

# Language Is a “Quite Useless” Tool: A Rejoinder to Fedorenko, Piantadosi, and Gibson’s “Language Is Primarily a Tool for Communication Rather Than Thought”

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## Abstract

Contrary to the prevailing assumption that language is “primarily a tool for communication rather than thought”, I argue that language is, to invoke Oscar Wilde, “quite useless”. Arguing from aesthetic philosophy and the minimalist program for linguistic theory, I conjecture that language, like art, is not “for” anything—it simply *is*, conforming to aesthetic rather than utilitarian principles. Of course, like art, language can be a powerful instrument of communication, but its function is not that of *expressing* thought; it *creates* thoughts, “primarily” for communicating with oneself, engaging in Popperian critical rationalism, making thoughts (e.g., sentences, constructive proofs) to match Platonic objects (e.g., propositions, classical proofs).

## Keywords

aesthetics, communication, critical rationalism, language, minimalist program, Platonism, proof theory



“All art is quite useless”

– Oscar Wilde, *The Picture of Dorian Gray*

So concludes Oscar Wilde’s classic defense of *art for art’s sake*, his portrait of the artist as one who simply is “the creator of beautiful things” (Wilde, 1891/2003). One can of course use art as a *tool* for, say, self-expression, edification, education, entertainment, escapism, et cetera, but a work of art—a poem, a symphony—simply *is* (see Martel & Ford, 2023). An analogy of Wilde’s apologia of *l’art pour l’art* was echoed in G. H. Hardy’s *Mathematician’s Apology*: “A mathematician, like a painter or a poet, is a maker of patterns[...]. The mathematician’s patterns, like the painter’s or the poet’s must be *beautiful*; the ideas like the colours or the words, must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics”. The most beautiful mathematics is consistently “wholly ‘useless’”; this is the “real” mathematics of the “real” mathematicians (e.g., “Fermat and Euler and Gauss and Abel and Reimann”). And as a “real” mathematician, Hardy concludes, “I have never done anything ‘useful’[...]. I have just one chance of escaping a verdict of complete triviality, that I may be judged to have created something worth creating[...]: I have added something to knowledge[...]; and that these somethings have a value which differs in degree only, and not in kind, from that of the creations of the great mathematicians, or of any of the other artists, great or small” (Hardy, 1940). Of course, whatever its aesthetic value, mathematics can be a powerful tool in science, engineering, economics, et cetera, but a mathematical object—a Platonic solid, a sound proof—simply *is*. Thus mathematics, like art, is quite useless—an end in itself, as Kant would have said, not merely a means. And it is in the uselessness of art and mathematics that we see them for what they really are: “*Euclid alone has looked on beauty bare*” (Millay, 1922). And what did he see? What did Hardy and Wilde see in their patterns? They saw what I see in the design of the human language faculty: “virtual conceptual necessity”, manifest in its “simplicity, economy, symmetry, nonredundancy, and the like” (Chomsky, 1995).

I should stipulate here that by *language* I mean the intensional function internal to the mind of an individual of the species *Homo sapiens sapiens* (anatomically and cognitively modern humans). More technically, I am assuming the Hopf algebra formalism of Marcolli et al. (2023), which is consistent with the Linguistic Turing Machine formalism (see Watumull, 2015), both of which picture language as a free magma, defined by the binary set formation operation Merge. Language, so conceived, is a (biologically realized) mathematical object, and is thus *aesthetic* in that its structure is determined purely by mathematical law, like a snowflake or a Platonic solid—it exists for its own sake. It is as intrinsically useless as any mathematical object, but like any said object, it can be used, and here humans use it primarily in “giving material form to imaginal reality” (Martel, 2015); in the “making of perceptible forms expressive of human feeling” (Langer, 1966). In this way, language—like all art—unifies the worlds of abstractions, minds, and bodies.

To state my admittedly esoteric conjecture as simply as possible: Language is the finite means by which humans—as artists, mathematicians, philosophers, or any other creator—can access the infinite set of possibilities. The latter, like everything in my Pythagorean metaphysics, is fundamentally mathematical (Watumull, 2015): Everything that was, is, and could be—from stones to symphonies, moons to movies, persons to poems—is some species of mathematical structure. I shan't tarry over the formal schematism here (see Tegmark, 2014), so suffice it to say that by *mathematical structures* I mean, informally, abstract entities with relations between them (e.g., sets, functions, groups, algebras, etc.). A stone may not appear to be an abstract entity, but if we consider that it can be decomposed into elementary particles which themselves pixelate ontologically into numbers (e.g., an electron is nothing more/less than  $-1$ ,  $0.5$ , and  $1$ , which we have named *charge*, *spin*, and *lepton number*, respectively), which float about in the multidimensional manifold that is spacetime, then the idea that everything is mathematical becomes more intuitive. Nevertheless, I concur with Plato that there is an ontological difference between the purely mathematical entities that exist as possibilities—the Forms—and their actualizations in our physical world. Indeed we can define *life* as that which brings into the actual what otherwise would only ever remain possible (see Watumull & Chomsky, in press). In other words, Forms exist as counterfactuals—possibilities—that we as living beings can actualize in our creative work. Indeed that is my definition of *art*, and it is the linguistic mind that most powerfully, most beautifully, mediates the mathematical and material (physical) worlds, making objects in the latter to match their idealizations—their Platonic Ideas—in the former.

This picture of language as primarily “aesthetic”, in a sense I shall further expound, contrasts radically with the prevailing conception of language as “primarily a tool for communication” assumed by “FPG” (Fedorenko et al., 2024). They “review evidence [in neuroscience] for a double dissociation between language and thought, and discuss several properties of language that suggest that it is optimized for communication”, concluding that language “only reflects, rather than gives rise to, the signature sophistication of human cognition”. *En passant*, it is quite perverse that a paper entitled “Language is primarily a tool for communication rather than thought” fails to define “language”, “thought”, and “communication”. (In due course I shall define what I mean by “thought” and “communication”, Figure 1.) It is intellectually reckless to assert what something is *for* without first establishing what that something is.

My conjecture that language may conform to virtual conceptual necessity—that, evolutionarily, “language is designed as a system that is ‘beautiful’ but in general unusable” (Chomsky, 1991)—has been tendentious since first proffered in the minimalist program for linguistic theory (Chomsky, 1995), but by now has in my judgment been cogently explained, rigorously formalized, and empirically corroborated (see the works in Leivada & Grohmann, in press); and I shall adopt it here as my metaphysical and methodological framework. It is, from my point of view, ultimately an aesthetic framework within which

we see that language is, like art and mathematics, existing simply as something beautiful, mathematically perfect, “quite useless” for any practical purpose.

Obviously, language is not literally useless. As a system of communication, language effectuates aesthetic choices irreducible to automation (see [Chiang, 2024](#)). Galileo wrote with astonishment of this capacity to communicate our “most secret thoughts to any other person [...] with no greater difficulty than the various collocations of twenty-four little characters upon a paper”—an “invention” he adjudged comparable with the aesthetic creations of a Michelangelo, a Raphael, or a Titian (see [Galileo, 1632/2003](#)). Equally astonishing, and more importantly, is the continuity—and possible identity—of communicating a thought and creating it. As Arthur [Koestler \(1964\)](#) observed:

“The vital importance of language as a thought-crystallizer was perfectly described by little Alice who, on being admonished to think carefully before she spoke, indignantly exclaimed: ‘How can I know what I think till I see what I say?’ For it is, of course, undeniable that in some forms of intellectual activity language is not only an indispensable tool, but that the stream of language actually carries the thought, so that the processes of ideation and verbal formulation become indistinguishable”.

Though it may sound cheeky or even sophistic, it is the “I cannot know what I think until I hear what I say” phenomenon that demonstrates the primacy of language in forming thoughts, which we may choose to subsequently communicate or not. (My sense is that we all know phenomenologically that only a vanishingly small subset of language is ever externalized; that we are mostly conversing with our inner daimon(s).) The philosopher [Susanne Langer \(1966\)](#) put it most compendiously:

“Language, of course, is our prime instrument of conceptual expression. The things we can say are in effect the things we can think. Words are the terms of our thinking as well as the terms in which we present our thoughts, because they present the objects of thought to the thinker himself. Before language communicates ideas, it gives them form, makes them clear, and in fact makes them what they are. Whatever has a name is an object for thought”.

Indeed, to insist upon some ontological distinction between thought and its expression would be theoretically and empirically otiose, as [Marvin Minsky \(1986\)](#) convincingly argued: “It is an illusion to assume a clear and absolute distinction between ‘expressing’ and ‘thinking,’ since expressing is itself an active process that involves simplifying and reconstructing a mental state by detaching it from the more diffuse and variable parts of its context”.

In giving form to the “more diffuse and variable parts” of our mental lives, language is an art: “And as imagination bodies forth / The forms of things unknown / the poet’s pen / Turns them to shapes and gives to airy nothing / A local habitation and a name” (*A Midsummer’s Night Dream*, V, i). In giving form to thought—in *forming thought*—language makes each one of us a poet with each sentence we think. Language provides symbols, encapsulating mental primitives into words and arranging them into sentences, thereby making and objectifying—and, in this aesthetic sense, expressing—thoughts, rendering them comprehensible to ourselves. (This is not “self-expression”, which implies the communication of something that has already been created; language is the finite instrument for the creation of infinite beauty, expressive of itself, not the creator; beauty is objective (Platonic), self-expression is by definition subjective.) Even if the sentence simply expresses (what seems to be) the ineffability of a thought, this is, paradoxically, “effing” that very ineffability.

It is undeniable that we frequently “feel” ourselves to be “at a loss for words”. However, upon examination, when we say it is *impossible* to express something in words, what we actually mean is that it is *difficult*. To be *actually impossible* means it is *forbidden by the laws of nature*. Admittedly, it is difficult to articulate, say, the crystallinity of Mozart’s music in language, but we have come close, and can *always* get closer:

“Displace one note, and there would be diminishment. Displace one phrase, and the structure would fall” (Shaffer, 1981).

This hitherto unarticulated quiddity of all great art—in fact all great creative work—has an *explanation*: it was known to the composer, and it is known to the listeners who appreciate it, if only inexplicitly, which does not mean non-linguistically. The “Displace one note ...” articulation is only the beginning of its infinite elaboration in language. (And the future of creativity cannot be predicted, and so the fact that something seems ineffable now does not mean it will remain so for all time.) This implies that even were I to concede that there exist some linguistically inexpressible thoughts, such thoughts could become *objects of knowledge* only if explained in language. “It is not that the meaning cannot be explained. But there are certain meanings that are lost forever the moment they are explained in words” (Murakami, 2013). A cheeky corollary of this implication is that we would know something was ineffable only because we could say so. For instance, with mental imagery, it would be its linguistic scaffolding—how we describe the images to ourselves in discrete representations—over which we reason. It goes without saying that such reasoning is in the main nonconscious. Our problem to express the inexpressible would be quite analogous to the problem of a mathematician studying an undecidable question (e.g., Turing working on his *Entscheidungsproblem*). The mathematician may *prove* that it is undecidable—and explain why. For the mathematician, this is a success. Although it does not answer the *mathematical question*, it does solve the *mathematician’s problem* (see Deutsch, 2011). Analogously, a philosopher could perhaps

explain *why* some thoughts are ineffable. This would not express the inexpressible, but it would solve the philosopher’s problem. Indeed I shall later explain why some thoughts are “unconstructable”.

In any event, I contend that linguistic creativity is equal to the task of expressing what is presumed to be inexpressible. To reject my contention is to concede it: “Certain forms of thought can’t be intelligibly doubted because they force themselves into every attempt to think about anything. Every hypothesis is a hypothesis about how things are and comes with logic built into it” (Nagel, 1997). One must use logical argument to deny the primacy of logic, thus negating the denial, affirming what it intended to confute. And logic reduces to language, in my theory, for logic is simply syntax—the “shape and arrangement of symbols” (Chomsky, 1955/1975)—and the computational rules that govern its manipulation. And thus any conjecture as to the nature of reality is fundamentally linguistic. “The same is true of every doubt or counterproposal. To dislodge a belief requires argument, and the argument has to show that some incompatible alternative is at least as plausible” (Nagel, 1997). It is *inevitable* that in engaging in human-style thought, in being conscious, in reflecting upon our thoughts—to render ourselves intelligible to ourselves (and others)—we use linguistically structured argument. This is why language always gets “the last word” (Nagel, 1997).

Nevertheless, since antiquity there may been philosophers denying not only that language gets the last word, but that language gets any word at all. This is the tradition of *apophasis*: the “negative theology” within which God or the World—or whatever the ultimate nature of reality is—cannot be described, to say nothing of explained, in “positive” terms. We cannot even name it “It”. *A fortiori*, It does not admit of predication (e.g., one cannot even say “God is good”, “the World is all that is the case”), transcending as it does all linguistic/cognitive frames; It, unlike anything else in metaphysics, cannot be “framed out” and symbolized; It therefore cannot be comprehended, or even apprehended. Paradoxes abound obviously as to how we can even know that we cannot even know It’s nature. For this reason, it is all too easy to dismiss apophasis as mystical obscurantism. Yet I am mindful of—and do abide by—one weird and wonderful ostensibly apophatic doctrine: to wit, Plato’s “unwritten doctrines”.

To say Plato’s unwritten doctrines are controversial is, dare I say, ineffably understated. Scholars debate not only their contents, but their very authorial legitimacy. Here I shan’t tarry to adjudicate these interesting scholastic disputes. Consistent with my philosophy to approach history aesthetically rather than literally, I shall proceed to play with Plato’s ideas so as to expound my own doctrine of effability. I focus here on a(n) (in)famous passage from Plato’s Seventh Letter.

Plato says of his esoteric teachings that only those initiated in the *elenctic* method of conjecture and refutation, those who have been subject to philosophical midwifery (*maieutics*), are epistemically and morally—and even aesthetically—prepared to divine the highest truths. Aristotle recounts a lecture in which Plato identified the highest of

these high truths as that of the Form of the Good. Of course the very fact that Plato discoursed on this idea testifies to his denial of strict apophysis and affirmation of some kind of *cataphasis* (“positive” philosophy); or, to use less anachronistic (and misleadingly theological) terminology, Plato denied ineffability, and affirmed the expressive power of language to articulate knowledge of the Forms. Such gnosis, according to some schools, is to be equated with the “mystical”. I regard it as magical (see Martel & Ford, 2023), for it is noetic contact with the Forms that induces us to *match* them in the art we *make*. The aesthetic praxis of *making* and *matching* is fundamental to my philosophy.

In my metaphysics, Forms emanate from the Platonic realm as images in the *Imaginal*, and our embodied phenomenology of them is what I mean by *feeling*. Forms and images are effective and affective. Echoing Martel (2015) and Langer (1966), I conceive of art as the making of material forms expressive of felt imaginal realities. (By this definition, essentially all true creativity is artistic.) This is art as magic.

The magical language of the unwritten doctrines is one in which fluency can be attained only gradually, and never completely. But even incomplete attainment of it is epiphanic. Plato explains (in language):

“[The unwritten doctrine] does not admit of exposition like other branches of knowledge; but after much converse about the matter itself and a life lived together, suddenly a light, as it were, is kindled in one soul by a flame that leaps to it from another, and thereafter sustains itself”.

The language of the unwritten doctrine is something abstract and atemporal but which is used *in time, over time*, by *embodied* souls (minds) engaged in the kind of *dialogue* that inspires new leaps, cuts, dreams into the Platonic world, ensconcing one, if only fleetingly, in the Imaginal (see Plato’s *Phaedrus*). Plato, in the voice of his avatar, Socrates, narrates his own experience of this initiation in the *Symposium*, his dialogue on the nature of Love. (Love seems to me to be the lived experience of the Beautiful.) Reading into the text, we can say that after much converse with the wise witch Diotima, possibly a life lived together with her, Socrates has enkindled within him from her a divine spark of insight into the ultimate nature of things: “He will suddenly perceive a nature of wondrous beauty; [this nature] always *is* and neither comes to be nor passes away, neither grows nor decays, neither waxes nor wanes; it is not beautiful this way and ugly that way, [nor is it] beautiful to some people and ugly to others. [This nature is] the Beautiful itself, absolute, pure, simple, separate, and everlasting”; “to behold this nature is to bring forth not mere images of beauty, but of realities”. This is redolent of the minimalist conception of language: abstract, simple, beautiful.

The Beautiful, the Good, the True: each are facets of the One—or whatever that thing(s) or nonthing(s) is (are)—that almost everyone, from apophatic philosophers—ancient and modern—to laypersons—whether their metaphysics be explicit and formal



or implicit and informal—would deny can be rendered in words. But Plato denies the deniers in the Seventh Letter, enshrining *in text*—which is just brilliantly paradoxical and ironic—what read like instructions for a magical working. To reach the “thing which is cognizable and true” (*gnōston te kai alēthes*), the One—the thing of things—which people then and now believe to be ineffable, we begin with the word, the “name” or the “account” or the “explanation” (*logos*). Logically, we must begin with language. Even those insisting upon ineffability accept this premise, protestations to the contrary notwithstanding. Denial of the power of language exhibits the power of language, and it is not sophomoric gotchaism to call this out. And even were the apophaticist to be silent, that act—a kind of *speech act*—would not be inexplicable—would not signal the ineffability of the One (or “the truth” or “god” or whatever that thing of things is), either to an observer or to the “speaker”, the latter whom must be *thinking* “Whereof I cannot speak, thereof I must be silent” (Wittgenstein, 1921/2001). There is a poetry even in silence.

Every single sentence—every single word even—is an instance of this fundamentally aesthetic process giving form to our mental lives. Language literally *embodies* abstract objects (e.g., in the brain). Mathematical objects become realized in the matter of our bodies when via the Imaginal we reach for abstractions to use in the material world. Thus, like Spinoza, we see bodies (subsuming brains) as paragons of *intelligence*, meriting contemplative regard on a level with the loftiest of abstractions and concepts. In this way, Spinoza echoes Neoplatonists like Iamblichus who saw the body not as a Gnostic prison, but as a prism refracting noetic light from the Formal facets of the One. The body immanentizes, hypostasizes, singularizes Platonic forms. So regarded, Spinoza tells us, rightly, we see that “no one yet has determined what the body can do”. I sense we all know this, implicitly, whether by intellect, meditation, psychedelia, love, or whatever. But none has yet answered Spinoza’s question explicitly: *What is a body?*

Endeavoring to answer this question is important in the context of FPG’s arguments from neuroscience. Adducing data of “the language network” in the brain to support their theoretical claims presupposes that we can “reason upwards” from localized brain activity to the functionality of language. However, to reiterate Spinoza’s dictum from *The Ethics*: “no one yet has determined what the body can do”. So what can we infer from the fact that (diffuse) activity in some areas in the brain (imperfectly) correlate or fail to correlate with some uses of language? Analogous questions can be posed of the “neural correlates of consciousness” and every other feature of mind. “When Spinoza says that we do not even know what a body can do, this is practically a war cry”, Deleuze (1990) remarks. “[Spinoza] adds that we speak of consciousness, mind, soul, of the power of the soul over the body; we chatter away about these things, but do not even know what bodies can do. Moral chattering replaces true philosophy”. Indeed the indignant chatter by neuroscientists that we *must* defer to data before we have even expounded a



philosophy of what those data mean is quite irrational. The rational approach is the way of true philosophy: theory-driven.

“[I]t is the mentalistic studies that will ultimately be of the greatest value for the investigation of neurophysiological mechanisms, since they alone are concerned with determining abstractly the properties that such mechanisms must exhibit and the functions they must perform” (Chomsky, 1965).

The primary function language performs is the aesthetic creativity we constantly feel giving form to our mental lives. (And logically it must precede externalization.) It is an instrument for reaching into the Imaginal, into the Platonic, grasping at Forms to match in the art we make. It is most commonly manifest in writing and reading (consciously experienced in composing and interpreting this very text), but as the soundtrack of the mind is always playing, from perception to ratiocination, sometimes loudly (in the “Wagnerian opera” of discursive thought or the Romantic ecstasy of poetic thought), sometimes softly (in the “ambient music” of contemplative thought), sometimes subliminally (in the “infrasonic symphony” of nonconscious thought), never silently (“Authentic speechlessness comes with death. To die is to stop chattering”; Steiner, 2011). Language is the music of thought.

No psychological or neurobiological experiment can falsify the reality of the apodictic introspection that the ease or difficulty of articulating a thought is coextensive with its creation. Nevertheless, FPG posit a neurobiological “language network” construct for adducing evidence from neurocartography that “thought” (which they never define) and “language” (which never define) overlap only imperfectly in the brain, and can dissociate in performance (e.g., arithmetic competence and linguistic competence can be independently operative). But contrary to what FPG assume, such evidence does not contravene the contention that language structures all thought. Tests for dissociation are testing performance—they are testing what can be used, not the internal competence (the knowledge of language); here FPG fail to acknowledge the elementary competence/performance distinction (see Chomsky, 1965). Consider dissociations between reading and language competence. There are persons who possess normal language competence but cannot read, and conversely. Of course there cannot have evolved a separate “reading faculty”, so what such tests show is that what FPG are studying is the utilization of the competence; they are not testing the competence itself. This argument goes for all the cases FPG adduce. None disproves the conjecture identifying thought with language.

The identification of creating and articulating thought is one reason we humans are constantly talking to ourselves, coursing through the river of consciousness, struggling or swimming in prose and poetry. Thinkers from Plato to Popper have all testified to the reality of this phenomenology, which we all experience to some extent, as modern psychology has corroborated (see Fernyhough, 2016).

FPG concede that such inner speech merits “further investigation”, but relegate it to their Supplementary Information, dismissing it as an inconsistent phenomenon typical of only some individuals. Such purported nonuniversality, they conclude, “rules out a strong version of the idea that inner speech is critically necessary for thinking”. The inference is demonstrably invalid. The fact that only some individuals report the presence of an “inner voice” does not rule out the possibility that language is always implicitly constructing thoughts—and there are exceedingly cogent reasons to suppose that it is. An anecdote from Karl Popper contrasting his writing process from that of his friend Bertrand Russell is illustrative (and amusingly analogous to Salieri’s astonishment upon reading Mozart’s scores: “it was beyond belief. These were first and only drafts of music, but they showed no corrections of any kind. Not one. He had simply written down music already finished in his head! Page after page of it as if he were just taking dictation”; see Shaffer, 1981).

“[Russell] showed me a manuscript of his in which there was not a single correction for many pages. With the help of his pen, he had instructed the paper. This is very different indeed from what I do. My own manuscripts are full of corrections—so full that it is easy to see that I am working by something like trial and error; by more or less random fluctuations from which I select what appears to me fitting” (Popper, 1978).

However, because critical rationalism—the Socratic, elenctic process of conjecture and criticism—is the only method by which knowledge (including beauty) can be created (see Deutsch 2011), the seemingly perfect creations of a Russell were, Popper conjects, *emergent* expressions—those that survived *subconscious* criticism of the creative faculties in that constructive process formally analogous to natural selection. It is simply that this process of Darwinian epistemology can be performed at varying levels of consciousness—with some artists (including scientists, mathematicians, philosophers) predisposed to operate subconsciously, whilst others operate more consciously. Introspection is not infallible: just because one does not hear an inner voice does not mean it is not there; if it is ineliminable from the best theory of how thought is created, then we must be ontologically committed to its existence; that is how we know what is real. Thus, Popper continues,

“We may pose the question whether Russell did not do something similar [to critical, rational trial and error-elimination], though only in his mind, and perhaps not even consciously, and at any rate very rapidly. For indeed, what seems to be instruction is frequently based upon a roundabout mechanism of selection, as illustrated by Darwin’s answer to the problem posed by Paley. I suggest that we might try out the conjecture that something like this happens in

many cases. We may indeed conjecture that Bertrand Russell produced almost as many trial formulations as I do, but that his mind worked more quickly than mine in trying them out and rejecting the non-fitting verbal candidates. Einstein somewhere says that he produced and rejected an immense number of hypotheses before hitting on (and first rejecting) the equations of general relativity. Clearly, the method of production and selection is one that operates with negative feedback” (Popper, 1978).

FPG would surely dismiss such qualitative anecdotal data from Popper, preferring quantitative data. The latter would be interesting, but to insist that they must be privileged over the former is simply irrational. Qualitative evidence should not be summarily dismissed as “illegitimate”. Rational inquiry should seek good explanations, adducing whatever kinds of evidence it can, whatever their nature. Some of our best theories of how the mind works are purely qualitative—William James’s *Principles of Psychology* is a case in point. Indeed implicit in James’s work on perception is a theory for how language works to cut nature at its joints.

“The first thing [language] does is to break up what William James called the ‘blooming, buzzing confusion’ of sense perception into units and groups, events and chains of events—things and relations, causes and effects. All these patterns are imposed on our experience by language. We think, as we speak, in terms of objects and their relations[...]. Without words, sense experience is only a flow of impressions, as subjective as our feelings; words make it objective, and carve it up into *things* and *facts* that we can note, remember, and think about. Language gives outward experience its form, and makes it definite and clear[...]. But the process of breaking up our sense experience in this way, making reality conceivable, memorable, sometimes even predictable, is a process of imagination. Primitive conception is imagination. Language and imagination grow up together in a reciprocal tutelage” (Langer, 1966).

In short, the blooming, buzzing confusion becomes organized and patterned into symbols. Our linguistic imagination is one of symbols, whose “shape and arrangement” is what “syntax” has always meant in generative linguistics (see Chomsky, 1955/1975). This is the domain-general sense of *generative grammar*—by which is meant an explicit (see Chomsky, 1965), or computably universal (see Watumull, 2012), or recursive (see Watumull et al., 2014), function defined in intension to derive an infinite set of hierarchically structured expressions. So understood, *language* is algebraic, whose variables can be valued by words (for “language” in a domain-specific sense), notes (for music), numbers (for mathematics), etc. Whatever the values for the variables, it remains fundamentally

*poetic*, in an abstractly ontological sense: even imagistic and auditory thought, even emotions are given form “linguistically”: Our thoughts and feelings *mean* something, and *where there is meaning there is structure*, ultimately mathematical—hence aesthetic, poetic—structure (see Watumull & Chomsky, in press). Elsewhere we have described this domain-general “language”—effectively a “language of thought”—as a Universal Generative Faculty (UGF): A suite of contentless generative procedures that interfaces with different domains of knowledge to create contentful expressions in thought and action (see Watumull & Hauser, 2017).

And, I conject, it was the evolution of this language, this UGF, that endowed us with a symbolic mind; the emergence of this symbolic level—a meta level of mental life—made *Homo sapiens sapiens* “The beauty of the world. The paragon of animals” (*Hamlet*, II, iv).

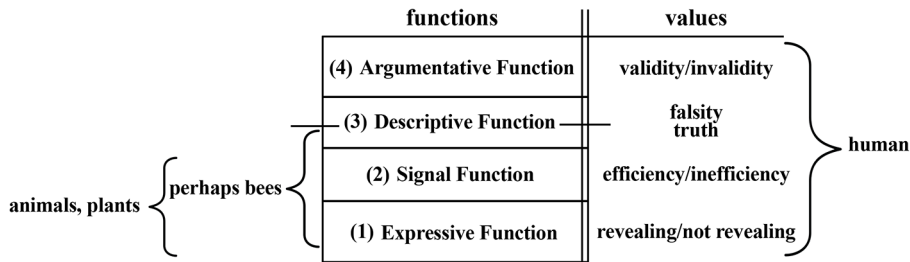
“Man has, as it were, discovered a new method of adapting himself to his environment. Between the receptor system and the effector system, which are to be found in all animal species, we find in man a third link which we may describe as the *symbolic system*. This new acquisition transforms the whole of human life. As compared with the other animals man lives not merely in a broader reality; he lives, so to speak, in a new *dimension* of reality” (Cassirer, 1944).

In this dimension, the “function” of language is distinctively human. The human singularity is the function of *critical rationalism*: the process of conjecture and criticism used in all forms of knowledge creation, from science to art (see Popper, 1963); this is what I mean by “thought”. Schematizing linguistic competence in terms of its functionality—how we *use* language—in critical rationalism draws into relief just how categorically different human language is from anything in nonhuman animals. Inspired by Popper, himself inspired by Bühler, we can organize a hierarchy of linguistic functions in Figure 1 (with higher levels subsuming lower levels): (1) the expressive function (i.e., the expression of an inner state); (2) the signal function (i.e., the expression in (1) functions as a signal to some receiver, whether it was intended to or not); (3) the descriptive function (i.e., over and above (1) and (2), it makes statements that can be true or false); and (4) the argumentative function (i.e., over and above (1)–(3), it adds argument, with its values of validity and invalidity).

Many nonhuman animals—and many nonhuman systems—are capable of Level 1 and Level 2 functionality. Level 1 is particularly trivial: All behavior, from that of bacteria to traffic lights to humans, is a form of “self-expression” or “communication” of an inner state. Level 2 presupposes Level 1. The self-expressions of inner states by many systems (e.g., nonhuman animal alarm calls (whether intentional or not), thermostats, human communication) cause reactions—send (informative) signals—to other systems in the environment. Levels 1 and 2 define “communication” in its rudimentary sense. Incidentally, it is in this most rudimentary of senses that language, *qua* system of symbolic

Figure 1

*The Functions of Language*



*Note.* This is a simplification of course. There are myriad other functions (e.g., Austin’s performative utterances, etc.), but we can set those aside here.

thought, depends upon the communication of signs, for it is the latter that stimulates the former: Primary linguistic data in the environment stimulate the development of linguistic competence as light stimulates the development of the visual system. But ultimately, the signs “communicated” to the linguistic mind are radically transformed into symbols that enable epistemic gnosis and aesthetic creativity transcending any utilitarian functionality.

Level 3 is where something categorically new emerges: *propositional structure* supporting epistemic notions, *primus inter pares* being *truth* and *falsity*. This is where the system can begin to access something similar to what Popper called “World 3” (i.e., the world of abstractions, including propositions, theories, and—in my picture of that world—mathematical objects and other Platonic Forms, etc.). (World 1 is the material world. World 2 is the mental world.) On Earth, humans seem to occupy this level uniquely (with the possible exception, Popper notes, of bees, whose waggle dances may be said to function as descriptive statements, see Gallistel & King, 2009). Level 3 is the necessary basis for the all-important Level 4: Linguistically-structured argument and reasoning, governed by notions of validity and invalidity; these are the processes and principles that enter into conjecture and criticism—critical rationalism—whereby humans and, pending the advent of human-style AI or the discovery of some comparable extraterrestrial intelligence, only humans create explanatory knowledge. Such knowledge can be externalized and communicated, but its primary use is internal and aesthetic.

Indeed beyond the four functions of Figure 1 is a fifth function, homologous in its profundity—and mystery—to Plato’s fifth solid, the dodecahedron. Of the latter, having associated the other solids (the cube, the octahedron, icosahedron, the tetrahedron) with the classical elements (earth, air, water, fire), Plato remarked in the *Timaeus* that “the god used [the dodecahedron] for arranging the constellations on the whole heaven”. What

function of language could be so celestial? The poetical function. Ironically, I mean this literally.

One reason [Figure 1](#) does not include an explicit fifth function is that the poetical function is a kind of argument (subsumable in Level 4), in that poetry—like any work of art—is *created* in a critical process of inspired-trial and error-correction. Keats, for instance, was distinctively Popperian. Drafts tattooed with “crossings-out [...] show us Keats improving his first thoughts in the moment”. Consider, in the first version of “La Belle Dame sans Merci”, we see how he “removes a couple of specific references to ‘death,’ replacing them with the less heavy-handed indefinite article ‘a’ in what seems like an effort to pare the poem down further:

I see ~~death's~~ [a] lilly on thy brow  
 With anguish moist and fever dew,  
 And on they cheeks ~~death's~~ [a] fading rose  
 Fast Withereth too—

In *Endymion*, ‘a thing of beauty’ is capsized into abstract nonentity by the indefinite article. Here, the ‘a’ is a boon, adding to indefinable atmosphere the poem creates” (Miller, 2022).

We see Keats conjecturing and testing words, correcting what he perceives to be errors or inadequacies—subjective *and objective* alike—by measuring the distance between where he is and where he wants to go, between what he has made in his mind and what he seeks to match “out there”. Poetically: “Our human essence lies not in arrival, but in being almost there, we are creatures who are on the way, our journey a series of impending anticipated arrivals. *We live by unconsciously measuring the inverse distances of our proximity*: an intimacy calibrated by the vulnerability we feel in giving up our sense of separation” (Whyte, 2021).

Returning to [Figure 1](#), Popper criticized “radical behaviorists” and “radical physicalists” in terms that apply with equal force to FPG, who argue that their “view that language is simply a communication system aligns with a continuity view of human evolution”, and that my “contrasting alternative—that language is the medium for thinking—implies a sharp discontinuity between our species and others. This alternative view centres language—perhaps innately—as the mechanism of change, and the mechanism that endowed humans with a novel representational format for mental computations”. Correct: I am positing such an alternative, not to install humans atop some *scala naturae*, for all species—and all individuals of all species—are singularities, but simply to observe what makes our species—and every individual of our species—a singularity. This is the aesthetic alternative: to “make the human humanly”.

Art exists to “make the stony stony[...]. Art is a way of experiencing the artfulness of an object”, in the words of literary theorist Viktor Shklovsky (1917). An ordinary object—a stone, say—can be transformed—or, rather, revealed to be—extraordinary by framing

it out of the flux in a work of art (see Martel, 2015). Whether it is Van Gogh limning and enframing sunflowers, the enframing quatrains of Blake's (1796) "Ah! Sunflower!", or Turing precisifying and thereby "enframing" the mathematics of sunflowers (Turing, 1954/2013), aesthetic works make manifest the *Imaginal*—the numinous, the Platonic—character of things. Art, in rendering the singularity of anything, proves the beauty of everything. It can make us see the stoniness of the stone. Conversely, and equivalently, in proving the beauty of everything, mathematics can render anything a singularity. And thus, by seeing language, *qua* mathematical system, as fundamentally aesthetic, we see its beauty as the singularity of the human. It makes us see the humanness in the human.

Nevertheless, though it is as intrinsically useless as any work of art, the singular beauty of human language does attain singular functionality.

"[F]unctions (1) and (2) are almost always present in human language; but they are as a rule unimportant, at least when compared with the descriptive and argumentative functions. However, when the radical physicalist and the radical behaviourist turn to the analysis of human language, they cannot get beyond the first two functions[...]. The physicalist will try to give a physical explanation—a causal explanation—of language phenomena. This is equivalent to interpreting language as expressive of the state of the speaker, and therefore as having the expressive function alone" (Popper & Eccles, 1977).

Here Popper is echoing the Enlightenment in understanding that, unlike all contemporary automata and some nonhuman animals, *Homo sapiens sapiens* use language in creative ways appropriate to situations but not caused by situations, and to formulate and express these thoughts coherently and without bound, perhaps "incited or inclined" to speak in particular ways by internal and external circumstances but not "compelled" to do so (see Chomsky, 1966/2009).

In other words, humans use language "quite uselessly", enlivened simply in expression—in making symbolic forms.

Returning to Popper and Eccles (1977):

"The behaviourist [...] will concern himself also with the social aspect of language—but this will be taken, essentially, as affecting the behaviour of others; as 'communication', to use a vague word; as the way in which speakers respond to one another's 'verbal behaviour'. This amounts to seeing language as expression and communication. But the consequences of this are disastrous. For if all language is seen as merely expression and communication, one neglects all that is characteristic of human language in contradistinction to animal



language: its ability to make true and false statements, and to produce valid and invalid arguments”, the warp and weft of *intelligence*.

Here we see Popper and generative linguistics converge explicitly:

“[T]he characteristic openness of human language—the capacity for an almost infinite variety of responses to any given situation, to which Noam Chomsky, particularly, has forcefully drawn our attention—is related to the descriptive [and argumentative and poetic] function of language. The picture of language—and of the acquisition of language—as offered by behaviouristically inclined philosophers such as Quine seems, in fact, to be a picture of the signaling function of language. This, characteristically, is dependent upon the prevailing situation. As Chomsky has argued [...] the behaviorist account does not do justice to the fact that a descriptive statement”, to say nothing of an argument or poem, “can be largely independent of the situation in which it is used” (Popper & Eccles, 1977).

This imaginative use of language is what empowered humans to reach the new symbolic dimension of reality.

It is on this symbolic plane—the *Imaginal* (see Martel, 2015)—that we can access an abstract—essentially mathematical—space of possibilities, counterfactuals, that we can render actual in the material world, in our words, in our art, in our “forms of life” (Wittgenstein, 1953). The philosopher Ernst Cassirer (1944) explained:

“No longer in a merely physical universe, man lives in a symbolic universe. Language, myth, art, and religion are parts of this universe. They are the varied threads which weave the symbolic net, the tangled web of human experience. All human progress in thought and experience refines upon and strengthens this net. No longer can man confront reality immediately; he cannot see it, as it were, face to face. Physical reality seems to recede in proportion as man’s symbolic activity advances. Instead of dealing with the things themselves man is in a sense constantly conversing with himself. He has so enveloped himself in linguistic forms, in artistic images, in mythical symbols or religious rites that he cannot see or know anything except by the interposition of this artificial medium. Even here man does not live in a world of hard facts, or according to his immediate needs and desires. He lives rather in the midst of imaginary emotions, in hopes and fears, in illusions and disillusion, in his fantasies and dreams. ‘What disturbs and alarms man,’ said

Epictetus, ‘are not the things, but his opinions and fancies about the things.’”

In a word, my word, if not Cassirer’s, we experience the world *aesthetically*, as something to be interpreted *imaginally*. But, contra Cassirer, or how Cassirer could be construed, the *Imaginal* is not imaginary; it is not at all unreal. The *Imaginal* is not something that occludes reality. That is the false picture presented by some strains of (Neo-)Kantianism. As the philosopher J. F. Martel (2015) has artfully explained, the truth is that the *Imaginal* is the framework within which reality—ranging from the material to the mathematical—can be comprehended. Returning to the sunflower example to emphasize my/Martel’s main theme, sunflowers exist as material (living) objects emanating from mathematical (informational) Form, but “fully flower” metaphysically only when given form in matter via the working of intelligence—which is to say, when they are realized in art, from the paint of a Van Gogh to the poetry of a Blake to the prose (and elegant equations) of a Turing. Philosophy then enframes within discursive language the frames of art, rendering the meaning of art explicit and conceivable, enabling the understanding of art to be critical and productive—knowing what it is and imagining what it could be, what it ought to be. As the informational warp and weft, discursive and poetic language weave via intelligence the fabric of life. Langer (1942) explains:

“Here is a crossing of two activities: for discursive symbolism is always general, and requires *application* to the concrete datum, whereas non-discursive symbolism is specific, is the ‘given’ itself, and invites us to read the more general meaning out of the case. Hence the exciting back-and-forth of real mental life, of *living* by symbols. We play on words, explore their connotations, evoke or evade their associations; we identify signs with our symbols and construct the ‘intelligible world’; we dream our needs and fantasies and construct the ‘inner world’ of unapplied symbols. We impress each other, too, and build a social structure, a world of right and wrong, of demands and sanctions”.

Thus language, and the actuals it creates from the counterfactuals it enables us to access, powers the imagination, not only in art but in science: “It is one of the novelities of human language that it encourages story telling, and thus *creative imagination*. Scientific discovery is akin to explanatory story telling, to myth making and to poetic imagination”. Of course, “[t]he growth of imagination enhances [...] the need for some control, such as, in science, inter-personal criticism” (Popper, 1994), linguistic argument and disputation. But linguistic criticism of any form—including, primarily, *intra*-personal criticism—is a prerequisite for constraining the search—the “stage-setting”—of our mental models; the nonfictional and fictional stories we tell ourselves seeking to describe, explain, understand, predict, and appreciate all the worlds and characters we experience.

Indeed, as the late Dan Dennett (1995) asked insightfully, “how good can the ‘stage-setting’ be without the intervention of language to help control the manipulation of the model?” We all—consciously and/or subconsciously—must be soliloquizing (primarily internally, occasionally externally), figuring out what *is* and what *could/should* be. “How intricate and long-range can the look-ahead be, for instance? [Darwin] was convinced that language was the prerequisite for ‘long trains of thought’”, and so am I. (“Stage-setting” is a telling phrase: The mental life is experienced as a play—that is to say, aesthetically. Read *As You Like It*, *Macbeth*, ...)

Speaking of Darwin, his *Origin of Species* (Darwin, 1859/2005)—the actual text itself—proves how “long trains of thought” are architected linguistically. Darwin described the book as “one long argument”. In one long but comprehensive passage, where I have emphasized in italics the operative “genetic” traits of its logical “phenotype”, he masterfully orchestrates his linguistically-structured reasoning into the theory that would revolutionize our understanding of life by inverting the argument from design and explaining how *constraints* and *selection* on processes of *assembly* (see Sharma et al., 2023) ineluctably generate diversity and complexity:

*If*, during the long course of ages and under varying conditions of life, organic beings vary at all in the several parts of their organization, and I think this cannot be disputed; *if* there be, owing to the high geometric powers of increase of each species, at some age, season, or year, a severe struggle for life, and this certainly cannot be disputed; *then*, considering the infinite complexity of the relations of all organic beings to each other and to their conditions of existence, causing an infinite diversity in structure, constitution, and habits, to be advantageous to them, *I think it would be a most extraordinary fact if no variation ever had occurred useful to each being’s own welfare*, in the same way as so many variations have occurred useful to man. But *if* variations useful to any organic being do occur, *assuredly* individuals thus characterized will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance they will tend to produce offspring similarly useful to each being’s own welfare, in the same way as so many variations characterized. This principle of preservation, I have called, for the sake of brevity, Natural Selection.

This passage—like so many in the history of science (to say nothing of art)—inscribes thoughts no nonlinguistic mind could think. It is therefore baffling that FPG should maintain that “language appears to not be necessary for any forms of thought”. To the contrary, the necessity of propositional—linguistic—structure is literally self-evident in the Darwin passage and indeed all discursive—to say nothing of poetic—thought. (And

note its primary function: it is the structure of thought; its communication would be ancillary, an exaptation.) Propositions—linguistic objects that can be predicated of truth and falsity—are the building blocks of explanations. Humans, by dint of the recursive power of language, are *universal explainers*, the prerequisite for being *universal constructors*. (And note that explanations and constructive transformations neither imply nor require communication.) The languageless mind could never explain and thus never transform its world (for the better or for the worse) to the limits of the possible.

“Consider the set of all conceivable transformations of physical objects. Some of those (like faster-than-light communication) never happen because they are forbidden by laws of nature; some (like the formation of stars out of primordial hydrogen) happen spontaneously; and some (such as converting air and water into trees, or converting raw materials into a radio telescope) are possible, but happen only when the requisite knowledge is present—for instance, embodied in genes or brains. But those are the only possibilities. That is to say, every putative physical transformation, to be performed in a given time with given resources or under any other conditions, is either [...] impossible because it is forbidden by the laws of nature; or [...] achievable, given the right knowledge” (Deutsch, 2011).

And, as Hamlet asked, what is a mind that fails to attain such transformative force but the “quintessence of dust”? By contrast, as Shakespeare demonstrated, the linguistic mind *can*—and in fact *has*—become a force of nature, literally, and therefore *could* attain—and perhaps *has* already attained—almost angelic action and godlike apprehension—as is needful to attain rational, moral, and aesthetic *arete*. Indeed, when used artistically, language also gives experience its form, making it conceivable: “As soon as the natural forms of subjective experience are abstracted to the point of symbolic presentation”, as they are in language (and other artistic forms), “we can use those forms to imagine feeling and understand its nature. Self-knowledge, insight into all phases of life and mind, springs from artistic imagination. That is the cognitive value of the arts” (Langer, 1966).

*Nota bene:* The self-knowledge conferred by the arts is the moral prerequisite for deciding whether to engage in a particular transformation task. As Rilke (1908/2024) observed, art demands that “You must change your life”. Aesthetics, epistemology, and morality are all aspects of the same metaphysical crystal. It is logically impossible to predict what the effects of our (always fundamentally aesthetic) creativity will be, so there is always promise and peril—the potential for beauty and horror, behold the *mysterium tremendum et fascinans*. From this philosophy of creativity (competence) follows a philosophy of action (performance):

“The future depends upon ourselves. It is we who bear all the responsibility. For this reason, an important principle holds: It is our duty to remain optimists[...]. The future is open. It is not predetermined and thus cannot be predicted—except by accident. The possibilities that lie in the future are infinite. When I say ‘It is our duty to remain optimists’, this includes not only the openness of the future but also that which all of us contribute to it by everything we do: we are all responsible for what the future holds in store. Thus it is our duty, not to prophesy evil, but, rather, to fight for a better world” (Popper, 1994).

Optimism is thus not a symptom of temperament, but a recognition of a metaphysical truth—that of infinite possibility—which entails a moral—and ultimately aesthetic—commandment: make the world beautiful. (“You must change your life”). Why? There is no why. Beauty—the beauty of the world, including all life—is worth it for its own sake.

Thus, whilst profoundly valuable as a cognitive tool for the art of self-knowledge, to say language is “for” anything other than “its own sake” strikes me as discordant. Like a work of art, the language faculty and the structures it creates simply exist, with no intrinsic utilitarian telos. As we have explained elsewhere (see Hauser et al., 2014), a biological organ does not evolve “for” anything; rather, things emerge with their form determined by natural law, and then may be exapted and iterated upon by natural selection; furthermore, throughout this process, natural selection is not selecting *for* any particularly adaptative purpose, but only *against* maladaptive traits—and is in this way analogous to Popperian epistemology, which does not select *for* (verify) theories inductively, but only selects *against* (criticizes and possibly falsifies) bad conjectures deductively.

Whilst Popper’s Darwinian epistemology explains how knowledge—be it scientific (i.e., information in the mind and its products) or biological (i.e., information encoded genetically and expressed phenotypically)—is used to solve problems—explain phenomena or adapt to the environment—it does not purport to explain the origin of knowledge. Knowledge—and thought generally—is subject to the Parmenidean principle *ex nihilo nihil fit*: nothing comes from nothing. Thought cannot come from nothing. And it cannot come from us, for that would imply either the logical impossibility of thinking the thought into existence (consciously or nonconsciously) or the demonstrable falsehood of randomness: thought is novel but nonrandom. Ergo, the thought is never created: it is *discovered*. It is “out there” in exactly the same way mathematical theorems are “out there” once the axioms are defined. With thoughts, they are “out there” once the “axioms” of language are “defined”: once the mind/brain is endowed with the principles, primitives, and procedures of the language faculty—to wit, Universal Grammar.

Sentences—thoughts—are “out there” waiting to be discovered. The feeling that we experience of “expressing our thoughts” is the feeling of discovery. We are experiencing

the *making* of objects in our minds that *match* the objects “out there”—*making and matching* being the modus operandi of aesthetic creativity (expounded in the work of E. H. Gombrich).

Prior even to the structures (thoughts) it creates synchronically, the language faculty itself was “discovered” diachronically, not by any mind, of course, but by biological evolution. As we have explained elsewhere, the human language faculty is a species of Turing machine (see Roberts et al., 2023), a mathematical object, now embodied in *Homo sapiens sapiens* (and possibly in some extraterrestrial intelligence(s) and possibly in our future AI).

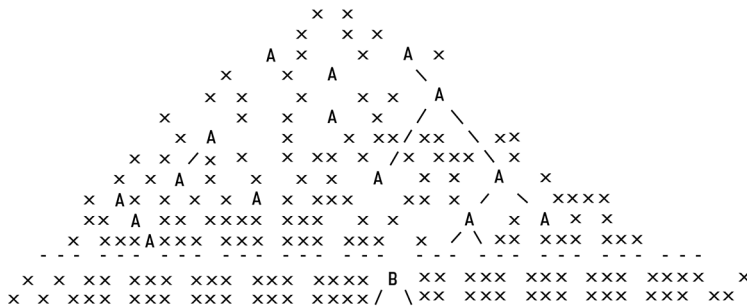
We can investigate the nature of this Turing machine by exploring “the space of all possible Turing machines (i.e., the space of all possible computer programs); not exhaustively of course, but with sufficient breadth and depth to make some profound discoveries. Marvin Minsky, as founder of the artificial intelligence laboratory at MIT, and his student Daniel Bobrow, once enumerated and ran some thousands of the simplest Turing machines (computer programs with minimal numbers of rules). Intriguingly, out of the infinity of possible behaviors, only a surprisingly small subset emerged. These divided into the trivial and the nontrivial. The boring programs either halted immediately or erased the input data or looped indefinitely or engaged in some similar silliness. The remainder, however, were singularly interesting: *all* of these programs executed an effectively *identical* counting function—a primitive of elementary arithmetic. In fact, this operation reduces to a form of the recursive function generative of syntactic structures in human language” (Watumull & Chomsky, 2020).

This is the Merge function. The implication of the fact that all these Turing machines—these “A-machines”—reduce to Merge is profound:

“[I]t seems inevitable that, somewhere, in a growing mind some A-machines must come to be. Now, possibly, there are other, really different ways to count. So there may appear, much, much later, some of what we represent as ‘B-machines’—which are processes that act in ways which are similar, but not identical to, how the A-machines behave. But, our experiment hints that even the very simplest possible B-machine will be so much more complicated that it is unlikely that any brain would discover one before it first found many A-machines” (Minsky, 1985).

Figure 2

Universe of Turing Machine Rules



Note. Adapted from Minsky (1985).

“This is evidence that arithmetic—the foundation of any mathematical/computational system—as represented in an A-machine—reducible to Merge—is technically an *attractor* in the *phase space* of possible mathematical structures:

‘any entity who searches through the simplest processes will soon find fragments which do not merely resemble arithmetic but *are* arithmetic. It is not a matter of inventiveness or imagination, only a fact about the geography of the universe of computation” (Minsky, 1985).

Obviously this thesis generalizes beyond arithmetic to all simple computations (see Wolfram, 2002). “Because of this, we can expect certain ‘*a priori*’ structures to appear, almost always, whenever a computational system evolves by selection from a universe of possible processes” (Minsky, 1985). Analogously, I submit that it is not implausible that an evolutionary search through the simplest computations will soon find something like Merge. Merge is a function so elementary as to be subsumed somehow in every more complex computational procedure: take two objects X and Y already constructed and form the object Z without modifying X or Y, or imposing any additional structure on them: thus Merge(X, Y) = {X, Y}” (Watumull & Chomsky, 2020).

The operation of Merge and the structures it generates conform to virtual conceptual necessity—satisfying principles of simplicity, economy, symmetry, nonredundancy, et cetera—which can conflict with communicative efficiency, thereby falsifying FPG’s claim that language is a tool *primarily* for communication. Beauty—computational optimality—is primary, communication ancillary. Consider the textbook case of the structure-dependence of syntactic rules.

By dint of logic, two forms of Merge are logically possible given the definition of Merge as  $f_{\text{MERGE}}(X,Y) = \{X,Y\}$ . Call these External Merge and Internal Merge. The former—



basic combinatoriality—applies if neither of the objects includes the other:  $f_{\text{MERGE}}(X, Y) \mid ((X \notin Y) \wedge (Y \notin X)) = \{X, Y\}$ ;  $f_{\text{MERGE}}(\text{Cheshire}, \text{cat}) = \{\text{Cheshire}, \text{cat}\}$ . The latter applies if one of the objects includes the other:  $f_{\text{MERGE}}(X, Y) \mid ((X \in Y) \vee (Y \in X)) = \{X, Y\}$ ;  $f_{\text{MERGE}}(\{\text{which}, \text{cat}\}_1, \{\text{Alice}, \{\text{saw}, \{\text{which}, \text{cat}\}_1\}\}) = \{\{\text{which}, \text{cat}\}_{1,2}, \{\text{Alice}, \{\text{saw}, \{\text{which}, \text{cat}\}_1\}\}\} = \dots \{\text{which cat did Alice see}\}$ . Internal Merge is not a complication, computationally speaking (see Watumull, 2015): it is automatically available given the minimax generative procedure (i.e., the effectively unary binary function of an algebraic free magma). Internal Merge is equivalent to a movement operation or displacement transformation: the *wh*-phrase is interpreted in two positions: as the object of the verb and as a variable binding the object position (i.e., “for which cat *x*, Alice saw cat *x*”). With Internal Merge it is unnecessary to construct a copy and figure out how to relate it to the object in base position, which is impossible for many AI parsing programs. Internal Merge thus complicates communication: communication would be simpler were both copies of the *wh*-word pronounced, but the language faculty minimizes computation. It is more beautiful than useful.

“If both of the copies were pronounced in such examples as these, perception would be much easier. In fact, one of the main problems faced in theories of perception, and programs of machine parsing and interpretation, is to find the unpronounced gaps—so-called filler-gap problems. There is a good computational reason why only one of the copies is pronounced: to pronounce more of them would yield enormous computational complexity in all but the simplest cases. We therefore have a conflict between computational efficiency and efficiency of use, and computational efficiency wins hands down. As far as is known, that is true for all constructions, in all languages. [T]here are many other cases of competition between computational efficiency and efficiency of use (parsability, communication, and so on). In all known cases, the latter is sacrificed: language design keeps to computational efficiency. The examples are by no means marginal. The case just discussed, for example, is the core problem of parsability and perception. These results suggest that language evolved for thought and interpretation: it is fundamentally a system of meaning. Aristotle’s classic dictum that language is sound with meaning should be reversed. Language is meaning with sound (or some other externalization, or none)” (Berwick & Chomsky, 2016).

That rules determine dependencies within structures emerges from the fundamental architecture of the language faculty as equivalent to a formal axiomatic system (see Watumull & Chomsky, *in press*). In our framework, *knowledge of language*—i.e., *linguistic competence*—subsumes Aristotle’s notions of *possession* and *use*. The latter is a proper

subset of the former in the sense that the set of expressions we *can* use is a proper subset of the expressions we know. Possession consists of the set of expressions generated by the “axioms” of the language faculty and the rules of “inference” or derivation. These expressions are formally analogous to the infinite set of *classical proofs*—geometric objects—generated by a formal axiomatic system. The proper subset of expressions we can use—derived by specific computational operations inscribed in our knowledge—are formally analogous to the infinite set of *constructive proofs*—stepwise computations—matching a given set of classical proofs. To say “formally analogous” is the strongest of claims: a sentence *is* a proof. This “linguistic proof system”, constitutive of competence, is *one* of the systems accessed in *performance*—the production of the set of expressions we *actually* use (in art and self-understanding and thought primarily, in communication ancillary). Analogously, the set of proofs mathematicians actually produce is a subset of the proofs they *could* construct, itself a subset of the proofs entailed by their knowledge of the axioms, rules of inference, etc.

In the abstract there is a logical order from axioms to theorems, but in actual production the proof can be approached from whatever direction works pragmatically. One profound implication of this conception is a unification of epistemology and metamathematics: *We always know more than we can use*. The knowledge we possess is infinite, like the infinite set of theorems generated by the axioms of a formal system; these are the *computable* expressions. The knowledge we can use is also infinite, but a smaller infinity: namely, the *efficiently* computable subset. We have known since Cantor that there exist different sizes of infinity “out there” (in Plato’s heaven, accessible via the Imaginal), but never before have we appreciated that they exist “in here” (in our minds). Of course, the knowledge we actually *do* use is finite, because we are finite creatures (at present).

In order for the possession of linguistic knowledge to be used—in other words, in order for the abstract objects to be cognitively and neurobiologically realized, for the classical proof to be constructed, for the counterfactual to be actualized—the mathematical structure of the possessed knowledge must be computed in its use. This is the technical meaning underlying the cheeky dictum that *language is perfect, but unusable*. Language is, *pace* FPG, not at all “optimized for communication”. The only sense in which it is optimal is proof-theoretic in that it is the minimal system generative of maximal complexity: a parsimoniously finite endowment creative of infinite knowledge. It therefore conforms to Leibniz’s *lex parsimoniae* that “the simplicity of the means counterbalances the richness of the effects” such that “the maximum effect [is] produced by the simplest means” (see Roberts & Watumull, 2015).

To understand the classical/constructive distinction in language, let us explore its analogue—or possibly homologue—in Euclid’s *Elements*. We can picture a *classical* proof graph of all 465 of Euclid’s theorems derived by his rules of inference (Figure 3). (Of course the axioms generate an infinite set of theorems, but Euclid limited his scope to that *interesting* subset—which is itself interesting.) By analogy, the axioms of the



linguistic derivations. It should go without saying that this knowledge is *intensional*, not *extensional*: What is possessed in the finite mind is the function defined in intension whose range is the infinite set of objects defined in extension, exactly analogous to the knowledge possessed by any Turing machine with access to unbounded memory.

It is profoundly interesting that this analogy from mathematical proofs to linguistic derivations shows us how to define *causality* in the space of abstractions (e.g., mathematical theorems, linguistic expressions, etc.): the classical proof graph is a *causal* graph—the latter equally applicable to defining causality in physical space. This purely structural notion of causality (i.e., causality is defined in terms of the abstract structure of the causal graph) is superior to temporal notions (in which causes are defined as preceding their effects in time), which are incommensurable with the theory of computation and inconsistent with the best theories in modern physics. Moreover, these causal graphs harmonize with the cogent theories of causality posited by David Lewis and Judea Pearl, *pace* Humean approaches—metastasized in modern statistics and machine learning—that reject causal talk—and even deny causality *per se*—altogether.

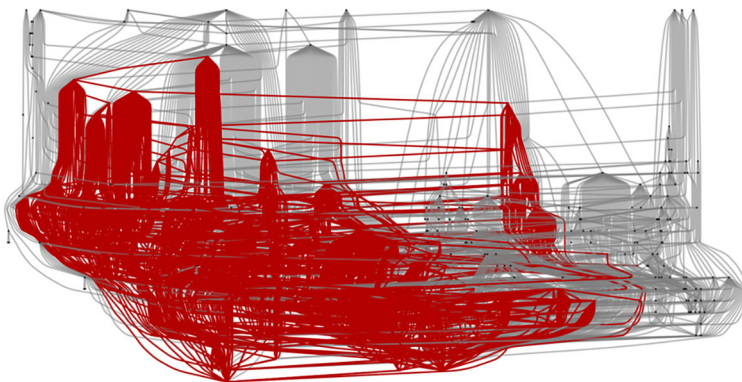
*Nota bene*: My sense of causality is quite idiosyncratic: Causal relations do not exist *in* time; they exist as mathematical objects *outside* of time as the preconditions for anything to *be*. This conjecture as to the abstract but causal nature of (linguistic) proofs comports with Plato’s Eleatic Principle, articulated in *The Sophist*, that to be real is to have causal powers: “My notion would be, that anything which possess any sort of power to affect another, or to be affected by another, if only for a single moment, however trifling the cause and however slight the effect, has real existence; and I hold that the definition of being is simply power”. Classical proofs certainly affect us, canalizing what proofs we can and cannot construct. The abstract rules of mathematics determine what can be proved; the abstract rules of language determine what can be thought/said. We are affected by counterfactuals—by possible/impossible proofs. We are affected by what sentences are possible—we cannot think/say the impossible, tautologically, but anything that is thinkable/sayable is possible (see Martel, 2015). And we certainly affect constructive proofs, tautologically: we are the constructors. I mean this literally, in the sense that our minds are constructors: systems capable of constancy across the performance of arbitrary transformation tasks. We make proofs, sentences, works of art.

Human mental computation of a causal graph starts from a set of “initial events” (a “big bang”, if you will), corresponding to the axioms (see Wolfram, 2020). Each consequent (not “subsequent”) theorem is then an “event”, and we can see the classical graph as tracing the causal connections between events. This graph, analogous to a causal graph for physics, defines a partial ordering: The proof of a given theorem cannot be computed “until”—or “unless” (to dispel any connotation of temporal flow)—the theorems that appear in said proof have been proved. Thus, within mathematical and linguistic causal graphs, we can define objects analogous to the “light cones” that can be defined

for physical causal graphs: the determinate set of “future” theorems that can be “affected” by any given theorem (see Figure 4).

**Figure 4**

*The “Future Light Cone” of Book 1, Theorem 5 in Euclid’s Elements: “In Isosceles Triangles the Angles at the Base are Equal to One Another, and, if the Equal Straight Lines Be Produced Further, the Angles Under the Base Will Be Equal to One Another”*



Analogues to such “light cones” exist in language wherever mathematical law constrains the possible continuations of the derivation: for instance, the interrogative *How many cars did he wonder whether the mechanics fixed?* is within the future light cone of the declarative *He wondered whether the mechanics fixed the cars*, whereas *How many mechanics did he wonder whether fixed the cars?* is not. The declarative can be transformed into the first interrogative, but not the second, consistent with virtual conceptual necessity.

Such constraints resolve a paradox implicit in my approach: How can I identify thought with language when it seems that some thoughts are thinkable but linguistically inexpressible? For instance, neither *the boy and the girls is in the room* nor *the boy and the girls are in the room* is well-formed, and yet it seems—we “feel” (seemingly)—that there is a well-formed “underlying” thought. This is an illusion, I submit. “We often find it hard to express our thoughts—to summarize our mental states or put our ideas into words. It is tempting to blame this on the ambiguity of words, but the problem is deeper than that. *Thoughts themselves are ambiguous*” (Minsky, 1986).

To reiterate, I reject as incoherent the notion of thoughts being (in)expressible, precisely because I *do* identify thought and language. There is an underlying thought, but I conject that it is linguistic: there does exist a well-formed classical “proof” of the expression-thought *the boy and the girls \_\_ in the room*, but its future light cone does not contain either inflection of the copula; to be specific, neither expression has a constructive “proof” within the system. Thus the thought is perfectly linguistic, and

it exists classically, but it is unconstructable, and hence it is unusable. Thus there is no *inexpressible* thought. Rather, the thought itself cannot be constructed, though we do know (possess) it, in the classical sense. Hence the sense of the ambiguousness of the thought itself. And most importantly, when we recognize the error in constructing the expression, we can recursively use language (as critical rationalists) to correct it, constructing a circumlocution, finding a different path in the proof graph. This is profoundly interesting: *unconstructable expressions are formally analogous to Gödel sentences*: we cannot derive the statements within the specific system, but by using “ordinal linguistic logic” and critical rationalism, we can “jump up” a level, “see” their well-formed classical structures, and construct effectively equivalent expressions (see [Watumull & Chomsky, in press](#)). As Roger Penrose (1989) has observed, such “insight” or “understanding” is the quiddity of the human mind. We can of course continue this recursively, accounting for our unbounded creativity and potentially infinite understanding (via the infinitely explanatory power of this process).

In sum, humans possess an infinite set of classically elegant computable expressions, only an infinite subset of which can be efficiently constructed. Hence we see that language—hence thought—is designed for beauty, not use.

For some readers, I imagine, the beautiful unusability of *language* is counterintuitive enough, and the beautiful unusability of *thought* beggars belief, for they think surely thoughts exist to be used. But this is not necessarily so. Plato certainly did not think so: knowledge of the Forms, or Ideas, was always incomplete, and (imperfectly) attainable only by rigorous elenchus (conjecture and criticism) and diligent anamnesis (discovery = recovery of knowledge); the use of such shadowy knowledge as the basis for the Good life was more difficult still. In my scheme, thoughts are homologous to theorems—they are “out there” in the set of expressions generated by the axioms of language. In this respect they are essentially Platonic. And like theorems, some are more or less interesting, more or less usable. In fact, in the case of Euclid’s *Elements*, we can even quantify how interesting and useful particular theorems are in terms of how frequently they are used in the proofs of other theorems (see [Wolfram, 2020](#)). [Figure 5](#) is a copy of [Figure 3](#), now mapped with all the theorems where size is determined by the number of uses (i.e., their sizes in the graph are determined by the sizes of their “future light cones”). Many theorems are indeed useful; some exceedingly so. However, some are never used (outside their own derivation) or can never be used *in particular ways*. And of course there exist infinitely many theorems beyond this graph that exist but cannot be used, or that could be used but will not be; and, obviously, there exist finitely many theorems beyond this graph that do follow from the axioms and that have been used or will be. *Mutatis mutandis* with the expressions of human language.



Figure 5

*The (Un)Interestingness-(Un)Usability of Euclid's Theorems*

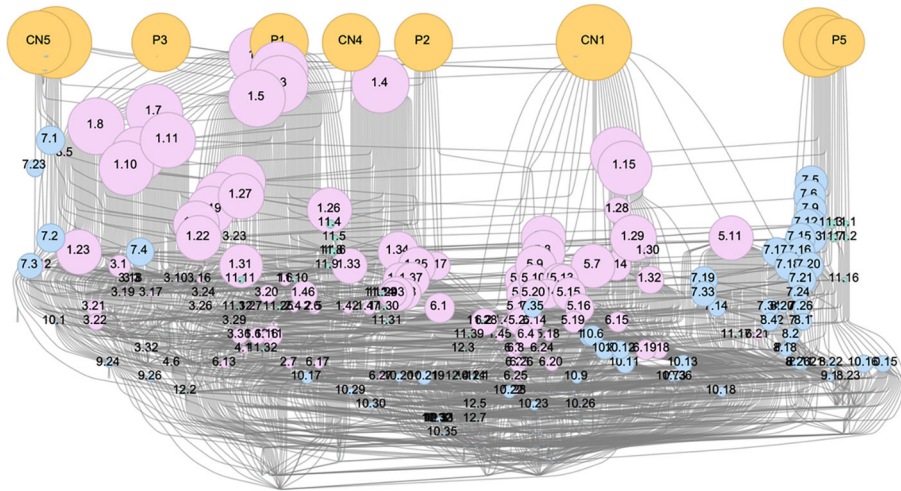


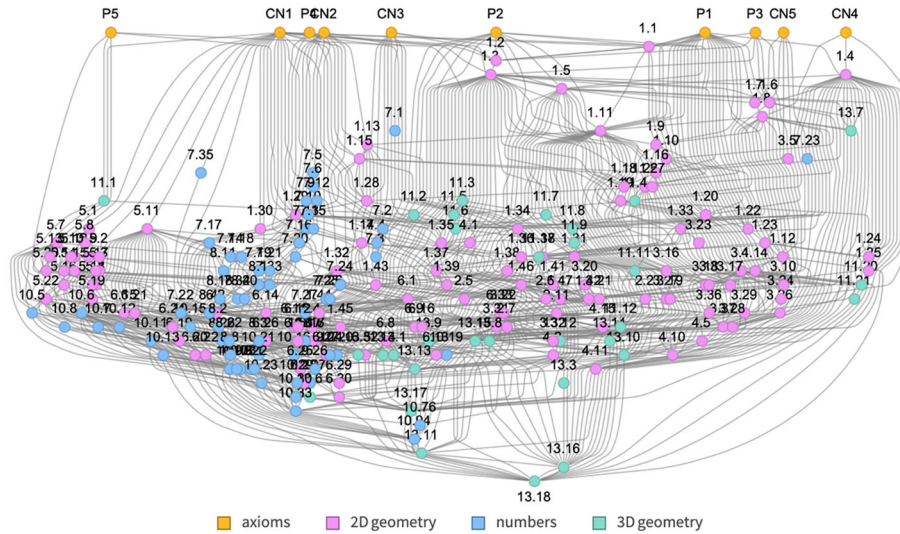
Figure 5 inspires a conjecture on the nature of *creativity*: Truly creative and novel thoughts could be conceived of as theorems (mathematics) or expressions (language) that exist in special places in the graph (the conceptual space) and/or are derived by special paths and/or form special vertices. Equivalently, we could say that the Imaginal is that plane of creativity where the spheres of constructive proving and classical proofs intersect. Such an intersection is technically a circle, but *the magic of the Imaginal cuts the circle so as to spiral* (see Martel & Ford, 2022).

Euclid's theorem for the existence of the Platonic solids (Figure 6) is in a quantifiable—and perhaps qualitative—sense the most difficult to prove, in that its garden of forking proof paths is the most elaborate.



**Figure 6**

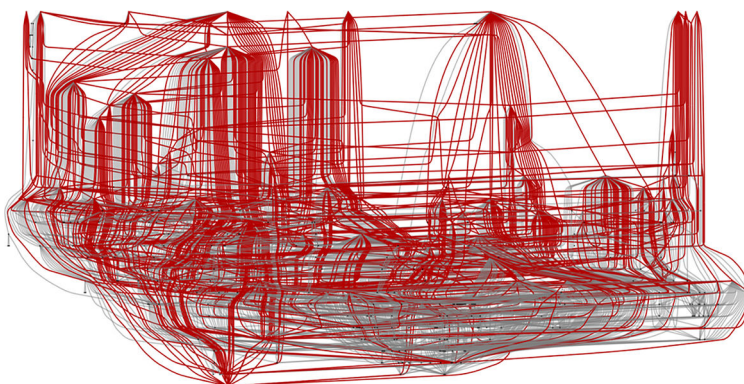
*The Classical Proof Graph of Theorem 18 of Book 13 of The Elements*



Given this classical proof graph—the abstract mathematical object—we can discern the “past light cone”—or, in assembly theoretic terms (see Sharma et al., 2023), the evolutionary history—of theorem 13.18: the set of dependencies that support the theorem (Figure 7).

**Figure 7**

*The “Past Light Cone” (Set of Dependencies) of Theorem 18 of Book 13 of The Elements*



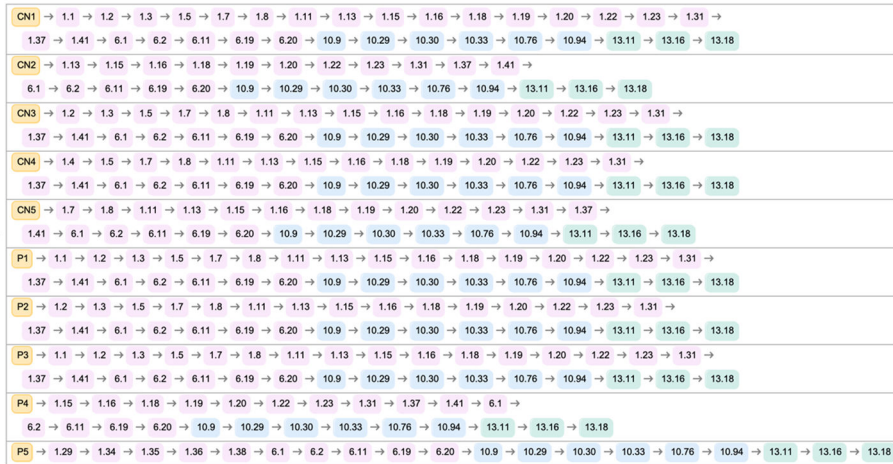
Such “support” is the basis for *counterfactual-supporting*—i.e., *causal*—statements. As we have discussed (see Chomsky et al., 2023), counterfactuals endow our species with the capacity for a new mode of explanation: humans, unlike modern AI, make sense of what *does* occur by reference to what *could*—and most importantly, what *could not*—occur, and why. Thus, to understand proofs—and analogously linguistic derivations—as classical objects over and above their particular constructions is to understand a new metaphysics: mathematical and linguistic objects are *abstract*, but not *acausal*. Many—dare I say most—philosophers and physicists would deem this a contradiction in terms: Surely, an abstract object is by definition acausal. But this is demonstrably not the case. For instance, and importantly for my theory, it is already obvious that those mathematical structures known as graphs interact causally with the physical world. In the Popperian parlance, “World 3” (the abstract) interacts with “World 1” (the material), I would say via World 2 (the mental). The *causal* explanation for why it is impossible to cross each of the bridges in Königsberg exactly once *is* the multigraph of those bridges (assuming, *arguendo*, that the number of Euler’s bridges has not changed since 1736). Within such a metaphysics we could arguably understand the more general concept of *information* as follows: The set of causes that can be permuted and combined and copied (or, more simply, as causal abstractions), whose effects are most manifest in the physics of life and mind (particularly language).

We can now discover natural orderings of efficiency within the space of possible computations—note, computational efficiency (mathematical elegance) with no consideration for its communicative (in)efficiency. Here, “to a first approximation, [computational] cost is determined by length; the condition requires the shortest derivation” (Chomsky, 1991). The notion “shortest length” can be defined in an objective, absolute sense (see Watumull & Chomsky, 2020). And thus we can rigorously reestablish the notion of an “economy of derivations”. This notion had been a prime desideratum in the minimalist program for linguistic theory as originally conceived, for “there is varied evidence suggesting that both derivations and representations are subject to a certain form of ‘least effort’ condition and are required to be minimal in a fairly well-defined sense, with no superfluous steps in derivations and no superfluous symbols in representations. Proceeding in the way indicated, we may hope to raise these ‘least effort’ guidelines to general principles” (Chomsky, 1991). Understanding linguistic derivations as formally analogous to mathematical proofs realizes this hope. We can see this by returning to Euclid.

For Theorem 13.18, its set of dependencies (Figure 7) is equivalent to its set of possible proofs. Here, as in language, “cost is determined by length” (Figure 8).

Figure 8

Some of the Proofs of Euclid’s Theorem 13.18, Starting From Axioms (Yellow), Traversing Steps and Lemmas of 2D Geometry (Pink), Numbers (Blue), and 3D Geometry (Green)



For instance, in Figure 8, from CN1 (“Common Notion 1” that “Things which are equal to the same thing are also equal to one another”), we need 32 steps to reach 13.18. The shortest proof (24 steps)—the most economical derivation—starts from P4 (“Postulate 4” that “all right angles are equal to one another”). Humans can in principle construct any such proof, but the shortest is understood to be the *best of all possible* proofs according to the Leibnizian *lex parsimoniae*, which within the minimalist program is not a methodological precept, but a metaphysical principle.

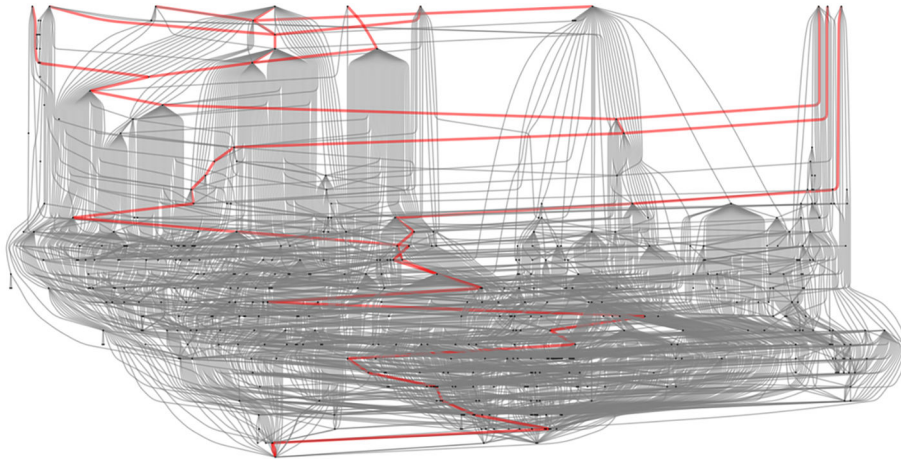
In the classical space, all proofs—mathematical and linguistic—are Real; in the constructive space, only some can become realized (i.e., only some can be created); and of those that can be realized, mathematical law constrains us to realize only the most economical. Substituting terms, in the classical space, all proofs are possible (i.e., all counterfactuals exist); in the constructive space, only some proofs can be actualized; and of those that can be actualized, those that are in fact actualized are those that conform to virtual conceptual necessity. Or, in terms pleasing to J. R. R. Tolkien, all proofs have been Created (by something beyond us), but humans “subcreate” only the most beautiful subset.

“[T]his approach tends to eliminate the possibility of optionality in derivation. Choice points will be allowable only if the resulting derivations are all minimal in cost” (Chomsky, 1991). This empirically corroborated linguistic conjecture is corroborated formally in my proof schema. For instance, in proving 13.18, one can “choose” any given starting point, and yet all paths inevitably converge at 6.1 (“Triangles and parallelograms

which are under the same height are to one another as their bases”), and thereafter follow the same final 14 steps—the shortest path, hence with minimal cost (Figure 9).

**Figure 9**

*Convergence (Inevitability) in Proof Space*



The lack of choice, the inevitability, of linguistic—ultimately mathematical—derivations is, paradoxically, the essence of *aesthetic freedom*. As the poet Danielle Blau (2023) has observed, this weirdness, this wonderfulness, is distinctly Spinozist: “I say”, Spinoza wrote in the autumn of 1674, “that a thing is free which exists and acts solely by the necessity of its own nature”. Here, already, we (seem to) see a weird and wonderful antinomy: “You see I do not place freedom in free decision, but in free necessity”.

Say it aloud: “*free necessity*”! The mind boggles. But here it is language—specifically poetic language—that resolves the (seemingly) contradictory notions of *freedom* and *necessity*. The poet David Whyte (2024) observes that all humans, by their nature, live in the poetic mode:

“Poetry might be the miracle art form we practice every day of our lives whether we are aware of it or not. Not all of us grow up from infancy practicing the art forms of painting, sculpture or music, but all of us grew intimately and from our very birth learning the power of words and the magic of language, when words first met and constellated together in such astonishing ways. Words were our horizon between self and other. A child learning the word ‘door’ for the first time is not describing something that lives only outside of themselves, but experiencing everything inside them or outside

their bodies that might be opened, leant against or closed against them. Poetry is the art of uniting the inner and the outer worlds”.

Poetry, Whyte says, is overhearing yourself say things you did not know, or you did not want to know, about yourself, about the world, and thus is “a break for freedom”. And what do we hear? Using language (see Whyte, 1992), every one of us, however prosaic,

... like Blake  
in his engraving shop, works  
with the fierceness of acid on metal.  
*Melting apparent surfaces away and displaying the infinite which was hid.*

This revelation of the infinite in the finite is to live Spinoza’s “free necessity”, to live according to its weird and wonderful internal laws of poetic logic, “determined utterly and decisively by the nature of the poem, and of the poem alone”, Blau says.

In my ontology, the poem—like all linguistic objects, all mathematical objects—is “out there”, and creativity consists in our seeking to make something to match it. (One might say we seek signs for the symbols, or phenomena for noumena.) The poem is thus autonomous, *inviting* us to *converse* with it. Whyte calls this invitational dynamic the conversational nature of reality. “And though the poem is beholden to nothing and no one beyond its own nature, if you listen, it will tell you—its writer—where it needs to go, in its own time, in its own language” (Blau, 2023). This perfectly—or I should say poetically—describes the phenomenology not only of writing, but of all linguistic creativity: linguistic “expression” is our acceptance of the invitation to a conversation with reality. It is in this sense only that language is “primarily” for “conversation”, but this obviously is not what FPG mean by communication. A “successful” poetic conversation of the kind I (and Whyte) mean may be that communion variously described in different traditions—everything from philosophy and religion to science and mathematics—as “transcendence” or “enlightenment” or “revelation” or “emptiness” or “ecstasy” or “epiphany” or “aporia” or “insight” or ....

The structure of our poetic conversation with reality is formalized in the linguistic proof graphs where we see the duality of *shortest path* and *minimal cost*, the former corresponding to a “representational” notion, the latter to a “derivational” notion, in linguistics speak. The obvious analogy in proof speak would be to the classical and constructive notions, respectively. Let us again consider Figure 8. The abstract representation of the proof path is its classical proof (i.e., the red line abstracted as an object). Its constructive proof corresponds to the stepwise, derivational drawing of the path.

Playfully, but usefully, we can say that the classical/constructive distinction is rather analogous to the bird/frog distinction discussed in quantum physics: “Everett’s many-worlds [...] theory becomes easier to grasp when one distinguishes between two ways of viewing a physical theory: the outside view of a physicist studying its mathematical



equations, like a bird surveying a landscape from high above it, and the inside view of an observer living in the world described by the equations, like a frog living in the landscape surveyed by the bird” (Tegmark, 2014). In minimalist linguistic theory, the bird sees the classical representation of an expression whilst the frog sees its constructive derivation.

We can see the classical proof as *a mathematical structure defined by a computation*, to wit, the constructive proof. In our bird/frog physics analogy:

“A mathematical structure is an abstract, immutable entity existing outside of space and time. If history were a movie, the structure would correspond not to a single frame of it but to the entire videotape. Consider, for example, a world made up of pointlike particles moving around in three-dimensional space. In four-dimensional spacetime—the bird perspective—these particle trajectories resemble a tangle of spaghetti. If the frog sees a particle moving with constant velocity, the bird sees a straight strand of uncooked spaghetti. If the frog sees a pair of orbiting particles, the bird sees two spaghetti strands intertwined like a double helix. To the frog, the world is described by Newton’s laws of motion and gravitation. To the bird, it is described by the geometry of the pasta—a mathematical structure” (Tegmark, 2014).

I conject that this analogy is not metaphorical, but metaphysical. It could be that the set of classical expressions language generates is “an abstract, immutable entity existing outside of space and time”, whilst the set of constructive expressions is contingent upon the physics of the universe in which the particular human language-user is realized. This is like saying *the set of classical proofs generated by a given axiom set is constant across the multiverse whilst the set of proofs actually constructed in a particular universe is contingent upon the physics of that universe*.

This thesis that linguistic derivations are forms of proof may seem incredibly reductionistic, to say nothing of sounding insufferably dry, but it is in fact the wellspring of life-giving poetry. We exist as constructors in a classical proof graph. The latter is a static, immovable, abstract object, and it is only by dint of the former—the fact that we are language-using entities—that dynamism, that embodied conceptual movement is possible. Cinematically, the cosmos is the film whose discontinuous frames flow into continuity only by our workings.

And once we exist as creative constructors, we must navigate the wild garden of forking paths that threatens to confound us. It is here that we use poetry like the light *Eärendil*:

“At times we feel immovable and stuck in the midst of all this constellating, movable wildness. But what is most immovable in us

is often what moves the most if we are able to articulate the exact essence of how we are feeling stuck. That is the essence of poetry. All of the impossibilities of our life start to become possibilities once they are articulated, once they’ve been spoken out into the world. It is the ability to speak our immovability, distance and our impossibilities in the world that allows us to join the wildness, movement, and incredible invitations that our ‘incarnation’ and our everyday life afford us. Poetry is the language that allows us to return to the world—to break through what is often a self-made perimeter or wall we’ve thrown up around ourselves, a bubble we have encapsulated ourselves in or a sense of insulation in which we only hear dull sounds from the outside—a dull reverberation that often takes the form of depression or difficulty. Poetry is a way of beginning to sing again and to sing our way through all barriers, back into the world through words” (Whyte, 2024).

These very words prove that even prose can be poetry. Poetic language is the singularity of language in the same way language is the singularity of intelligence, which is the singularity of life, which is the singularity of information.

“[This theory uniting Life, Information, Language, and Intelligence] can be conceived of as a set of singularities [in something like the mathematical sense]. We submit that if life is where information is most intense (where the density of information is maximal), then intelligence is where life is most intense (where the density of life is maximal); and language is where intelligence is most intense (where the density of intelligence is maximal). These transitions are perhaps phase transitions in the technical sense. Therefore, if one is interested in the laws of information, then one ought to study language. And the origin of universal intelligence is where language begins to affect life in nontrivial ways. Thus we see that the profoundest of questions—‘What is Life?’ (and its derivative ‘Are we alone?’) and ‘What is Intelligence?’ (and its derivative ‘Can machines think?’)—will be answered in the consilience of a unified explanatory theory subsuming a new physics of information and life, and a new philosophy of language and intelligence. From this consilience we may derive an aesthetic explanation for why there is something rather than nothing: an explanation that makes manifest how all explanations—all work(ing)s of human-style creativity—are fundamentally artistic” (Watumull & Chomsky, *in press*).



Poetic language, like all language, may but need not be consciously represented to condition our experience of the world(s). And even when externalized, it need not assume the form of speech: Touch can be poetic, movement can be poetic, et cetera—to say nothing of other modalities (e.g., music, painting, etc.), always structured “poetically”. Touch and speech, body and mind—there is a unification life, information, language, intelligence.

Thus we see the abundantly polysemous sense in which language is aesthetic in my framework: its design conforms to the virtual conceptual necessity—the mathematical beauty—of a formal axiomatic system, and its use is primarily “useless”, Wildean (i.e., giving material form to imaginal reality experienced as singular feelings in expressions which may or may not be communicated).

Here it is instructive to parse one of the first, partial articulations of the aesthetic framework (from Chomsky, 1992), giving the lie as it does to claims such as those in FPG.

“It’s often alleged that language is well adapted to the function of communication. It’s not clear that that statement is even meaningful, or any similar statements about biological organs.” (Chomsky, 1992)

Indeed, such allegations, exemplified in FPG, unfailingly fail to define what they mean by “language” and “communication”, and what it means for biological systems to be designed “for” some particular function.

“But to the extent that one can give some meaning to that statement, this one, again, looks just false. The design of language appears to make it largely unusable, which is fine. We just use those fragments that are usable for us.” (Chomsky, 1992)

Indeed, by now significant amounts of substantial work in the minimalist program has demonstrated that language seems optimally designed for computational efficiency rather than communicative ease. The structure-dependence of rules is the simplest and yet demonstrable evidence for this proposition (see Berwick et al., 2011).

“[T]his unusability property may be somewhat deeper [...]. Since the origins of modern generative linguistics, there have been attempts to show that the computational system is constrained by certain very general principles of economy, which have a kind of global character to them. [I]t turns out that quite a variety of strange things can be explained in these ways, in terms of a picture of language that is really rather elegant[...]. They’re not only elegant, but they’re pretty surprising for a biological system. In fact, these properties are more like the kind, what one expects to find, for quite unexplained reasons, in the inorganic world.” (Chomsky, 1992)

Indeed it has been shown that the basic procedures and fundamental principles of the human language faculty conform to general laws of economy as defined in theories of computability, complexity, and assembly (see [Watumull et al., 2017](#)).

“[In the end] what we might discover is that languages are learnable, because there isn’t much to learn, that they’re unusable in large measure, but that they’re surprisingly beautiful, which is just another mystery, if it turns out to be true.” ([Chomsky, 1992](#))

Indeed there isn’t much to learn because the basic procedures and fundamental principles of language are in a sense “out there”, like an abstract mathematical system—a species of Turing machine—“waiting” to be discovered—converged upon—by any evolutionary process (see [Roberts et al., 2023](#)).

It is not simply that language is unusable but beautiful; it is unusable *because* it is beautiful. In language, infinite creative scope is a direct function of limits that render some thoughts unusable. To reiterate, I do not mean literally unusable. I mean that language is not optimized for communicative use. It is optimal in the way the golden ratio is optimal—it is Platonically beautiful—as the solution to the physical constraints and mathematical equations that govern it.

Thus the mathematical limits that render some thoughts unusable—unconstructable—provide for literally limitless creativity. In using language not merely to communicate thoughts and feelings, but first and foremost to give form to thoughts and feelings—to make objects in our minds/bodies that match imaginal realities—we “reach” for the noumena—the “things in themselves” that manifest in phenomena. Yet, because of the Gödelian structure of language, we will never “grasp” all of them completely. This is the beautiful tragedy and irony of our condition, and there are profound mathematical-philosophical reasons for it, but I need not tarry over them here. Suffice it to say, in the poetic language of Robert Browning, “a man’s reach should exceed his grasp, Or what’s a heaven for?” ([Browning, 1855](#)).

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## References

Berwick, R. C., & Chomsky, N. (2016). *Why only us: Language and evolution*. MIT Press.

- Berwick, R. C., Pietroski, P., Yankama, B., & Chomsky, N. (2011). Poverty of the stimulus revisited. *Cognitive Science*, 35(7), 1207–1242. <https://doi.org/10.1111/j.1551-6709.2011.01189.x>
- Blake, W. (1796). *Ah! Sun-flower*. Poetry Foundation.  
<https://www.poetryfoundation.org/poems/43649/ah-sun-flower>
- Blau, D. (2023, October 4). *Sometimes I think that this is what it is to write a poem (and at such times I am, without doubt, a monster of grandiosity)*. Poets & Writers.  
[https://www.pw.org/content/sometimes\\_i\\_think\\_that\\_this\\_is\\_what\\_it\\_is\\_to\\_write\\_a\\_poem\\_and\\_at\\_such\\_times\\_i\\_am\\_with\\_out\\_a](https://www.pw.org/content/sometimes_i_think_that_this_is_what_it_is_to_write_a_poem_and_at_such_times_i_am_with_out_a)
- Browning, R. (1855). *Andrea del Sarto*. Poetry Foundation.  
<https://www.poetryfoundation.org/poems/43745/andrea-del-sarto>
- Cassirer, E. (1944). *An essay on man: An introduction to a philosophy of human culture*. Yale University Press.
- Chiang, T. (2024, August 31). Why A.I. isn't going to make art. *The New Yorker*.  
<https://www.newyorker.com/culture/the-weekend-essay/why-ai-isnt-going-to-make-art>
- Chomsky, N. (1955/1975). *The logical structure of linguistic theory*. Plenum.
- Chomsky, N. (1956). Three models for the description of language. *I.R.E. Transactions on Information Theory*, 2(3), 113–124. <https://doi.org/10.1109/TIT.1956.1056813>
- Chomsky, N. (1959). On certain formal properties of grammars. *Information and Control*, 2(2), 137–167. [https://doi.org/10.1016/S0019-9958\(59\)90362-6](https://doi.org/10.1016/S0019-9958(59)90362-6)
- Chomsky, N. (1965). *Aspects of a theory of syntax*. MIT Press.
- Chomsky, N. (1966/2009). *Cartesian linguistics*. Cambridge University Press.
- Chomsky, N. (1991). Linguistics and cognitive science: Problems and mysteries. In A. Kasher (Ed.), *The Chomskyan turn* (pp. 26–53). Blackwell.
- Chomsky, N. (1992). *Language and the “Cognitive Revolutions”* [20th Annual Killian Award lecture].
- Chomsky, N. (1995). *The minimalist program*. MIT Press.
- Chomsky, N., Roberts, I. G., & Watumull, J. (2023, March 8). The false promise of ChatGPT. *The New York Times*. <https://www.nytimes.com/2023/03/08/opinion/noam-chomsky-chatgpt-ai.html>
- Darwin, C. (1859/2005). *On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life*. W.W. Norton & Company.
- Deleuze, G. (1990). *Expressionism in philosophy: Spinoza* (M. Joughin, Trans.). Zone Books. (Original work published 1968)
- Dennett, D. C. (1995). *Darwin's dangerous ideas: Evolution and meanings of life*. Penguin Books.
- Deutsch, D. (2011). *The beginning of infinity: Explanations that transform the world*. Viking.
- Fedorenko, E., Piantadosi, S. T., & Gibson, E. A. F. (2024). Language is primarily a tool for communication rather than thought. *Nature*, 630, 575–586.  
<https://doi.org/10.1038/s41586-024-07522-w>
- Fernyhough, C. (2016). *The voices within: The history and science of how we talk to ourselves*. Basic Books.
- Galileo. (1632/2003). *Dialogue on the greatest world systems*. Oxford University Press.

- Gallistel, C. R., & King, A. P. (2009). *Memory and the computational brain: Why cognitive science will revolutionize neuroscience*. Wiley-Blackwell.
- Hardy, G. H. (1940). *A mathematician's apology*. Cambridge University Press.
- Hauser, M. D., Yang, C., Berwick, R. C., Tattersall, I., Ryan, M. J., Watumull, J., Chomsky, N., & Lewontin, R. C. (2014). The mystery of language evolution. *Frontiers in Psychology*, 5, Article 401. <https://doi.org/10.3389/fpsyg.2014.00401>
- Koestler, A. (1964). *The act of creation*. Hutchinson & Company.
- Langer, S. (1942). *Philosophy in a new key: A study in the symbolism of reason, rite, and art*. Harvard University Press.
- Langer, S. (1966). The cultural importance of the arts. *Journal of Aesthetic Education*, 1(1), 5–12. <https://doi.org/10.2307/3331349>
- Leivada, E., & Grohmann, K. K. (Eds.). (in press). *The Cambridge handbook of minimalism and its applications* (Cambridge Handbooks in Linguistics). Cambridge University Press.
- Marcolli, M., Chomsky, N., & Berwick, R. C. (2023). *The mathematical structure of syntactic merge*. ArXiv. <https://arxiv.org/abs/2305.18278>.
- Martel, J. F. (2015). *Reclaiming art in the age of artifice: A treatise, critique, and call to action*. North Atlantic Books.
- Martel, J. F., & Ford, P. (2022). *Spirals and crooked lines: On the star card in the tarot*. Weird Studies. <https://www.weirdstudies.com/122>
- Martel, J. F., & Ford, P. (2023). “You must change your life”. Weird Studies. <https://www.weirdstudies.com/139>
- Millay, E. S. V. (1922). “Euclid alone has looked on Beauty bare.”. Poetry Foundation. <https://www.poetryfoundation.org/poems/148566/euclid-alone-has-looked-on-beauty-bare>
- Miller, L. (2022). *Keats: A brief life in nine poems and one epitaph*. Alfred A. Knopf.
- Minsky, M. (1985). Why intelligent aliens will be intelligible. In E. Regis (Ed.), *Extraterrestrials* (pp. 117–128). MIT Press.
- Minsky, M. (1986). *The society of mind*. Simon & Schuster.
- Murakami, H. (2013). *1Q84*. Vintage.
- Nagel, T. (1997). *The last word*. Oxford University Press.
- Penrose, R. (1989). *The emperor's new mind: Concerning computers, minds and the laws of physics*. Oxford University Press.
- Popper, K. (1963). *Conjectures and refutations*. Routledge.
- Popper, K., & Eccles, J. C. (1977). *The self and its brain: An argument for interactionism*. Springer.
- Popper, K. (1978). Natural selection and the emergence of mind. *Dialectica*, 32(3–4), 339–355. <https://doi.org/10.1111/j.1746-8361.1978.tb01321.x>
- Popper, K. (1994). *The myth of the framework: In defense of science and rationality*. Routledge.
- Rilke, R. (1908/2024). *New poems* (E. Snow, Trans.). North Point Press.
- Roberts, I. G., & Watumull, J. (2015). Leibnizian linguistics. In Á. J. Gallego & D. Ott (Eds.), *50 years later: Reflections on Chomsky's Aspects* (pp. 211–222). MIT Press.

- Roberts, I. G., Watumull, J., & Chomsky, N. (2023). Universal Grammar. In D. Vakoch (Eds.), *Xenolinguistics: Toward a science of extraterrestrial language* (pp. 165–181). Routledge.
- Shaffer, P. (1981). *Amadeus: A play*. Penguin.
- Sharma, A., Czégel, D., Lachmann, M., Kempes, C. P., Walker, S. I., & Cronin, L. (2023). Assembly theory explains and quantifies the emergence of selection and evolution. *Nature*, *622*, 321–328. <https://doi.org/10.1038/s41586-023-06600-9>
- Shklovsky, V. (1917). Art as technique. In A. Berlina (Ed.), *Viktor Shklovsky: A reader* (pp. 73–96). Bloomsbury Academic.
- Steiner, G. (2011). *The poetry of thought*. New Directions Books.
- Tegmark, M. (2014). *Our mathematical universe*. Vintage Books.
- Turing, A. (1954/2013). The morphogen theory of phyllotaxis. In B. Cooper, S. Barry, & J. van Leeuwen (Eds.) *Alan Turing* (pp. 804–826). Elsevier.
- Turing, A. (1954/2004). Solvable and unsolvable problems. In B. J. Copeland (Ed.), *The essential Turing* (pp. 322–331). Clarendon Press.
- Watumull, J. (2012). A Turing program for linguistic theory. *Biolinguistics*, *6*(2), 222–245. <https://doi.org/10.5964/bioling.8907>
- Watumull, J. (2015). *The linguistic Turing machine* [Doctoral dissertation]. University of Cambridge.
- Watumull, J., & Chomsky, N. (2020). Rethinking universality. In T. Biberauer, J. Douglas, & A. Barany (Eds.), *Clausal architecture and its consequences: Synchronic and diachronic perspectives* (pp. 3–24). Cambridge University Press.
- Watumull, J., & Chomsky, N. (in press). A minimalist prolegomenon to life, information, language, intelligence. In E. Leivada & K. K. Grohmann (Eds.), *The Cambridge handbook of minimalism and its applications*. Cambridge University Press.
- Watumull, J., Hauser, M. D., Roberts, I. G., & Hornstein, N. (2014). On recursion. *Frontiers in Psychology*, *4*, Article 1017. <https://doi.org/10.3389/fpsyg.2013.01017>
- Watumull, J., & Hauser, M. D. (2017). The universal generative faculty. *Journal of Neurolinguistics*, *43*, 79–94.
- Watumull, J., Roberts, I. G., & Chomsky, N. (2017). *Economy in grammar learning* [Presentation]. Simplicity in Grammar Learning Workshop, MIT.
- Whyte, D. (1992). *Fire in the earth*. Many Rivers Press.
- Whyte, D. (2021). *Consolations: The solace, nourishment and underlying meaning of everyday words*. Many Rivers Press.
- Whyte, D. (2024). *Welcome*. <https://davidwhyte.substack.com/about>
- Wilde, O. (1891/2003). *The picture of Dorian Gray*. Barnes & Noble Classic.
- Wittgenstein, L. (1921/2001). *Tractatus logico-philosophicus*. Routledge.
- Wittgenstein, L. (1953). *Philosophical investigations*. Blackwell.
- Wolfram, S. (2002). *A new kind of science*. Wolfram Media.
- Wolfram, S. (2020). *A project to find the fundamental theory of physics*. Wolfram Media.