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Discerning the Historical Source of Human Language *by Edouard Belaga*

Edouard Belaga, researcher at the Institute of Advanced Mathematical Research, at Strasbourg University, argues that at the origins of the People of God, probably of humanity itself, there was a sudden 'inspired' emergence of human language. Dr Belaga was an upcoming Mathematics and Computer Science researcher at the Moscow Institute of Control Problems when he was forced to leave the country in the late 1970's for his dissident loyalities.

The problem of the emergence and evolution of natural languages is seen today by many specialists as one of the most difficult problems in the cognitive sciences, if not of science *tout court*. As the cognitive scientists Christiansen and Kirby put it:

> "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?"[1]

Human Language

A key, we think, to beginning to unravel this enigma is the close relationship of language to mathematics.

There are some significant linguistic phenomena that are characterised or accompanied by the presence of some clear-cut, non-trivial mathematical structures. This has been observed in ancient, 'fossilised' languages – i.e., in languages that fell out of use a long time ago, but which were well preserved in ancient texts. The presence of such structures, for instance in ancient Hebrew, cannot be explained (away) as resulting from the conscious efforts of systematization by savants.

The undisputed expert on Hebrew grammar Professor Weinberg explains:

> "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".[2]

In more modern technical parlance, the

> "mathematics involved [is] 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".[3]

There is a formal, extremely parsimonious, strikingly crystallographic structural beauty in verbal systems of Semitic and some other Afro-Asiatic languages. It is made all the more perplexing by the fact that it is most clearly discernible in the most ancient Semitic 'fossilised' texts.

Moreover, as part of a human language, this structure provides a unique basis for an incredibly effectual, efficient, nuanced, and versatile expressive power of description and communication of actions, mental and physical states and phenomena, etc., in brief, of all that defines the human being as an active, intellectually alert agent of personal and social life.[4]

We can go yet further when affirming the unique, counterintuitive nature of the verbal structures of Semitic languages, especially the fossilised ones, such as Biblical Hebrew with its verbal root system. These ancient languages have a tight, ordered etymological interdependence[5] and a mathematically meaningful, fully formalisable architecture.[6] It means that they are, conceptually and structurally, strikingly similar, though expressively vastly superior, to the best artificial Assembler languages, the basic low-level computer languages. In fact, the verbal structure of these languages closely mimicks the expressive power of computer architectures.[7] This is an absolutely novel, phenomenon nowhere else so clearly apparent in natural languages. It cries out for a new explanatory linguistic emergence paradigm.

Insufficient Explanations

Now, one should not underestimate the obvious importance of neurological constraints and imperatives for the functioning and development of human speech. There is no doubt, in particular, that many very important, linguistically discerned, defined, and analysed characteristics of language usage and formal linguistic structures, such as those of Biblical Hebrew, can be meaningfully referred to 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 "mind is computer" 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, what the prominent computational linguist, Jerry Hobbs, has wistfully termed, "the first, best hope of materialism".[8] David Israel, a writer in the same field, suggests

> "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."[9]

In short, the fundamental weakness of this and similar 'emergence explanatory schemes' is ignorance of the epistemological need to found logical computability and formal reasoning upon something outside the system, as shown by mathematicians Gödel and Turing, and by philosophers such as John Searle and, especially since he became Pope, Benedict XVIth himself.

"The fundamental weakness of some 'emergence explanatory schemes' is ignorance of the epistemological challenge to found formal reasoning upon something outside the system."

As a matter of fact, such schemes are usually more or less explicitly inspired and informed by one of the several well-known erroneous interpretations of the Church-Turing Thesis.[10] In reality

> "The Church-Turing thesis does not entail that the brain (or the mind, or consciousness) can be modelled by a Turing machine programme, 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."

The 'brain is computer' dogma goes back to the famous dictum of the French revolutionary and scientist Pierre Cabanis: "the mind secretes thought as the liver secretes bile". Certainly, such metaphors may have a certain applicability at certain organic levels. But any such 'mind as 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 ability.

> "The formation of the computer does not predate the reality of mind."

Moreover such a solution is forgetful of the history of the emergence and evolution of the Theory of Computation and Algorithms and of actual computers themselves. Human computational abilities, so much part of our culture today, are the fruit of a complex historical process involving the best scientific minds of the 20th century who created new theoretical disciplines sometimes in an atmosphere of deep doubt and controversy,[11] if not intellectual despair.[12] Their insights have been implemented by some of the best engineers, entrepreneurs, at universities and government agencies of the most developed nations of the world.

The formation of the computer does not predate the reality of mind.

Furthermore the truly important scientific questions which emerge in our search to understand the universe and ourselves could not have been well understood, let alone answered, in the cultural, conceptual and theoretical framework which was existing at the time of their emergence.

The Development of Mathematics

The Hungarian–American physicist Eugene Paul Wigner speaks of "the unreasonable effectiveness of mathematics in natural sciences"[13]. Steadily evolving before our eyes, since at least the 17th century, has been "the miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics".

Starting with Pythagoras' discovery of the theorem bearing his name, inspirational insights have been the crucial factor in the emergence and evolution of Mathematics. The renowned Russian mathematician Igor Shafarevich goes further:

> "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."[14]

Building on this metaphor, we will below propose a certain 'linguistic inspiration' as the driving force behind the emergence and, in part, evolution of language.

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 the intrinsic unity and reliability of Mathematics and for its unreasonable effectiveness in the natural sciences. This is especially true in the cases of counterintuitive implications of new, mathematically fully corroborated, laws.

The Source of Language

The sources of mathematical and computational insights have been, we believe, neither biological, nor social, but purely inspirational and intuitional – as a tragedy of Shakespeare or as the Requiem of Mozart. Furthermore systematic language has been at some historical juncture inspirationally created or invented.

The evolution of natural languages, as we know them today, was dramatically affected eight to ten thousand years ago by a linguistic Big-Bang. That is there was a sudden 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 environment. This emergence was restricted to just a single human family, if not to a single individual, and cannot be accounted for by a previously existing linguistic framework. It is the ancestor of the Semitic family of languages and of some Afro-Asiatic, Indo-European, and possibly other such families.

Language has been described as a vehicle for creating knowledge, for interpretation of meaning or of being, for the construction of identity, of truth, of intangible cultural heritage, etc. Our initial, only oral, proto-language, one would think, was ideally adapted to be a vehicle for a dramatic, prodigiously eloquent, unprecedentedly effective, radically new, previously unthinkable and unspeakable, eminently active vocation of man.

As the well-documented history of this and following epochs witnesses, the germ of these linguistic families has borne extraordinary fruits. On the geopolitical scene, we have seen for instance the emergence of radically different and rich Middle East cultures. In the religious sphere we have the emergence of a dramatically new tradition which, starting with a single man, his family, and then a nation, has spread all over the world forming Judaeo-Christian civilization.

The modern history of language and belles-lettres knows analogous cultural upheavals provoked by linguistic or philological revolutions carried by a single person, even if certainly much less radical and influential. Such has been the case, for example, of the Russian poetic genius Alexander Pushkin (1799-1837) who almost singlehandedly initiated the modern culture of Russian literature, better – the Russian modern culture *tout court*.[15]

> "The gift of language has its source in the human capacity to be inspired."

It is interesting to note that Umberto Eco's book, *The Search for the Perfect Language*, describes the

> "profound influence on European thought, culture, and history [... of] the idea that there once existed a language which perfectly and unambiguously expressed the essence of all possible things and concepts[, which] has occupied the minds of philosophers, theologians, mystics and others for at least two millennia. [...] From the early Dark Ages to the Renaissance it was widely believed that the language spoken in the Garden of Eden was just such a language, and that all current languages were its decadent descendants from the catastrophes of the Fall and at Babel." (Publisher's synopsis)[16]

Conclusion

Only such a scientifically mature perception of the phenomenon of man and his linguistic abilities can show how the gift of language has its source in the human capacity to be inspirational. We must be free from popular, infantile determinism. Through such an approach we can grow in understanding of the mystery of human intelligence, and of the noble, mysterious, superhuman and supernatural inspirations of the founders of our civilization and science. ■

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