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Cognitive Science, Phenomenology, and the Unity of Science: Can Phenomenology Be the Foundation of Science?

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Abstract: Hume once argued the basic science to be not physics but "the science of man" and the foundation of this science to be the empiricist mechanism of association governed by the law of similarity in appearance—now more popular than ever in the form of artificial neural networks. I update Hume's picture by showing phenomenology to be centrally concerned with providing a unifying basis for all the sciences (including physics) by going beyond the psychology of associationism (passive synthesis) to reveal phenomena that are irreducibly syntactic (not associative) in structure. I therefore argue that the language of thought (LOT) is the necessary mechanism at the basis of these descriptive phenomena. I conclude by sketching a new picture of all the sciences unified by LOT based on Husserl's opposition to Galilean "physicomathematical" science vis-à-vis the life-world (*Lebenswelt*).

Keywords: cognitive science, phenomenology, unity of science, associationism, language of thought.

ἔστι δὲ διωρισμένον μὲν οἷον ἀριθμὸς
καὶ λόγος, συνεχὲς δὲ οἷον γραμμή
(Aristotle, *Categories*)

πειρᾶταί γε καὶ τὴν αἰτίαν
ἀποδιδόναι τοῦ φαινομένου
(Galen, *On the Natural Faculties*)

Ever since the logical positivists about a century ago set the agenda for the philosophy of science, physics has been taken to be the basic science—the

most foundational, ontologically speaking, for all the other sciences. This made a lot of sense at the time: it stood to reason that physics is basic, given the non-existence of any sort of accepted metaphysics. Lacking a scientific metaphysics, despite the best efforts of a Descartes or an Immanuel Kant, what could be more foundational than physics? It was very reasonably thought, therefore, that if there's going to be some sort of dependency relation of the sciences, it will be *on physics*—conceived, naturally, in the manner of the Galilean/Cartesian mathematical physics, which has been the basic framework for modern (anti-Aristotelian) physics since the 17th century.

Yet one of the principal philosophical influences on the Viennese positivists (David Hume) had a very different conception of what the basic science might be. In *A Treatise of Human Nature*, Hume has this to say:

> 'Tis evident, that all the sciences have a relation, greater or less, to human nature; and that however wide any of them may seem to run from it, they still return back by one passage or another. Even Mathematics, Natural Philosophy, and Natural Religion, are in some measure dependent on the science of MAN [....] And as the science of man is the only solid foundation for the other sciences, so the only solid foundation we can give to this science itself must be laid on experience and observation. (Hume 1739/1969: 42–43)

By "Natural Philosophy," of course, Hume essentially means physics. According to Hume, then, physics is supposed to be a special science, and "the science of man" the basic science. In hindsight, it's easy to see what happened to Hume's legacy with the positivists: they paid attention to the method of "experience and observation" while neglecting the idea that "the science of man is the only solid foundation for the other sciences." It was natural for them to do so—they were very interested in being objective; far be it from them to base all of the objective sciences on the most subjective of foundations—i.e. the science of man, or, as we might now say, human psychology. But the progenitor of the positivists, as we see, was of a different opinion entirely.

Apparently also was the great enemy of the positivists/objectivists, Edmund Husserl. Husserl like Hume sought out a new foundation and unification for the sciences—one not rooted in the idea of Galilean, "physicomathematical" science as the basic (reducing) science (Husserl 1939/1970: 43). Building on Hume's idea of psychology as "the only solid foundation for the other sciences," but going beyond him (since Hume's empiricism entails psychologism for the objects of math, logic and semantics), Husserl accepted the reality of associationism as the lowest level of experience; but added, on top, an irreducible stratum, the phenomenology of categorial-syntactic objects connected with the faculty of judgment. It is this higher level which now serves a twofold function: (1) to found with descriptive evidence for the first time a genuine syntactic (as opposed to associationistic) psychology—a cognitive science, or what we might now today call Basic Cognitive Science (Fodor & Pylyshyn 2015; De

Almeida & Gleitman 2018)—and (2) by virtue of the constituting activities of the transcendental subject rooted in syntax, the unification of the sciences. This new unity of the sciences was apparently to be founded on the categorial-syntactic objects of judgment, presupposed by all the sciences—logic, mathematics and the syntactically structured meanings (and objects) formed by judicative activity.

But how does (2) displace physics as the basic science? The argument, which begins in *The Crisis of the European Sciences and Transcendental Phenomenology* (1936) and culminates in *Experience and Judgment* (1939), goes like this. Once we see that the sciences *in their objectivity* are categorial-syntactic products of syntactically structured thought—products, in particular, of what Husserl, in anticipation of Fodor, called "the natural psychological mechanism of symbolic inference" as distinguished *in principio* from the Humean "association of ideas" (Husserl 1994: 41–2)—then the "garb of ideas" that we call mathematical physics, which seems so basic and fundamental, will be seen to be "thrown over the world of immediate intuition and experience, the life-world [*Lebenswelt*]" as just one variety of structured thought upon the world. This kind of structured thought (i.e. mathematical physics) can then be set aside and "distinguished from other categorial activities" (Husserl 1939/1973: 45, 44). These other "syntactical (categorial) formation[s]" which are closer to our everyday experience, and which it is the task of phenomenology to reveal, beginning with the primary thesis of the *Logical Investigations* concerning categorial-syntactic intuition (Sokolowski 2003), can then be said to yield knowledge just as much and as fully as science in the 'Galilean style' (Husserl 1939/1973: 209). Thus the Sellarsian manifest and scientific images of man can be brought into line by (of all things) the computational theory of mind (CTM) and the language of thought (LOT)—which is, if not the *only* game in town now (e.g. deep learning), still the *best* game in town (Quilty-Dunn *et al.* 2023)[1].

Phenomenology has always been understood to bear some relation or other to physics. For example, the *Analyses concerning Passive and Active Synthesis* speaks of "a transcendental physics" (Husserl 1926/2001: 272). This transcendental

[1] LOT is still the best game in town because it provides explanatory support for a wide range of phenomena across the cognitive sciences. The classic case, of course, is logical cognition (active synthesis). But recent arguments show LOT's range includes phenomena traditionally thought to be better handled by empiricistic associationism and iconic-formats (the other (passive-synthesis) games in town): for example, "Mid-level vision, nonverbal minds, and system-1 cognition" (Quilty-Dunn *et al.* 2023). The relation of this research to deep neural networks (DNNs) hinges on the differences between the format of human cognition (syntactic and discrete in crucial areas) and the putative cognition of DNNs (which is associative and non-discrete, i.e. continuous). Even if syntax is approximated by DNNs, human cognition might still differ in representational format; for example, human language appears to be poorly modeled by DNNs (Bever *et al.* 2023). This disconnect points to LOT structures at the core of cognition, by the old argument that learning the semantics of a (natural) language, given its relation to experience, presupposes the semantics of an (internal, i.e. transcendental) language (see Fodor 1975: 61).

physics is *closer* in the dependency structure of the sciences to the Humean science of man than Einsteinian physics. A recent collection *Phenomenological Approaches to Physics* examines the issue of the possible dependency relation of Einsteinian physics on phenomenology systematically (Wiltsche & Berghofer 2020). One paper argues that physics presupposes phenomenology in the sense that the "framing" of physics is "a human product" and therefore bears reference back to the life-world; and this in turn bears reference back to the constituting subjectivity of the life-world (Crease 2020: 59) and its "syntactical actions" (Husserl 1929/1969: 110)[2].

But the project of this paper is not to defend a particular thesis in the phenomenology of physics. The project here is to set the language of thought hypothesis at the basis of transcendental subjectivity/phenomenology whose associative and syntactical products are the objects, properties and relations of the life-world, and consequently *a fortiori* all the sciences at the periphery. I'm going to lay the groundwork for a restructuring of the sciences in the form of an update to Hume's "science of man" by reference to the constituting activities grounded in syntax (not just association). I shall argue that at the basis of these constituting activities is a symbolic computational mechanism which Husserl had already theorized as going beyond Hume's mechanism of association and its phenomenology of passive synthesis. What I'm doing, then, is updating Hume's relation of physics to the mechanism of association and putting Husserl's mechanism of symbolic inference, or a Fodorian language of thought (LOT), in its place. The LOT is basically the theory that (1) mental states are syntactically structured, and (2) the syntactic structure of a mental state determines its causal processes. This picture of the mind allows us to reconstruct the idea of trains of thought as arguments with syntactic structure capable of formally preserving the semantic truth-values of judicative propositions, as opposed to the mere association of ideas (sans truth-preservation). As we'll see, Husserl already theorized both (1) and (2) as against associationism. I argue that phenomenology is primarily about revealing this upper syntactic layer over and above empiricistic associationism, i.e. passive synthesis. In

[2] The non-linear conception of time, for example, places the mathematical physics of "Einstein" more at the periphery of the life-world, inasmuch as its evidence is non-intuitive in terms of that life-world, which regards the linearity of time as self-evident. But the mathematical framework of theoretical physics, which gives rise to "Einstein's curvature of space-time," is nonetheless as much "a human product" as the cognitions of transcendental physics, which are closer to the life-world, and in which the linearity of time appears to be self-evident (Islami & Wiltsche 2020: 164; Crease 2020: 59; Husserl 1926/2001: 195). Thus we can begin to see how "physicomathematical" science can go beyond the life-world while nevertheless maintaining contact with it through the syntactic structures of transcendental phenomenology (more on which in section IV). If phenomenology were constituted entirely by perceptual kinaestheses at the level of associative receptivity (e.g. "active" inference) the relation between the non-intuitiveness of even Copernican astronomy and the life-world becomes mysterious (as it was for Merleau-Ponty), as opposed to intelligible and complementary.

particular, active syntheses are the phenomenology of LOT mechanisms, passive syntheses the phenomenological effects of associative mechanisms (e.g. Bayesian neural networks). A new argument for the unity of science, therefore, arises, one based on the irreducibility of the functions of symbolic-syntactic judgment (e.g. truth-preservation) to association—a theme that unites Husserl's earliest mechanistic-computational essay (1891) with *Experience and Judgment* (1939)—an irreducibility, moreover, which Fodor and Pylyshyn (2015: 47) insisted upon continuously.

1. *The Origin of Phenomenology in Computationalism as a Possible Basis for the Unification of the Sciences*

The origin of phenomenology arises out of a twofold need to clarify the relationship of the mind or cognition to *symbolic modes of procedure*—both internal to the mind, in the form of symbolic mental computations (Lopes 2020), and externally, in the form of increasingly symbolic methods in the sciences. This twofold, Janus-face of phenomenology—one pointed toward psychology, the other toward the ontology of the sciences—is already thematized in Husserl's earliest essays: for example, "On the Logic of Signs (Semiotic)" (Husserl 1891/1994). Here we find Husserl, beginning with a section entitled "Further Division of Signs into Natural and Artificial," waxing somewhat rhapsodically concerning "the immense significance [that] the inauthentic representations, as well as symbols in general, possess for our entire psychical life" (Husserl 1994: 28). Symbolic representations are said to "take hold on the earliest levels of psychic development, and accompany that development... up to the highest levels of development" (1994: 28–29). They are present "right from the beginnings of life and thought" (1994: 37). The relation of the development of the mind, both psychologically and scientifically, to symbolic modes of procedure is not a contingent fact that the (scientific) mind's maturation may very well do without. On the contrary, the real existence of symbolic representations, both in our heads, and in external procedures deemed "scientific," is a necessary condition for all mental-scientific development. "They do not merely accompany," Husserl argues, "psychic development, but rather they essentially condition it, making it possible to begin with" (1994: 29). For "without the possibility of symbolic representations […] there would simply be no higher mental life—much less, then, science" (1994: 29). In sum, cognition and symbolic thought in symbolic procedures mutually condition one another in a necessary, not a contingent, manner.

The origin of science, therefore, is dependent on a higher mental life emerging in us, essentially conditioned by discrete symbols, and initially giving rise to language, everyday logical thought, and basic arithmetical ideas. The discrete symbols of the LOT processed by a symbolic inference mechanism

Husserl calls "natural surrogates"; Husserl calls the symbols in external procedures "conventional surrogates": and it is argued that "[i]n every case, the source for the conventional modes of procedure lies in the natural ones" (1994: 43, 44; italics removed). The natural symbolic mechanism, which Husserl calls (as Willard mistranslates) "indigenous [*naturwüchsig*]" (1994: 40), scientifically explains the arising of systems of language, logic, and arithmetic, and undergirds even our conscious use of conventional symbols and procedures. There is no thought without symbols, even for Husserl, because the natural psychological mechanism of symbolic inference is the causal explanation behind all thought, all judgment, and all cognition (expressed in arithmetic, logic and language)—as opposed to the mere association of ideas.

It might be thought that there is a difference between Fodor and Husserl on this point. For Fodor there obviously is no thought without language (of thought), but can this idea be found in Husserl? The answer is yes. The natural psychological mechanism of symbolic inference is the idea that there is no thought without language (of thought), because the symbols of the mechanism of symbolic inference are language-like, and underpin all cognition from a causal perspective. Husserl explicitly analogizes the symbols of his mechanism underpinning all thought to language (1994: 42). For example, he says with reference to the mechanism: "The systematic forms of conjunction for the words must precisely reflect those of the thoughts" (1994: 42). Notice that he is ascribing syntactic form to the thoughts, which here are conjoined symbols with syntactic structure. In virtue of this structure—and only in virtue of this structure—mental processes can preserve truth (Fodor & Pylyshyn 2015; Lopes 2020). Thought is a mental operation on syntactic structures; conventional systems of signs (like English and arithmetic) are derivative of the original syntactic system with natural (language-like) symbols and structures (Husserl 1994: 46).

The significance of conventional signs and procedures deriving from naturally occurring, symbolic mental representations—i.e. computational elements of what Husserl calls a "natural psychological mechanism of symbolic inference" (1994: 42)—or what we might today call the *language of thought hypothesis* (Quilty-Dunn *et al.* 2023)—is that every complicated symbolic system (e.g. every system of logic, every linguistic system, and, especially, every system of arithmetical operations) can be clarified by reference to the evidence (*Evidenz*) that this computational mechanism (or class of mechanisms) apodictically presents to our conscious minds. These symbolic systems cannot be clarified by reference to associations, or mechanisms of association (e.g. deep learning networks), because "the arithmetical operations" for example "insofar as they are formative of numbers, are *rule-governed* methods for the production of inauthentic representations" (Husserl 1994: 46; italics added).

The need for phenomenological clarification of symbolic mental computation is especially felt in the case of arithmetic, because arithmetic is "the most certain of all the sciences" and yet "is to be based upon such concepts"

as symbols whose meanings are not authentically (i.e. consciously) possessed (1994: 20). As Husserl puts it:

> Upon the conscious application of symbols, the human intellect raised itself to a new and truly human level. And the progress of intellectual development runs parallel with progress in symbolic technique. The magnificent development of the natural sciences, and that of the technology based upon it, constitute above all else the pride and glory of recent centuries. But it certainly seems that no less a claim to fame belongs to that remarkable symbol system—which has not yet received its clarification—*to which the sciences and technology owe most, and without which theory as well as practice would be helpless*: the system of general arithmetic, *the most wonderous mental machine that ever arose*. (1994: 29–30; italics added)

Arithmetic is ground zero for the Janus-face of phenomenology. Arithmetic is the simplest of all formal systems. It must therefore arise in tandem with the very first developments of any sort of higher mental life based on symbols. The computational operation of Merge "by which one constituent is added to another to form a larger constituent," provides a natural explanation for arithmetic, as well as the syntactic complexities of language (Matthews 2014: 241; Chomsky 2012: 15). These two systems are linked for Husserl in this essay: for language presupposes arithmetic in the phylogeny as well as ontogeny of mental life: "the system of language, with its finely articulated grammatical structure" is, as Husserl argues, as much a product of the psychological mechanism of symbolic inference as "the system of arithmetic," which "is not a product of intentional foresight, but rather is a natural development" (Husserl 1994: 46). We can say with phenomenological evidence that if there is an alien or artificial intelligence, it will *at least* have arithmetic. About this side of the Janus-face of phenomenology, then, the one that points toward psychology, arithmetic presents to us the very first object of phenomenological description. Phenomenology is here understood as that which is to be cognitively described over and above the effects of empiricist causal mechanisms.

On the other side of the Janus face, the one that points toward the ontology of the sciences, the system of arithmetic conditions our knowledge of the existence of objects, properties, and relations in all other scientific domains. Without arithmetic, scientific "theory as well as practice would be helpless" (1994: 30). And this is again because all symbol systems are related to arithmetic as an epistemological as well as computational precursor. In this sense, arithmetic is the first indication of the epistemological unity of the sciences. Through this epistemological unity, Husserl intends an *ontological* unity by opposing empiricism (and the related tendency of objectivism/positivism) by recognizing the products of the mechanism of symbolic inference (or a Fodorian LOT) as *objects in their own right*, as much as sense-based objects, which are the products of the mechanism of association (Smith 2008).

Phenomenology is distinguished from empiricism as a discipline by recognizing objects as experiential that are not proper products of the mechanism of association (Willard 1984). From the early essay on signs, through the *Logical Investigations* (1900–1901) and *Ideas* (1913), and especially in the *Analyses concerning Passive and Active Synthesis* (1926) and *Experience and Judgment* (1939) Husserl is centrally concerned with disentangling the non-sensuous (i.e. syntactic) objects and epistemological products of the mechanism of symbolic inference from those of the mechanism of sensuous association, first statically, then dynamically.

There is another sense of the unity of the sciences, which I will discuss further below in section IV. This sense has to do with the objectivistic/positivistic tendency of thinking that all the special sciences will be reduced to physics *in the long run* (Oppenheim & Putnam 1958). Fodor famously opposed this thesis (1974); and ever since, Fodor's view has been the *de facto* consensus view, much to the chagrin of reductionists (e.g. Kim 2010). Pombo *et al.* (2012) have collected papers arguing that Fodor's thesis may be opposed by noting that unification happens "just slowly" and therefore "a permanent landscape of apparent disunity is an unavoidable consequence […] [a] gradual integration process" (3). While it is true that Fodor's thesis of the autonomy of the sciences was empirical, based on "apparent disunity,"—Fodor (1998) even adverting to *university course-catalogs* as evidence—it should be noted that the core argument was always phenomenological. Fodor essentially argued that scientific intentionality, what we mean by the nonlogical vocabulary intratheoretically entering into scientific laws, is not susceptible to intertheoretic reduction in the absence of bridge laws. Any possible reduction would entail a distortion of meaning concerning what holds for genuine objects in a given domain of reality lacking these bridge laws. Thus Fodor offers the reductio that Gresham's Law of economics cannot even be coherently proposed as reducible to physics barring "an accident on a cosmic scale" (Fodor 1981: 134).

Of course, Fodor's intention with the Special Sciences paper was to secure the autonomy of computational cognitive psychology from empiricist attempts to reduce that psychology at present to physics (via neuroscience or behaviorism), by referring all things mental to sensory inputs/behavioral responses and mechanisms of association. What I am arguing is that the scientific significance of phenomenology today can be construed along the same lines: as the autonomous descriptive taxonomy of a cognitive psychology which goes beyond the limits of empiricism and therefore mechanisms of association (e.g. deep learning). Naturally, this has implications, both for present-day cognitive science and artificial intelligence. In particular, this means phenomenology provides descriptive evidence for the language of thought hypothesis (LOT) (e.g. with regard to arithmetic, language, meaning etc.) as against currently popular empiricist approaches in the form of deep artificial neural networks (ANNs) and dynamical systems theory applied to the mind (DST) (Lopes 2023a).

2. *The Epoché as an Anti-Empiricist Methodological Device and the Question of Naturalism: The Mechanisms of Association and Symbolic Inference at the Basis of Passive and Active Syntheses*

When the very conspicuous fact that the domain and objects of cognitive science overlap substantially if not entirely with phenomenology, the issue of naturalization is brought up. The epoché is brought up, for example; and since this means a suspension of the natural attitude, and the natural attitude engenders naturalism in science, it is inferred transitively (and correctly) that cognitive science and phenomenology must be orthogonal. When Fodor's work is mentioned in the context of phenomenology, it is immediately dismissed as irrelevant *due to its naturalism*. But this is a serious mistake, as I shall now argue.

To debunk the soundness of the inference, we need to examine the chain of inferences more closely. The epoché is defined as a "procedure of bracketing […] certain belief components of our experience" (Moran & Cohen 2012: 106). In particular, it is meant to exclude the natural attitude. The natural attitude is the way entities in the world are perceived to exist as factually existing particulars or as actual individuals. It is opposed to the idea of seeing universals (or other active-synthesis level meanings) as objective and encourages an empiricism with regard to them as mental objects inducted from factually existing particulars/individuals resulting in similarity amalgams. This attitude therefore prepares the ground for the naturalistic attitude "as a specific evolution and deformation of the natural attitude" (2012: 219). The naturalistic attitude is "the attitude determined by modern science" (2012: 220). This is an attitude that is essentially "linked with naturalism" (2012: 220). But what does naturalism mean here? Might syntax and symbolic procedures founded thereon as a natural property of the mind fall outside of the scope of this criticism?

The answer is a resounding "yes." Husserl's issue with naturalism is obviously not its syntacticism (hence not cognitive science) but its empiricism. For naturalism "recognizes only one method for gaining scientific knowledge, empirical observation and induction" (2012: 218). And what is shared by "all [the] versions of naturalism" that Husserl criticizes "is a commitment to empiricism" (2012: 218–219). Therefore, the ultimate purpose of the epoché in its use against naturalism in the sciences is to block empiricism and associative induction. It follows that cognitive science qua non-empiricist syntax falls outside the scope of Husserl's critique of naturalism.

More formally: every *N* (naturalism) that Husserl criticizes as such is *E* (empiricism); but no *FCS* (Fodorian cognitive science (FCS)) is (notoriously) an *E* (empiricism); therefore, no *FCS* is *N* (naturalism) in the sense of Husserl. This is in Modus Camestres form (a valid syllogism of the second figure). But of course, FCS *is* a naturalism, just not the kind that Husserl discusses, since every naturalism Husserl discusses is an empiricism. Therefore, FCS necessarily lies outside the scope of Husserl's discussion of naturalism. Hence any attempt to dismiss the naturalism of cognitive science on phenomenological grounds

must face this argument. Its conclusion is an iron fact that needs discussion, but which has not attracted any (the argument having been unknown hitherto) in any part of the literature on these topics.

My logical inference shows that phenomenology's *telos* toward categorial intuition, active synthesis, and predicative phenomena has not been understood. For it has not been understood that the epoché is a methodological device for overcoming a very particular kind of naturalism prevalent in Husserl's day and still prevalent today in the form of artificial neural networks and dynamical systems theory but is not as all-encompassing as it once was. That kind of naturalism is empiricism. Naturalistic-empiricism and its psychologistic absurdity with respect to categorial intuition, active synthesis and predicative phenomena afflicts the recent generative modeling movement of phenomenology based in Bayesian probabilistic update without LOT supplementation. Only LOT supplementation can defend recent generative modeling efforts against the absurdity (see next section).

Once we allow the logico-syntactic products of the mind to emerge in their descriptive evidence for consciousness, so that we can no longer doubt them from the point of view of a naturalistic empiricism, i.e. generative modeling or Bayesian probabilistic update, it is no longer clear why we must forever after remain in the epoché, as many phenomenologists seem to want to do with respect to the causality of syntax. For the epoché is *pro tempore* and methodological, not substantive. It reveals by suspending *pro tempore* the empiricist assumption that the limits of the mind are the limits of associationism and statistical induction via Bayesian update. But this *pro tempore* suspension does not causally explain what it reveals. We do not, in the manner of "a sophist," as Husserl claims in the famous epoché section from *Ideas I*, deny or "negate" (or "disavow" with Merleau-Ponty) the existence of the natural world (Husserl 1913/2014: 55). We do not therefore deny that our phenomenological minds and attendant mental processes are substantively within the natural world. Nor do we cast any doubt as to the existence of the natural world, in the manner of "a skeptic" (1913/2014: 56). We do not therefore cast any doubt on the fact that all mental phenomena must be *substantively* related back to objective causalities in the unity of science. For, as these passages from *Ideas I* suggest, the epoché is methodological, not substantive. It is not any sort of positive doctrine of anti-naturalism (e.g. proof of a second substance). Rather, it is a methodological device, intended primarily to overcome the naturalistic-sensualistic psychology of "Locke" (Husserl 1926/2001: 31). On pain of sophistry and/or irrational skepticism, therefore, we must revert back to naturalism, once the aim of the epoché has been achieved, namely, the overcoming of the limits of empiricism. We therefore must eventually drop the descriptive epoché and turn, now with explanatory not descriptive intent, to some mechanism in order to explain causally and objectively what we have merely *methodologically* found *within* the epoché that goes beyond associationistic empiricism (e.g. cognition of arithmetic). The explanatory mechanism that goes beyond associationistic

empiricism is, however, one that Husserl himself discovered: the computational-syntactic mechanism of symbolic inference, which is the causal basis for active synthesis, insofar as active synthesis consists of the phenomenology of syntax (Sokolowski 2003); in the same way that the mechanism of association is the causal basis for the phenomenology of passive synthesis or association via similarity. The resulting picture—the current version of Plato's "divided line"—looks like this:

phenomena of passive synthesis	phenomena of active synthesis

ANNs & DST	CTM & LOT

The first bar represents phenomenological descriptions; the second, lower bar their descriptively adequate causal explanations. The dividing lines represent distinctions in kind. In other words, the phenomena and explanatory apparatuses do not differ merely in degree. In particular, the latter halves must not be *continuous* with the former, i.e. reducible one to the other, on pain of psychologism—which is here understood as the reduction of the content of laws of logic, mathematics and semantics to the causal history of the organism/system (Lopes 2024). For in that case, the work of the epoché, of showing us a realm of active synthesis (e.g. productivity, arithmetic etc.) distinct in kind from passive synthesis, will have been undone; and it will once again be a mystery how a rational life emerges from Lockean/Humean associationism (or associative neural networks) (Husserl 1926/2001: 31; Husserl 1929/1969: 14). I proceed in section IV to connect "the physicomathematical sciences" with the top-tier of this distinction in kind (Husserl 1939/1973: 43). But first it is necessary to dismiss the central alternative to my approach, which models only passive synthesis—"generative modeling" or, more generally, neurophenomenology.

3. *On the Empiricistic Psychologism of Generative Modeling / Neurophenomenology as an Alternative to LOT-Phenomenology*

Generative modeling is currently considered the main naturalization project associated with phenomenology (Pokropski 2022; Albarracin *et al.* 2022; Beckmann *et al.* 2023; Yoshimi 2023). This approach is, as Ramstead *et al.* (2022) note, "quintessentially probabilistic or Bayesian in nature." It is based on predicting, through generative modeling with artificial neural networks (ANNs), the incoming stream of (sensory) data. Bayesian networks predict the sensory flow of hyletic data inputted to the organism/system. In order to better predict the phenomenal features of the incoming sensory flow, the body with its kinaestheses (including saccades) will sample behaviorally different aspects

of the environment in order to adjust the weights of the neural network. Eventually, through many probabilistic updates, the weights will settle into a stable pattern and determine regular activation patterns relative to an environment.

But as Husserl says, the point of the phenomenology of active synthesis—hence the point of phenomenology insofar as it goes beyond empiricism and doesn't merely recapitulate it—is to show how "the essential structures of the cognitive life […] [go] beyond what is capable of being verified in [sensory] experience," in particular, experience "in the mode of anticipation…" (Husserl 1939/1973: 288). But predictive processing of neural networks is exclusively concerned with "anticipation" in passive synthesis, no matter how 'active' (in the sense of active inference) the body may be in its kinaestheses. As such, according to Husserlian phenomenology itself, generative models are only capable of explaining the anticipatory expectations of passive experience (associationism) whose intentional contents are amalgamations of the history of past sensuous experiences of the subject (organism/system). Such intentional contents essentially refer back (counter-sensically) to experiences of particulars/individuals in the sensory flow and inductive amalgamations of individuals, represented in Bayesian neural networks by probability density functions. Notice that it is the point of the epoché to abstract from precisely this. These probability distributions approximate but do not—and essentially cannot—express logical forms, objects, predicate senses, judicative meanings and states of affairs. Due to their intentional contents being functions of the history of individual inputs and similarity amalgams based thereon, generative models do not and can never express or instantiate intentional contents referring to universals, eidetic essences, kinds, genera, concepts etc.—which, however, it was the very point of phenomenology to reveal as against empiricism.

Generative modelling is therefore essentially inadequate to phenomenology—indeed constitutes a refutation thereof—since the very meaning of phenomenology is to overcome the cognitive limitations of Lockean-Humean associationism and psychologism to reveal descriptively at first (explanatorily later) all the categorial objectivities belonging to the level of active synthesis and which cannot be reduced to passive synthesis (associationism) on pain of empiricistic psychologism. It has recently been argued, as a result, that all of neurophenomenology is a psychologism, since this field only refers to Bayesian modeling, ANNs, and dynamical systems theory—all of which are associationisms, which directly result, without supplementation by LOT/CTM, in psychologism (Lopes 2024). Psychologism is not a mere historical worry, as the proponents of these views sometimes say (without argument)—it is a living absurdity, directly entailed by ANNs. The spectre of psychologism essentially motivates all of Jerry Fodor's arguments against ANNs ever since the Systematicity Challenge. Systematicity, be it noted, is repeatedly brought up by Husserl, from the *Logical Investigations* to *Experience and Judgment*, as an essential law of active synthesis which cannot be reduced to passive synthesis (on pain of psychologism). As a result, all generative modeling in

phenomenology, insofar as these theories do not recognize the predicative layer of experience founded in syntax which can support categorial phenomena like systematicity irreducible to associationism, are one and all (counter-sensical[3]) psychologisms—essentially reducing the validities of all categorial objectivities to the sensory flow which it is the purpose of Bayesian update in generative models to predict. As we shall see below, then, according to my thesis, all of science through logicomathematical thought, beginning with the mathematical physics of Galileo/Descartes, is cognitively beyond, in principle, the similarity amalgamations and probabilistic expectations modeled by Bayesian networks (or variously configured ANNs in general, no matter how deep, convolutional or recurrent). For these contents are generated by the associative history of the system and used to predict (expect) features of the incoming input stream

There is a quick fix to the psychologism of Bayesian networks: since "Bayesian computational psychology naturally complements LOT architectures" (Quilty-Dunn *et al.* 2023)—just as passive synthesis naturally complements active synthesis—all the above theorists need to do is accept my thesis and modify their probabilistic generative modeling to involve symbolic syntax—as in PLOT (Goodman *et al.* 2015). The alternative is a psychologistic associationism that denies precisely what it was the point of phenomenology to reveal[4].

4. *The Unity of Science through the Constituting Activity Rooted in Syntax of Transcendental Subjectivity*

I shall now attempt to synthesize LOT, anti-psychologism, and anti-empiricist naturalism all together to make clear how transcendental phenomenology is intended to perform a dual role: (1) as a non-empiricist psychological description or transcendentally subjective investigation of those intentional

[3] The reason why ANNs are counter-sensical is because ANNs generate content-similarities essentially relative to the causal history of the system. These content-similarities, though meaningful to a degree, correspond only to half-objects, not genuine objects. See Quine (2004) for this distinction, though Husserl (1926/2001) already made the point. ANNs must therefore be supplemented by a LOT which is the only explanatory apparatus capable of generating non-psychologistic (because non-empiricistic) content-identities corresponding to actual objects. See Lopes (2023b) for this argument.

[4] Indeed, phenomenology was the motivation for PLOT, as "Bayesian networks" were seen to "fail" the test of intuition (i.e. the phenomenology) in capturing "genuine productivity in thought" as well as "the fine-grained compositionality inherent in our intuitive theories"—primary phenomena of active synthesis (Goodman *et al.* 2015: 638). Of course, the LOT must be able to be detached from the PLOT (i.e. stochastic functions) on pain of psychologism, as probabilities essentially belong to passive synthesis. The point of replacing Bayesian ANNs with PLOT would therefore be twofold: (1) to better model genetic phenomenology which observes activity in passivity, and (2) to avoid the empiricism in content constitution inherent in ANNs and thus the psychologism of ANNs.

experiences that constitute logico-syntactic objects for consciousness that go beyond associationistic empiricism—for example, the intending of arithmetic and logic, as well as universals/types/species, and thus the intending of repeatable individuals as of one and the same type; and (2) as an epistemological foundation for all of the objective sciences, from the metaphysically "basic" science of physics to the "special" sciences (e.g., and most importantly, empiricistic psychology) (1926/2001: 29; 1929/1969: 108). (2) is centered on the idea that all the sciences presuppose arithmetic, logic, and the kind of semantics that only a LOT provides.

The idea of phenomenology, then, as a new foundation for the sciences was intended (a) to block empiricism's totalizing influence in both psychology *and* epistemology, as well as (b) revive, in a new "science of cognitive reason" form (Husserl 1926/2001: 103), the Aristotelian idea of logic (e.g. syllogistics, as well as predicate logic) at the foundation of the sciences, which had been intentionally discarded as useless and barren of results by the founders of the scientific revolution. The scientific revolution of the 17th century, whose paradigm for knowledge is still in effect, and was reified into nature by the positivists, was based on mathematical physics, or what Husserl calls "physicomathematical natural science" (1939/1973: 43).

There are two main aspects of the Unity of Science in philosophy generally and in Husserl specifically:

- *The Ontological Claim*: All sciences reduce to one all-encompassing science
- *The Epistemological Claim*: All explanations are subsumed by one kind of most-general explanation

Both claims had influence through the auspices of the positivists, who modified the Ontological Claim to read:

- *The Positivistic Ontological Claim*: All special sciences reduce to physics

And this was further modified by Oppenheim and Putnam to read:

- *The Oppenheimian/Putnamian Ontological Claim*: All special sciences reduce to physics *in the long run*

Fodor's famous discussion of the Oppenheimian/Putnamian Claim—as filtered through Ernest Nagel (1961/1979)—led to the following phenomenological/empirical claim:

- *The Fodorian Ontological Claim*: All special sciences are irreducible to physics

And this claim was bolstered by the Quinean view that one must ontologically accept the entities quantified over in scientific laws. If, therefore, there are scientific laws in the special sciences whose nonlogical vocabulary denotes entities that are irreducible to physics, these entities must be accepted as part of our ontology. If, furthermore, there are scientific laws concerning syntax, then syntax must be accepted as part of our ontology. Although there have been rumblings against the Fodorian Ontological Claim, most notably through the work of Jaegwon Kim (2010), I do not see any convincing evidence against

the view that reality is ontologically stratified in just the way that Fodor (and Husserl) claimed.

Now I want to reground this whole discussion in the Epistemological Claim, in light of the syntactic basis of Husserlian phenomenology, on the one hand, and the justice of Fodor's contention that we must accept syntax into ontology, on the other. Again, the Epistemological Claim is the view that there is one all-encompassing explanation for all the explanations in the sciences. The phenomenological unity of science view consists in the idea that all the sciences presuppose formal structures (of logic, arithmetic and judicative meaning) which are spontaneously constituted by the active, rule-governed syntactic syntheses of the transcendental subject. These are in principle not explained by empiricism and its descendants (e.g. sense-data theory, behaviorism, deep learning). Carnap (1928/2003) takes over the epistemological aspect of Husserl's project (i.e. these are valid objectivities), while neglecting the reality of the constituting activities of transcendental subjectivity.

But our main concern is with the positivist ontological claim. We contradict it as soon as we note the irreducibility of transcendental subjectivity to the mathematizing physics at the basis of the positivist hierarchy. This phenomenological fact is the subject of Husserl's *Crisis of the European Sciences and Transcendental Phenomenology* (1936/1970) and *Experience and Judgment* (1939/1973). The argument here is that the constituting activity rooted in syntax of transcendental subjectivity is constitutive of the life-world (*Lebenswelt*) *as much as* it is constitutive of science—they have the same basis. If I am right, they are both products of the language-of-thought. Each therefore can have as much justification as the other, though they often contradict one another (e.g. the Copernican hypothesis and Merleau-Ponty's phenomenology of perception). Husserl was aware of this contradiction, but thought, unlike later phenomenologists and theorists of intentionality (e.g. Kriegel 2011), that scientific theory is completely justified in contradicting the life-world and cannot actually be corralled by it (see Husserl 1906–1907/2008: 94). The way out of the contradiction between the scientific image and the manifest image is not by saying that the manifest image can epistemologically police the scientific image (a manifest absurdity, no pun intended) but by referring both to the constituting activities rooted in syntax of the transcendental subject / the language of thought. This can serve to clarify the mathematizing sciences by relating their symbolic procedures to the phenomenological evidence connected with symbolic procedures in the head. For this referral to the mechanism by which both are produced allows us to say that the contradiction is paradoxically complementary due to their single foundation in the science of cognitive science (as *cogitationes*). In this way, the ontology of the world is not exclusively determined by the scientific method of physicomathematical science as inaugurated by Descartes and Galileo.

I've just argued that the priority of cognitive science to mathematical physics, as a special science of *cognitive science* has to do with the syntactic

syntheses of the knowing subject, available as self-evident to transcendental phenomenology in the form of categorial-syntactic intuitions over and above associationism. These categorial-syntactic intuitions (object, property, states of affairs, and their computational phenomena: productivity, systematicity, compositionality) are discussed throughout the whole length of Husserl's phenomenological corpus, from the *Logical Investigations* (1900) to *Experience & Judgment* (1939). Echoing Hume as the founder of cognitive science (Fodor 2003) but going beyond his associationism to reach a language of thought (Fodor 2008), we can say once again with a new meaning that "the science of man is the only solid foundation for the other sciences" (Hume 1739/1969: 42–43). Unless, of course, one doesn't believe that mathematizing theories are part of a framework of thinking that can only be a projection of a language of thought. But provided I have made this plausible, the new view disestablishes the Oppenheim-Putnam (1958) thesis but nevertheless effects unity across the sciences in a new way—one that simultaneously respects the empirical (and phenomenologically essential) disunity of the sciences, as originally argued by Fodor (1974), and, curiously enough, is based on Fodor's apparently independent theoretical proposal for cognitive science (1975). This proposal is not at all outdated; it is still the best game in town (Quilty-Dunn *et al.* 2023). According to phenomenology, it will always be.

Of course, more needs to be said to fully defend my hypothesis. For example, it needs to be shown that the world, prior to our understanding of it in terms of mathematical physics, is already determined by cognition's "syntactical actions" in another way (Husserl 1929/1969: 110). If this cannot be shown, then the positivist ontological claim still stands.

I shall therefore now argue that the positivist ontological claim, even as an ideal, cannot stand. This is really the heart of the argument: to show that the very same function of cognition is at work in both (or in several) directions (i.e. in another way), and that *therefore* mathematical physics isn't *basic* but rather a *special branch* of the originating "judgment-syntaxes" whose intentional objects include those of mathematical physics (1929/1969: 112). Call this "*the Husserlian strategy for undermining positivistic physics*." The main other direction in which judgment-syntaxes project structure is *the life-world* or *the manifest image*, which "is always already pregiven to us as impregnated by the precipitate [*Niederschlag*] of logical operations" (Husserl 1939/1970: 42). These are "the precipitate of cognitions" (1939/1970: 16). Mechanistically, these are the causal products of the language of thought (Lopes 2023a). If these considerations are evident, then we can infer that "physicomathematical natural science […] is itself the result of a function of cognitive methods" (1939/1970: 43). If not, then not. But there is, at least, a large body of opinion that will at least grant the priority of the life-world to mathematical physics (see Wiltsche & Berghofer 2020). I only add that this priority is in virtue of the symbolic functions of the language of thought, from which arithmetic and all other formal systems must be said to be accessible to cognition. In other words, it's

not associative structures of prepredicative experience that's giving us Galilean physics—it's the subjective conditions behind *predicative* experience.

The 1st historical phase of the unity of science was the Aristotelian; the 2nd phase is the Galilean/Cartesian. In making the transition away from what the positivists took to be the 'in itself' of nature, our 3rd phase must be the Husserlian/Fodorian:

Unity of Science (effected by)
α. Metaphysical Logic (Aristotle)
β. Mathematical Physics (Galileo and Descartes)
γ. Syntactic Thought (Husserl and Fodor)

The transition from β to γ is entirely centred on the above argument, which I'll spell out here:

1. Mathematical physics as the basic science is an idealization imposed on the life-world
2. The life-world is prior to this idealization and is "always already pregiven to us as impregnated by the precipitate of logical operations" (Husserl 1939/1970: 42)
3. These logico-syntactic operations are epistemically and ontologically prior to the life-world
4. Therefore, "judgment-syntaxes" (Husserl 1929/1969: 112) or "syntactical actions" (1929/1969: 110) result in the ontology of the life-world and the ontology of mathematical physics in that order
5. Therefore mathematical physics is not the basic science
6. Therefore the logical operations and their objects in the life-world are the basic science

I identify this basic science with "basic cognitive science (BCS)" (Fodor and Pylyshyn 2015: 16). In other words, "a language of thought cum phenomenology program" is the basic science. Husserl calls this logic in an extended sense because it transforms the Aristotelian termini of the judgment into "syntactic cores" (Husserl 1926/2001: 302) and because it is Janus-faced. As Husserl puts it: "we stand within logic, whose two-sided theme is all possible sciences as such: on the subjective side, the possible forms of the actions productive of and cognitive of scientific cognitional formations; on the Objective side, these formations themselves [e.g. mathematical physics]" (Husserl 1929/1969: 108). I put this forward, in the spirit of Fodor, as a working hypothesis for overcoming the impasse Fodor himself created concerning the unknown status of the special sciences in relation to the basic science of physics *given the positivist ontological conception*. What is needed is a change of perspective, a Copernican turn toward the transcendental subject, which, facing the subjective side, finds the language of thought hypothesis; facing the objective side, finds the sciences and the life-world / manifest image as the products of a language of thought,

whose evidence is found in categorial intuition, not associative sense data or statistical amalgamations of hyletic data.

5. *Conclusion and Summary*

The point of the preceding, of course, is not to defend any sort of material idealism. Donald Hoffman (2019) is currently using computationalism to support a material idealism (à la Berkeley). I am not of that persuasion: I think material objects exist when no one is looking at them; and I don't think Occam's razor helps the alternative. But I am saying there's a reason to take transcendental idealism seriously if it's identified with the language of thought hypothesis. And since transcendental phenomenology is nothing other than transcendental idealism without a causal mechanism (Husserl 1931/1964: 86); and as LOT denotes a causal mechanism while accounting for the very same syntactic phenomena of thought Husserl outlined, the theoretical union, I think, is scientifically necessary.

If therefore transcendental phenomenology implies a dependency relation of physics on the idealizing functions of the language of thought, then a restructuring of the positivistic hierarchy of the sciences is in turn justified. That seems like a good result of combining LOT with transcendental phenomenology. The resulting structure of science is less a hierarchy with physics at the bottom than an arborescent bush, with the constituting syntactical judgments of a "language of thought cum phenomenology" at the centre (always retaining, of course, the possibility of the suspension of nature with the epoché). In other words, it's Hume's idea that physics is dependent on "the science of man," but that science happens not to be (merely) a theory of the mechanism of associationism (hence not just ANNs or DST) but a theory of the symbolic mechanism of computation, whose constituting activities are defined over the constituent structures of rule-governed syntax, made evident in phenomenological intuition. This theory is currently, for the first time, accumulating neurological support (Gallistel 2021, 2018); and since I'm not a material idealist, that's grist for my mill.

Like Husserl, Gallistel (2021) bemoans the continuing influence of Locke on our theories, rendering the apprehension of arithmetic on the part of animals inexplicable. He is dead set on refuting associationism and defending "the natural psychological mechanism of symbolic inference": "Fodor realized that there must be symbols in the brain, just as Mendel realized that there must be physically mysterious 'particles' in seeds.... Fodor also realized that there must be computational machinery that operates on those symbols, the machinery that embodies the syntax" (Gallistel 2018: 292). One might suggest that Gallistel needs to recommend the epoché to the field of neuroscience, as I do to neurophenomenologists, to overcome the natural attitude, which predisposes one to believe that Lockean psychology must be correct. It is not

rationality that supports the continuing influence of Locke and his descendants (e.g. Yoshimi 2016) but the naturalism connected with the naturalistic attitude derived from the natural attitude of everyday life, which must therefore be suspended with the epoché. For "empiricism is without rational foundation, is, in fact, a mere assumption, no more than a common prejudice" (Husserl 1900–1901/2001: 60). If neuroscientists, psychologists and philosophers do not apply the epoché to realize that the language of thought hypothesis is the best game in town, it will never cease to be "extraordinary that empiricism should give a readier credence to a theory so loaded with absurdities than to the fundamental trivialities of logic and arithmetic" (1900–1901/2001: 60). The current empiricist movement of generative modelling of phenomenology has failed to realize this.

Nevertheless, Hume had the basic idea of the unity of science based on cognitive science. In saying this, I agree with Fodor (2003) that Hume is the founder of cognitive science. Husserl developed this idea by pushing the boundaries of the phenomena that could appear to consciousness beyond the limits of the mechanism of association into the descriptive territory of the mechanism of a language of thought. This is what is known as Husserlian phenomenology, a descriptive endeavour that points two ways—toward the subjective conditions of psychologically descriptive phenomena that go beyond empiricism and toward objective unification of the products of these subjective conditions (i.e. the sciences, both of the life-world and the Galilean sciences).

It is possible that Hume was motivated in his orientation, like Husserl, by realizing that the Galilean mathematization of nature could not be identified with nature "'*in itself*'" (Husserl 1939/1973: 43). As Chomsky has recently argued, this realization occurred to Hume in light of Newton's surprise discovery within the mechanical worldview of gravity, which demonstrated once and for all to Hume's mind that we do not know nature as it is "in itself"—all we have are idealizing theories, something quite different (Chomsky 2016: 81). As a result, in the structure of the sciences, the idealizing theories of physics bear reference to and presuppose, as Husserl argues, "cognitive methods" (Husserl 1939/1973: 43; Crease 2020). These were ignored by the positivists in their anti-subjective and behavioristic zeal; a similar tendency occurred in the post-Husserlian phenomenologists in their devaluation of cognition in favor of the body and associationism. This is not to say that Husserl didn't theorize along the lines Merleau-Ponty would later trace; it's to say that Merleau-Ponty, like his followers in predictive processing and neurophenomenology (see Clark 2016: 288–291), rejects the fundamental stratification between association and syntax, the phenomenology based on this anti-psychologistic division, and therefore the thesis that cognition is a function primarily of active synthesis, not passive synthesis.

The upshot of our thesis is that the structure of the sciences is like an arborescent bush with phenomenologically informed basic cognitive science at the center; the transcendental sciences of the life-world radiating outward (for

Hume, these were "Logic, Morals, Criticism [e.g. Classics] and Politics" (Hume 1739/1969: 43); and at the periphery the mathematizing sciences (for Hume, "Natural Philosophy [e.g. Newtonian physics]" (ibid)) in the Galilean style. The Galilean sciences are autonomously stratified in a manner consistent with Fodor's Special Sciences thesis—with the crucial modification, if I'm correct, that the special science of cognitive science has become the basic science by the auspices of transcendental phenomenology.

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