

The Cognitive Gap, Neural Darwinism & Linguistic Dualism

—Russell, Husserl, Heidegger & Quine

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Abstract

Guided by key insights of the four great philosophers mentioned in the title, here, in review of and expanding on our earlier work (Burchard, 2005, 2011), we present an exposition of the role played by language, & in the broader sense, *λογος*, the Logos, in how the CNS, the brain, is running the human being. Evolution by neural Darwinism has been forcing the linguistic nature of mind, enabling it to overcome & exploit the cognitive gap between an animal and its world by recognizing environmental structures. Our work was greatly influenced by Heidegger's lecture notes on metaphysics (Heidegger, 1935). We found agreement with recent progress in neuroscience, but also mathematical foundations of language theory, equating Logos with the mathematical concept of structure. The mystery of perception across the gap is analyzed as radiation and molecules impinging on sensory neurons that carry linguistic information about gross environmental structures, and only remotely about the physical reality of elementary particles. The most important logical brain function is Ego or Self, guiding the workings of the brain as a logos machine. Ego or Self operates from neurons in frontopolar cortex with global receptive fields. The logos machine can function only by availing itself of global context, its internally stored noumenal cosmos *NK*, and the categorical-conceptual apparatus *CCA*, updated continually through the neural default mode network (Raichle, 2005). In the Transcendental Deduction, Immanuel Kant discovered that Ego or Self is responsible for conscious control in perception relying on concepts & categories for a fitting percept to be incorporated into *NK*. The entire CNS runs as a "movie-in-the-brain" (Parvizi & Damasio, 2001), at peak speed processing simultaneously in a series of cortical centers a stack of up to twelve frames in gamma rhythm of 25 ms intervals. We equate global context, or *NK*, with our human world, Heidegger's *Dasein* being-in-the-world, and are able to demonstrate that the great philosopher in EM parallels neuro-science concerning the human mind.

Keywords

Cognitive Gap, Perception, Phenomena, Transcendental Ego or Self, Prefrontal Cortex PFC, Parietal Cortex PC, Top-Down Processing, Default Mode Network DMN. Language *L*, Universe *U*, Language

System (or Machine) *LS*, Logos Machine, Noumenal Cosmos *NK*, Conceptual-Categorical Apparatus *CCA*, Pre-Linguistic Structure *pLs*, Internal Structural-Historical Records *ISHR*, Formal Linguistic Dualism *LD*

1. Our Mottos, from What the Founders Have Said

There is no *precise* sense in which we can be said to perceive physical objects.

—Bertrand Earl Russell

The being of the objective, a being that appeared to the contingent consciousness as “over against” it and “in and of itself”, has now appeared as a meaning constituting itself within consciousness itself.

—Edmund Husserl

Only in the resonances of one’s own individual “I” does a first-hand [environmental] thing get experienced, only there does “world happen”, and wherever and whenever world does happen for me, I am somehow entirely there.

—Martin Heidegger

We respond to visual clues, organize them in a twinkling, and compare the result with what is stored in memory.

—Willard van Orman Quine

2. Preface

The MAIN THRUST of my efforts in the present review-style essay is to DEEPEN INSIGHTS gained in earlier work to be reviewed here, by delving into metaphysics, seeking a new ground to stand on, in these first steps, be they exploratory, stumbling, and likely preliminary.

A major motivation was that in my earlier works¹. I had cited & referred to Heidegger’s 1935-52 metaphysics textbook/lecture notes but had not worked out or even fully understood the place of it in the great history of the subject.

The result, this essay, is based on motto quotes by Russell, Husserl, Heidegger, and Quine that frame the thesis of a metaphysical-cognitive gap as the center of discussion and as its principal topic of interest.

3. Introduction: Philosophy Meets Science

Progress in science adds to philosophy always, the famous case of the Copernican revolution in astronomy serving as the opening chapter of the Modern Era, followed through by Galileo, Kepler, and Newton. Today we see a similar break-through in neuroscience that we should expect to lead to radical review of our theories of the mind.

Progress in philosophy can now be expected and achieved through a more perfect linkage with science, specifically what neuroscience has to say about traditional philosophical themes, constructs and theories. Today this appears to be proceeding a-pace, and we are beginning to sense a form of a new universal science, a science of philosophy.

The opportunity for such a development of a new science of philosophy may present itself especially at this juncture when a lineage of uniquely able and influential scientists and philosophers, including many from the fields of logic, mathematics and physics, mental giants from the preceding centuries up until today, have worked over & shed fortuitous new light on efforts past and present and provided us with new insights in several areas of science and logic.

For the intellectual culture of three or more of the most recent centuries a common path was charted by these pioneers, these giants who preceded us, to explore the reflection in human understanding of the reality of nature. This reflection is precisely what here we call the *noumenal cosmos*, *NK*.

Among the giants, the pioneers, we count four great thinkers, Bertrand Russell, Edmund Husserl, Martin

¹See below, June 2005 and January 2011.

Heidegger, and Willard V.O. Quine. They provide us with intellectual access to the global context on which we depend for each of us to build our *NK* adequately, i.e., in a functional completeness that we require in order to conduct our affairs. Their commonality of insight is well illustrated in their four motto quotes placed above the present text and opening this work serving as four pillars in support of the entrance to the temple of philosophy and thereby of the whole edifice of human science.

The union of philosophy and science may be said to have been foreseen by naturalist philosophers Russell and Quine, who practiced scientific methods in metaphysics, their featured quotes standing as the end pillars of the guiding architecture of scientific metaphysics.

The intellectual content of these four motto quotes and its significance for the current essay and for the whole of Western thought is the main topic of the discussions below, and is fully introduced in §4 under the name of *metaphysical-cognitive gap*.

Philosophical-mathematical break throughs worthy of note also deserving special mention are those by Georg Cantor, Ernst Zermelo, Alonzo Church, Willard Van Orman Quine, with many of their students and followers contributing. Indeed, of brilliant, productive minds far too many have been effective, to even attempt a comprehensive list.

Central foundations build on work of Georg Cantor, Ernst Zermelo and others, especially the definitive theory of computability and recursive functions of Kurt Gödel and of Alonzo Church and his students, Alan Turing, Stephen Cole Kleene, Barkley Rosser.

Besides Russell, who explicitly involves science every time an opportunity may seem to present itself, Husserl for one already had foreseen the need for scientific philosophy in his 1910 work “Philosophy as Rigorous Science”. Quine follows suit as an engaging naturalist philosopher. Heidegger, too, has written widely about science, although not always approvingly, but clearly testifying to his abiding interest.

We learned much from Heidegger’s metaphysics, specifically his 1935 Summer Semester course on hermeneutical metaphysics, that he taught at Freiburg University, *Einführung in die Metaphysik* (EM, Heidegger, 1935). Various intimately related and interwoven aspects of his philosophy are presented in EM and in his most famous, monumental work, *Sein und Zeit* (SZ, Heidegger, 1926, 1979).

The many references within EM to SZ, a great deal of identical terminology, and its publication history² confirm that we should consider EM a continuation of SZ, albeit plowing new ground and branching out into different directions. This is underlined especially by Heidegger’s term for a human life, *Dasein*, being employed identically in both, EM and SZ.

On the other hand, *being-in-the-world*, Heidegger’s term for how humans relate to their environment has disappeared in EM.

His definitive treatment in EM of *λογος*, the Logos, that grants a leading role to it in any metaphysical consideration, is most important for us and has been a major influence that we have received from EM & to which we remain indebted.

Accordingly, there is much overlap in this present essay and in our related earlier work, showing how much we depend on Heidegger’s insights, *esp.* from EM.

4. The Metaphysical-Cognitive Gap

The four great thinkers, pioneer-giants, Bertrand Earl Russell, Edmund Husserl, Martin Heidegger, and Willard V.O. Quine, play a special role for our work in this essay on account of their four motto quotes. The intellectually significant content that these four motto quotes each describe is what is named in the section title as *metaphysical-cognitive gap*.

In the mottos, each of the four men expresses a sentiment, a thought, about the mystery of the human experience of our world, our environment.

Each offers his personal view point, his special insight, his own philosophy on a very basic philosophical issue, of how we can know what is going on around us, which at the same time is of the greatest interest to science.

The four sentiments describe how we think about *external phenomena*, that these relate to our mental activities, and that we build our own inner world hoping to reflect the external universe accurately, rather than directly embracing external entities, which we are incapable of doing.

²Cf. translators Gregory Fried & Richard Polt, their introduction to EM.

We learn that we humans, to discover our environment, must involve our innermost being, a seemingly paradoxical situation, indicative of a *metaphysical gap*, a separation, even a chasm, between the phenomena of the external environment where although at home we yet are strangers, but yet we have available an inner world *NK*, to serve in lieu of the external universe.

Remarkably, they formulate matters in their private ways, yet all four appear to echo this common theme, of a separate inner world model *NK* from the reality of external phenomena. In this way, they have in fact struck upon a fundamental principle of metaphysics. Heidegger characterizes the gap as follows (Heidegger, 1935):

EM, p. 88 *As pointed out repeatedly above, the divorce of “being and thought” completely predominates in the life of the West.*

We can see from this, his version of the gap is the divorce of being and thought, which he considers a cultural phenomenon. But, as we believe, the gap is founded upon metaphysics, a cognitive gap, an invariant structure belonging to the life of vertebrates and other organisms.

Indeed, this inner world, the noumenal cosmos, is our inner castle, (Saint Teresa of Avila, 1577) i.e., our access to global context provided by our reservoir of world-knowledge, of images of phenomena and associations, relational structures and living biota. The point we here are attempting to get across, and that our four sainted sages were making, each in his own way, is that the primacy of forming global context rests within us in our *NK*, not in the unknowable universe on which we so desperately depend for our survival³, and that there is no known pathway from phenomenal structures of the environment to the neuronal structures that constitute the noumenal cosmos. More in detail, we might conceivably reach the point were our brain is an open book but we will never find out what the universe actually is on its own, except structures we can verbally describe as we ourselves are made of them. And this is the real reason for science to be written in the language of mathematics.

The four philosophers appear to hint that this elementary matter rests in the shadows and remains hidden from our day-to-day understanding.

And yet, the metaphysical gap also is a cognitive gap, the Ego or Self’s only approach to know nature, to obtain knowledge about what exists and goes on in the landscape of our lives, our fellow humans, their activities, plants and animals, hills and valleys, rivers and fields, oceans, mountains, and deserts. It is the roadway for self along which it may interact with its neighbors in the universe, a rampart from where to impact the universe with words and deeds, and in reverse to receive reactions to its existence from natural agents in its surround.

We let the four thinkers teach us about metaphysics by introducing us to a recondite side of mankind’s condition. Though differing in expression, the four agree in substance.

As we read the motto quotes, unfamiliar, even paradoxical but characteristic logical aspects of the gap are brought out and shape the four columns of our architecture for scientific metaphysics:

- 1) We cannot be said to perceive physical objects, not in any precise or certain, scientific sense [RUSSELL].
- 2) The objective arises within the Ego or Self, within subjective consciousness, instead of standing against it as expected in external objects [HUSSERL].
- 3) Experience of the external environment occurs in resonance of my Ego or Self, and I find my own Ego or Self in the environmental world, now all my own and no longer foreign [HEIDEGGER].
- 4) Sensory clues about the world are gathered up and sorted according to a catalog in my memory, looking toward a good match with external reality [QUINE].

These four principles described in the giants’ mottos each pertain to an individual human’s perception of phenomena or in somewhat casual language, the *external world*, or *external reality*, his or her cognition of external reality, in opposition to internal subjective experience. The four principles also express limitations imposed by the nature of the gap on such cognition. The human individual, while engaged in gathering empirical data, must cross the metaphysical gap and reach out yet remain confined in its own inner world, attempting to look beyond its own internal delights, yet locked into a private, concealed universe. Therefore we are obliged to acknowledge that the metaphysical gap has revealed itself as implying a *meta-cognitive gap*, providing insight into cognition, i.e., more than cognition.

But what exactly is it that crosses over the cognitive gap, what are these complex and often chaotic apparitions of external phenomena that are glancing through Maya’s veil, i.e., our incoming *sense data*, —reflecting the beauty of nature but mostly confused and disorderly? In this, there lies one deep mystery, one of a dual pair of mysteries, which we must try and unravel. The second mystery concerns the nature of the gap itself, this is

³Including the spiritual dimension, *vide infra* for more on this.

addressed a little further below.

Structure is a modern Western concept nearly identical in scope with Plato's *forms*, the Latinized rendition of Hellenic εἶδος or ἰδέα, playing a fundamental role in philosophy and analytical science ever since. Note that a sense of *image* is carried by both εἶδος and ἰδέα, which thus could be read and identified as *visual structure*. Phenomena *are* structures, we can say, or they *have* structures, specifically such as can be described verbally, or more generally by linguistic means, and for this reason *phenomena* are described, and also in this way given a more precise sense, as *pre-linguistic structures*.

That which is transmitted across the gap in my response to an external phenomenon is its structure, its identity, specifically in the sense of pre-linguistic structure. Empirical structural sense data upon entering into the gap are converted into internal linguistic predicates, by applying geometry, time series, and other mathematical constructs, to define the structure in formal terms of the language of science.

To be precise, here we are relying on Immanuel Kant's scheme explained by him in his *Transcendental Aesthetics*, the opening chapter of his *Critique of Pure Reason* (Kant, 1781, 1787): All phenomena appear as structures in spatial geometry or temporal sequence.

The spoken description, the design, of a phenomenon based on *spatial geometry* and/or *temporal sequence*⁴, is its *λογος*, which we may adopt as *another word for structure*, influenced by Heidegger's metaphysics, more on this below.

However, *λογος* originally means "speech", also "reading", both originating from an even more basic meaning of "gathering" (EM), so the identification with structure is not straightforward, and depends on internal linguistic description of the pre-linguistic structure, relying on synthesis inside global context, the noumenal cosmos, an important exception requiring additional consideration. This in fact is the origin of *linguistic dualism*, in stark contrast with ancient tradition. From as early as Heraclitus and on to Philo and Christian metaphysics. Heraclitus seems to have held the logos as all pervading essence combined with material monism. Consequently we ascribe to him the intended monistic interpretation: that the same *λογος* is present on both sides of the gap.

An example may clarify the logical processes involved and bring out the fine points and subtle distinctions of the attempted definitions of structure and its *λογος*. Choosing Plato's favorite example of a house, we may observe its construction by the masons and carpenters, or read the blue prints, both before and after its completion. Many details of its construction, imply a vast amount of additional language that may be devoted to render its *λογος* more completely, without possibly being able ever to exhaust it.

Indeed myself, a human neural organism, which in its essence is a self-governing, self-recording logos machine (Burchard, 2011) and cf. § 4.2, *vide infra*, and thereby grows to become itself in the struggle to survive, —in survival we always include the spiritual dimension, indeed the gamut of living self-intentionality, and we never mean to suggest the sense of mere biological enduring but an act of being one's own holistic self, with its eternal destiny kept intact throughout its life time although bound ultimately to perish like a worn-out garment, —is itself a pre-linguistic structure which in this essay we hope to make progress toward hermeneutical deciphering.

Thus, we may envision the cognitive gap as a channel of yet unknown formation and nature, but to be fully explored and its Darwinian design revealed in this essay, the subsequent sections, connecting the individual human's self with the universe, information flowing across the gap to the biological organism, with Ego or Self relying on its own inner world, which we like to refer to as our *noumenal cosmos*, the private version of our common universe, a model world providing for the global context required in each application of Ego's conceptual-categorical apparatus when forming judgments about events in the environment. On one side or terminus of the cognitive gap we find man's intelligent response to a lifetime of experience, distilled in his internal noumenal cosmos, on the other end Nature and her phenomena in *external reality*. On the human side language forms the world of experience, with its foundation in *NK*, the noumenal cosmos, on the natural side spatial geometry and temporal sequence, fashion and shape a universe of the real. This partition of our total world, the *rational universe*, we here term linguistic dualism. Note this dualism is unlike others mentioned in philosophy, not dependent on opinions or world views but dictated to any scientist or philosopher by the form of what is being studied.

The transmission across the metaphysical gap of a phenomenon or of its structure is subject to qualifications and limitations implied by the four motto quotes, yielding new interpretations of the mottos in terms of quantitative science.

1) Details of structure are adjusted for transmission.

⁴More generally: Mathematical analysis.

- 2) An objective percept can be formed in the mind.
- 3) The *λογος* of the percept resonates with the mind.
- 4) The percept must fit in with the mind's world model.

The result of our considerations is that structures can pass through the cognitive gap almost unimpeded, almost unscathed, and almost whole, subject to the above conditions, predicated by the mottos of the four giants. We may wish to notice that all four conditions basically express the same requirement, —as noted above in respect of the mottos themselves, that sense data must comply with demands internal to the gap.

The language concept needs to be framed very large for our purposes, beginning from its origins in pictorial image messaging, to verbal language in the vernacular, clerical, or professional languages, machine control and processing languages, and ultimately subsumed under a formal umbrella theory of language, with the character of first order mathematical logic. This is alluded to below in relation to the RNA/DNA genetic code as processing language for the ribosome machine.

Reality, the animal's external world, is separated from the biological organism, its logical structure, by the metaphysical gap for which the hard sciences have no concept and no name, not a physical separation, not a spatial distance because the animal's own anatomical body is not identical to its self, its Ego or Self, in the human case. But perhaps we should allow that every animal possesses an Ego or Self, from the functional, logical definition. We arrive at the observation that science, scientific philosophy, has before it the task of investigating the metaphysical gap as a cognitive gap. Its deep mysteries emerge from science and mathematics, they separate us from the reality of the environmental world, but we carry in ourselves records to account for the facts.

However, this notion of a cognitive gap that separates an individual from reality, at the same as it connects the two, raises several issues and/ or questions to the scientific analytical investigator:

- 1) What is this external reality?
- 2) What is the nature of the cognitive gap?
- 3) What do humans gain from perception?

In this transcendental enterprise (Kant, 1781, 1787) of investigating the cognitive gap, a game of words perhaps, there are no items of empirical self-knowledge to address, because the gap is the place where experience is made. How then could the gap be anything but unobservable by self, *i.e.*, to the individual, its Ego in its Dasein? And yet, according to Kant, we can and do observe, using pathways of the inner sense, Ego engaged in conceptual categorical scrutiny, by applying CCA to the items in the scene and by taking action against the forces that impinge on us (Burchard, 2011).

Empirical observations do exist of brain wiring and of neural cluster functionality, offered by today's neuroscience fMRI, and physiological psychology EEG technologies. Here, spread out before our eyes are vast arrays of brain cytological studies revealing intricacies of cortex layers, fMRI photographic records, EEG measurement charts, also fabulous transcranial magnetic stimulation (TMS) results, and volumes of published research articles evaluating and analyzing the observed data, topics we have reported on at length with broad coverage of the historical origins and chief results in our earlier work (Burchard, 2011).

But any inferences from biology, neuroscience, or physiological psychology regarding the beauty of the sunset on the distant horizon over the sea being perceived via structural data transmission across the cognitive-metaphysical gap as interpreted via neurolinguistic processes must be regarded as highly tentative because indirect⁵.

Any further insights regarding this linkage would seem remote at this epoch.

In this section, we have been considering the gap as the channel through which the universe, *i.e.* the fullness of what is real, can send signals into our interior castle (Saint Teresa, 1577).

4.1. Elements of Scientific Metaphysics

We investigate what form the inquiry into the metaphysical gap might take and which resources are available and what is their shape and condition to help us out with our study into the non-empirical transcendental hence unknowable in a certain sense.

The elements that give science a chance of being applicable to the metaphysical gap are the most basic aspects of human understanding.

- Language: Verbal, Processing, Image, *e.g.* pictograph, and syllabic languages. These perhaps are not suffi-

⁵Qualia problem, *cf.* relevant vast literature.

ciently explored, from a theoretical point of view, & there may be more here than mere variants on the alphabet theme.

- Spatial Geometry/Temporal Sequence.

It is worth our while to consider why these two endowments of our world should be the basis for all other forms of knowledge, a topic we have investigated previously (Burchard, 2005, 2011).

To be sure, this partition is preliminary, but it is a foreshadowing of our main theme for this current essay, *linguistic dualism*.

For, language is a matter of our internal universe, or as we prefer to put it, the interior castle (Saint Teresa, 1577), or our noumenal cosmos, while the order imposed by space (geometry) & time (sequence) are our primary, our quintessential source of information about the external, the natural universe.

In effect, linguistic dualism is dictated by the two ends of the metaphysical gap, language on the human side, spatial geometry and time order on nature's side of the gap.

It is a dualism that we cannot avoid and it has often been misinterpreted in the history of philosophy, taking on false guises such as Cartesian dualism, or vitalism vs. materialism, both being rejected by our current thought systems, and rightfully so.

Only, it should be clear that such negative insights do not apply to linguistic dualism in any way.

Ultimately we must imbed geometry and order into mathematics, of course, and even language is an integral part of a mathematical universe⁶, but this will take some explaining to get across to a largely non-mathematical public, i.e., a public not accustomed to thinking about mathematics as a separate endeavor, one that is fundamentally self-contained and aloof from material concerns, except of course, for the need to record mathematics in a material substrate, such as on paper, blackboard, or in an electronic computer file.

Here, then, is a revised version of our partition.

- Formal Mathematical Language Theory.
- Mathematical Formation of Phenomena.

4.2. Formal Mathematical Language Theory

The significance of language, its ability to record predicates, was recognized by Immanuel Kant. For his early insight into the linguistic nature of sense perception, cf. his dissertation, “De Mundi Sensibilis atque Intelligibilis Forma et Principiis”, III, Section 11 (Kant, 1756, 1770): [···] *etiam praedicata dentur sensitive observabilia, predicates also are observable sense-data*. The full import of Kant's discovery, his exceptionally clear formulation, of what has been discovered and stated in allied manners by others including Hobbes and Leibniz, has not yet been understood in philosophy of science, and in the science world proper.

A solution was found by Nature to formulate linguistic records, that could be transmitted, processed and stored. Performed in the nuclear DNA, language coded in cipher is as ancient as life itself.

Language is fundamentally a recursive structure, a fact that amounts to a sharpened version of the traditional point of view of finiteness in human knowledge, in the human mind, in the following sense. We fairly well understand mathematics based on first-order set theory, but we don't comprehend the actual structure of the universe. This means we must investigate the nature of our language-based science, which can only reflect things in nature which are language-like, or as we formulate this pre-scientific terminology, pre-linguistic structures, or, equivalently by definition, phenomena.

We understand well language in its generality as systems for symbolic representations of all kinds. For formal languages various alphabets are used, systems or characters, geometric configurations of a recursive design. Mathematics essentially is the logical elaboration of formal languages in recursive function theory. Such formal languages should be identifiable as the fundamental processing system of the human (or mammalian, vertebrate, ...) CNS.

Nature is uncountable, so the immediate inference from recursive language is that our minds are capable only to absorb gross features of the universe. For this reason, it becomes necessary, to discuss and explain more fully the nature of language as a communication tool, but even more, as a mode of internal CNS processing, for coding and for information storage. This is a mathematical term, covering instances of the most extreme generality and variety, yet being mathematical necessarily *formal* in a sense familiar from mathematical practice, and not readily associated with empirical structures. Yet this needs to be accomplished.

⁶This fact indicates that the gap does not have infinite depth, if we view it as a yawning chasm between two shores, facing each other across the chasm, *vidi*.

Language needs to be understood in the widest sense, e.g. verbal language, oral and written, but also computer processing languages, and the image languages of metaphorical function, as familiar to us from our dreams. The common nature of all of these languages is understood from the concepts of mathematical language theory, and from the functional principles common to all, which are

- 1) recording and storage of records,
- 2) replay of records for repeat performances,
- 3) transmission to remote receivers,
- 4) program actions of animals and devices.

The cognitive gap is defined by language, on the outside natural structures in the Universe beyond my own CNS, on the inside pre-linguistic phenomena in my noumenal cosmos. It is the source, the origin of why metaphysics establishes its governing order, the science seeking to answer what is the reality of our human world, and why natural selection of the CNS is evidence for the logic of metaphysics structuring reality, exigencies subject to which a human (or animal) organism must carry out its struggle for life.

Accordingly, a closer look at language is required and here we can rely on essential progress made possible due to the special place occupied by linguistic dualism based on work in formal logic, also known as symbolic or mathematical logic, and thus linked to mathematical set theory.

All language is symbolic language. For written verbal languages, this should be fairly obvious, the letters, or other graphemes, such as cuneiform characters, are the symbols. For spoken language we may point to the phonemes. Computer languages have their own internal system of symbols. The genetic code is a language, the ribosome processing language for making protein, with its symbols DNA and RNA codons formed from nucleotide triplets. Nucleotides are organic molecules capable of forming nucleic acid helices which are translated into proteins. In a Post-Turing machine, the quads or quadruples are the symbols for its programming language

All language is formal, symbolic language. A fixed set of rules applies to formally define correct expressions. This may not be so obvious for the vernacular languages of every day human commerce, but the formal structure of such languages was elucidated beginning with Noam Chomsky's work in ~1950 on transformational grammars later called generative, and even earlier with Lucien Tesnière, ~1930 and dependency grammars, etc., early work probably by Panini ~500 - 400 BC.

All language depends on a formal language system (LS). The LS in its simplest form is a Post-Turing machine. It reads and executes a program, a set of Post-Turing quads.

The Linguistic Brain is a Language System (LS). Based on this linguistic understanding of neural processes, we see the mental world as a Language L, or a Language System LS, to set it apart from a Universe U deemed to be ultimately inscrutable (Burchard, 2005).

The LS codes and stores linguistic items, from the scene as it appears, the map-making function of the L.

We refer to an LS as a *Logos Machine*, cf. § 9.1, if it has an *internal world model* or *noumenal cosmos NK*, and a *categorical-conceptual apparatus CCA*, which it continually updates through a neural *default mode network* processing and incorporating fresh observational data, and on the basis of which it is able to identify certain external phenomena from a restricted class of *pre-linguistic structures*. These the Logos Machine obtains by being connected to the environment through sensory neurons and end-effectors, and capable of hermeneutics, reading and interpreting such as phenomena contained in them.

For convenience, we do not always make a clear distinction between Language L and the Logos Machine or Language System (LS).

By *pre-linguistic*, we mean decipherable in terms understood by speakers of the vernacular. A related concept is Heidegger's *hermeneutics* introduced by him in SZ and much studied by his student Hans-Georg Gadamer, *vide infra*. We here continue to depend on the popular and widely used structure concept, which is not dissimilar from, and claiming the title of representing, the modern version of Platonic forms, *vide supra*.

In this, our attempt to account for and explain to non-mathematicians both, the ancient origins and high degree of utility of formal languages, we are able to rely on insights from current neuroscience (fMRI) and physiological psychology (EEG), as well as today's formal language theory which is well-developed in the academic disciplines of logic-mathematics and linguistics-psychology (Burchard, 2005, 2011). Language, and especially *verbal language*, may be seen as one of the easiest ways into the NK, because the NK is able to decipher words, symbolic references as they are to real world phenomena. A familiar scene, stowed away in memory for ready access within global context, may be characterized by a few words, a familiar image is identified by its name, a single word of reference. At an earlier stage of evolution, *image language* was a more direct link to reality. Special

human abilities for storing vast numbers of images in retrievable fashion have been noted in a remarkable research work (Brady, 2008). This capacity seems to be of ancient evolutionary origins and likely constitutes a common heritage of our mammalian or even vertebrate ancestry, considering their ability to navigate and survive in their environment (Burchard, 2005). Denise Schmandt-Besserat has explained how image language, actually three-dimensional, in the form of clay tokens became gradually transformed into writing (Schmandt-Besserat, 1992). But of course at that time, in the Neolithic Age of the Near East, verbal language was already the order of the day, and the true origin of visual image language lies much deeper, with animals having the first pit eyes, allowing them to track motion in their environment.

While we feel sympathetic toward materialism, that self-limited philosophy, their thought patterns need to be augmented by the logical dimension. Perhaps this may be not very familiar to non-mathematicians. True, to see logic as distinct from matter is a form of dualism, but this remains far from any vitalistic tendencies.

4.3. Mathematical Formation of Phenomena

Geometry is paramount in scientific metaphysics, wholly inherent in structures of natural phenomena, not a mere abstract pursuit of mathematics.

In fact, any structural description of phenomena is wholly dependent on the geometry of Euclidean space⁷, more generally Riemannian geometry and on time sequences, or, on Lorentz-Einstein invariant space-time geometry perhaps best referred to as General Relativity. This topic is treated more fully in (Burchard, 2005), from which excerpts are quoted here in edited form.

Geometry enters into our human lives in a seemingly trivial way, easily disregarded or held to be insignificant but world-forming and the true source of human life and of the happiness that comes to people on rare occasions and in precious moments.

Language, when recorded in written form, depends on geometry buried in the symbols.

The same symbols and many others are used in mathematics, thought to be a purely theoretical science, although they are natural structures and identifiable as such, e.g., in letters and diagrams:

As an example, consider the most frequently used letter of the Western alphabet,

E, *e*.

The two variants are symbols, read as images, εἰκωνα, recognizable shapes of mathematical definitions, in terms of and composed from straight lines and circles, that easily can be given in detail.

Such mathematical definitions tend to be a bit more complicated than for the letter E, for most of the images that we encounter in our daily lives.

For example, let's say during a visit to the zoo, we can recognize and discern different animals, such as an elephant or a tiger.

Here, there also are mathematical definitions for each which our mind, our CNS can and must decipher.

But wait! Are not these "symbols" in the universe, U, nothing but matter, and not in L? Are they not mere black inky spots on paper or pigment in a tiger's fur, or again heaps of chalk on the blackboard?

True, yet endowed with pre-linguistic, phenomenal structures, if positioned in reach of a functioning *LS*, they can be read, their recursive mathematical structure internalized, and after analysis identified as the letters which they are.

Here we discover an illustration of how mathematics precedes philosophy:

Much of geometry and basic calculus are required merely to read the symbols of philosophy or of later abstract mathematical theories, whose origin we still can discover in the shapes and relationships of the phenomena of Nature.

Stunningly similar views concerning the use of mathematical symbols and figures were expressed by David Hilbert, but with the authority of one of the great mathematicians of the last century, expressing our own views far better and more powerfully than we ourselves would be able to do, in the introduction of his famous address to the 1900 2nd Intern. Mathematics Congress in Paris (Hilbert, 1900). For more on this, cf. (Burchard, 2005).

But the universe tends toward orderliness and harbors recondite laws of nature deep within its coiled fist.

5. Mysterious Perception

The nature of the cognitive gap lies in the deep mystery of perception, which has kept philosophers busy since

⁷The time sequence always remains as an additional description.

Plato, resolution being offered below in this essay.

5.1. Malebranche Accepts Light Waves (Huygens)

The mystery of perception occupied Malebranche, who gave up occasionalism, his initial attempt, after he learnt about light waves from Christiaan Huygens, an instance in the history of philosophy not widely reported today.

The actual events in the gap that produce perception initially physical in nature, and in the end logical, first there is an advance into the gap of energetic wavefronts, acoustic, electromagnetic, or material de Broglie waves, radiating from a phenomenon producing effects in the human body through intricate quantum mechanical and chemical processes impinging on our sensory neurons which act as digitizers that translate structural aspects of the incoming wavefronts into linguistic, symbolic form in a recursive internal processing language of the neural circuits through which they travel. The Hellenic verbform φαίνομενον meant as much as “radiating” (Burchard, 2011).

While radiation and molecules impinge on our sensory neurons, where they do originate, in a realistic situation, there probably is an infinity of possible structures!

5.2. Naturalist Philosophers Russel & Quine

Russell and Quine both pointed out that science deepens rather than resolves the mystery.

Our understanding is formed by Bertrand Russell, as in the above motto quote (Russell, 1948: p. 207):

The motto is his summation of a brilliant Chapter IV, *Physics and Experience*, of Part Three, *Science and Perception*, explaining that we are not perceiving that which physics instructs us is the real, elementary particles, quarks and gluons for us today, with much interstitial empty space, well, not quite empty, rather the physicist’s vacuum.

On p. 197 in the same chapter, he defines the fundamental problem at issue.

The problem is this: Every empiricist holds, that our knowledge as to matters of fact is derived from perception, but if physics is true there must be so little resemblance between our percepts and their external causes that it is difficult to see how, from percepts, we can acquire a knowledge of external objects.

He goes on to point out the logical difficulty that physics, used to cast doubt on experiential knowledge, is based on just that, on our faith in its correctness.

Quine believes in physical objects but considers them to be myths akin to Greek gods, from *Two Dogmas of Empiricism*: (Quine, 1951).

[...] *experience is analogous to the rational numbers and that the physical objects, in analogy to the irrational numbers, are posits which serve merely to simplify our treatment of experience.*

Never straying far from behaviorism, in the end he refuses to consider the science of perception and instead resorts to *dispositions*, which puts him close in line with Leibniz’ pre-established harmony between monads.

Quine remains deeply sceptical toward social validation of this pre-established harmony among dispositions as in this remark that reflects his negative attitude toward unity of scientific knowledge outside context and famously terse, often casual, style (Quine, 1974: p. 23):

Perception being such a private business, I find it ironical that the best evidence of what to count as perceptual should be social conformity. I shall not pause over the lesson but there is surely one there.

Similar to advances in quantum particle physics, Quine correctly anticipated that his behaviorist logic one day would be understood by neuroscience, which in this essay we are seeking to demonstrate, by the workings of the Logos Machine, cf. § 7.1.

5.3. No Direct Perception, No Given Objects

Today, physicists are quite aware of the plain fact that there is nothing direct in human knowledge, but there still is wide-spread belief in “an object given” to an observer immediately or directly in perception, even among professional philosophers.

Indeed, so it appears to our inattentive minds but the actual process is indirect and far more uncertain as to what is the correlate of the percept eventually arrived at. As remarked above, perception is a morphism with no known source or preimages.

The fault is traditional in philosophy, and appears to originate from an unwarranted interpretation of αἰσθησις

in Plato's *Theaetetus* (Plato, 360 BC). The mistake later becomes explicit, quite recently with Ayn Rand⁸ who is following in the footsteps of Immanuel Kant, his famous first paragraph of the Critique of Pure Reason, famous for its difficulty, cf. e.g. (Musil, 1906), p. B33, A19 (Kant, 1787):

In whatever way and by whatever means cognition may refer to objects, intuition [= aisthesis] is that through which it refers to them immediately, and at which all thought aims as a means. But intuition takes place only if the object is given to us.

There is nothing immediate in perception, and no object is given, sorry...!!

The proscription of given objects is implicit in the mottos cited from Russell and Quine and placed over our essay as its guide posts, is meant to apply to the environmental structures of metaphysical relevance. Actual organisms, in their interactions with the environment, are subject to limitations from available receptor and effector organs, also counting the organism's endocrine system, and other internal physiological and anatomical structures. But, we do allow *object* as a valid term for the percept obtained after and through Heidegger's *Ereignis*, *owning*, vide *infra* § 6. The percept exactly matches Husserl's *objective*, that is expressed by him in our motto quote from his Amsterdam Lectures (Husserl, 1925): ... *the objective ... has now appeared as a meaning constituting itself within consciousness itself*...

The biological organism is external to its own functional logical self as indicated by the cranial and spinal nerves, for higher mammals and even vertebrates, that feed information based on sensory data from the environmental scene & from its own body to the animal's cerebral cortex.

6. Global Context & Global Receptivity

What Heidegger wrote in 1919, our motto quote (Heidegger, 1919), one of four that we have selected to start this essay, he later will call *das Ereignis*, *the owning*, vide *supra* § 5.3. More commonly, "owning" is translated *appropriation*, and can be identified as integration of newly perceived phenomena into the *noumenal cosmos*, our internal world model. This is thought to reside in the CNS, specifically, the dorso-medial prefrontal cortex, cf. § 6.1, where an engram would be incorporated anatomically in the neural tissue. For related references & citations, cf. (Burchard, 2011).

This neuro-anatomical process of integration is performed by elaborate verification based on massive feedback, cf. verbatim quotes after Kosslyn, cited in (Burchard, 2011). The latter fact is of long standing in neuroscience, but its function fully understood only fairly recently as *top-down processing* (TD) vide *infra* § 9.2, also referred to as *re-entrant or recurrent processing*. The point of importance is that the newly acquired percept must fit into global context, must be consonant with the noumenal cosmos. What is integrated is the Husserl's *objective* from his motto quote, "constituting itself within consciousness", in form of a linguistic description of internal neural process language provenance.

Incoming sense data are processed through a stack of analyzers, neural complexes with increasingly large receptive field⁹ expanding along the data stream, the process being steered "from the top-down". The control ultimately is exercised through pervasive feedback, down from *Ego brain centers* located in the orbito-frontal (or frontopolar) lobe, known by some or all of their neurons having *global receptive fields*, i.e., by their *global receptivity*, that render ultimate decisions of the reality of perceived phenomena based on whether sense data fit hand-in-glove into global context. For the latter, Ego uses the so-called *default mode*, or *resting state, network*, (DMN)—here presumed to be the neural domicile of the noumenal cosmos, discovered by Marcus E. Raichle and coworkers in St. Louis (Raichle, 2005),—with TD relying on early clues from low spatial frequency signals aiming to pre-guess the identity of phenomena causal for sense data, as discovered by M. Bar and coworkers (Burchard, 2011).

A key ingredient in the TD process is Kant's mechanism of self-scrutiny that can be found in his Critique of Pure Reason, Transcendental Deduction, his discovery of conscious & conceptual control we exercise at all times to ensure correct identification of percepts within the momentary scene. This is performed by parietal centers, site of the *conceptual categorical apparatus CCA*. Kant emphasizes, in one of his notorious footnotes¹⁰, that we are quite aware of, and can observe, ourselves applying *CCA* to phenomenal items and events within the present scene, significantly in case of initial uncertainty of their exact nature. This is wholly confirmed by the

⁸The Stanford Encyclopedia of Philosophy.

⁹The portion of the rational universe from which a neuron receives data.

¹⁰His footnote on p. B156, (Kant, 1787).

best authorities of neuroscience today. A full discussion of this important complex, with verbatim quotes from the authorities on the subject, are given in (Burchard, 2011).

As a key topic of interest we observe that Heidegger in SZ by his specialized expression of “*being-in-the-world*” actually is referring to our *overall or global context*, that we need each time when a novel observation is made, or a fresh insight is harpooned. This is the metaphysical key to epistemology, truly fit for unlocking all of the secret marvels of cognition. The noumenal kosmos, *NK* is a *world model* that we carry on our inside, that provides the neurological depository for the global context. This in our view is the basis in human neurological design that enables Heidegger’s approach to provide a realistic image of human existence.

This global context, as a private sphere where Being dwells, is what Heidegger refers to in his motto quote, saying that it involves the totality of his own existence. This is our own, familiar circle of life, everything we know carrying the stamp of our ownership.

Everywhere we must attempt to see the role played by global context, as each contact between reality and mental life experience remains meaningless and mindless without passing through *NK*. This was the unfortunate situation of Phineas Gage who had lost the ability to filter life through *NK* due to the loss of the orbito-frontal lobe in his brain from an injury that he had received in an accident as foreman of a railroad construction gang (Damasio, 1994).

Noumenal Cosmos—Global World Context

As it turns out, as an early conception approaching what now is known to actually go on when we perceive the scene (Burchard, 2011), Quine’s dispositional theory is a fairly accurate guess (Quine, 1951), and we can restate this mental framework by giving it the interpretation that perception depends on context¹¹. But we still would like to know the science of it, why we have emerged from our own phylogenetic past with a pre-established harmony of dispositions depending on a method of stored context.

Global context-based top-down feedback is discussed in some detail and important throughout the body of this essay. Much more below about this central problem circle. To be sure, this issue still needs to be understood better by the wider scientific public, or even be turned into a known concern, yet its very nature as belonging to recondite metaphysical issues stands in the way of progress in that direction.

Wavefronts do carry information about material structures, but we don’t actually recognize atomic nuclei, electron shells, but only coarse-grained structure.

The CNS must function to make the best of what it can determine concerning the environmental scene, phenomena, other agents, ongoing events, opportunities and threats.

But often only vague signals arrive at the organism’s sensory neurons, what we like to call *apparitions*, perhaps confused and chaotic, without immediately revealing the scene. We illustrate our theory per Heidegger’s example of hearing a wood grouse (capercaillie) in flight as he presents it in his 1935 textbook with the peculiar whirring sound that its wings make.

EM, p. 26: ... *we hear the flying bird, although strictly speaking we have to say: a wood grouse is nothing we can hear, the bird is not a sound that could be registered on a scale.*

In Heidegger’s remarkable lectures from his course on metaphysics, we find deep insight into the role of the logos in cognition and how it enters into the perceived world in his fundamental ontology of Dasein. In a suitably expanded meta-context, we may, in this essay, identify Heidegger’s world-revealing being-in-its-world, cf. SZ, with a neuroscience internal stored world model or global context, as analyzed and investigated in my earlier work (Burchard, 2011). —The meta-context still remains subsumed under global context *NK*.

Our human world—as experienced—is a production of the CNS, directed by neurons in the orbitofrontal cortex (OFC), which are distinguished by having global receptive fields, and are responsible to ensure through conscious control of perception, that the jointwork of the noumenal cosmos is preserved in good order.

At this point we need a tutorial preparation regarding the historical place of the *λογος* and as a default mode network or *NK* plus *CCA*. There is ample reference to Heidegger’s own remarks in EM on history beginning with Heraclitus and Parmenides. But there also is a surprising emphasis on the pervasive issue of universality of hermeneutics in writings beside EM by Heidegger himself, and also by authors in the hermeneutics field, including Gadamer, Grondin, and others, whose contributions to hermeneutics we have recognized above.

The importance of these and following citations for us here is that all of these should be seen as historical an-

¹¹Duhem-Quine thesis (Quine, 1951).

tecedents of the noumenal cosmos *NK*, as well as of its neuro-scientific correlate, Marcus Raichle's DMN, cf. § 6 above. These in turn are significant in this essay, as explained, because these human capacities are the *ultimate result of neural Darwinism in response to the cognitive gap*, cf. § 7 below.

The central role in all of this is played by the Logos, λογος, the word. We find quotes especially from Saint Augustine, his voluminous literary output. Also Plato (~380 BC), his *Phaedo*, inter alia. Plato recounts the death of Socrates who in his last hour explains immortality of the soul, his real personhood, to be found in the logoi, often translated *thoughts*.

Plato's *Phaedo* (~380 BC), 99, 100: Ἐδοξε δὲ μοι χρῆναι εἰς τοὺς λόγους καταφυγοντα ἐν ἐκείνοις σκοπεῖν τῶν ὄντων τὴν ἀληθειαν.

But it appeared to me, that I should take refuge in the thoughts, to contemplate in these the unconcealment of the beings.

In the spirit of EM, we follow Heidegger and render “unconcealment”. The remarkable point we wish to make here is that Socrates appears to have had a vision of an internal, a noumenal cosmos in his logoi, thoughts, mind. This particular traditional rendering, “thoughts”, is debatable, however. Equally, the translation might be, “take refuge in the words”, the *inner word*, not dissimilar to the Biblical *still small voice*¹².

In a somewhat parallel historical reference, Heidegger in SZ gives a quotation from Aristotle, translates it, then interprets, and enlarges upon it.

SZ, p. 14: ἡ ψυχή τα ὄντα πῶς ἐστίν. *The soul (of man) in a certain sense is that what-is; the “soul”, which amounts to man's Being, in its modes of being, αἰσθησις and νοησις discovers all that is, that it is, and how it is just so, i.e. always also in its Being.*

Where Heidegger interprets (or translates) “[...] discovers all that is, [...]” he is showing Aristotle's soul to amount to a noumenal cosmos.

In Hindu Vedanta, Dvait-a-Dvaita, a theory of dualistic non-dualism was created by Nimbarka, century XIII. Sarvepalli Radakrishnan (Radakrishnan, 1957) explains how this is one Brahman = Atman, one Universe, but with a dualism imposed by the gap, really an abyssal chasm between Logos, or Language, and Physis, or Nature. The gap separates our logical reason from the wild growths of unreasoning material processes, hinted at by Heidegger, in SZ, p. 14, text quoted above, pointing toward dvaitadvaita. In Hindu Vedanta, Advaita elaborates on the doctrine of essential unity of the Atman and the Brahman. There should be no doubt that Nimbarka was expressing that the Atman incorporates a noumenal cosmos. Hindu scholars are offered apologies for our arbitrary reduction of their ancient knowledge to Formal Linguistic Dualism. The fact that the Chasm does not have infinite depth is saying the same as Advaita, & that indeed there is a Chasm nonetheless is the meaning of Dvaita.

This also is Saint Augustine's *verbum interius*, his inner word, in the quoting of which hermeneuticists delight, in reference to the beginnings of their discipline with Saint Augustine, in his *Confessiones*, Books 10, 11, and *De Trinitate*, Books 14, 15 (Di Cesare, 1997). Also, Grondin's recounts his conversation with Gadamer who points out *verbum interius* as affording the universality of hermeneutics (Grondin, 1997).

Unmistakably, there is a description of the noumenal cosmos given by Saint Augustine.

Saint Augustine, De Trinitate, Book 14, Chapt. 7: [...] *we have a kind of knowledge of certain things stored up in the recesses of the mind, and [...] this, when it is thought of, as it were, steps forth in public, and is placed as if openly in the sight of the mind; for then the mind itself finds that it both remembers, and understands, and loves itself, even although it was not thinking of itself, when it was thinking of something else [...]*¹³

With astonishment we take note of the Saint's early account of the noumenal cosmos, here in this brief sample quote. By implication, because hermeneuticists assign such high rank to Saint Augustine's *verbum interius*, we cannot but conclude that the noumenal cosmos is a familiar, a standard concept within the field of hermeneutics, and from this the divergent name of *verbum interius* cannot distract, may not be adduced to discredit a claim of essential identity.

Thus we may state unequivocally that the neurologists' default mode network is the neural function which supports Augustine's *verbum interius*, our noumenal cosmos *NK*¹⁴. It also supports the conceptual-categorical apparatus *CCA* as a separate structure¹⁵.

As global context or world model, the noumenal cosmos is a familiar concept in neuroscience, esp. physiolog-

¹²1. Kings 19.

¹³Translation by Arthur West Haddan, The Online Library of Liberty.

¹⁴In the dorso-medial prefrontal cortex, cf. § 6.

¹⁵In the parietal lobe.

ical psychology, and often occurs in explanations of the P300, a neural evoked potential seen in the EEG in response to new information that requires a context update at 300 ms after stimulus when the percept enters consciousness (Burchard, 2011)¹⁶.

Thus the question Heidegger must address, and we along with him, steady in our pursuit of the science-in-EM metaphor, how to understand the Chasm and how a bridge across is possible. For possible it is as evidenced by our successful existence on this planet, being a part of a 4,500 million year chain of life.

A partial answer we can suggest here is that in *LD* there are several items that deserve to be considered logoi.

Simply put, the Logos of a phenomenon is its internal structural-historical record, the ISHR¹⁷.

This is the center piece of our essay and depends on global context, the noumenal cosmos, into which a percept is to be fitted.

The new phenomenon newly deciphered must fit into the jointwork of the universe, as represented or perhaps rather created and accessible through *NK* to the perceptive filters, *vide infra*, “Nine-Step Process”. The particular structures present in the fresh apparition must be consonant with the overall structure of our experience. Our human world should be identified with the noumenal cosmos, and with Husserl’s transcendental anonymous subjectivity, all anticipated by Kant. Here, we equate *NK* with Heidegger’s human world. Ego or Self is seen as corresponding to Heidegger’s *Dasein*.

7. Neural Darwinism in Response to the Cognitive Gap

Neural Darwinism, i.e., neural adaptation to the cognitive gap, has in fact shaped our human world, or, in Heidegger’s terms, *Dasein*’s existence as being-in-the-world, to be what it is and as it is for us today as a consequence of the power that the cognitive gap holds over the organisms success in life, modifying and modulating the means available to the organism as it strives to obtain the needed provisions for its survival, —survival, i.e., as what it is, a full-fledged human *Dasein*, which to live and breathe must remain in possession of its world and of all its accoutrements.

Through neural adaptation to the metaphysical gap we have a case of neural Darwinism, a required necessary accommodation to linguistic dualism because the greatest limit on the organism is on its CNS primarily referring to the brain, and its important connection to its body and its world via spinal and cranial nerves, forcing it to compensate for linguistic dualism, processing linguistic data streams in afferent white matter tracts.

What concerns us is the question: How do data streams in neural tracts relate to the cognitive gap and its function as communication channel? As a result of the evolutionary pressure, we can infer the metaphysics from the lay-out, the configuration of the organism. Then, we consider a human being as a biological organism driven by the mechanisms of natural selection, its CNS adapted to fulfilling its task of informing us of the world around us and to enable us to pursue our goals and ambitions in the endeavor of survival according to our conception of what makes life worthwhile.

Or we can experience ourselves as our *Dasein*, in the identity of *Dasein* and man, each one of us, one at a time, as we are disclosing Being in our human world: **Being is disclosed**, —this is Heidegger’s main result in EM, as well as his methodology, —in the hermeneutics of *Dasein*, the process of $\phi\upsilon\sigma\iota\varsigma$, becoming. As explained by Thomas Sheehan (Sheehan, 1999: pp. 288-297): *Contrary to popular accounts of his philosophy, Heidegger’s central topic is not “being” (at least not in any of the usual meanings of the term) but rather the disclosure of being within human understanding*¹⁸. Each one of us continually, for him or herself, is forming disclosure of being.

This now implies our theme for the present essay, our main project: To trace the effects which neural Darwinism has exerted by forcing neural adaptation to the gap on the anatomical and logical structures of the human CNS. We appraise the role of Darwinism for the human mind, how the mind accommodates the gap.

What are the implications for the animal organism’s survival, its very existence as its own Self, its plans of action for the short term as well as for duration, what does it all mean to the Ego or Self in its estimation of its own status and performance.

When applying Darwinian theory to the evolution of the nervous system, prime consideration must be given to a very special kind of selection pressure, that of the demands placed on animal organisms by the structure of reality, a subject matter for metaphysics.

¹⁶The notion is attributed to Helmholtz.

¹⁷*Vide infra* for more on the ISHR of a pre-linguistic structure.

¹⁸This is roughly identical with our “naive rule of thumb”, *vide infra* § 9.1.

The way that metaphysics comes into play is by the permanent necessity for an animal to interact with its world, the environment:

1) There is the ambient scene and whatever is present or occurs in it, that constantly must be perceived and identified by the animal as what it is.

2) There is action of whatever kind as may be required or beneficial for it to take, constantly concerned about and taking care of its wellbeing, alert at all times preparing for optimal skilled performance, and ready to deal with contingencies and potential adversities arising, to overcome obstacles, confront adversaries.

The receptor and effector organs bridge that gap, to some extent, without being able to completely erase it, even for the most powerful creatures. This gap, connecting the organism and its world, has its source, origin, and living expression in basic metaphysics, the mystery of nature and the structure of nature.

Through natural selection has been determined the brain's function as we find it today.

8. Pre-Linguistic Phenomena—Genetic Structures

The difficulty of perception is that what we perceive is not present in the physics.

Taking into our considerations the details of the perceptive process, by necessity we are perceptual dualists (BonJour, 2012).

Rather, we claim, structures exist externally and thus, *structures replace objects*, to make phenomena, not objects, however, which we have outlawed (Burchard, 2005), under the influence of Quine's lost roots of reference (Quine, 1974), the inscrutability of reference.

He assigns physical objects to the realm of mythology, convenient posits to simplify neural processing of experience, an idea most clearly enunciated in *Two Dogmas of Empiricism*.

*Our statements about the external world*¹⁹ *face the tribunal of sense experience not individually but only as a corporate body.*

We should amend this a bit.

Even our "tribunal of sense experience" must face global context *NK* as its tribunal, so all he is saying here is "our statements about the external world only will face *NK* as a corporate body", i.e., *NK* is facing *NK*, i.e., *NK* must be internally consistent. Since this is unlikely to be true, we can see good reasons why the DMN is forced to work ceaselessly on straightening out our neural world model, *NK*, cf. § 6 above.

To translate into accurate images of the ever-changing scene the phantasms, the sudden apparitions entering its data streams requires for the organism to command an intimate familiarity with metaphysics by way of neural adaptation, indeed a command of defensive tactics vis-à-vis ontic pitfalls, which only could be bred into the CNS by means of natural adaptation to the cognitive gap, to metaphysics.

Instead we look at discernible structures, *esp.* those which we have characterized as pre-linguistic.

A brief analysis of what the actual facts are of perception should convince anyone that percepts never are objects, never are given. Instead we perceive phenomena by anticipating them, sometimes erroneously. To answer these concerns, in our earlier publications we have proposed a new conceptual framework for metaphysics that began to emerge in developing a detailed theory of perception which constituted our main result in our earlier work (Burchard, 2005, 2011).

An essential advance is provided in our work reporting on a new epistemology, founded in new metaphysics, in that mental percepts of phenomena are linguistic entities, existing in a world of Language (*L*) analytical investigations in the spoken vernacular²⁰ corresponding to a class of structures in the external Universe (*U*) that are identifiable, i.e. capable of being deciphered, in terms of verbal language and on these grounds may be perceived by Dasein becoming classified as the phenomena of the human environment.

Pre-Linguistic phenomena are structures that can be deciphered in terms of verbal language based on their possessing an internal structural historical record (ISHR).

In our earlier work, we presented comprehensive accounts of neurolinguistic psychology and ethics, grounded in the basic ontology of pre-linguistic phenomena, cf. (Burchard, 2005). i.e., ones decipherable in terms of verbal language on the basis of their internal structural historical record ISHR, that can be deciphered hermeneutically and read to tell its history or genetic origin, qualifying it as a pre-linguistic structure, with its genetic record ISHR.

¹⁹This is meant to include statements about physical objects.

²⁰Heidegger: *Language is the house of Being*.

Nature, the Universe *U* comprises all environmental phenomena, considered observable phenomena, in a pre-linguistic manner, i.e., not-yet-expressed verbally, or in any recursive formal language, but capable of so being expressed, based on the interpretation or deciphering, now: hermeneutics, their internal structural-historical records ISHR.

But *U* also includes elementary particles, quarks and gluons, quantum foam, which are not phenomenal or at least only indirectly through their interactions. Such physical processes can be recorded and the records read in the way of a history of a pre-linguistic structure.

A defining condition for pre-linguistic structures (pLs) is that each includes a record of its own history in itself, a genetic account of how it came into being, coded in its internal structure, a historical-genetic record, ISHR.

When entering a house we can discover how it was constructed, plans of architect and builder put into effect in its walls and doorways, as well as signs of subsequent habitation, all part of its ISHR, *cf.* explanations above, in § 4 relating to this, Plato's favorite example. If we walk the floors and hallways, we can observe much and give a fair description of the house, or we can attempt the same based on blueprints, which in fact by themselves are linguistic descriptions²¹ of the house, and thus reflect a great deal of the *λογος* of the house, especially to a skilled architect or builder. However, the fullness of sensory, aesthetic, and perhaps even emotional impressions that we experience from residing and living in the house, imply a vastly greater pre-linguistic because unexpressed, structure being present in the building, yet somehow all part of its ISHR.

The ISHR of a pLs serves for its *prima facie* identification, regardless of external means such as provenance records.

Rocks, studied in geological petrology, offer another great example of ISHR identifying a pLs. A rock's ISHR may be specified in terms of its mechanical (inclusions, pores, shock lamellae), mineralogical, chemical, and isotopic composition.

Metamorphic rock, marble an example used in construction and monuments, shows signs of heating and often has igneous veins and fossil inclusions, giving details of its depositional history and of subsequent alteration.

Our brains give evidence of memories of our life histories registered over the time of our existence. This is each person's *NK* and in Chapter IV of Heidegger's *EM* is to be given a new name, a person's *logos*: Heidegger places such a consideration at the very center of his metaphysics.

EM, p. 70: [...] *our effort at determining the word-meaning of "Being" becomes explicitly what it really is, a contemplation of our own hidden history.*

9. Linguistic Dualism

The cognitive gap reflects a special kind of partition of our world, which to our inquiry into reality appears as *linguistic dualism*, so-called because of the deep division between on the one hand phenomenal structures and events in the world outside the organism, that is, not a part of its noumenal cosmos *NK*, *vs.* on the other hand their reflection in records kept internally in the CNS which should be thought of as being linguistic by their nature and in the human world understood as *language*. The *λογος* of a phenomenal structure is its linguistic characterization. It is harbored inside the organism's *NK*.

We like to refer to the cognitive gap by the name of *Heidegger Chasm*, for the reason that, in *EM*, Heidegger assigns a high degree of significance to it, expressed in his way as opposition of *λογος vs. φυσικς*, really a yawning abyss, between the environmental scene and *Dasein*, his name for the human being, here studied with a methodological twist under the guise of the biological organism the logical functions of which support the human self or Ego or Self, a logical, functional construct, as treated in our earlier work (Burchard, 2005, 2011).

As explained above, if we consider our subjective experience of the scene as it may relate to neurolinguistic theories of perception then we merely entertain a transcendental game of words incapable of empirical verification, in view of the cognitive-metaphysical gap being unobservable.

The term *Sorge*, was chosen by Heidegger in *SZ*, as characteristic for the Being of *Dasein*. *Sorge* and *Dasein* are common words of the vernacular, although encountered most often at elevated levels of discourse. *Sorge* for Heidegger brings to mind the care required of a human being, required of *Dasein*, constant, sorrowful active care, for and about its world.

This designation of *Sorge* is in accord with our analytical investigation above of the action side of the meta-

²¹In a non-verbal geometric image language, verbal items interspersed.

physical gap in response to adaptive forces acting on the individual.

Therefore, we may consider *Sorge* to be Heidegger's name for the metaphysical gap, although we find in *SZ* less about its cognitive aspects. It is worth our while to briefly consider why this is so. The reason is that the cognitive burden on *Dasein* is already subsumed in its *being-in-the-world*. Not that Heidegger does not discuss cognition in *SZ*, not delving into it to see how it works as we do here, in *SZ* there are many pages where he develops ideas about it, the confrontation, the *Angst*, fear, other people, pressure exerted on *Dasein* by the *Umwelt* = the environment. But, —unlike *EM* where by the naive rule of thumb we find that treatise to amount to a theory of perception, *vide infra* § 9.1, prime territory of cognition, —these things are discussed in *SZ* more because *Dasein* must take care of them, must exercise *Sorge* to keep these forces at bay, less because a cognitive duty arises, because this is already fully accounted for by *Dasein* being-in-the-world.

For the same reason is Heidegger averse to giving science credence to adequately analyze *Dasein*'s being-in-the-world, and does not believe science capable to determine *Dasein*'s nature.

For us here the cognitive aspects are paramount, and so we have selected Heidegger's *Sorge* to denote the reflection in *SZ* of the cognitive gap, of which we may claim to have this subjective experience which we can identify with *Sorge*, sorrowful care of and caring for *Dasein*'s world and its well-being, in the sense of a deep and permanent concern, which arguably he imposed on his term just for this very purpose.

These new insights make it possible to overcome concerns regularly being expressed, primarily by Martin Heidegger and his students, about organismic functions being confused with his basic insight about the *world* of human *Dasein* and its *being-in-the-world*.

We specifically are encouraged to ignore such concerns by the recent dramatic and unexpected discoveries of how the conscious life of a human individual is supported organically by neural circuits which produce just such a Heideggerian world as a central logical function supporting human existence, its full expression in all aspects of humanity that distinguish the human life as we analyze and investigate it in his epochal work *SZ*. Instead we are able here as an application of meta-context, *cf.* § 6.1, to present a merger of our human world and the neurological computational world of our inner castle, the noumenal cosmos, as we have called it (Burchard, 2011).

Next, we bravely endeavor to discover as best we can any relevance for our understanding of subjective experience of whatever fMRI and EEG neuroscience and physiological psychology technologies may be capable of delivering by way of insights into the consciousness-related processes involved.

Entering uncharted territory, we here attempt to connect the brain or CNS rude anatomy and crass logical functioning to our subjective experience of the environmental scene.

Availability of this kind of knowledge has no effect upon the workings of the gap, but is valuable for us to understand how the gap may function in actuality. It must be based upon reasoning about brain procedural principles, for which we so far only have putative accounts.

9.1. The Logos Machine—Hermeneutics

A valid mathematical scientific theory becomes visible of how *Dasein* is able to perform world-discovery subject to global context, *NK*, by working its Logos Machine, *cf.* § 4.2, which is the new, radically extended sense of hermeneutics, in reference to *Dasein* represented by a human organism prosaically standing in as a scientific analytical investigation for *Dasein*, i.e., the bio-physical structure acting on behalf of *Dasein*, as a Language Machine, operating Formal Language *L*. It performs the logical functions of a Language System (*LS*) (Burchard, 2005).

How does Heidegger see today's conceptual formation of the cognitive gap which prevails as separation of logos from physis? Heidegger begins by declaring history equivalent with character in his appraisal of this contextual complex of mental issues.

EM, p. 94: [...] *we again pursue this separation in its historical, i.e., also its essential origin. [...] Our question about the origin of the separation therefore is also and primarily a question about the essential togetherness of Thought with Being.*

As suggested above, the "correct" reading in the way of *LD* of *EM* is as a Theory of Perception. In this paragraph he has introduced a line of reasoning, which sends us to Immanuel Kant's famous Transcendental Deduction for an important historical explanation and perhaps even a solution of the *Seinsfrage*. If we try and posit a *naive rule of thumb*, to crudely replace *EM* "Being" by "perception of natural phenomena", then we can read *EM* like a treatise on psychology, and will find that we actually are embarked on the easiest passage to sail to-

ward a science approach to his subject-matter in these remarkable lectures.

EM, p. 94: *Historically the question is: What is it with this togetherness at the onset of Western philosophy? [...] We can take a hint from the Hellenic doctrine of Thought becoming one of logos and “logic”. [...] We only need to free ourselves from the opinion that logos and legein originally and properly meant as much as Thought, Mind, and Reason.*

The significant semantic conclusion is revealed by deriving logos from the verb $\lambda\epsilon\gamma\epsilon\iota\nu$, to speak, read, gather, collect, with the basic conclusion: logos is gathering. This is to be identified with Kant’s synthesis, a fundamental part of the *NK* top-down process, as the chief way we identify phenomena mentally.

However, needless to say, he makes no mention of dualism, a concept fundamentally opposed to his concept of Dasein as being-in-the-world. Hence, following our stated goal, on the basis of *LD* we apply hermeneutics to EM seeking to retrieve a perceptive theory, those essential elements identifiable from *LD* and characteristic of dualistic epistemology.

9.2. Top-Down Processing

To accomplish signal extraction from the human environment, an observable, accessible part of the Universe *U*, translate signals into linguistic predicates, as was noted by Immanuel Kant in his inaugural dissertation, to interpret and incorporate this linguistic data stream into Dasein’s internal world model or noumenal cosmos, and finally decide on action to be taken in the momentary scene in order to enhance the animal’s survival chances, typically, incoming data pass through a series of neural centers, each with a filter-like function adding detail and specificity to any preliminary forms of percept ruling phenomena at hand.

Each filter receives feedforward data from lower centers but importantly also early feedback from downstream centers presenting the type of phenomena likely encountered from contextual information gleaned by running through *NK* as its dictionary and encyclopedia.

In *LD*, thought as application of *CCA* is needed for identifying phenomena.

Remarkably, parallels exist with key passages from Kant’s Transcendental Deduction, *esp.* footnote B156, *cf.* (Burchard, 2011).

In addition to this forward feed, in recent decades there has been discovered solid evidence for feedback from the prefrontal cortex, known as re-entrant or top-down processing signaling the influence of conscious attention to the visual field.

In the Transcendental Deduction, Immanuel Kant discovered how Ego or Self is responsible for conscious control in perception of correct percepts of phenomena from raw sense data, relying on the global context of the noumenal cosmos for identification of phenomena using the equipment provided by the conceptual-categorical apparatus (*CCA*) located in parietal cortex (*PC*).

Ego or Self largely is in control of all brain function, and ensures that the noumenal cosmos (*NK*), in EEG studies known traditionally as global context or world map, one of the principal productions of the CNS, and housed in medial prefrontal cortex (*mPFC*) remains preserved with its jointwork in good order.

We review the event sequence of perception as spelled out in my earlier work (Burchard, 2011), in the following *Nine-Step Process*:

- 1) Radiation from phenomenon ϕ reaches *LS*.
- 2) Sensor neurons on *LS* pick up radiation.
- 3) Sensors transmit linguistic signal *A* along afferent neural paths.
- 4) CNS forms apparition from *A*, begins forward analysis.
- 5) Higher centers keep feeding down early percept π from *NK*.
- 6) Stack of perceptive centers progressively clarifies π .
- 7) Ego or Self verifies, confirms final identity of π using *CCA*.
- 8) Ego or Self receives adequacy of π .
- 9) Ego or Self now infers Being of ϕ (i.e., of π qua ϕ).

The last, ninth step is what in EM is referred to as bringing into unconcealment Being, better: Being of phenomenon ϕ .

Proposing Step Nine is the radical new thought on Hermeneutics.

This Nine-Step Process is performed in the *LS* by means of top-down processing, as analyzed and investigated above.

The signal *A* is compared with pre-stored *NK* data, a process of deciphering pre-linguistic phenomena, signal extraction from the environment, that actually first brings phenomena into Being.

There is consideration of several cognitive levels here. Let us consider the case when a word printed on a page of paper is read. We compare the imprint on paper with neuronal structures of the read word, and with the fully identified concept represented by the word which we believe is given in the OFC, gaining an understanding in a step-wise progression.

Printed word on page modifying reflected light
 Word image on retina sends signals down the optic nerve
 Word image in neural structure of thalamic nuclei
 Word image in neural structure of V1 striate cortex
 Geometry, semantics analyzed in V2, V3, ... cortex
 Re-entrant signals from OFC aid lower centers V1, ...
 OFC supervises CCA identification of word...
 ... as OFC fits word into *NK* to identify its concept
 & to make sense of the printed page

There is still more when I as thinker hold this word, and its concept, in my world, my noumenal cosmos *NK*. This internal world model, so we interpret Parvizi-Damasio (Parvizi, 2001), is a movie in the brain where the owner makes an appearance. The *NK* is updated continually through the neural default mode DMN network, that operates constantly unless urgent goal-oriented activity is required (Raichle, 2005). The entire CNS operation runs continually as a “movie-in-the-brain,” processing up to twelve frames at any one time, with 25 ms intervals. Still mysteriously even today, my inner sense, discovered by Immanuel Kant, standard-issue equipment for exercising an objective perception of my own thought processes, not to be confused with introspection, where I explore my subjective leanings in the back of my mind. It allows me to observe my Ego or Self’s mental performance, specifically the role played by my Ego or Self neurons while I determine the identity of each item in the scene through the use of my conceptual-categorical apparatus (*CCA*), i.e., as I exercise my judgment, as I must, knowing exactly what’s what. Each item is brought up before the Ego or Self’s judgment chair, and categorized applying any concepts fitting raw perceptual data²² into the global context, including everything related to the scene before me. The way this is accomplished, the Ego or Self neurons are in command of full oversight over a global field of receptivity including the scene, its background, and the entire noumenal cosmos (*NK*), meaning that everything into which I have any insight can be brought into the center of my attention. Just so, the outer sense is revealing to me the printed word, and of course by the way, foremost has me be aware of my body embedded in the environmental scene.

The fact of massive parallelism available to the CNS is not a distraction from this point of view, but nonetheless the parallel architecture is important, and needs to be closely considered and studied.

One important consideration is that humans are able to reprogram themselves, devising new or novel action plans on a voluntary basis, and divesting themselves of old worn-out action schemes or habits.

That is to say that humans have free will to this extent. We should infer, from our overall approach to behavior, some higher mammals do too, as recently observed with a dolphin which sought help from a human person, familiar to it from frequent visits to the place, in the hope he would free it from entanglement in a fishing line. We explore the Darwinian evolution of the CNS forced by the cognitive gap exerting selection pressure. The momentary perceived world is the *scene*, this particular scene at this instantaneous moment in time.

This gap, the yawning chasm that separates an animal from its environmental scene, requires an effort of it in reaching across, both in *perceptive analysis* of the scene using its categorical-conceptual apparatus (*CCA*), and in *programmed action schemes* which the animal has at its disposal to alter the scene, both parts of its own inner world, or world model.

The nature of the cognitive gap is the subject matter, a problem, for science to explore, and we here are attempting to treat it from different angles in several sections above.

It should be stressed that the noumenal cosmos is a substitute for *all aspects* of reality at the disposal of the animal and which by necessity it must maintain inside its CNS.

Therefore it would be a mistake to think of top-down perception as based on unfounded assumptions, for, its

²²What we have termed an apparition (Burchard, 2011).

own *NK* is all that Dasein's organism has available for making its way through the voids of existence.

Nonetheless, that our grasp of reality has the aspect of hanging in the air in a dark room does deserve the "unfounded" epithet. But, it is for this very reason that Raichle-Gusnard discovered their DMN by its ceaseless operation of updating itself, *cf.* § 6 above, refining and self-correcting its intricate system of associations and relationships, metaphors and allegories.

It, DMN, only stands down at times when *NK* and *CCA* are required to attend to urgent business of task-oriented performance of their perceptive logical functions.

Also, as a prime example of a pre-linguistic structure, Dasein's self-governing, self-recording biological organism is ever growing to become itself—on the way to its ultimate inevitable demise. This had been recognized clearly and distinctly by Bergson (Burchard, 2011). To help decipher in verbal language its common structures, its ISHR, indeed is what here, in this essay, we are seeking to do.

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