In the Beginning Was the Verb: The Enigma of the Emergence and Evolution of Language and the Big Bang Epistemological Paradigm

Edward G. Belaga

March 21, 2009

Abstract

The enigma of *the Emergence of Natural Languages*, coupled or not with the closely related problem of their *Evolution*, *E&ENL Problem* for short, is perceived today as one of the most important scientific problems and even, according to the provocative title of [13], as the "hardest" one: *"Despite a staggering growth in our scientific knowledge about the origin of life, the universe and (almost) everything else that we have seen fit to ponder, we know comparatively little about how our unique ability for language originated and evolved into the complex linguistic systems we use today."*

All living beings are known to somehow communicate with their fellow creatures. It means that the language has been evolving over a very long stretch of time and, before becoming the language we learn, use, and enhance today, it has passed through a number of stages, or plateaux of relative stability, with each particular radical transition driven by proper to it forces and guided by proper to it laws.

The purpose of the present study, concerned with the emergence and, in a lesser degree, the evolution of modern languages of the Afro-Asiatic and Indo-European language extraction, is to outline such a solution to our problem which is epistemologically consonant with the *Big Bang solution* of the problem of *the Emergence of the Universe*.

The guiding light of our inquiry will be Eugene Paul Wigner's metaphor of *"the unreasonable effectiveness of mathematics in natural sciences"* [69], i.e., the steadily evolving before our eyes, since at least XVIIth century, *"the miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics"*. Kurt Gödel's incompleteness and undecidability theory will be our guardian discerner against logical fallacies of otherwise apparently plausible explanations. John Bell's *unspeakableness* [8] and *the commonplace counterintuitive character* of quantum phenomena will be our encouragers. And the radical novelty of the introduced here and adapted to our purposes *Big Bang epistemological paradigm* will be an appropriate, even if probably shocking response to our equally shocking discovery in the oldest among well preserved linguistic fossils of perfect mathematical structures outdoing the best artifactual Assemblers.

Contents

I was beside the Master craftsman,
delighting him day after day,
ever at play in his presence,
at play everywhere on his earth,
delighted to be with the children of men.

Proverbs 8:30-31

1 Preamble

The present paper is both the first installment laying the ontological and epistemological foundations for, and a *resumé*, hopefully sufficiently comprehensive, of the report on our inquiry – with most sections of the paper supposing to summarize a separate track of this inquiry currently in the works – into the cluster of questions both linguistic and epistemological related to the problem of the emergence and evolution of natural languages, the subject which is seen today by many specialists as one of the most difficult problem of cognitive sciences, if not of science *tout court*:

"Language is one of the hallmarks of the human species – an important part of what makes us human. Yet, despite a staggering growth in our scientific knowledge about the origin of life, the universe and (almost) everything else that we have seen fit to ponder, we know comparatively little about how our unique ability for language originated and evolved into the complex linguistic systems we use today. Why might this be?" [13]

Reading this eloquent call to both linguistic and epistemological arms extracted from Morten H. Christiansen's and Simon Kirby's influential paper *"Language Evolution : The Hardest Problem In Science?"*, one cannot escape the impression that it characteristically blends humility, jealousy, and wistful admiration of a cognitive scientist aspiring to sometime emulate the alleged effectiveness, formal precision and fabulous successfulness of, not mentioning the universal respect commanded by natural sciences in their systematic studies of the emergence, functioning, and evolution of (everything in) the observable universe, – that is to say, of everything outside and different from *"what makes us intelligent human beings"*.

By an accident of education, métier, and cultural preferences of the author, the present study has been advancing, from its very conception, on the opposite tack.

Ours has been the case of a natural scientist and mathematician educated on the steadily evolving before our eyes, since at least XVIIth century [26], [38], [25], *"miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics ... a wonderful gift which we neither understand nor deserve"* [69], and both humbled by the last century's discoveries, by Kurt Gödel and his followers, of fundamental *cognitive limits* of his "natural" trade [28] and fascinated by his own and his colleagues experience to be systematically exposed, these logical limits notwithstanding, to the bursting open the security

of respected rules of the scientifically correct thinking to give way, paraphrasing and elaborating on John Bell's famous formula [8], to *"inherently contradictory"*, *"flagrantly counterintuitive", "incorrigibly unthinkable and unspeakable"* – and yet eminently intelligent paradigms of the newly acquired cognitive and epistemological foundations of this trade.

2 Introduction

2.1 An overview of the motivations and results

All living beings are known to somehow communicate with their fellow creatures. It means that the language has been evolving over a very long stretch of time and, before becoming the language we learn, use, and enhance today, it has passed through a number of stages, or plateaux of relative stability, with each particular radical transition driven by proper to it forces and guided by proper to it laws. The present study is concerned with the emergence and, in a lesser degree, the evolution of modern languages of the Afro-Asiatic and Indo-European language extractions.

The guiding light of our inquiry will be Eugene Paul Wigner's metaphor of *"the unreasonable effectiveness of mathematics in natural sciences"* [69], i.e., the steadily evolving before our eyes, since at least XVIIth century, *"the miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics"*. Kurt Gödel's incompleteness and undecidability theory will be our guardian discerner against logical fallacies of otherwise apparently plausible explanations. John Bell's *unspeakableness* [8] and *the commonplace counterintuitive character* of quantum phenomena will be our encouragers. And the radical novelty of the introduced here and adapted to our purposes *Big Bang epistemological paradigm* will be an appropriate, even if probably shocking response to our equally shocking discovery in the oldest among well preserved linguistic fossils of perfect mathematical structures outdoing the best artifactual Assemblers.

Very informally and as briefly as one could manage to tell it while staying on one foot, in our case – on the pure cognitive one:

(1) Our approach builds on our recovery and reinterpretation of remarkable verbal structures found in, and from the grammatical point of view, absolutely dominating the oldest well-documented fossils of modern natural languages, the fossils of Semitic languages, – the structures which not only are morphologically and topologically tight and all but optimal from the point of view of Information Theory, but are also supplied with, and powered by a rich and fully formalizable system of tenses, times, modalities, and conjugations. Let us metaphorically qualify languages with such and similar characteristically well-developed verbal structures as *verbate* and others, imitating the paleontological classification, as *inverbate*.

(2) We proceed then to conjecturally recreate an instantaneous linguistic climacteric of major importance for the history of humanity – a Big-Bang-like

emergence of the germ of a *verbate proto-language* – against the background of the already existed *"primeval soup of inverbate languages"*, the proto-language which has given birth to the ancestors of Semitic, some other Afro-Asiatic, and Indo-European languages,

(3) This hypothetical proto-language germ starting to "explode" – i.e., to widely grow, spreading out, and rapidly evolving in different, often unrelated ways, similarly to the Universe after the Big Bang, but in our linguistic case – under the pressure of innumerable evolutionary mechanisms of pure linguistic, but also psychological, social, cultural, economic, political, military, national, migrational nature and, first and foremost, driven by the revolutionary strikes of geniuses, poets and writers (like Homer or Shakespeare), statesmen (like Lycurgus or Lincoln), etc., the language became:

(i) the bearer, or vehicle, of *a radically new type of human speech*,

(ii) endowed with a never seen before potential of versatility and expressive power in all domains of human *action*,

(iii) communicating the fruits of an intellectually upright, diligent, insightful, extremely creative *thinking*

(iv) of a beautiful, spiritually extraordinarily enlightened and magnanimous *mind*.

(4) We assign the conjectured critical historical event of the emergence of this germ of new type of language to an extraordinaire and defining inspirational experience of a single individual and his family who lived from eight to ten thousand years ago.

2.2 Facing up to two eventual objections

We recognize that two important objections of opposite nature to our emergence of modern natural languages scenario – from what might be potentially a long list of manifestations of disapproval – should be addressed here on the spot (preempting, at least for the first objection, a more detailed and in-depth discussion, §§8.1-4): that the proposed solution departs too radically from the mainstream scientific approaches to our problem and, on the other hand, that from a pure cognitive and literary point of view our solution sounds too familiar – and more like humanistic science-fiction or theology than science.

The First Objection: The apparent absence of reference of substance, even circumstantial, to the body of the current *mainstream evolutionary approaches* to the *E&ENL Problem*, as they are presented, for example, in the cited above collection [13].

Here is an obvious answer to this reproach, the answer all the more convincing that it has been penned by a competent adherent of the evolutionary school of exclusively biological inspiration – the answer surely valid, but in our opinion, as missing the most important points of the emergence of natural languages challenge as the solutions of his colleagues in, say, [13] or [2]:

"The evolutionary origins of language should intrigue anyone interested in the relationship of humans to other species. For them, 'Language Evolution' will

provide a useful starting point. But the volume is not a summary of mainstream views, because no such mainstream exists." [12]

On a more constructive note, we do appreciate, and hope to eventually contribute to the unique value – theoretical, algorithmic, and experimental – of the biological-linguistic evolutionary links pursued today with great success by many researchers [31]. As to the efficiency, if not relevancy, §§8.1-4 , of these and similar methods in treating the emergence problem, we are bound, however, to ascertain that (quoting from an unrelated to our problem source [63]) *"rarely have so many worked so long and so hard with so little to show for their trouble"*.

The Second Objection: Sounds familiar – and more like humanistic science-fiction or theology than science:

"The idea that there once existed a language which perfectly and unambiguously expressed the essence of all possible things and concepts has occupied the minds of philosophers, theologians, mystics and others for at least two millennia." (Publisher's synopsis of Umberto Eco's book [21].)

(1) Humanistic Si-Fi ? Fully sharing the generous, universalist vision of the human destiny, personal and collective, underlying this and similar insights into the language vocation and emergence, we have no doubts that the real historical acquisition of the cultural universalism respectfully and considerately integrating distinct cultural identities and noble aspirations of nations and individuals has never been ruined by an accidental, unfortunate departure from a *Golden Age normality of ideal perfection*, but instead, always was, and still remains, a slowly advancing, tortuous process, – the process fraught with misinterpretation and violence from its very beginning and yet approaching, apparently inexorably, its noble universal objective, whatever might be our linguistic, *verbate*, *inverbate*, or cultural backgrounds.

More to the point of the present inquiry, ours will be a couple of Physical and Mathematical metaphors and models, and first and foremost – the *Big Bang* paradigm which perceives and fully appreciates in the distant past the *germinative beauty and perfection* of the Universe's Beginning, having no misgivings whatsoever to both admire and impartially confront the full-blown linguistic universe of modern times – with all its unadulterated, apparently incomprehensible complexity, the immoderate abundance of fundamental patterns, and the savage, unexplored beauty of its formal structures and letters.

(2) Theology ? When David Hilbert, one of the inspirational figures of the present study, §5.3, gave his Basis Theorem of Invariants (1888), Paul Albert Gordan, "the king of invariants" who worked on the subject for twenty years using what we would now call Constructive – i.e., in our terminology (Section 4, §§5.2,8.3,9.3), *strongly reductionist, locally incremental* – Mathematics, said of it, *"Das ist nicht Mathematik, das ist Theologie."* (*This is not Mathematics; this is Theology.*) As the story goes, Gordan has later admitted *"that Theology also has its merits"*.

We believe that our research program, which brings to the field alongside a couple of new mathematical technics, some relatively recent and powerful ontological and epistemological insights of modern Mathematics, Physics, and,

yes, Biology, has the potential to eventually contribute to the healing of the chasm [1] separating scientific and scientist approaches of the overwhelmingly *Darwinian* (the qualifier which, contrary to the popular misconception, is not synonymous with *evolutionary* [47]) inspiration and more traditional, cognitive, redolent with Humanities vision.

3 Linguistics – and Its Mathematical, Physical, Biological Mirror Reflections and Metaphors

3.1 Linguistics and the ultimate *"unreasonable effectiveness of mathematics in the cognitive sciences"*

Much has changed, in a most radical way – and for better, since Wigner's highly influential pronouncement, with the miracle of the profound *epistemological, conceptual, and formal entanglement* between Physics and Mathematics rapidly spreading to natural sciences at large.

As a matter of fact, we are witnessing today how the accelerating process of *"the unreasonable effectiveness of mathematics in the natural sciences"* (the title of Wigner's talk) becoming an even more stunning reality – as in the case of Biology, to give just this, most important for what follows example, suggests the title of a keynote address [15] at the 2003 *Symposium on Accelerating the Mathematical-Biological Linkages* (Bethesda, Maryland):

"Mathematics is Biology's Next Microscope, Only Better; Biology is Mathematics' Next Physics, Only Better."

The underlying and, to some degree, driving the present inquiry assessment concerning the eventual *quadruple entanglement* between Linguistics and Mathematics / Physics / Biolgy could be stated in a similar way:

"Linguistics is Mathematics and Physics Next Biology, Only More Comprehensive and More to the Point; Mathematics, Physics, and Biology are Linguistics' Next Enlightening Metaphors and Models, Only More Penetrating, Eloquent, and Effective."

Fittingly, our inquiry – in *its* emergence and evolution – has followed a well-known, even if not so well understood scenario redolent of the emergence and development of some most important, both major and minor physical theories of the last four centuries, from Newtonian Physics to John Bell's interpretation of *the EPR argument* in Quantum Theory.

3.2 The ontological germ of the present study

Ontologically, such theories are inspired by, and are providing a new mathematical interpretation to a theoretical or conjectural identification, based on an experimental (real or of the *Gedankenexperiment* nature) discovery – accidentally stumbled upon, or long-awaited, or cleverly invented, or just "coming out

of the blue" – of a distinct, apparently minor but formally strikingly transparent, beautiful, well-structured and yet manifestly paradoxical (at least, as it it perceived by, and thus motivates the author(s) of the future theory in question) phenomenon – *the theoretical-experimental germ* of the future theory.

In the case of Isaac Newton's Mechanics, such "germ" were the mysterious Keplerian laws of Celestial Mechanics, whereas Albert Einstein's Special and General Relativity theories were "growing from the germs" of Albert Michelson's and Edward Morley's most perplexing to the physicists experimental discovery of the isotropy of the speed of light and, respectively, the empirical fact of the numerical equality of the inertial and gravitational mass of bodies, the equality viewed by Newton – without bringing it into question – as the elemental foundational axiom of his Theory of Gravitation.

As to Bell's theory of quantum nonlocality, it owns its very existence and utmost utility, both theoretical and experimental, for Quantum Mechanics [8] and Quantum Information Processing [11] to Bell's most transparent, and yet extremely counterintuitive solution of the *EPR-paradox*, i.e., of the Einstein-Podolsky-Rosen *Gedankenexperiment* [23] which has been ingeniously designed to expose a seeming inconsistency of Quantum Mechanics – and in consequence to baffle the best physical minds for more than a quarter of the century, until John Bell's restoration of Quantum Mechanics' ontological and formal integrity.

The ontological germ of our program of solution of the E&ENL Problem will be our rediscovery in the oldest among well preserved linguistic fossils of strikingly perfect mathematical structures outdoing the best artifactual Assemblers, §§6.1-2, 9.1 [7].

And as in the case of the physical theories mentioned above, it is Mathematics who enters in the most decisive way our ontological linguistic fray, to bring to it some interpretative clarity. Surprisingly, Mathematics intervenes here not in one, but in several distinct epistemological ways, §§5.1-4, and – most unusually – so does Physics, §§5.4(3), 6.2(3), 7.1, 9.1.

The interplay between epistemic and methodological aspects of our linguistic study and the mathematical/phisical *metaphors, models, formalisms* introduced, developed, and applied therein, represent undoubtably one of the most important, radical novelties of our approach – second only to our far-reaching, paradigmatic, and counterintuitive program of solution of the *E&ENL Problem*. In this context, it is most instructive to read the following witness of the fruitfulness of a similar interplay, albeit on a lesser ontological scale, between Mathematics, Metamathematics, and Philosophy [3]:

"To some, the precision of a formal logical analysis represents the philosophical ideal, the paradigm of clarity and rigor; for others, it is just the point at which philosophy becomes uninteresting and sterile. But, of course, both formal and more broadly philosophical approaches can yield insight [into a pure mathematical conundrum]*: philosophical reflection can inspire mathematical questions and research program, which, in tern, inform and illuminate philosophical discussion."*

4 The Emergence and Evolution Conundrum

With the discovery of biological evolution in the XIXth century, the question *"Why and how came it to existence, and how it evolves?"* became for natural and cognitive sciences as legitimate and important as the much older type of questions, known already to Greeks: *"How is it built and how it functions?"*

It is also a much more difficult question, taking in account the fact that the origins of what we deem worth to investigate today are hidden in a distant past, when humans either not yet existed, or were uninterested, or unable, or both, to leave to us their testimonies about the events of interest to us. (One wonders if in a some distant future researchers would not complain about *our* inability or unwillingness to adequately report on events of hight importance to our intellectual progeny.) It is this absence of a humanly recorded evidence – even in the presence of well discernible archeological traces – which makes the inquires about emergence and evolution so difficult in the first place.

And yet, as we show below, §§5.3(2), 5.4, 6.1, 9.1, the history of *the emergence and evolution of modern Mathematics*, fundamentally free from this genetic obscurity, could shed some light on the *the emergence and evolution of natural languages*.

There exists, however, another, even more fundamental difficulty affecting emergence and evolution inquiries, a major obstacle of both methodological and epistemological nature, and it were mathematicians who have identified this obstacle in their characteristically idealistic and rigorous way – rigorous exactly because idealistic. This difficulty concerns the very nature of what we usually understand under the term *scientific explanation*.

Informally speaking, such an explanation has been traditionally expected to be a conceptually faithful, relatively rigorous, and reasonably formal deduction/simulation of the emergence and evolution processes according to some well defined basic and pertinent to these processes laws satisfying the similar conditions of faithfulness, rigorousness, formalization, and *local incremental causality*.

It is this universal assumption of *incremental causality* – let us call it here *The Generalized Epistemological Reductionist Hypothesis of Local Incremental Emergence/Evolution Causality*, *GERHoLIE/EC Assumption* (for short ?) – that such laws together with corresponding deductive procedures should always exist, which is contested by some revolutionary in their epistemological implication physical and mathematical discoveries of the last century. In Physics, they were the already mentioned above discoveries of the Big Bang and quantum non-locality. In Mathematics, Kurt Gödel's, Alan Turing's, and others theorems – strictly speaking, valid only *in fully formalized, rigorous contexts* – demonstrating *the incompleteness* of some theories and *the undecidability* of some problems, especially those of *consistency* [20].

This said, we are neither questioning, nor underrating here the importance, utility, and eventual explicative efficiency of the mainstream, favoring incremental causality approaches to the problem of *evolution of natural languages*.

What is contested here and what will be explicated and, with the help of

the aforementioned undecidability results, refuted below, §§5.3(1), 8.1-4 , is the politically correct today and thus predominant, to the detriment of all other approaches, conviction of their universal and exclusive applicability, and in particular, their applicability to the problem of *emergence of natural languages*. It was our very personal confrontation with, and understanding of this scientist fallacy which has been the crucial motive behind our original resolution to look for a new approach to the *E&ENL Problem* – non-incremental, not based on the above *GERHoLIE/EC Assumption*.

5 Mathematics as a Multifaceted Metaphor

5.1 Science thrives on metaphors

We proceed now to the central to the present inquiry aspect of the linguistic-mathematical entanglement, *the profoundly metaphorical character of Mathematics*, and its eventual implications for our inquiry.

To be sure, science as a whole thrives on *the metaphoric thinking* – from Louis de Broglie's pertinent *wave-particle duality* to Gell Man's irrelevant *eightfold way* (of grouping the families of elementary particles, with a reference to Buddhist philosophy's eight attributes of right living), from Albert Einstein's mysterious *"subtle is the Lord, but malicious He is not"* to the erroneous one of *aether* (having its etymologic origins in the personification of the "upper sky", space and heaven, in Greek mythology), from James Clerk Maxwell's suggestive *molecular size daemon* to Pierre Cabanis (1757-1808) plainly absurd *"the brain secretes thought as the liver secretes bile"*.

However, compared to all known scientific metaphoric enterprises, the double-edged, *object-tool* metaphorical character of Mathematics and of *"the miracle of its appropriateness as natural language of science"* are probably the most profound and comprehensive.

5.2 Metaphoric character of Mathematics as a tool.

The perception of Mathematics as a particularly metaphoric language used, as it were, by Gods and, ultimately, humans to report in a most exquisite way about the beauties of the both real and ideal Platonic worlds is as old as the Mathematics itself. More recently, in the article *Mathematics as Metaphor*, Yuri I. Manin commented on this metaphoric quality of Mathematics in the following way [48] (p. 1666):

"Considering mathematics as a metaphor, I want to stress that the interpretation of the mathematical knowledge is a highly creative act. In a way, mathematics is a novel about Nature and Humankind. One cannot tell precisely what mathematics teaches us, in much the same way as one cannot tell what exactly we are taught by' [Leo Tolstoi's] *'"War and Peace".*

The story of Johannes Kepler's discovery of the laws of Celestial Mechanics named after him [38] is especially revelatory in this respect. Like a child learning

to read – Kepler has been inspired by *the Augustinian idea of the Book of Nature* [51] (p. 27) – and not knowing where to turn, he has found his laws only on the fourth try, after his three first improbable and bold *metaphoric choices* [70] – as diverse as *musical harmonies*, *regular pentagons*, and *regular solids*.

As it has been already mentioned above, §3.2, we introduce and study here two following new *mathematical metaphors* relevant to our inquiry:

(i) the metaphor of *computer Assembler language*, §§6.1, 9.1, mimicking the tight mathematical structure of idealized verbal systems of Semitic and some other Afro-Asiatic languages and their fossils, §§6.1-2 [7],

(ii) and the above metaphor of *incompleteness and undecidability*, §5.1, formally mimicking an intuitively perceived intractability of certain emergence and evolution problems by scientific explanatory methods of a purely reductionist, incremental extraction, §§5.3(1), 8.1-3.

5.3 Metaphoric character of Mathematics as an object

(1) Similarly to natural languages, Mathematics, besides being a particularly expressive and highly specialized language of sciences, has also become, starting from the middle of the XIXth century, an object of study by a full-fledged *"linguistics of Mathematics"* – the theory of Mathematics as a language, called *Metamathematics* – which comprises Mathematics' *"grammar, syntax, semantics"*, etc.

It is in the framework of this theory founded by David Hilbert (1862-1943) that he has formulated his – slightly caricaturing Hilbert's intentions – *reductionist program to explain Mathematics away*, with the explicit purpose to formalize all existing mathematical theories to a finite, complete set of axioms, and to provide a proof that these axioms were consistent. The mentioned above, Kurt Gödel's (1906-1978), discovery of incompleteness has wiped out the reductionist core of Hilbert's program, its central, most ambitious and far-reaching appeal to formalize *all of Mathematics* (cf., e.g., [71]).

We believe that this truly extraordinary story provides us with a powerful metaphor shedding a new light on the eventual intrinsic deficiency of the existing reductionist solutions of the *E&ENL Problem* – see §§8.1-4 for details.

(2) Rudiments of a properly mathematical science were known to, and cultivated by Babylonians and Egyptian priests and scholars already around 2000 BC; as to the known Indian and Chinese relevant documents, they were written after 1000 BC. Employing the well-known biological metaphor, these fragments of isolated mathematical facts and primitive counting and measuring rules could be perceived as forming a *primeval mathematical soup*.

The first full-fledged mathematical theories have appeared in Greece around 800-500 BC, and the first comprehensive treatise on geometry, proportions, and the theory of numbers, Euclid's "Elements", were written about 300 B.C. Ever since, developments, sometimes revolutionary of Mathematics and its achievements as *the language of sciences* are well-documented, carefully preserved, analyzed, and interpreted, with the historical, biographical, and analytic mono-

graphs abound – including those bearing dramatic titles like this [60]:

"The Forgotten Revolution: How Science Was Born in 300 BC and Why It Had to Be Reborn."

As to the origins of modern natural languages, which are commonly traced to 20000-8000 BC, they are, of course, much more obscure (cf., e.g., [31]).

We believe, however, that the emergence, history, and driving forces which have shaped the evolution of *Mathematics as a language* [60] provide us with an extremely suggestive and powerful explanatory metaphor for a new understanding of, and a new approach to solution of the *E&ENL Problem* – see §§5.4, 6.1, 9.1 for details.

5.4 Contrasting metaphors of the Mathematical inspiration

(1) Starting with Pythagoras discovery of the theorem bearing his name, his public thanksgiving prayer, and the hecatomb of oxen which followed, *inspirational insights* of the practitioners of Mathematics became the crucial factor in the emergence and evolution of Mathematics. Even more important, such inspirational insights are rarely coming isolated – the well-known fact framed by a distinguished living mathematician in the following romantic picture [61] (p. 182):

"Viewed superficially, Mathematics is the result of centuries of effort by many thousands of largely unconnected individuals scattered across continents, centuries and millennia. However, the internal logic of its development much more resembles the work of a single intellect developing its thought in a continuous and systematic way, and only using as a means a multiplicity of human individualities, much as in an orchestra playing a symphony written by some composer the theme moves from one instrument to another so that as soon as one performer is forced to cut short his part, it is taken up by another player, who continues it with due attention to the score."

Building on this metaphor, we will concretize below the idea of *Linguistic Inspiration* as the hypothetical driving force behind the emergence and, in part, evolution of language.

(2) With all its tremendous and steadily accelerating expansion – resembling the expansion of the Universe after the Big Bang – Mathematics invariably refers, for purposes of both education and research, to its elemental axiomatic framework and basic laws of rigorous deduction. The existence of such a relatively elementary, and yet exquisitely and robustly structured framework is crucial for both the intrinsic unity and reliability of Mathematics and for its *unreasonable effectiveness in the natural sciences*, even – or especially? – in the cases of flagrantly counterintuitive implications of new, mathematically fully corroborated laws.

We will pay here a particular attention to linguistic phenomena characterized or accompanied by the presence of some explicit, nontrivial, and clear

cut mathematical structures, especially in the cases when such phenomena are observed in ancient, fossilized languages where their presence is not susceptible to be explained (away) by conscious efforts of systematization by savants.

(3) Finally, **in the spirit of nonconformist interpretive traditions of physical sciences of the XXth century, we intend** to research into and, in the case of a *succès d'estime*, to assume the scientific responsibility for an eventual solution of our problem on the merits of its explicative adequacy alone, no matter how epistemologically most counterintuitive or, as the physicists put it, *crazy* [67] might it appear to a competent bystander – with no debts to pay to scientific precedents or to entrenched (an uncivil synonym for *mainstream*) philosophies and ideologies of science, however successful or plausible or politically correct are they deemed by our teachers and peers.

6 Semitic Fossils

6.1 Fine-tuning of the Semitic verbal systems

From this fundamental epistemological outline of our approach to solution of the *E&ENL Problem*, let us turn now our attention to *the linguistic raison d'être* of our enterprise: to our rediscovery in the oldest among well preserved linguistic fossils of strikingly perfect mathematical structures outdoing the best artifactual Assemblers (§§6.1-2, 9.1) – the discovery which should be perceived, in accordance with the epistemic taxonomy of §3.2, as *the ontological germ of our program of solution of the E&ENL Problem* [7].

We speak here about the author's rediscovery and reinterpretation [6] of the well-known but mostly misunderstood or overlooked – and yet most extraordinary and as mysterious as ever – semantically meaningful, combinatorially and topologically tight, and from Information Theory viewpoint, essentially optimal *triconsonantal* morphological structure of verbal systems of Semitic languages (cf., e.g., [4], with its inspirations originated in Molecular Biology, and more recent [10], of purely linguisitic extraction) coupled with the potentially or, as in the *Biblical Hebrew* case, *BH* for short, almost fully formalizable grammatical architecture of these systems [32].

It has been well known for a while, at least since the beginning of the last century, that *"Hebrew grammar is essentially schematic and, starting from simple primary rules, it is possible to work out, almost mathematically, the main groups of word-building"* [68], with, in a more modern technical parlance, *"mathematics involved being that of a finitely generated partially ordered semi-group, also called 'semi-Thue system' by mathematicians, 'rewrite system' by computer scientists and 'production grammar' – Chomsky's Type zero – by linguists"* [41].

This formal, extremely parsimonious, strikingly crystallographic structural beauty found in verbal systems of Semitic and some other Afro-Asiatic languages is all the more perplexing that, first, it is clearly (and in some well documented cases, even more clearly than in modern Semitic languages) discernible in the most ancient Semitic fossils, and second, semantically, it provides a unique,

nowhere else in natural languages occurring basis for the most effectual, efficient, nuanced, and versatile expressive power of the description and communication of *actions, mental and physical states, occurrences, etc.* – in brief, of all what defines human being as an active, intellectually alert agent of personal and social life.

And as if all this would be not enough to emphasize the unique, counterintuitive nature of (in the first place, fossilized) Semitic languages, one is compelled in the next breath to admit that the entropically and topologically tight morpho-semantic verbal organization [14] and mathematically meaningful, fully formalizable architecture of verbal systems [41] make these ancient languages conceptually and structurally strikingly similar and expressively vastly superior to best artifactual *Assembler languages*, the basic low-level computer languages closely mimicking the expressive power of related computer architectures [59] – an absolutely novel, paradoxical phenomenon nowhere else in natural languages observed, and thus crying out for *a new explanatory linguistic emergence paradigm* [7].

Ours will be a specifically adapted to this linguistic reality pattern of the *Big Bang paradigm*, §§7.1-2, 9.1-2.

6.2 Historico-linguistic aside

(1) The special attention paid to Semitic languages in this, or for that matter, in any other study of *emergence/evolution of natural languages* should not come as a surprise: beside being *"spoken nowadays by more than two hundred million people"*, Semitic languages, *SLs* for short, *"constitute the only language family the history of which can be followed for four thousand five hundred years"* [46]. In particular, *Biblical Hebrew*, *BH*, the best documented of *SLs*, is historically privileged to have the unique cultural, philological and linguistic following as well as a high reproduction fidelity, due to its status of the language of the sacred text, the Bible or Book, the Hebrew Bible for Jews, the Old Testament for Christians, – so much that during the last two millennia the Jewish people has been often identified as *the people of the Book*.

(2) This well-preserved fossil of a linguistic relative of a hypothetical proto-Semitic language – the linguistic equivalent of a fully preserved mammoth of the Pleistocene epoch found in the frozen Siberian soil – has no Indo-European analogues. And yet, paradoxically, it is exactly the contrasting presence of the Indo-European languages, which exhibit an astonishing variability and attendance, both historical and modern, and possess an incomparably more rich history and library of preserved texts – but no well-preserved fossils, that adds a supplementary and, for that matter, decisive argument for the validity of our impending *Big Bang* solution of the *E&ENL Problem*.

(3) The following comparison of the Semitic and Indo-European *etymologies* borrowed from [24] (p. Etymology-1), illustrating the above thesis, suffices to informally introduce here our picture of the linguistic Universe filled with flying in all directions, unceasingly and steadily accelerating, linguistic debris of the exploded "primeval linguistic nucleus":

"The etymology of the Indo-European languages is a painstaking effort to sort through the havoc wreaked upon the originally perfect language by its diverse and dispersed speakers. One of its aims is the recovery of the root system of the primitive Indo-European language, lost in these upheavals. It is also greatly preoccupied with tracing the distortions suffered by words apparently common to the various members of this family of languages as they gradually drifted apart from the mother tongue. The etymology of the Semitic languages, which are fully developed yet have retained their primeval root system in pristine form, is of a different nature; theirs is an entirely internal affair."

(4) Historically, the unique peculiarity of the *triconsonantal* morphological pervasiveness of, in the first place, *BH* verbs did not completely escape the attention of previous generations of Western linguists, as shows the following "methodological" warning opening a popular Hebrew grammar edited more than a century ago [49]:

"The roots, whatever may have been their original form, are in the Old Testament almost entirely tiliteral, ... thus imposing upon the memory a very heavy strain. ... Every verb has to be learned separately; the verbs to go out, to go up, to go down *are quite different, having nothing in common with one another and being quite unrelated to the verb* to go."

This amusing résumé has the merit to recognize, even if under the guise of an earnestly banal and misleading pedagogical clueing in, two extraordinary fundamental morphological phenomena pertinent to the linguistic vision of the present study.

(5) First, the extreme parsimoniousness, from the point of view of *Information Theory*, of the *triconsonantal representation* of verbs: with about thousand three to five hundred known different *BH* verbs (the exact number depends on etymological principles of classification), two consonants would be not enough and four would be too much.

It is this exquisite *combinatorial precision and efficiency* that is, in particular, the source of the so much deplored above *difficulty of mechanical memorization of verbs*, – the *"difficulty"* which would be considerably aggravated if the manual [49] could be written somewhen in between the third and second millennium BC [65] (p. 241):

"It has, of course, long been recognized that the ancient Hebrew vocabulary must have been markedly larger than that preserved in the OT [Old Testament, *alias* Hebrew Bible]*."*

Now, from the combinatorial point of view, 23 letters of the Hebrew alphabet provide for $V = 23 \cdot 23 \cdot 23 = 23^3 = 12167$ triconsonantal combinations. With many of such combinations potentially excluded according to supplementary morphological and phonological criteria, known (cf. e.g., [50], [29], [4], [10]) and still to determine, one could be certain that the original verbal vocabulary of the parent language of *BH* didn't exceed 6500 – a remarkable prediction! By comparison, according to the most recent *Computational Lexicon of Contemporary Hebrew* [35], there are in use today 4485 Hebrew verbs, almost all of them

being triconsonantal and fitting into the tridimensional matrix $23 \times 23 \times 23$.

(6) Second, the *meaningful morphological topology* of the body of *BH* verbs, a fundamental and unique feature of the *BH* and some other Semitic languages verbal architecture. Two triconsonantal verbs are *morphologically* or, equivalently, *topologically neighboring* if they differ in just one consonant or in two consonants of similar *phones*, with many pairs of *topological neighbors* having close, or similar, or related *semantical values*. Thus, for the verbs chosen by the author of the quoted above grammar, *to go*, "he-lamed-kaph", "to progress step by step toward a goal", is both semantically and morphologically neighboring the verb "he-lamed-qoph", "divide and portion", and not the verbs *to go out, to go up, to go down*, i. e., "iod-tzade-aleph", "ain"-lamed-he", "iod-resh-daleth", which are neighboring the verbs "iod-tzade-ain" (extend), "aleph-lamed-he" (master), and "ghimmel-resh-daleth" (scrape; scratch), respectively. Another example: "ph-tav-heth" (open) and "pe-tav-resh" (solve).

7 The Big Bang Emergence Paradigm

In this section we introduce and adapt to our purposes one of the previously unthinkable archetypes of the modern scientific *Weltanschaung*, *the Big Bang paradigm*, *BB-paradigm* for short, modeled on the *Big Bang theory* of the emergence and evolution of the Universe [42], [62]. This paradigm will play a crucial explanatory role in our contribution to the solution of the *E&ENL Problem*.

7.1 Defining the Big Bang emergence paradigm

Very summarily, five features are central to our interpretation to the BB-paradigm.

First, the assertion that some observable today, full-blown, well-defined and potentially intelligible fragment of what might be legitimately called *reality*, physical, biological, or cognitive, has been brought to existence, or *emerged* at some chronologically backtracked juncture, *the Beginning* for short, in a way that could be summarily and reasonably characterized as both "mysterious" and "all of a sudden".

Second, the closer one comes to *the Beginning* in her/his tracing its observable experimental implications, the better these data should fit into the fundamental mathematical model – when and where it exists – associated with the *"immediately after the Beginning"*.

Third, the farther one moves away from *the Beginning*, the more numerous, complex, diverse, unreciprocated becoming the chapters of laws governing the different facets of the evolving fragment of reality in question.

Fourth, ontologically, the nature, or the ontological character of this emerged *fragment of reality* possesses some absolutely novel features not found anywhere in the related "universe" and represents a radical conceptual rupture with what has been or could be known before *the Beginning*.

Fifth, epistemologically, the eventual "causes" of the emergence of the related fragment of reality are not only fully independent of the intelligibility order

which existed previous to this emergence (assuming, of course, that the adjective "previous" has a precise formal meaning in the case under investigation), but our very ability to reason about these or any other closely related cause has "emerged" (or, more precisely, "has been acquired") as one of the implications of this primarily emergence, – similarly to the case of the Cosmological Big-Bang where the questions about its "physical nature" are misplaced because the "physical" and "nature" did not exist previous to, but have emerged only after and as implications of this *"meta-physical and supernatural event"*.

7.2 Terminological and methodological asides

(1) Our usages of the words "mystery", "mysterious", "supernatural" have here and elsewhere a very specific and otherwise pithily unattainable terminological purpose: they are supposed to refer to clearly delineated fragments of reality which, or properties of which, are at the moment outside our conceptual or explanatory construct and yet, in some universally agreed sense of this word, fundamental to it.

(2) Thus, for example, the axiomatic method of the Greeks has left undefined, unexplored, unexplained such basic geometric objects as *point*, *line*, *plane*, restricting the geometric inquiries to the logical laws of their *interconnections* and leaving to informal anecdotes and paradoxes of such philosophers as Zenon (4th century BC) to dwell wittily, and yet interminably and indecisively upon the related *mysteries of their interactions*. It is only with Bernard Bolzano (1781-1848) and Georg Cantor (1845-1918) [19] that *the infinity* and *the mystery of the continuum* became the objects of fruitful scientific – in this case, mathematical – inquiries [5].

(3) And in the case of particular manifestations of the axiomatic method which, according to Gödel, has certain limits to question its own origins and consistency, the currently existing natural languages we inherit, together with all their current cultural treasure – the real source of their available explicative potential and conceptual power associated with them – have certain limits to question their own origins and consistency.

(4) Respectively, the problem *whether* or *not*, and *if yes, how* the aforementioned "causes of the emergence" could become in their turn the object of a scientific inquiry could eventually belong to an as yet nonexistent, different, and independent of what we know today kind of science. Such limitations of the available explicative power have something to do with the basically formal and (to some degree, unavoidably) reductionist character of our scientific theories, and their presence is readily recognized by philosophers of *Mathematics as science and language of science* [40] (p. 315):

"The philosophical task of a check of agreement between theory and intended mode cannot be accomplished by a reductionist epistemology here since this epistemology lacks precisely the means to articulate itself the intended model.

(5) In other words, any inquiry about the emergence causes formulated in terms and notions which have been developed in the conceptual framework of,

and thus remain conceptually and logically fully dependent on these very causes, is most probably bound to be undecidable – in the spirit of Gödel's arithmetical clause questioning its own provability [28] or, even more pertinently, in the spirit of modern, more elaborated formal claims belonging to "elementary" (finitist) Mathematics and Algorithmics which could be "decided" (i.e., proved, disproved, verified, or otherwise "understood") only in the light of some extremely powerful, absolutely non elementary, even if in some very abstract, infinitary sense most plausible assumptions [27].

(6) On the other hand, these unavoidable and universal formal limits do not deprive us, and are not obstacle neither to our active pursuing of informal and yet powerful insights of purely intuitive character, nor to new experimental revelations filling the conceptual gaps in question. In fact, they invite and stimulate the search for both new insights and and new experimental settings. In our case, among the insights which have driven our inquiry into the *E&ENT problem*, there are those which *conceptually localize* but in no way *explain* the sources of the *linguistic Big Bang* we conjecture. These sources, we believe, §5.4, were neither of biological, nor of social nature, but purely *inspirational* – as a tragedy of Shakespeare or as the Requiem of Mozart. In other words, the language as we know it *has been at some historical juncture inspirationally created or invented.*

8 Transcending Some Popular Explanatory Schemes

8.1 Presenting the *"brain is computer"* metaphor

Before advancing in §§9.1-2 our formal solution to the emergence chapter of the *E&ENT problem*, it would be most helpful from the methodological point of view to look in the present and three following sections into the relevancy and irrelevancy of some existing and most outspoken candidates to the linguistic emergence solution.

To those of our readers to whom this analysis – unexpectedly bringing into an apparently pure cognitive play, among other uncommon arguments, Gödel's unprovability insights and machinery – might sound too negative, if not destructive, let us remind that science thrives not only on *the metaphoric thinking*, §5.1, it also *"thrives on criticism"*, even if such criticism, according to Robert Crease [17], *"may sometimes end up appearing to reduce science to these other types of knowledge via ideological straitjackets"*, thus giving the impression *"to undermine scientific knowledge by exposing its limitations"*.

Taking into account our "assembler" metaphor and terminology, §6.1, it should be the most natural choice to start this critical overview with the closely related and most suggestive *"brain is computer"* approach according to which *"the mind can be thought of as biological information processing device"* [36].

There is no doubt that the relevant to such schemes theoretical methodology, together with appropriate experimental methods and data could be most helpful in resolving, in the linguistic context, some of the most important prob-

lems about *why and how* the languages, both oral and written, function, are transmitted, and even – to some degree – how they evolve [2].

Surely, one should not underestimate the obvious importance of neurological constrains and imperatives for the functioning and development of human speech. There is no doubt, in particular, that many very important, linguistically discerned, defined, and analyzed characteristics of the language usage – such as, for example, *the phonological Obligatory Contour Principle*, *OCP* for short, [39] – could be forced upon oral realization of even perfect formal structures, as those of Biblical Hebrew mentioned above, by the capabilities and limitations of the human brain and the physiology of the human voice tract.

We claim, however, that the plausibility, if not the very legitimacy of the *"brain is computer" emergence explanatory schemes* should be denied here from the outset, even if one resolves to totally ignore both their well-known theoretical pitfalls and the related ideological obsession with *"the first, best hope of materialism"* [33]:

"No thesis has played a more central role in Cognitive Science and contemporary philosophical conceptions of mind than the thesis that cognition is computation. But this thesis hardly wears its meaning on its sleeve and differing conceptions (and misconceptions) of computation may lie behind what seems a widespread consensus." [34] (p. 181)

Stating our case very broadly, the fundamental weakness of this and similar "emergence explanatory schemes" is related to their blindness to epistemological vicious circle revealed and exemplified by that of Kurt Gödel – the vicious circle which they invariably, even if under different and mostly very impressive garbs smuggle in: cf. above §§5.2, 7.2(5).

As a matter of fact, such schemes are usually inspired and informed by – mostly, without formal references to – one of the several well-known erroneous interpretations of the *Curch-Turing Thesis* [16]:

"The Church-Turing thesis does not entail that the brain (or the mind, or consciousness) can be modelled by a Turing machine program, not even in conjunction with the belief that the brain (or mind, etc.) is scientifically explicable, or exhibits a systematic pattern of responses to the environment, or is 'rule-governed', etc."

To be sure, it is only *metaphorically speaking* true that *"brain is computer"* – and, as Pierre Cabanis claimed, it also in a certain sense *"secretes thought as the liver secretes bile"*. In fact, such metaphors, as images in mirrors of different clarity, from murky or distorted to high quality, are fully legitimate, each one in its domain of semantical relevancy. In our case, they are as unsatisfactory as the state of the mind of a person who is not sure whether it is him or his image in the mirror who is real.

In particular, a momentarily perceived metaphoric picture, a *"brain is computer"* photo of our brain activity or of our linguistic ability, has no bearing whatsoever on the mystery of the emergence of either such activity or such ability.

8.2 Putting the *"brain is computer"* metaphor to the test of the emergence and the evolution of the artifact called *"computer"*

There are at least *two strong additional epistemological reasons of historical origins* to dismiss as unsatisfactory the "brain is computer" solution of the *E&ENL Problem*, with appropriate reasons of similar nature available also for solutions outlined in the next section (we leave to the reader to work out there the corresponding epistemological exercises).

First, such a solution is forgetful, intentionally or by ignorance, of the history of *the Emergence and Evolution of Modern Computer* and of its precursor and companion, *the Emergence and Evolution of Modern Theory of Computation and Algorithms* [20]. Let us remind the reader at this point that these historical advancements in the analysis, understanding, and acquirement of novel human and "mechanical", both logical and computational abilities are the fruits, first, of the new theoretical disciplines created, debated, and guided – sometimes in the atmosphere of deep doubts and controversies [18], if not intellectual despair [66] – by the best scientific minds of the XXth century, and then – on the ensuing, still flourishing implementation stage – of sustained, labour- and cost-consuming efforts of the best engineers, entrepreneurs, universities, and government agencies of the most developed nations of the world.

Not less detrimental to the legitimacy of the currently circulating *"brain is computer"* metaphor is the discovery and the accelerating progress in the acquisition of the culture of *Quantum Computing* [11], with its very foundation, *physical non-locality* [8], representing the most far-reaching challenge to the traditional understanding of causality and, thus, of the current *"brain is computer"* concept. On the other hand, one can be reasonably optimistic that the new quantum computational paradigm will eventually bring novel, most probably revolutionary insights into the understanding of brain activities – and *vice versa*.

8.3 Presenting the epistemology of local incrementalism

As a matter of fact, all known to the present author *reductionist explanatory schemes* advanced on the occasion of the *E&ENL Problem* – such as *"from animal languages to the human one"*, or *"from accidental vocal articulations to discourse"*, or *"the gestural origins of language"* – are inspired by one or another version of *the epistemology of local incrementalism*.

Consequently, they suffer from the exaggeration of *local trends*, i.e., of the formatting factors of essentially *local nature* producing *strictly local incremental changes* occurring according to strictly local causality laws – local both in time and on the level of the currently existing body of the emerging language. The unspoken assumption that such micro-management alone should account for all *global trends*, i.e., to be able to produce the desired macro-effects – the heritage of the two-centuries old mechanical, local action doctrine of Pierre-Simon Laplace [43] (p. 3) and of his followers, such as Cabanis – has been

already proven to be wrong both in Biology [30] and in Physics, here on such different occasions as Maxwell theory of electro-magnetism, relativity [22] (pp. 20-21), quantum non-locality [8], and the failure of conceptual scalability [44].

On the other hand, the fundamental assumption – borrowed from, capitalizing on the public success of, and expecting to substantially generalize biological evolutionary theories of Darwinian and post-Darwinian natural selection inspirations [30] – is supposed to correct this deficiency by postulating the existence of some mysterious, universal, auto-scalable, omnipresent, everlasting, and fabulously efficient *force of self-organisation* of the material world, which is pushing up its avatars along the infinite ladder of the increasing *complexity*, from the debris of the Big Bang to electrons and protons to atoms to bacteria to humans, and eventually beyond [45].

In the linguistic cases, and even in cases related to the emergence of *moral sentiments* (Adam Smith's 250 years old formula), this hypothetical force could be called, for example, *the language instinct* [55] and *the moral instinct* [56] , with the usual Darwinian procedure of *the survival of the fittest – the metaphor* borrowed by Charles Darwing (1809-1882) from, and modeled on Thomas Malthus' (1766-1834) theoretical apologetic of the early and savage era of Capitalism [30] – taking over after the end of the protocol of the language emergence [54].

8.4 Putting the locally-incremental reductionist argument to the test of Gödel's unprovability

In fact, the proponents of such approaches are taking undue advantage of the extended temporal duration of related processes and conditioned by such duration an extreme factual obscurity of these processes, with no or almost no material control data available. Similar conditions adverse to an alternative, independent conjecturing being absent in the case of the emergence and evolution of Mathematics, §5.3, such arguments are here to little avail, even after their enhancement by the *born with it* arguments like the following one [56]:

"According to Noam Chomsky, we are born with a 'universal grammar' that forces us to analyze speech in terms of its grammatical structure, with no conscious awareness of the rules to play. By analogy, we are born with a universal moral grammar that forces us to analyze human actions in terms of its moral structure, with just as little awareness."

And similar to the cases of logical fallacies already mentioned on several occasions, the proponents of such arguments are gullibly enteringthe vicious circle of "prophesying the past" – with absolutely nontrivial, unproven, and possibly unprovable hypotheses about the provability of statements questioning their own provability, §§5.2, 7.2(5).

To be sure, some of these claims might turn out to be verifiable, with the modern conceptual means at our disposal. However, as the proof theory suggests and the cultural history of the humanity convincingly illustrates, the most nontrivial and interesting of such assumptions might wait for a while, until the theories at our disposal would be mature and complex enough to treat such

problems – the scientific progress which is historically inseparable from unpredictable and profound, if not revolutionary cultural changes – sometimes nothing short of cataclysms.

In the case of the Fifth Postulate of Euclid [64], for example, the necessary scientific maturity came only after the span of more than two thousand years of cultural and scientific upheavals, engulfing several civilizations, Greeks, Romans, Arabs, the Western Christendom. One might also mention on this occasion the passage from the Ptolemaic to the Copernican universe, which has been only one of the most spectacular among many other discoveries pertinent to the invention, after two millennia of futile attempts to prove this postulate, of *non-euclidian geometries* – the geometries as "legitimate" from the mathematical point of view and as physically relevant and "real" as the Euclidian one.

Not less important a lesson to learn from the story of the Fifth Postulate of Euclid is *the radical actuality*, and not just an academic importance of Kurt Gödel's independence results: *the truly important scientific questions* which could not be answered and even well understood in the existing conceptual and theoretical framework are regularly emerging in our very quest for the understanding of the Universe, society, and ourselves – of what we perceive, think, and talk about – and not just as artificial formal statements assembled, as in the original proof of Kurt Gödel [28] , from known axioms and logical deduction schemes according to Cantor's famous *diagonal procedure*.

In other words, in many historically important for us cases, the discovery of still missing conceptual links in an eventual chain of our understanding and solution of a baffling problem was coming ultimately only as the fruit of a general cultural and conceptual maturity acquired during a possibly very long, complex, often unpredictable and mostly totally besides out control *experience* – intellectual, spiritual, social, both personal and collective, – of which *the scientifically controlled experimental activity* and *the search for rational, rigorous explanations* (as such activity and rational rigor are understood at related historical junctures) are only minor, even if most cherished by the current scientific mentality factors.

Thus, for example, the space-time aspects of the Big-Bang, as they are presented in modern scientific treatises and popular introductions, have been already discussed by Rabbinical exegetes – and for that matter, in quite rationalistic terms and at least as early as a half a millennium ago – as the immediate logical implications of the biblical *"In the Beginning"*, the first word of the Hebrew Bible. Thus, Rabbi Sforno have interpreted the meaning of the "event" described by this word as

"the beginning of time, the very first moment. Since time did not exist prior to Creation, the verse cannot mean to separate a point in time from what came previously; rather it describes the instant when creation began, as the first instant". [72] (p. 30)

The proof that the intuition behind this and similar reasonings has been valid came, as everybody now knows, only much later. (According to Wikipedia, *Obadiah ben Jacob Sforno*, 1475-1550, was an Italian rabbi, biblical commentator,

philosopher and physician. Obadiah was an indefatigable writer, chiefly in the field of biblical exegesis. The characteristic features of his exegetical work are respect for the literal meaning of the text and a reluctance to entertain mystical interpretations.)

9 An Outline of the Solution

9.1 A radically new language germ: verbal syntax

Looking with our powerful mathematical *"magnifying glasses"* into the oldest among well preserved linguistic fossils could be compared to, and turned out to result in a discovery of similar nature and novelty, as the search in the remotest corners of the Universe with the most powerful optical and radio telescopes for the secrets of its *emergence and evolution history*, – the enterprise which will lead us here ultimately to the conclusion that the evolution of natural languages, as we know them today, has been dramatically affected eight to ten thousand years ago by a linguistic *Big-Bang*, i.e., a sudden, restricted to just a single family, if not to a single individual, and unaccountable in the existing linguistic framework emergence of a *radically new language germ*, markedly similar to an essentially modern *"natural super-assembler"*, thrown into the *"primeval linguistic soup"* of its contemporary oecumen – the ancestor of the Semitic, some Afro-Asiatic, Indo-European, and possibly other families of languages [6].

9.2 A radically new language germ: cultural semantics

Last but not least: the vocation of a natural language is to serve as a *wordy carrier*, always spoken even if not always written, for communication, – and such a vocation in its turn might greatly influence the language evolution. So what exactly might be, and hopefully really was the vocation of our conjectured proto-language germ ?

Sorting through popular, dominating the modern cultural scene definitions of language as a carrier, or vehicle, one encounters those of *language as a vehicle for creating knowledge – for interpretation – either of meaning or of being – for the construction of identity*, or *language as a vehicle of ideas – of knowing – of truth – of intangible cultural heritage*, etc., – with no clues for our case in sight.

Turning now for such clues to *BH* [65], one discovers primarily a verbal language, with an average verse of the Hebrew Bible containing no less than three verbs and with the biggest part of its vocabulary representing morphological derivations from verbal roots, almost entirely *triliteral*, or *triconsonantal* – one of the features, already mentioned above, which *BH* shares with all Semitic and a few other Afro-Asiatic languages. Assuming that the *BH* fossil faithfully reproduces [57] the main features of our initially only oral proto-language, one has all reasons to think that it was *an ideally adapted vehicle for a dramatic, prodigiously eloquent and unprecedentedly effective appeal to a radically new, previously unthinkable and unspeakable, eminently active vocation of men.*

And as the well-documented history of this and the following epoch witnesses, this appeal has borne extraordinary fruits, both on the geopolitical scene, with the emergence of radically different and rich Middle East cultures, and in the heart of men, with the emergence of a dramatically new religious and cultural testamentary tradition which, starting with a single man, his family, and then a nation, has spread all over the world molding a new Judaeo-Christian civilization.

Modern history of language and *belles-lettres* knows analogous, even if certainly much less radical and less fateful cultural upheavals provoked by linguistic or philological revolutions carried by a single person (cf. above §7.2(6)). Such has been the case, for example, of the Russian poetic genius Alexander Pouchkin (1799-1837) who has almost singlehandedly initiated the modern culture of Russian literature, better – the Russian modern culture *tout court* [9], – the assertion that *"style is more Important than the person"* notwithstanding [58].

9.3 A radically new language germ: the genuine novelty of the argument

With our subject, problem, objectives, and inspirational sources being briefly and fleetly exposed, the following remarks are intended to direct the attention of the reader to almost unavoidable misunderstandings which could distract her or his attention from the real scientific and epistemological challenge indissociable from our arguments and conclusions.

Let us start by affirming that we do not use in this study any epistemological hypothesis which could be characterized or perceived as *darwinist*, *creationist*, *by design*, or whatever, – similarly to Isaak Newton with his *hypotheses non fingo* [52] when publicly challenged to give an explanation for the commonly acceptable causes of gravity rather than just the mathematical principles and equations of kinetics and gravitation.

And as to our *proto-conjectures*, they are no more hypotheses than working assumptions made in a certain epistemological and experimental context, say, by a paleontologist who has found elephant-sized bones in Siberia and attempts to prove, without excluding other, as yet unknown options, that they are remnants of a mammoth who lived there somewhen during the Pleistocene epoch.

This said, we are duty-bound to alert the reader, even if in passing, to a genuine novelty of our approach: our readiness, on the one hand, to downplay in our inquiry into the *E&ENL Problem* the usage, and in same cases even doubt the utility of *mathematical, physical, epistemological, and ontological metaphors of the reductionist, local inclremental nature*, and on the other hand, to systematically introduce instead, and expand on numerous *antireductionist metaphors* – in the absence, momentarily, of a better term than this ugly, even if useable and helpful *antireductionism* [37].

To clarify this *antireductionist* point, let us characterize metaphors and theories of the reductionist, local incremental nature as *conceptually bottom-up*

and downsizing. Then the metaphors tentatively used in our study could be informally described as *conceptually top-down and expanding*.

We strongly believe that only such a radical reversal – from *bottom-up* to *top-down* and from *downsizing* to *unfolding* – of the directions where our scientific curiosity might lead us, without any intention to denigrate the validity and practical importance of the *bottom-up* and *downsizing* methodology and notwithstanding all scientist reproaches to the unquestionably theological insights guiding such an inquiry as ours (as, for example, that of Albert Einstein: *"Raffiniert ist der Herr Gott, aber boshaft ist er nicht"* [53]) could permit us eventually to approach the mysteries of *"what really makes us intelligent human beings"*, including the mystery of the human dignity of which the language is the most faithful, astonishing in its beauty and effectuality image and of which the noble, often prophetical inspirations of the founders of our civilization and science are the most daring manifestations.

10 Acknowledgments

After his forced exile from Russia, the author has received a most generous moral and educational support during his first three years in Jerusalem, 1978-1981, from many Jewish Orthodox Rabbis and laity, – too many to list them here by their names but not to remember each one of them and to be deeply grateful to all of them. It is during these studies of the Torah, Tanakh, Mishnah, Midrash, and Talmud that the author has conceived, among many other things – the intellectual challenges still to assume, the main idea of the present inquiry, albeit inevitably in a very vague and primitive form.

The interest and patience of the author's spouse, Genia, and of his children, occasionally exposed during the last twenty years to the outbursts of his linguistic enthusiasm, at the time with nobody else to share, are gratefully acknowledged. Special thanks are due to my daughter Xenia for her qualified encouragement and to my son Isaac who has patiently read one of the drafts of this paper, to check spellings and to eliminate typos.

In a more professional vein, the author appreciates the recent interest to some of the above ideas, as well as some very helpful practical advices of Professor Edit Doron, of the Hebrew University of Jerusalem.

Professors Yigal Levin, of the Hebrew University of Jerusalem, Philippe Flajolet, of INRIA, Paris, and Dr. Graeme J. Mitchison, of Cambridge (who, among other things, has suggested to the author the reference [21]), have read a draft of the paper. Their questions, observations, and (in Philippe's and Graeme's case) healthy skepticism have helped the author to improve some important points of the presentation.

Professor Jan Joosten, of the Strasbourg University of Humanities, has generously shared with the author some of his original papers on the Biblical Hebrew; his remarks and bibliographical suggestions [10], [47], [57] were as helpful as his generous moral support and friendly encouragement:

"Eizehu Chacham? Halomed mikol adam. – Who is the Wise Man? The one who learns from every person."

Far be it from the author to assume *the Wise Man's mantle* so generously bestowed on him by a friend. Still, the above quote from *Pirkei Avot 4:1* (*Chapters of the Fathers*) correctly captures the most salient subjective aspect of this study: all of it, from its very beginning thirty years ago, has been the most perilously intense, rich, and rewarding learning experience for which the author is deeply grateful to Providence.

It is going without saying, however, that neither Providence, nor Jan, nor anybody else mentioned above bear the slightest responsibility for the ideas, realization, and conclusions of the present study.

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Edward G. BELAGA
Institut de Recherche Mathématique Avancée de Strasbourg
7 rue René Descartes, F-67084 Strasbourg Cedex, FRANCE
e-mail: *edward.belaga@math.u-strasbg.fr*