniel C. Matt), vol.I, Stanford California 2004, pp 108/109, FN 11. Cf. also Solomon ibn Gabirol, The Kingly Crown – Keter Malkhut, Notre Dame Indiana, 2003, p 52; and Solomon ibn Gabirol, A Crown for the King, (transl. by David R.Slavitt), New York Oxford, 1998, p 14.

Information Monism

and its Concepts of Substance, Attributes, and Emergent Modes

by Dan Kurth

(version:draft, 24.08.2013)

‘ … non poterunt dari plures, sed tantum una.’[1]

‘Filoteo. Io dico l'universo tutto infinito, perché non ha margine, termino, né superficie; dico l'universo non essere totamente infinito, perché ciascuna parte che di quello possiamo prendere, è finita, e de mondi innumerabili che contiene, ciascuno è finito. Io dico Dio tutto infinito, perché da sé esclude ogni termine ed ogni suo attributo è uno ed infinito;’[2]

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[1] Baruch Spinoza, Ethica, Prop. V, Dem., in: Spinoza, Opera, vol. II, ed. Konrad Blumenstock, pp. 84 – 557; p. 90/91, Darmstadt 1967 (‘ … there cannot be given several (substances), but one (substance) only.’

(PROPOSITIO V. In rerum natura non possunt dari duæ, aut plures substantiæ ejusdem naturæ, sive attributi.
Demonstratio. - Si darentur plures distinctæ, deberent inter se distingui, vel ex diversitate attributorum, vel ex diversitate affectionum (*per Prop. præced.*). Si tantum ex diversitate attributorum, concedetur ergo, non dari, nisi unam ejusdem attributi. At si ex diversitate affectionum, cum substantia sit prior natura suis affectionibus (*per Prop. 1*), depositis ergo affectionibus, et in se considerata, hoc est (*per Defin. 3 et Axiom. 6*) vere considerata, non poterit concipi ab alia distingui, hoc est (*per Prop. præced.*) non poterunt dari plures, sed tantum una. *Q.E.D.*

PROPOSITIO V. There cannot be in the nature two or more substances having the same nature or attribute.
Proof. - If there would be several distinct substances, they must be distinguished one from the other, either by the difference of their attributes, or by the difference of their modifications (by Prop. IV.). If only by the difference of their attributes, it will be granted that there cannot be more than one (substance) with an identical attribute. If by the difference of their affections (modifications), - as substance is naturally prior to its modifications (by Prop. I.), - it follows that setting the affections (modifications) aside, and considering substance in itself, that is (by Def. III. and Axiom VI.) truly, there cannot be conceived one (substance) different from another, - that is (by Prop. IV.), there cannot be given several (substances), but one (substance) only. Q.E.D.)

[2] Giordano Bruno, Opere Omnia, Opere Volgari, DE L'INFINITO, UNIVERSO ET MONDI, ed. Gentile; Aquilecchia, 1584, p. 382. (‘*Philotheo*. I say that the universe is entirely infinite because it hath neither edge, limit, nor surfaces. But I say that the universe is not all-comprehensive infinity because each of the parts thereof that we can examine is finite and each of the innumerable worlds contained therein is finite. I declare God to be completely infinite because he can be associated with no boundary and his every attribute is one and infinite.’Giordano Bruno, On the Infinite Universe and Worlds, http://www.positiveatheism.org/hist/brunoiuw1.htm)

Introduction

Information monism is a neutral substancemonism, i.e. a monism, in which an assumed immanent informational substance is the one and single substance. Mind, ideas, mental states as well as any physically based, material or organical objects and also any by information gathering, producing and utilizing subjects gathered, produced and utilized informational output or content then are nothing else than instantiations of such an immanent substantial information.
These instantiations then are emergent modes or emergent modes of emergent modes or emergent modes of emergent modes of emergent modes … of the one and single substance.

This one and single substance has only two attributes, nonexistence and existence. These only two attributes of the one and single substance, nonexistence and existence, are only given as universal properties of the two most fundamentally distinctive kinds of objects: nonexistent and existent objects. The attributes of substance, nonexistence and existence, are not emergent, but they are (the only two) universals or rather universal characteristics, i.e. they mark the utmost elementary difference between the two kinds of objects, to one of which any object necessarily belongs. I.e. all objects are strictly disjunct, either existent or nonexistent objects.[3] Together these two fundamental attributes or universals, nonexistence and existence, are the inherent essence of the one and single substance. Not at least for this reason the one and single informational substance is ineffable.

The one and single substance is ineffable, it is not given and can only be conceived as the subject of a necessary assertion. The substance appears in its two attributes and its potentially infinitely many emergent modes.

Information monism and its concept of informational substance stands in stark contrast to the notion of 'individual substances'. That hardly comprehensible notion of 'individual substances' is as well in unsurmountable contradiction to the most essential results and the core methodological program of modern science(s), namely reductionism, and already therefore not fit to be seriously discussed, as it is – from its Leibnizian heydays – just a contradictio in adjecto.[4]

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[3] That also excludes the possibility of so called abstract or Platonic objects, i.e. nonexistent objects, which then still are assumed to somehow (pre)exist.

[4] The affirmative use of the notion of 'individual substance' is just a symptom of philosophical illiteracy. This also explicitly relates to Leibniz' use of this concept. In Leibniz' case the reason for that implicit categorial confusion is short and simple: If one has no proper concept of

To justify this insult[5] let's take recourse to a famous example

(1) This is Socrates

In this sentence the postulated 'individual substance' (here stemming from a to my conviction incorrect interpretation of 'ουσια') of Socrates shall somehow be evoked.
Now let's look what ever that could be or rather: what it will not be. By the common definition of 'individual substance' it strictly cannot be any of the secondary attributes of Socrates, i.e it cannot be any ingredient of Socrates, i.e. it cannot be any material, physical, chemical, biological or organic property or part of Socrates. Equally it cannot be any form, or shape or size of Socrates. And impossibly it can be any feature of appearances or impressions of Socrates. I.e. the so called 'individual substance' of Socrates cannot be any material, quantitative or qualitative property or part of Socrates.
So, what's left? Now, whatever that may be, it hardly can be any kind of substance. But there actually two characteristics of Socrates are left, which could help to understand, what that sentence (1) could mean. Both of these characteristics will designate the uniqueness of the individuality of Socrates, but they will do so with respectively very different means and scope.
The first of these characteristics is the spatio-temporal determination of Socrates, i.e. his (historical) presence or world line and the ultimate basis for his existence. This leads to

(2) This 'such and such spatio-temporally determined object' is Socrates

Although world lines are good particulators, they say nearly nothing about the immanence or inner nature of the respective particulars. I.e. except for their spatio-temporal distinctions, all world lines are equal. Thus (2) says nearly nothing about Socrates, except, that he had a unique (historical) presence, and consequently, that he existed.
Yet how insufficient the world line of Socrates may be to tell us much, that would be meaningful, about Socrates, it at least is obvious, that a spatio-temporal determination has nothing to do with whatever 'individual substance'.

Then let's look for the last remaining particulator, which could satisfy the 'This' in (1).

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substance, then one also cannot have a proper concept of essence, and then one is destined to muddle up these concepts – ad ridiculosum.

[5] And those in the preceding Footnote.

And now it should be a particulator, which doesn't particulate only with respect to the existence of, in our case, Socrates. Such a particulator once had explicitly been introduced in scholastic philosophy by Duns Scotus under the name of 'haecceitas'.[6] Haecceity or the 'thisness' of an existent or even nonexistent object doesn't relate to any spatio-temporal determination or any material composition of the object in question, but to the highlighted fact, that 'this object is **this** object'. This is not – as it seems – a mere tautology, but a statement of identity. This leads us to

(3)This Socrates is Socrates

Yet again, although identity is a very good particulator, the answer to the question, if it tells us something meaningful about the respective particular, depends entirely on what kind of identity it is here about.
(3) seems rather to be a statement about self-identity. And, like a world line, self-identity is a good particulator, and, other than a world line, it relates to nonexistent objects as well as to existent ones. But again like a world line self-identity doesn't tell us much about the immanence or inner nature of the respective particulars. That 'Socrates is self-identical with Socrates' isn't exactly much of information about Socrates.

(4) This actually existent target object (or codomain) of the (partial) isomorphism between itself and that particular configuration of substance, which is the respective source (or domain) of that isomorphism, is Socrates.

FN: since an isomorphism is a bijective mapping there shouldn't be a clear distinction in a target object and a source object, yet the isomorphism here in question is partial for the reason, that the source object, i.e. the particular configuration of the one and only substance is indistinguishably existent and nonexistent at once, and the target object, Socrates is or was merely existent.

A shorter and hopefully a bit more readable version of (4) then is

(4*) This actual instantiation of this particular configuration of substance is Socrates

an equivalent version of (4) and (4*) is

[6] Yet the idea behind that concept originates in the Aristotelian notion 'τοδε τι'.

(4.1) This actual instantion of his (haecceic) essence is Socrates

a less deictic version is

(4.2) Socrates is the actual instantiation of his (haecceic) essence

It now hardly must be mentioned anymore, that haecceity, self-identity, transworld identity, and essence haven't – already by their respective definitions – anything to do with so-called 'indidual substances'.

Since (the notion of) 'substance' from its true Aristotelian beginnings is defined as being – so to speak: categorically – different from the various and varying individuals which consist of substance and (respectively inherent) forms, whereas the individuals differ from each other as individuals according to their different locations in space and time, and with respect to their different kinds also according to their respectively different essence(s). Yet this Aristotelian concept of substance[7], albeit – other than the notion of 'individual substance'[8] – conceptually consistent, leads to the so called substratum theory of substance. A substratum theory of substance however is again strictly incompatible with information monism.

The concept of substance in information monism isn't that of a substratum, i.e. information monism doesn't entail nor propose a substratum theory of substance. It doesn't entail nor propose a substratum theory of substance for the reason, that the ineffable immanent substance of information monism is all-pervasive and all-encompassing, i.e. all existent and nonexistent objects are entirely of the same substance, i.e. they are not built upon any substratum, and they only differ with respect to their generation[9] as different modes (of modes etc.), and with respect to them being individuals as instantiations of different essence(s). Nullum substratum requisitum, nullum substratum admissum!

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[7] I.e. the so called subtratum concept of substance, which in Aristotle's Metaphysics goes by the name 'υποκειμενον'. Cf. also Aristotle, Cat. 2a 13-14.

[8] That notion of 'individual substance' actually originates in an at least one-sided, if not even tilted, interpretation of his concept of 'ουσια'.

[9] I.e.with respect to them as being generated.

Now let me resume. Information monism is neither compatible with 'individual substances' nor with a substratum concept of substance.
'Individual substances' are incompatibel with information monism, since their underlying concept blatantly contradicts the concept of a single unique all-pervasive and all-encompassing omnipresent substance.
A substratum concept of substance on the other hand may find some correspondence in the most advanced theories of High Energy Physics and/or Quantum Gravity. But then that also shows the physicalistic limitations of the substratum concept, which cannot serve as a representation of the required philosophical concept of substance. Such a philosophical concept of substance has to cover and explain the role of substance not only with respect to (possibly) existent objects, but also with respect to nonexistent ones. And furthermore an adequate philosophical concept of substance must have as its scope not just the utmost elementary parts of things or objects, but also any aspect of the emergent complexity of their respective compositions at – and in – once. Already by its definition a substratum theory isn't designed or apt to do that.
Only a concept of an all-pervasive, all-encompassing omnipresent and intelligible substance can do that – and, as it is to be hoped, more sober than that sounds.

(against, Modal Realism –>s. D.Lewis, 'The Plurality of Worlds' which appears to be an unhelpful confusion of possible world semantics with ingredients of the 'Many World Interpretation of QM' and (meta)cosmological Multiverse models.)

against 'Axiomatic Metaphysics' (Zalta, Meixner) this whole ansatz, which perhaps could be paraphrased as 'Der axiomatische Aufbau der Hinterwelt[10],[11] is a fierce violation of Ockham's razor 'entia non sunt multiplicanda praeter necessitatem' and of course a striking example of the Platonist's original sin: the attempt to grasp the reality and unity of the multifarious, polymorphic and ever

[10] "Einst warf auch Zarathustra seinen Wahn jenseits des Menschen, gleich allen Hinterweltlern.
Eines leidenden und zerquälten Gottes Werk schien mir da die Welt.
Traum schien mir da die Welt, und Dichtung eines Gottes; …
Also warf auch ich einst meinen Wahn jenseits des Menschen, gleich allen Hinterweltlern.
Jenseits des Menschen in Wahrheit?"
Friedrich Nietzsche, Werke, vol.VI, Also sprach Zarathustra, Leipzig 1899, p 41
[11] Cf. Rudolf Carnap, Der logische Aufbau der Welt, Hamburg 1998

changing world by just – at least – doubling it. Yet this wasn't the question, and this isn't the answer[12].

Ontifying consistent nonexistent objects – like mathematical and/or physical invariants, (higher dimensional) relations or mathematical, physical etc. structures, abstractions of quantities like natural numbers, (complex) operators, measure terms, and so on – doesn't add anything to what they already had been before: nonexistent objects consistently applied in mathematical and scientific theories, and perhaps in some other consistent conceptual frameworks not being scientific theories in a proper sense.

Ontifying such nonexistent objects only leads to ascribing to them another quasi-supernatural kind of preexistence or abstract existence, and thus it leads to a hinterwelt populated by spectres of concepts and golems of (theoretical) terms.

Yet ascribing any kind of existence to nonexistence (including nonexistent objects) is still simply contradictory.

In a clear contrast to such black art Meinong's theory of objects entails no violation of Ockham's razor, for nonexistent objects are no entia.

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[12] The question rather was (and is): "How can the multifarious, hyper polymorphic, chaotic-dynamical, and hyper complex, i.e. Heraclitean, world be conceptually comprehended and (theoretically) represented in (dynamically) invariant, i.e. Pythagoreo-Eleatic, models?" And the answer is: "By a strictly internalist analysis of its intrinsic 'nature', and not by having recourse to as many invented Hinterwelten as convenient, i.e. not in a Platonic mode."

Now the question may arise, what such a strictly immanent analysis might be or on what it might be based. Instead of giving an outright answer, let me make some suggestions: An immanent analysis is based on an immanent, i.e. not metatheoretical foundation of the subjects of the respective analyses. In mathematics such a foundational platform could possibly be provided by category theory, which is primarily a proper branch of mathematics, even with some seemingly metamathematical applications implied. (For an earlier attempt to attain to metamathematics with means of rather purely mathematical theories cf. Helena Rasiowa, Roman Sikorski, 'The Mathematics of Metamathematics', Warszawa 1963. Yet the most promising candidates for such an approach, namely model theory, which however is in itself a chimera of mathematical and metamathematical theories, and the – proper and purely mathematical – category theory, with topos theory included, are – partly obviously for reasons of the historical stage of the development of these theories in the early nineteen sixties – only scarcely mentioned (model theory) or not at all (category theory)).

Such an approach would also allow a – in my view most favourable – nominalist foundational attempt, an outline of which can be found in the post re structuralist effort of Geoffrey Hellman, 'Mathematics without Numbers', Oxford New York Toronto 1989. For such a nominalist approach an interplay of (perhaps even higher dimensional) category theory and mereology might well serve the purpose. For a less rigorous attempt topos theory – due to its intrinsic universality – seems to be the perfect choice, yet at the cost of some built-in set theoretical, for once to put it Greek and kindly, 'metaphysics'.

In (the natural) science(s) again an interplay of mereology and category theory should be the perfect candidate, perhaps in the form of meros theory as I've suggested in my paper 'The Emergence of Existence' (cf. Dan Kurth, Information and Existence LLLL DATE)

Nonexistent objects are no entia, since entia are objects, which are supposed to exist. Yet – by presupposition – nonexistent objects do not exist. And that's, what Ockham's razor is all about: to defy the unwarranted claim of existence. Thus it follows: the acknowledgement of nonexistent objects entails no violation of Ockham's razor.

> *'… seine Natur hat in sich ihre eigene Natur: seine Natur theilet und scheidet die Natur: seine Natur begegnende ihrer Natur / freuet und verwandelt sich (als der rechte PROTEUS) von Natur zu Natur: seine Natur überwindet ihre Natur …'* [13]

Substantia ineffabilis modo Protei

In the immediate following we will call the ineffable protean substance 'information', and that doesn't seem to be a good example of something being 'ineffable'. But as we will see that information will not be pinned down as, for example, a certain physical or mathematical theory or a certain algorithm or else. And it will not be fixed for the very reason, that it cannot be fixed. Therefore 'information' is just another name for that protean substance, which ever tends to evade the question of the nature of its nature. And rightfully it does so, since all appearances, all nonexisting and existing objects and all facts and states of affair, constituted by the various relations between these objects, are, albeit as various modes, also true manifestations of that substance. Thus, one might say, the substance is ineffable not because it has no name, but because it has all, i.e. infintely many, names. Therefore the one and only substance is utterly one and infinitely many at once. I.e. all the nonexisting and existing objects differ amongst each other by a) their essence, and b) their individuality, but all nonexisting and existing objects do not differ to their substance. This implies, that the information monism heralded here is a strict immanentism as well.

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[13] Heinrich Khunrath, Vom Hylealischen, Das ist Pri-materialischen Catholischen Oder Allgemeinen Natürlichen Chaos …, Oehrling, 1708, p 9; (' … its nature comprises its own nature: its nature divides and separates the nature: its nature coming to(gether with) its nature / enjoys and transforms itself (as the true PROTEUS) from nature to nature: its nature overcomes its nature … '). The object, the nature of which it is here about, is known as lapis philosophorum.

The Protean Substance: Information

One substance: information
Two attributes: a) nonexistence, b) existence (FN.: What btw. is somewhat less than infinitely many ones)

Speaking of an ineffable protean substance is not meant to be a mystification or to sound mysteriously, arcane or sublime, but to oint out the objectological difference between the substance itself and any of its existent as well as nonexistent instantiations or manifestations. The substance cannot be the same as any of its manifestations.
But on the other hand there is also a far more prosaic account of that matter. I tend to hold, that an abstract quantum automaton could show some aptitude for serving as a fairly good approximation to that otherwise still ineffable protean substance. In particular I would propose an abstract quantum automaton with eamObs, 2-amObs as objects and appropriate mereological and mereotopological compositionrules as admitted operations or actions. Such an abstract quantum automaton then would be just a quantum meros in an other setting.
Against cellular automata a cellular automaton always implies at least a weak metric, not necessarily by the form or shape of its elementary cells, but by the contiguent nature of their arrangement, i.e. the elementary cells of a cellular automaton necessarily constitute a respective space, for which relative positions and relative, yet not necessarily absolute, distances are definable.

Information as such or substance in itself is ineffable, i.e. it is unattainable and cannot be represented as such, it only and solely appears in its instantiations (or manifestations). Thus it appears in one or the other of its determining attributes, namely either as nonexisting objects or as existing objects and – with the only exception of the primordial nonexistent objects eamOb– it appears as such in the way of their respective emergent modes.

Careful analogy: information substance ⇔ Ein Sof; primordial nonexistent objects eamOb ⇔ Keter; elementary existing objects (spin networks ?) ⇔ Malkhut

Substance and Essence I: objects ← essence as mapping → counterparts in substance

Identity up to isomorphism or: (haecceic) essence as mapping

$$object \xleftarrow{essence-mapping} (counter)part\,in\,/\,of\,substance$$

(haecceic) essence is a partial bijective mapping from parts or rather counterparts (of respective existent or nonexistent objects) as configurations of or in the one and single substance to these existent or nonexistent objects as instantiations, actualisations or objectifications of their counterparts in substance. That bijective mapping is partial only for the reason, that the (counter)parts or configuations of or in substance are – as the entire substance as well – existent and nonexistent at and in once, whereas the instantiated, actualized or objectified objects are distinctively either existent or nonexistent.

There is no difference, except one, between the nonexistent or existent objects, which are the appearances or instantiations of substance and their respective (corresponding or partially isomorphic) counterparts in substance. These objects or appearances or instantiations of substance are equivalent and even identical with their counterparts in substance. This correspondence or partially isomorphic mapping of the existent or nonexistent objects being the appearances or instaniations of substance with their counterparts in substance brings forth the presence of the essence of those objects.
The only difference between these either existent or nonexistent appearances or instantiations of substance, which are just the existent or nonexistent objects altogether, and their counterparts in substance is the fact, that (every part of) substance is existent and nonexistent at and in once.
This does not imply or has as a consequence a kind of difference like the one between an original and a copy. But there is no other difference (of aspects) than that, that substance as such and every part of it is existent and nonexistent at and in once, and that any appearance or instantion of substance, i.e. any object, is distinctively either existent or nonexistent.

The emergent Modes of Information: Informatio Informans – Informatio Informata

Ex uno plures, e pluribus unum. [14]

Lit: Stanford Encyclopedia of Philosophy: Emergent Properties

There is no autonomous emergent occurrence in the sphere of nonexistence, i.e. in the sphere of nonexistent objects, except the emergence of existence (or existent objects) itself.[15] Yet nevertheless existence is not an attribute or mode of any nonexistent objects. Primordial existence (or primordial existent objects) is/are an equally original instantiation of the underlying substance (i.e. information) as primordial nonexistent objects are. I.e. primordial nonexistent objects are not the substance (or information) in itself yet just an original instantiation of it.

History of science may serve as an example of an epiphenomenal (i.e. a nonautonomous) emergence relating to the sphere of particular nonexistent objects (obviously primarily scientific theories). The emergent instants which may take place in the history ofscience then will not occur in any hypostatized realm of ideas or *Logik des Begriffs*, yet – as instances of the via inveniendi[16] – they arise entirely in the thinking of the scientists involved.

Emergent Instants and Dynamical Emergence

There are no "emergent events' but 'emergent instants' this goes with strict nominalism: no 'emergent properties' but instead 'emergent individuals' cf. the following:

"Merricks (2001) takes such a position and affirms emergence as the criterion for the existence of true composites. He does not, however, give an account of what emergence is, apart from its involving macroscopic causal powers that do not supervene on the causal powers of and relations among the basic microphysical entities. (Is the relation of physical substrate to emergent features one of causal determination, as above, or is it a brute fact? Do emergent features necessarily appear in all systems attaining a requisite

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[14] A somewhat twisted Latin version of a part of a Heraclitean fragment, cf. Heraclitus, DK 22 B 10. There are also various other sources for at least parts of this phrase, amongst others cf. Augustinus, Confessiones, IV, 8; cf. also the 'Great Seal of the United States'.

[15] That existence (existent objects) emerges from a sphere of nonexistence (nonexistent objects) does not imply or presuppose any timelike relation between primordial existent objects and primordial nonexistent objects. On the contrary physical space(s) and time(s) are essentially properties of (emergent) fundamental existent objects.

[16] 'Via inveniendi' may somewhat inappropriately be translated as 'logic of discovery'.

level of complexity, or is this at best a contingent fact?) Nor does he indicate a position on the nature of causation itself, an issue that is crucial to understanding what the nonsupervenience of causal powers amounts to. (Presumably Merricks would reject a Humean account, on which causation is reductively analyzed in terms of actual or counterfactual patterns in the distribution of qualities over the world's history.) In any case, it seems fair to conclude from this overall account that Merricks believes there are emergent composite individuals." (Stanford Encyclopedia of Philosophy: Emergent Properties) cf. Merricks, Trenton (2001). Objects and Persons. Oxford: Oxford University Press, 2001 (FN: To avoid possible misconceptions, I shall mention, that I do not share the (in this book) proposed radical reductionist and/or mereological nihilist views of Merricks, but share his view of emergence as the emergence of (composite) individuals.)

In the case of organisms (or other comparable IGUSes) with adequate neural (and cognitive) capacity respective emergent features, which came up together with their individual bearers then can possibly be shared, acquired, copied, transferred, propagated, and spread in the available ways.

The Metaphysics Of Emergence

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…….

III. Ontological Emergence and its Metaphysical Underpinnings

III.1 Emergence as a Species of Nonstructurality

One moral from our previous remarks is that if a notion of emergence is to improve upon the unhappy alternatives rejected above, it had better be robustly ontological. This is contrary to the tendency among recent philosophical commentators to conflate or blur ontological and epistemological issues when applying emergentist ideas to nonlinear phenomena, artificial life, and human mentality. Discussions of senses of 'unpredictability' dominate these other expositions. While seeing how an emergent property would be unpredictable from a certain, limited empirical standpoint is a useful way of getting a fix on the concept, this is but a consequence of its core metaphysical features. There are two such features, both critical to the usefulness of an emergentist approach to understanding the mind-body relationship.

Older discussions of emergence sometimes spoke of the 'novelty' of such properties in relation to more fundamental physical properties. This term is not felicitous, however. Novelty cannot simply mean "not having been instanced previously," as this has been true of ever so many non-emergent features at various junctures in the world's history (e.g., the first occasion on which a composite had determinate mass M, for somearbitrary, large value of M). Nor can it mean "not had by any of the object's proper parts," as this is true, e.g., of the mass of any composite. What such theorists had in mind, we think, was something like irreducibility in an ontological, rather than semantic, sense, within the context of a property theory that can do some principled differentiation. Platonism, with its abundant properties, is too indiscriminate. We shall want, instead, a sparse theory, on which the properties a thing has are far fewer than the concepts it falls under, such that properties make a difference to how the objects act in at least some circumstances. (Properties in this sense answer to what is alternately termed the "Eleatic Principle," or "Alexander's dictum," on which all existents possess causal power.) Either of the theories of immanent universals or tropes will serve our purposes here. On these

theories, there are a quite limited number of types of basic properties, instanced in most cases by fundamental particulars, whatever these might be (quarks and electrons, or what have you). Each type is non-redundant with respect to the others in determining the behavior of such particulars. Now consider an unremarkable composite object, C, comprising the atomic individuals *a* and *b*.[5] It is plausible on empirical grounds that many, if not all, of C's properties are complex, being 'built up' from the properties of its parts. (David Armstrong 1978) attempts to define this idea through the notion of a 'structural universal'. A modified version of it is this:

> A property, S, is structural if and only if proper parts of particulars having S have properties not identical with S and jointly stand in relation R, and this state of affairs is the particular's having S.

That is to say, there is nothing more to having the structural property than being composed by parts having certain other properties and bearing certain relations to one another -- it is ontologically reducible.[6] Consider Armstrong's favorite example of being a methane molecule, or CH_4. Let us pretend for example's sake that carbon and hydrogen atoms are mereological atoms and the properties of being a carbon atom and being a hydrogen atom are likewise basic. It will then be plausible to suppose that the property of being a methane molecule just consists in having as parts a carbon atom and four hydrogen atoms bound in the relationship characteristic of methane.

The notion of an emergent property can then be understood in part by way of contrast with structural properties. An emergent property is a property of a composite system that is wholly nonstructural. If we allow simple conjunctive properties, the conjunction F&G of emergent properties F and G will count as nonstructural in this sense, though we should not deem it basic. The basic properties and relations of our world will be those properties whose instantiation does not even partly consist in the instantiation of distinct properties by the entity or its parts. *It is the thesis of emergentism that some basic properties are had by composite individuals.*

III.2 The Generation of Emergent States

Emergent properties are nonstructural properties of composite individuals. We further presume that they arise from and are sustained by underlying microstructures. How shall we conceive this dependency relationship, and what nonredundant difference can they make to the future distribution of such microstructural properties? We answer these

questions from within a traditional causal realist framework, on which properties confer propensities to act. One could adapt some of what we say within a Lewis-style Humean picture, and rather more within the currently fashionable Armstrong-Tooley account of causality as a higher-order relation among universals. (As we see things, the Humean ontology championed by Lewis is deeply counterintuitive and has radically skeptical consequences, and the Armstrong-Tooley picture is simply second-order Humeanism, adding a bit more structure to the inert Humean picture of the world at no explanatory gain whatsoever. But our conviction on these scores is independent of our attraction to and basic understanding of emergence.)

Of central importance is to recognize that the relationship of micro-level structures and macro-level emergent properties is dynamic and causal, not static and formal (in a quasi-logical sense). Contemporary discussions of emergence by (Kim 1999), (McLaughlin 1997, though apparently not 1992), and (Shoemaker 2002) all tend, to varying degrees, to assimilate the concept of emergence to the nonreductive physicalist's picture. Insofar as this leads them to assume that the emergent property synchronically supervenes on the microphysical property which is its 'base', the assimilation generates confusion. Emergent properties are basic properties, token-distinct in character and propensity from any microphysically structured properties of their bearers. If their

appearance in certain systems is to be explained at all, they must be explained in terms of a causal, not purely formal, relationship to underlying, immediately preceding structures. And the whole question of whether there is any sense in which they supervene on lower-level features -- which we discuss in §IV -- is subtle, and should not be built in definitionally from the outset.[7]

Here is how we think of the matter.[8] An emergent property of type E will appear only in physical systems achieving some specific threshold of organized complexity. From an empirical point of view, this threshold will be arbitrary, one that would not be anticipated by a theorist whose understanding of the world was derived from theories developed entirely from observations of physical systems below the requisite complexity. In optimal circumstances, such a theorist would come to recognize the locally determinative interactive dispositions of basic physical entities. Hidden from his view, however, would be the tendency (had by each of the basic entities) to generate an emergent state. This tendency is not discernible in contexts lacking the requisite macrocomplexity,

as it is a tendency towards a joint effect of an organized system of the right kind.[9] We further suppose that the continuing instantiation of the emergent property depends on the continuing presence of the structural universal that generated it.[10] Clearly, the *way* in which microdispositions must combine to generate an emergent feature -- even the form of the summation function capturing the relevant notion of organized complexity -- is a matter for empirical theory, not a priori analysis. But the notion at play here seems in the neighborhood of the familiar concepts of scalar and vector addition in physics.

IV. A dynamical emergence model

Our picture of emergence becomes more complicated once we consider not just the generation of an initial emergent state, but the dynamics of an object's having one or more emergent features for a period of time. Think of what we've just described as a baseline case, involving the onset of an emergent state. Then consider that, as a fundamentally new kind of feature, it will confer causal capacities on the object that go beyond the summation of capacities directly conferred by the object's microstructure. Its effects might include directly determining aspects of the microphysical structure of the object as well as generating other emergent states. In setting forth a general account of how this might go, we are guided not by abstract intuition about how it must go in any possible emergent scenario, but about how it is plausible to suppose it goes with respect to our own mental life, on the supposition that qualitative and intentional features of our mental states are emergent. (The diagram below, then, is not intended to capture a minimally sufficient schema for emergence, but a variant that plausibly applies to the mental, if any emergentist scenario does.)

It is plausible that there are enduring baseline mental states that partially underwrite more specific and often momentary mental states. (Underlying one's visual awareness of a computer screen, e.g., is a more general state of conscious awareness that persists when one looks in another direction. We might plausibly conjecture that underlying our entire mental lives are certain highly general states, themselves mental in character, disposing us towards having specific sorts of mental experiences and cognitive states in suitable circumstances.) Suppose, then, that when a neurophysiological system S comes to have a certain kind of complex physical configuration P* at time t_0, the baseline emergent state E is the direct result at t_1. (P*, of course, will have to be of a sufficiently general type as to persist through constant and over time dramatic change. Therefore, we cannot equate it with the total physical state of the system at any given time.) P* will also partly determine the underlying physical state of S at time t_1. Let P_0 be the remaining aspect of S's intrinsic physical state at t_0, and $P@_0$ be the summation of those physical factors in S's immediate environment that will bear upon the physical state of S at t_1. Letting "?"represent (minimally sufficient) causation, we have

P^* at t_0 ? E at t_1

and

$P^* + P_0 + P@_0$ at t_0 ? $P^* + P_1$ at t_1

(The conjunction P^*+P_1 is the total intrinsic physical state of S at time t_1.) Now E at t_1 will help to determine the physical state of S at the subsequent moment, t_2, but presumably not its continuing to exhibit P^*.[11] E, we may suppose, will also help to determine the occurrence at t_2 of another emergent state, E_2. Diagrammatically, the overall picture is this:

$t_0\ t_1\ t_2\ t_3\ t_4$
$E_2\ E_3\ E_4$
E E E E
P* P* P* P* P*
$P_0\ P_1\ P_2\ P_3\ P_4$
$P@_0\ P@_1\ P@_2\ P@_3\ P@_4$

Dynamical evolution of system S over time
upward causation of baseline emergent state E
upward causation of super-emergent states E_n
maintenance causation of emergence-sustaining configuration P*
wide horizontal causation (including downward causation)

It would be absurd to suppose that this simple diagram could adequately represent any actual mental episode, with its complex array of mental elements. Nonetheless, a toy example may help one to see the thrust of the view we are promoting. Suppose, then, that E is a very general state of being disposed to visual awareness. At t_0, P* obtains, giving rise to the disposition to visual awareness at t_1. This dispositional state, in conjunction with the total physical state of S at t_1, and in the presence of certain physical stimuli, cause the visual awareness of a red apple in front of S, E_2, and an aspect (P_2) of the subsequent physical state. (The physical state of S and its environment at t_1 suffice, apart from E, to maintain the critical structural feature, P*.) As, let us suppose, the apple is moved and this information is encoded in S's physical state, E_2 accordingly gives way to E_3 as well as influencing the perceptual information encoded in P_3.

For many contemporary theorists, the all-important questions to ask of any seemingly adventurous view of the dynamics of mental properties are whether and in what sense the mental supervenes on the physical. We place less stock than they do in the significance of these questions.[12] But let us approach the matter by first asking whether the emergent properties of S as characterized above strongly supervene on its physical properties. Strong supervenience is a relation between families of properties, and is usually thought of as synchronic. The family of emergent properties would strongly supervene on the family of physical properties just in case having an emergent property

E at time t implies, of causal necessity, (1) that an object has some physical property P at time t and (2) necessarily, if it has P at t, it has E at t.

The first condition -- having some physical properties -- is evidently satisfied. The slogan used to capture the second condition is: 'No mental difference without a physical difference.' Consider first the status of our baseline emergent feature E, with reference to times t0 and t1 in the diagram. E is absent at t_0 and present immediately thereafter. The underlying physical properties are different, too, but that is not the reason for the difference in emergent properties. For the differentiating factors (P_0, P_1, and the variable $P@_0$) are, by hypothesis, not directly relevant to the occurrence of E. P* alone is so relevant. Yet E is absent at the first time, since P*'s obtaining at t_0 causally determines not what will occur at that very time, but immediately thereafter. So at the first instant of P*'s instantiation in S, S will not bear E. This indicates that there might be two objects having identical intrinsic physical properties (including P*) and existing in the same external circumstance, yet one has E and the other lacks it.

But this is only a slight departure, restricted to the first instant at which the 'base' property P* occurs. More interesting divergence between emergent properties in the face of physical similarity can be seen when we turn from the baseline emergent property E to the more specific features E_2, E_3, and E_4. Consider E_2 at time t_2. You might have the underlying physical properties P* and P_2 without having had E_2. For E_2 is a causal

product of the immediately prior state of S at t_1 (comprised of P*, P_1, and E). This prior state presumably E at time t implies, of causal necessity, (1) that an object has some physical property P at
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However, these two ways for strong supervenience to fail within our framework are consistent with global supervenience, where the base of underlying properties fixing the supervening properties is the entire state of the physical universe. (We again restrict the base synchronically. In a moment, we shall consider the effect of lifting this restriction.) For global supervenience to fail, it is necessary for the causal connections to be probabilistic only. In the case of such a stochastic process, we can hold fixed the immediately prior state of S and its environment and suppose a scenario in which the physical state of S at t_1 were to cause the actual underlying physical state at t_2, but, owing to a different chancy outcome, cause the occurrence not of E_2, but of some distinct property, E_2', at the emergent level.
Finally, we consider whether fixing the physical state of the universe at all times suffices to fix the distribution of emergent properties. Again, we believe the answer is No. For it is possible to imagine a case in which an indeterministic physical state P1 has two possible emergent outcomes, and these emergent states, in turn, have a possible physical effect in common. (Perhaps they differ in their other possible effects, or perhaps they differ solely in the strength of their propensity for each of the same range of outcomes.) In such a case, it is possible for their to be two physically and nomically indiscernible worlds which nonetheless differ with respect to their emergent properties. Schematically:
W1: Pa—> Pb & E—> Pc

W2: Pa—> Pb & E'—> Pc_{13}
All of this contrasts with what we should suppose (at least on standard physicalist assumptions) regarding ordinary, purely structural properties of composites. If an object's having a certain biological property B just consists in its parts having certain properties and being arranged in a certain fashion, then we cannot suppose a scenario, consistent with natural law, wherein those lower-order properties and relations obtain but B does not. Fix the physical, and the garden varieties of chemical and biological properties are thereby fixed, too. But not so the emergent properties, if such there be.

V. Metaphysical objections

Emergence properties are epiphenomenal

Are emergent properties inevitably epiphenomenal, at least with respect to the purely physical states of S and its immediate environment? Is the emergent system in its purely physical aspect -- is physics more generally, on the present picture -- causally closed? Clearly, the answer is No. P_3's obtaining at t_3 is in part a product of E and E_2's obtaining at t_2. Had one or both of these failed to obtain at that previous time, something other than P_3 would have occurred subsequently. Consistent with this, it is true in an emergentist scenario that everything that occurs rests on the complete dispositional profile of the physical properties prior to the onset of emergent features. For the later occurrence of any emergent properties are contained (to some probabilistic measure) within that profile, and so the effects of the emergent features are indirectly a consequence of the physical properties, too. (We might, then, speak of a dispositional supervenience, taking care to note that this does not imply the closure thesis stated at the outset of this paper.) The difference that emergence makes is that what happens transcends the immediate, or local, interactions of the microphysics.[14]

Emergence involves either causal circularity or systematic overdetermination

In "Making Sense of Emergence" (1999), Jaegwon Kim argues that unless ontological emergence is given a deflationary, epistemological interpretation, it is implausible because its component notion of downward causation is incoherent. He considers two varieties, synchronic and diachronic. With the synchronic variety, the whole's having emergent property M1 at t1 both supervenes on its physical state P1 at t1 and is partly causally determinative of that very physical state. With the diachronic variety, the whole's having emergent property M at t1 supervenes on its physical state P1 at t1 and is partly causally determinative of its physical state P2 and mental state M2 at the subsequent time t2 (pp.26-31).

Kim judges the synchronic variety to be absurd on the grounds that it involves causal circularity. (We let this pass, since our view of emergence is not of this type. But note that if one resolves the whole's physical state into two sub-states, as we do above -- a state that generates the emergent property and a distinct state that is causally affected by it -- Kim's charge of causal circularity would be unfounded.) The diachronic variety, he allows, escapes the circularity worry, but it is prone to his causal exclusion argument: "…I earlier argued that any upward causation or same-level causation of effect *M** by cause *M* presupposes *M*'s causation of *M**'s lower level base, *P** (it is supposed that *M** is a higher-level property with a lowerlevel base; *M** may or may not be an emergent property). But if this is a case of downward emergent causation, *M* is a higher-level property and as such it must have an emergent base, *P*. Now we are faced with *P*'s threat to preempt *M*'s status as a cause of *P** (and hence of *M**). For if causation is understood as nomological (law-based) sufficiency, *P*, as *M*'s emergence base, is nomologically sufficient for it, and *M*, as *P**'s cause, is nomologically sufficient for *P**. Hence *P* is nomologically sufficient for *P** and hence qualifies as its cause. The same conclusion follows if causation is understood in terms of counterfactuals -- roughly, as a condition without which the effect would not have occurred. Moreover, it is not possible to view the situation as involving a causal chain from *P* to *P** with *M* as an intermediate causal link. The reason is that the emergence relation from *P* to *M* cannot properly be viewed as causal. This appears to make the emergent property *M* otiose and dispensable as a cause of *P**; it seems that we can explain the occurrence of *P** simply in terms of *P*, without invoking *M* at all. If *M* is to be retained as a cause of *P**, or of *M**, a positive argument has to be provided, and we have yet to see one. In my opinion, this simple argument has not so far been overcome by an effective counter-argument" (p.32).

Kim's argument against diachronic downward causation boils down to this: The diachronic activity of an emergent property will inevitably be redundant, since its effects are directly (and not just indirectly) attributable to the conditions which sustain it; thus,

emergent properties could not, as emergentism demands, confer “genuinely novel causal powers" -- powers that “must be capable of making novel causal contributions that *go beyond* the causal powers of the lower-level basal conditions from which they emerge” (p.25).
We confess to be puzzled by Kim’s argument, even given its assumptions about the dynamics of emergence.[15] But Kim’s argument clearly cannot get off the ground against the dynamical model of emergence set forth above, which characterizes the relation between emergents and their ‘base’ conditions as diachronic and causal, rather than as a sui generis variety of synchronic supervenience. As noted in discussing the epiphenomenalism charge, the distinctive potentialities of emergent properties do stem indirectly from the total potentialities of the basic physical properties. But they do not determine the emergent effects (or fix the emergent probabilities) independently of the causal activity of those emergents. ....“

Dynamical Emergentism

Zusammenhang mit topos theory und Mereological Emergentism herstellen !!

And there are Levels, though

Emergence – in two and a half Steps

The ‘emergent’ tropes which eventually will come up by an ‘emergent’ instant are completely (mereo)dynamically caused in the subvenient or underlying environment and by that they are not even properly emergent since that they only will become when being embedded in an environment of objects with akin tropes with which the objects with those ‘emergent’ tropes here in question can and do interact. Thus that causation should better be seen as a preemergent (mereo)dynamics on a – as it later may turn out to be – respectively lower level.
The new environment essentially established by these ‘emergent’ tropes and their mutual interactions then becomes to be supervenient with respect to the one on which that original (mereo)dynamicyl causation took place which eventually brought forth the ‘emergent’ tropes in question. Thus the respective ‘emergent’ tropes become emergent – so to speak – only with hindsight, namely within the perspective of the supervenient environment aka supervenient level.

The emergent instant itself then lies somewhat in between these – respectively subvenient or supervenient – levels, since it will only be of that kind, if the new trope actually becomes embedded in an adequate environment, where such an environment may very well *not* actually exist preceeding the advance of these and probably other compatible emergent tropes. I.e. the emergent instant is the fact of the instantanious fitting of any such new tropes in an environment which itself only becomes created by such tropes themselves.

Mereological Emergentism: Objects on Levels

Existence is a feature intrinsically adjunct to objects. Thus the emergence of existence is rather the emergence of existing objects up from (a state being made of) nonexisting objects. There is no existence not being embodied in the existence of (an) object(s).

Mereological Emergentism as it is outlined in this paper is meant to provide a basis for bringing together the mereological entrails and ingredients of (actually) existing objects with the dynamics of their coming up in the largely evolutionary and emergent processes of the selforganization of nature.

Zusammenhang mit topos theory herstellen !!

Mereological emergentism is by no means based on or reducible to classical extensional mereology, simply for the reason that it is not restricted to extensional matters. Mereological emergentism rather relates to nonexistent objects not less than to existing ones.

Mereological Emergentism is inconsistent with and therefore opposed to mereological nihilism and occasionally therewith aligned eliminativism, since mereological nihilism by its very defnition denies and rejects the reality and actuality of complex emergent objects as proper independent objects of their own right. Such a position is hardly worth to be discussed anyway, in the case of information monism its obscurity becomes obvious, since its immanent radical ontological reductionism would have as a consequence a reductio ad nihilum, and for this one, not as the usual facon de parler yet literally a reduction to the nonexistent objects up from which even the utmost elementary existent objects will first of all emerge. In case a mereological nihilist then still holds his presumptions he has to refuse not just the reality and actuality of complex emergent objects but reality and actuality as such, i.e. existence altogether – including his own's.[17]

Mereological Emergentism is also rather incompatibel with mereological essentialism. This is due to the fact that the identity of the – emergent – objects of Mereological Emergentism is by no means completely determined by and – consequently – reducible to the identity of their (proper) parts. Quite on the contrary the identity of an object is essentially determined by its belonging to (i.e. by being an object of and on) its proper definying level (of complexity) or by being an object of its proper complexity class and not by the identities of its various (physical) parts. This is even true in the somewhat peculiar case of (material) artefacts (as for example tables, chairs, computers and so on), since these also are not entirely or even mainly determined by their material (or physical) composition.
Any object including any artefact is first of all characterized and determined by its essence. And by this insight the very shortcoming of mereological essentialism comes to light. Mereological essentialism simply misses the concept in question, namely (the concept of) the essence of an object. The essence of any existing or nonexisting object is its elementary informational equivalent, i.e. the underlying 'program' (at the primeordial level of information substance) of which the respective object is merely an instantiation (or actualisation).

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[17] And then the central proposition of mereological nihilism evidently would just become self-contradictory with respect to necessarily presupposed conditions.

Such an elementary informational equivalent or 'program' or essence of an object is not another kind of instantiation of that object, but a feature of and at the primeordial level of the universal substance of all existent and non-existent objects, i.e. a sort of subprogram of the primeordial information substance. Thus conclusively the relation of the concepts of 'substance' and of 'essence' as they should be seen in information monism became clear: 'substance' here denotes the entirety of information of and at its primeordial level, 'essence' then relates to a particular elementary informational equivalent of an emergent (existent or non-existent) object and therefore can be seen as a substructure or subprogram of the primeordial information substance.

Emergent Individuals – Emergent Objects

C.F. Kit Fine, The Non-Identity of A Material Thing and Its Matter

against Mereological Essentialism

The Non-Identity of A Material Things and their Matter becomes increasingly more of a feature of objects radically inconsistent with mereological essentialism according to the degree of complexity of the respective objects, i.e. the more complex an object is the more its being selfidentical or being an individual becomes less and lesser dependent on the identity of its material components or parts.

Ontological Objectification and Stratification

Objects are on levels. I.e. what an object is in the scope of a respectively higher level ontology is neither conceivable nor representable within the scope (or by the means) of a respectively lower level ontology.

Can the Hierarchy of Emergent Levels be described by a Hierarchy of succesive Heterotopic Mappings?

Genus then becomes for the topic of increasing (structural) complexity some sort of an analogy to what theconcept of dimension means in geometry in general and for the increase of the degree of directional freedom in spatial affairs in particular.

A general description of the emergence of higher ontological levels may be hindered by the very different material nature and composition of the respective (relatively higher and lower)

levels themselves. Yet this aspect of different material instantiations is – in the view of the information monistic concept of substance – not of particular relevance.

Überleitung zu: topology of programs / higher topos theory

Increase of (local) complexity as stratificational increase of the connectivity (structure) of the respective emergent object(s) with respect to their predecessors and this increase then should become represented in the (increase) of their respective genus. Or so one would expect. Yet in the increasingly more complex material structures of the emergent objects the assumed increased connectivity structure or its respectively increased genus must not necessarily become obvious as such. Therefore it may better be described in the presupposed informational equivalent of these material structures. New level or higher number of brackets in a lambda calculus type of program which then entails a sort of recursive closure of the subprograms (or parts of the program) which are contained in a lower account of brackets.

Substance and Essence II: The very essence of essence

'Substance' in informationmonism means the most elementary algorithmic equivalent to the physical, material and – in general – natural as well as cognitive or mental or (even technically produced) semiotic instantiations up to arbitrarily advanced and complex programs.

The essence of an object or a more complex objective (in the sense of Meinong) then is the respective most elementary algorithmic equivalent which is the underlying and therefore intrinsic invariant source of any such instantiations, which may be actualized in various possible worlds.

Objects and Programs

λ-calculus and mereology

recursiveness naturally particularizes

Parts of Programs

Toposes and meroses

A meros than should be conceived as an elementary category of parts.