Towards a theory of the semiotic mind-body link and its relationship to communicative selves, cultures and society
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Abstract

The ontological and epistemological transcendence of the mind-body dichotomy and its ramifications have ever since been at the center of religious, philosophical and scientific inquiries. No plausible explanations have been advanced even after the current resolution of imaging technologies have improved our understanding of brain processes, enabling us to decode high level cognitive signals in our brains.

Various accounts of the mind-body link have been proposed, yet the essential relationship between consciousness and communication, and its anthropological dimension in connection with culture and society haven't received prime attention by the scientific community[0.1]. This investigation on the fundamental semiotic essence of consciousness postulates that the rich semiosis we make use of while communicating, actually serve as our mind-body link; explaining its main theses through three semiotic developments: the syntactic expression of the concept of kinetic energy as part of our physical culture; the Western musical scale as an artistic one; and the formulation of the concept of parallelness among lines and distance within the mathematical corpus of The Elements.

Keywords: consciousness, "hard" problem of, neural correlates of (NCC); mind-body dichotomy; communication; semiotics; socio-semiotics; cognitive semiotics; socio-psychological self

As social animals, we live in and through highly developed semiosis. We create models as representational devices to aid memorization and socio-personal communication as well as higher level comprehension. Models functionally describe the particular subject matters of scientific disciplines, asserting the maturity of their praxis, bringing to the fore new logical questions about their inner working and issues of general ontological and epistemological nature. The philosophical and

*[0.1] an opinion by Crick and Koch about first concentrating on meaning as a way to explain consciousness was mentioned by David Chalmers, yet he states: "meaning seems to be almost as difficult a concept as consciousness" (Shear (1997), pg. 411). Baars et al. (2003, pg. 35) included their paper "Consciousness and Neurosciences" as the only one pertaining to our semiosis (mostly about NCC) and as Putnam's "The meaning of 'meaning'" does not articulate a theory. Most co-opted term "information" is formally used in a technical sense as data transfer, not in its cognitive, semantic sense. Chalmers had "no good immediate ideas" about such prior studies (private communication)
political struggle of historic transcendence settled by the mechanical worldview promoted by Newton laws, debased geocentric ideas and factually proved cosmological and earthly reality to be the exact same type of physical matter\(^{[1,1]}\). These physical laws, however, presupposed "action-at-a-distance" mediating the gravitational interaction between objects: quite a foreign idea in an epoch in which we understood reality employing "an-object-acts-where-it-is" \[^{[0:1.25]}\] notions and "interaction-through-contact" ideas \[^{[0:1.27]}\]. As a result of their extensive field work and analysis; Wallace's and Darwin's conceptualizations about natural selection led to far reaching ideas about the origins and conditioning of life itself, fundamentally reevaluating the very foundations of biology and questioning entrenched religious beliefs. (Wallace 1858, \({*}\)) (Darwin 1859, \({*}\)

Attempts to explain the so-called hard problem of consciousness; basically, why and how we have rich and articulate qualitative subjective experiences as a result of the physiological inner working of our brains and related phenomena such as psycho-physical causation; or discard such experiences as epiphenomenal artifacts haven't been satisfactory so far. Schools of thought that scientifically acknowledge the mind-body dichotomy differ as to the degree they see it as primarily physical or metaphysical, their epistemological approach and their particular interpretations (Shear 1997).

Experiments on social animals with certain degree of communicative agency don't compare to our semiosis. Learning, for us humans, means definitely more than the conditioning of our reflexes. Current findings point out that the circa 99% figure quantifying the extent to which our genome matches that of our evolutionary relatives within the hominid family, isn't truly representative of what makes us different(*). Just a few regulatory genes seem to determine our larger brains' ability to house a great many more neurons, which enabled us to develop our senses to stand upright freeing two of our motor extremities, effectively opening up a new universe, our capacity to gain a much greater dexterity and gave us the capacity to conceive, make and improve tools; as well as greatly articulate language. (Pollard 2006)

Communicamus, ergo sumus

Descartes' memorable quote, as rendered in the Latin active first person singular (Descartes 1983, I 7), even if stated as an introspectively factual and logical proof of the existence of the self, has more of a plural sense not only due to it naturally being meant in a general way, but, more essentially, because communication (meant in this paper in a general semiotic sense) is by its very nature a social, eventually externalizing process. Thinking, which you do "privately" (consulting your "inner" voice) and/or introspectively (pondering about your own actions), you do by employing language, models and signs you socially appropriated in communicative intercourse to begin with. Even urgent, one-time decisions made in odd situations in cultures not predominantly based on codified knowledge (Sources of Power \(*\)); and dreams' story lines, as bizarre as some may seem, are perceived as meaningful metonymic and metaphorric expressions of familiar representations (Pateman 2003).

*\(^{[1,1]}\) in those times we used to literally believe "God" dwelled in heaven and physicists classified objects to be heavenly or sublunar
* \(^{[0:1.25]}\) Leibniz refused such notions despite the fact that Galilean falling objects' experiments supported the notion of a field and transmitted interactions through waves were known
* \(^{[0:1.27]}\) a la Michelangelo's "The Creation of Man"
As a result of one's biographical history, each individual bears a vastly interrelated and unique articulation of semantic associations initially received by our sensory perception, translated to nervous signals and retained in one's brain as ensembles of neuronal networks in a functionally coordinated way. While communicating, we establish mutually interrelating dynamics between these associations as concurrent actualizations of outer and inner intersubjectivity, respectively referred to as expression and reflection*[^1:1].

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* roundish, edible fruit from apple trees
* red or yellow when it is ripe
* are they sure Adam offered mitochondrial Eve an apple?
* I mean an apple, your eye pod what did you say?
* how did the story go exactly about an apple falling on Newton's head?
* how are apple trees gonna get pollinated now that honey bees have committed mass suicide to protest media stupidity? Oh, I see! They will use robotic bees.

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* apple comes as fruit snacks in boxes
* I would rather have some mango, pineapple or banana snacks
* oh boy, did I hate eating my veggies when I was a kid?
* what was that William Tell story about again?
* she said Adam was the apple of her eye, her Adam's apple or some Adam apple something
* all right, but what do you do with those rotten apples once you take them out of the barrel, if you can't just throw them away?

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Fig. 1: Intersubjectivity of communication. Concurrent outer and inner actualizations *[^1:1.125]

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Contrary to philosophers and mathematicians who see the intension-extension dynamic of meaning in some abstract, set-theoretic way, the concurrent intersubjective dialectic of communication doesn't presuppose a metaphysical, timeless, omnipresent, fixed and publicly available extension of meanings and as Putnam points out: "grasping these entities is still an individual psychological act" (Putnam, The Meaning of “Meaning”, 582), which won't elude cultural scrutiny and appreciation, as well as societal utilizations. Elster calls attention to our tendency "to overlook the implicitly relational character of certain monadic predicates" (246, Elster 1985)

[^1:1]: meant in this paper in a communicative way, not to be confused with cellular and gene "expressions" or involuntary "reflexes" from our central nervous system

[^1:1.125]: Leonardo's drawings: study of brain physiology and sketches for the Battle of Anghiari

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3/22
and as Walter (1985) points out:

"... a ten-dollar bill might seem to have a life on its own as a thing of value ..."

yet its value in a given transaction, as in any form of communicative interchange, depends on the semantic groundings of the exchanging parties, not only on the readiness of one side to accept money as payment for goods (Blue 237). Monetary interchange, per se, is not even necessary; when Native American Indians living in present day Manhattan allegedly traded their territorial rights to Dutch colonizers for goods worth some 60 guilders, not only did those items have an entirely different meaning for both parties, but so did values such as "nature", "territory" and "owning". Yet, these items served to "negotiate" that deal; and in that sense they not only independently and differently enacted valuing realizations for both parties, but they also engagingly bridged their realities. Meaning, all meaning, not only quantifiable physical properties such as mass and charge (Blue 261), is inner- and outer intersubjectively realized and also "explained" as they factor in formulae and take part in phenomena of our physical and technological awareness, verbal reports are just forms of conscious expressions.

Meaning is the currency of the dialectic of conscious communicative articulations in concurrent, immediate, utilitarian; as well as framing and gestalting ways. Galileo noticed that the period of the swing time was independent of the amplitude first by watching the swinging motion of a suspended lamp in a cathedral and then using his own pulse beats as timer to confirm his observation. He then found that the period is independent of the mass of the bob. The development of numeral systems was driven by societal needs. Ancient Etrusco-Roman numerals naturally evolved from tally systems which usage dates back to the Upper Paleolithic era as forms of recording and counting devices by simple economies. They did not include a zero and were neither positional nor additive, so they didn’t lend themselves well to basic Arithmetic operations. Expediency of calculations seem to have been the main concern in the use of various types of numeric notation for time, angles and fractional figures. Even activities which might seem to be wrongly based on some erroneous dealings may indeed be articulate parts of processes ultimately leading to conscious realizations. The studious and ongoing attempts to prove the 5th postulate of Euclid’s Elements demonstrate a great deal of logical coordination and the levels of epicycles on epicycles introduced to match more accurately the observed planetary motions as inconsistencies were found, eventually led to the reevaluation of the heliocentric models.

Communication does not merely happen as a result of the equality or even likeness of baseline assumptions among parties. People could communicate functionally well even if their individual assumptions would not match for the most part and they may be not even be aware of these baseline discrepancies as long as their inner intersubjectivity is fulfilled. The fact of signs' ultimate subjective meanings, as grounded in the large network of semantic associations and their functional interactions for engaged parties, not being exactly the same; actually motivates, dynamically enriches and drives not only interpersonal communication, but also cultures cohering around some common ideas, our general understanding of our physical reality and society's inner gears. A case of expression with far reaching personal reflection happened when Darwin's fellow ornithologist and excellent illustrator, John Gould, pointed out to him the typical resemblance among finches from different Galápagos Islands (Sulloway 1982). Geologists and paleontologists had already made a compelling case about the existence of life on earth for geologically long periods of time, that life had changed over time, and that many species had become extinct. For Darwin, Gould's observation was not simply about some similarity among birds, but one
of the key meaningful contributions that helped him align his experiences and ideas about his large biological compilation into a comprehensive, far-reaching theory.

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**Triadic semiology of consciousness**

Due to their common referential contexts and encoding some communicative relationships naturally coalesce into articulations with certain degree of functional autonomy. Families are the primary binding link between Society, the Self and our biological reproductive capabilities. One's own nervous system (NS) is one's self's physico-physiological link. Societal and individual requirements condition the organizational division of labor between the subject matters of Physics, Chemistry, Biology and Medicine, as well as subfield specialization within, even though they are basically about our physical reality. Physics became a science itself out of the essential nexus of fields of inquiry we thought to be unrelated such as Astronomy and mechanics. Also, all three basic aspects intrinsically relate and participate in our semiosis. While dancing, you joyfully employ your musical and textual audition, sense of balance and of timing/rhythm, as well as your own and your partners' proprioception, based on some cultural code and actually burn some fat, so that consciousness is concurrently engaged in various ex- and internal ways.

Even though prior principles and metaphors may not truthfully correspond with the main thrusts of this semiology, semantic spaces organically culture. The essential relationships between consciousness and our external physical reality; our communication in a personal, cultural and societal sense; the contraposition and coevolution of idealism and materialism; as well as the relationship between intensity and extension of meaning have been recurring philosophical topics since ancient times. Plato pondered deeply over consciousness through his discussions on his allegoric cave and Universals (Plato {*}), yet he argued that the very intelligibility of the universe presupposes the underlying existence of a pure transcendental intelligence (Plato {*}). Peirce, who invited communicating parties ("interpreters") into the Saussurean scheme, understood Logic in a semiotic sense, whose view was of our minds as some sort of semiotic machines mediating the relationship between objects and their interpreters, did, however, not consider consciousness as essential to the use of a sign. (Peirce {*})

The fundamental dynamic of conscious realizations among individuals, culture and society was emphasized by -- Karl Jaspers (Jaspers {*}) from a cultural point of view and linguistically by Hillary Putman, who underscored the contribution of society and our physical world in our semiosis largely neglected by semantic theory, including the semiotic aspects relating to the division of labour (Blue/Hillary Putman, pg 593). Our semiotic realizations understood as both "hammer" and "ship" kinds of tools acting in conjunction and simultaneously (Hillary Putman [The meaning of "meaning"] Blue {*}, pg 588) actualize the dia- and synchronic aspects of socio-personal communication; understanding "society" as Lotman's semiosphere (Lotman {*}) and its socio-conscious inner dynamic permeated by Hegelian "Spirit" (*).

Recycling Francis Crick's metaphor ("The astonishing hypothesis" (Baars, 48 (Crick (1994)))); one's experience of "green" depends primarily and very fundamentally on someone's own past experience. Furthermore inner brain processes which correlate to the mental realization of "green", more than the visually perceived color attributed to a region of the spectrum, is the most common natural color associated with
nature's fertility; and summer, which happens to be also the sunniest/most colorful season of the year; of tree leaves and the grass cows graze on, who give us milk which is white ... The concurrent intersubjective dynamic of communication renders as senseless such philosophical obfuscations as Wittgenstein's beetles (Wittgenstein {*}) and the assumption of methodological solipsism (Hillary Putman [The meaning of "meaning"] Blue {*}, pg 583).

* **society**: is the substratum cultures interrelate and foster on. Cultures are not delimited or defined by political states, they organically relate and mutually depend on each other across boundaries and beyond epochal trends through their various forms of encoding serving communication, such as scientific, commercial, technological and artistic. Societies support developmental interactions among cultures. The detailed anatomical depictions of Renaissance painters and sculptors were instrumental in seeing the natural beauty in the human body from obscurantist ideas framed and forcibly policed by medieval religious institutions. Art ultimately helped the advancement of medical sciences.

* **physics**: is the known realm of the "objective reality" as we have appropriated and are logically aware of; the corpus of knowledge of all scientific cultures dedicated to studies primarily based on physically expressed evidence, to the extent and in the particular way it is understood and technologically applied; such as: Botany, Geology, Genetics and Physics (the science itself)

* **the self**: represents each of the consciously communicating individuals, actualizing their own inner intersubjective semantics through the continually reassessing communicative interactions; outwardly with other members of society and with their own individual physical environment; and innerly through their own senses and the various forms of consciousness such as thinking, experiencing qualia and phasing through oneirologic states

**Common contexts in the triadic semiology of consciousness**

* **society -> the self**: Society nurtures the self initially through our bonding with our mothers, who thoroughly prime us with belongingness and language; family care; schooling and all kinds of morally charged narratives, largely contriving and norming one's own understanding, behaviors and expectations, so that "free will" is, to a large extent, framed by acquired cultural and societal codes of conduct (Berger & Luckman 1999).

* **society -> physics**: Physical experiments are forms of culturally intentional and attentional practices, aided by measurement equipments as functional, expressive extensions of our human sensory system, from which we get quantitative accounts in a verifiable way. Groups of people dedicated to maintain and advance cultures ultimately relating to physical reality, such as astronomers, archaeologists, chemists and doctors.

* **the self -> society**: One authors society through teaching to raise societal awareness and redefinition of cultural codes. As Mahatma Ghandi did by introducing the concept of Satyagraha to his people fighting off British occupation; Andréi Sájarov with his dissident activism for human rights, against nuclear arm races and the invasion of Afghanistan by his fellow Soviets; as well as Chaplin with his masterfully poetic humanization of our "modern" society in his tragic comedies, as well as advocating against injustice. Their engagement had broad societal repercussions not just narrow cultural, ethnic or national consequences.

* **the self -> physics**: physics is authored through
* discoveries of new scientific phenomena: such as the peculiar growth noticed by Alexander Fleming in the test tubes of his messy lab, X-rays noticed earlier then systematically studied by Wilhelm Conrad Röntgen, Camillo Golgi’s and Santiago Ramón y Cajal's discovery of neurons as basic structural and functional units of the nervous system and Ivan Pavlov's studies of the links of reflexes conditioning the behavior of the autonomic nervous system;

* giving objectively validating explanations to known phenomena: as the model by Aristarkus of Samos describing planetary motions reevaluated by Copernicus and the later, exacting mathematical reformulation as ellipses by Kepler and, using x-ray diffraction data collected by Rosalind Franklin, the visually appealing model of the structure of the DNA molecule by Watson and Crick

* predicting unknown and/or logically unifying phenomena as Maxwell's equations unifying the laws describing all electric, magnetic and optical phenomena from which the speed of light can be deduced based on electric and magnetic constants and Einstein's correction of the value and prediction of the deflection of the light emitted by a star as it passed near the space-time curvature caused by Sun's gravitation

physics -> the self: Physics is primarily acquainted to the Self through one's perceptive sensoro-psychological and responsive psycho-motor channels as baseline perceptual abilities and their most immediate capabilities such as being able to discern and identify geometric figures, colors and a sequence of sounds and to tell apart foreign languages even if one doesn't understand them

physics -> society: societal level activities such as agriculture, calendrical recording, land surveying and time keeping; the variations of our biological systems have gone through while adapting to new environments, our population and migration patterns during our evolution as well as the types of personal and collective tools we have used in our exploitation of natural resources

The link between Physics and the Self is mediated by society in most cases for most individuals. One may not personally know about the specifics of the dangers of excessive consumption of chemically treated food and cosmetics, or the technical details of how cell phones work, and even if you are an engineer or scientist well-versed in some field, you can't possibly know the specifics of all fields. However, we employ language, protocols, signs and user interfaces informing us of their possible hazards and guiding us through the safe agency of various technological devices.

The primary communicative essence of consciousness is not postulated as implying that charlatans are exceptionally great or specially conscious communicators, or that being a subject matter expert makes for a good teacher or illustrator, nor does it suggest that truthfulness and righteousness would be understood and become popular just by their appeal or mere factual weight. The effective socializing of certain ideas, is very much related to the semantic cultural groundings and social contexts and, as the logic of our personal and cultural mistakes as well as our erroneous social beliefs demonstrate, we are more communicative than factually logical. Aristarchus of Samos had presented alternative hypothesis for a correct heliocentric model of the solar system with the Sun as its center, the known planets in correct order and stars being so far away that no visible parallax was noticeable, from which estimations for the distance to the sun followed from rigorously logical geometry
even if not accurate; however theories by Aristotle and Ptolemy found favor in those times' comprehension even if, in general, of lesser explanatory power, not only because then the idea of the earth's atmosphere revolving with it and supposing the heaven to remain at rest and the earth revolving in an oblique circle, while it rotates about its own axis, was considered illogical and even impious to the point of indictment by his fellow scholars (Tassoul & (2004)), but also because of our ideas about our central position and role in the cosmological order.

The personal understanding of the language behind the sounds and the physics behind sensations are reflective, semantic matters. Poets, ideologists and marketeers exploit language; technical people such as doctors and engineers "see" a lot through their knowledge and some people stepping into a bath, may experience its temperature as more or less pleasant in relation to their body temperatures and their habits, while Archimedes furthermore had his "Eureka!" moment. There is also a degree of mutual conditioning between one's own physical environment and sensory perception. Musicians naturally learn to identifyingly filter out certain instruments or voices while practicing or listening as part of a group play or in an acoustically promiscuous environment.

Society and physics bear mutual ecological dependencies. Societies have their own physical requirements taken care of by exploiting nature and constructing cities along with their aqueducts, sewage systems, communicating venues, etc. Societies similarly share a dual-aspect common ground with the Self given by the need of procreating and maintaining their constituency and the maintenance of non-physical practices taken care of by institutions ensuring the continuation of their self identity, such as political governments, history and the code of law.

Our scientific and social history show that we progress through our semiosis. Social and even physical scientists entertain the illusion about their subject matters being ultimately based on some kind of fixed, absolute, "objectively true" realities which their theories incrementally and assertingly draw near. Those illusions are not sounder than the ones religions are based on. Culturally encoded practices are very much part of societal functioning. The sophisticated and versatile calendric system developed by Mayan societies very accurately approximated the tropical year, yet they rather used 260 day-based calendars relating to crop cycles and maternity, since the seasonal effects of rain seem to have been less of an issue than it was for societies inhabiting and depending on the Nile's periodic floods.

Objective reality

The all-encompassing objective reality, represented by the outer region of the triad, is the totality of the material existence regardless of our being rightly aware of it or not, our ability and ways to understand or even perceive it sensorily or instrumentally gauge it.

A dramatic explanation of what objective reality means is illustrated by what happens, if you jump into the void regardless of your personal judgment and "God's help". Yet, there are no less radical consequences, we, as society, are fully implicated in. As studies of migration genetics show, from the stable, favorably climatic and ecologically friendly conditions that we seem to have phylogenetically sprouted (from those African regions, which in those times were pretty much -the habitable world-), we, humans, have acquired a relative independence from our own ecosystem, populating and wandering the earth, and after the invention of mass production and the creation of a culture of boundless consumption, we have
increasingly squandered and sabotaged nature. We have been able to do this by exchanging our natural reliance on a certain habitat for dependence on our semiosis; using/making/improving tools, language, agriculture, trading, weapons, ideologies, social classes, armies, gods, ... in order to "distance" ourselves from and exploit our environment, and become relatively close and self-sustaining. We have gone to the moon (literally) and to the stars and back (through spectrographic analysis, however with the same veracity as nearby objects), but as we found no more free "Lebensraum" to get our ways into, we have, in as much of a self-serving as self-deceptive way, grossly misinterpreting Darwinism and whichever ideology is handy, invented gods we trust to consider our sins less equal than others, along with all kinds of dignifyingly sounding, explicit and implied guiding principles, such as, the "white man's burden", "we are God's chosen/blessed ones", "God's self-evidently given rights and natural consequences of our having better weapons", ... to justify tacit excesses and abuses. The US government and their allies have, expediently indeed, brainwashed themselves into believing that the avoidance of a comparable military force is just the smart thing to do; that going around bombing people to "spread justice and democracy" and "defend the 'free' world", that their "God-blessed", high-tech, "democratically determined" and "responsible" terrorism against people, who can't defend themselves on an equal basis is just the right kind, but when Nazis openly did it right in Europe against a superior force of "civilized" enemies from the "free" and "democratic" world, it was inhumane and crazy[1:8].

By becoming "homo symbolicus" and forgetting we are part of nature, that nature doesn't exist for us, we have become the first species to be able to destroy not only ourselves many times over in a fraction of a second, but also the fine orchestration of physically unique, stable states over geological times that conditioned the creation of nature. Nonetheless, the baseline objective reality will definitely survive ourselves and all those gods we have created in our image and likeness and so will the latent possibility for "life" in the universe to be recreated.

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Cultures

Most of what later became the intellectual canons of Western civilization was acquired from the copious Arabic translations of the great documents of Greek civilization and traditions of the Roman culture, as well as their own advances. "Inventions", "discoveries" and guiding principles, that the Western civilization later claimed as its own, can be found as prior art in ancient Asian civilizations. Many "technical advances" in Europe were made by scholars, who were devoted students and translators of Islamic technical literature themselves.[1:1.135] Excellent technical compilations such as Euclid's Elements[1:1.45] and Alī Šīnā Balkhi's (aka Avicenna) Canon of Medicine, which introduced ideas to the Western world such as systematic experimentation and quantification, evidence-based medicine, clinical pharmacology and the contagious nature of infectious diseases, became standard textbooks in European schools and universities well into the modern age (Heath 1956) (Boyer 1991) (Tschanz 2003).

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Even though the benefits of these transfers and repurposings accrue to societies at large, they actually happen through more narrow cultural venues. Luria's patient, pseudonymically referred to as "Lyova Zazetsky", who was a 23 year old Russian lieutenant when his left parieto-occipital region was massively damaged during the

*[1:8] and here I am just referring to the mindset of those claiming a higher moral ground than the rest of us; those, as they claim, "righteously taking upon themselves proxying to God's will"

*[1:1.135] such as monk Saccheri after studying Omar Khayyám work (Rozenfeld 1988)

*[1:1.45] considered the most influential technical book ever written second only to the Bible in number of editions
second Battle of Smolensk against invading Nazi Germany, was severely incapacitated from articulating sounds/verbal language, seeing properly, coordinating kinesthetic sensations, and logically understanding cause-and-effect, whole-part, grammatical and symbolic relationships (Luria 1987). After awakening from a long coma, his tenacious struggle while trying to regain a normal life was well documented in his 3,000 page diary, "I will fight on"; in itself extraordinarily difficult for him to do. A Canadian citizen born in 1951, Barbara Arrowsmith Young, suffering from similar perceptive and cognitive impairments, extensively learned about her own condition through Luria's reports, "He is describing my life"; she thought (Doidge 2007, pg. 34). She was not only able to heal herself with professional help through extenuating exercises to rewire the synapses of her brain, but went on into business as a special educator. All this specific culture needed to be brought about was lively conscious and attentive intersubjectivity among just three subjects: Zazetsky's heroic report of his fatal injury, Luria's professional account and Barbara's determination. Of course, there were more people involved, such as the translators of Luria's account, but their relationship to this cultural development was societal, not individually significant; they were not consciously grounded in the semantics that made this particular culture happen. Lively attention to the semantics of their subject matter and its realization in communicative interchange are essential to cultures. Many discoveries have been made through marginal observations and unexpected outcomes of experiments based on outrightly wrong yet mindful assumptions and a posteriori reinterpreted principles. The periodic table of the chemical elements was initially conceived to illustrate trends in the properties of the elements and was later reinterpreted in terms of the elements' atomic weights and subatomic particles. (*)

Darwinian and genetic principles, such as biological populations, natural selection and replication, have been employed to explain social processes. These theories aim to unify the physical sciences with the humanities within the same scientific framework, yet consciousness and the semiosis it manifests itself through don't seem to be equally bearing parts in this grand scheme. Terms such as "culture", "learning" and "information" tend to be overloaded in a narrow and utilitarian sense by behavioral and social scientists [1:1.52]. While describing differences in the side of the road on which you drive and farming habits, authors Richerson and Boyd even use culture to denote what may be better considered as conventions and traditions (Richerson & Boyd 2006, (30, 21)). Conventions such as the writing direction of language systems or the side of the road people drive on are just baseline agreements facilitating reading and enabling traffic, which don't determine what is written or hinder mobility. We may easily adjust to the side of the road we drive on, but not to the same sign in the same context with a different meaning. Some writing systems have more than one way to spatially write sequences of characters. Even the brain itself discriminates and adjusts direction with minimal neural spikes (Parker & Newsome 1998). All traffic lights; road signs with their locations as part of the logic of traffic; as well as regulations used by commuting people; are part of the comprehensively encoded traffic/commuting culture, not just the side of the road to drive on. Traditions are inherited practices particularizing certain aspects of a culture, which do not essentially change its main course. Christians share beliefs about Jesus Christ being the son of God. They have traditions or denominations differing in the emphasis of the main narrative and the procedural articulation of their rites, not different "cultures". Nor would carpenters, catering to the ergonomic features of building as part of society's own physical requirements, do, for the toolkit, fine skills and mechanical mindset, as encoded exercises, are well-defined as part of the division of labor, even if dwellings, hospitals, ships and airplanes require each their specific forms of carpentry.

* [1:1.52] in the Pavlovian sense in experiments with dogs and Aplysia, not their semiotic socio-psychological sense primarily meant in this study
Culture in a holistic and particularly encoded form of social expression within its own semiological reach and closure given by the communicative relationship of people through practices such as making tools, dressing and worshiping. Communicative situations are mostly multi-encoded in an ex- and/or intrinsic way. When you go out to eat; you: read a menu; of food made after some recipe; talk to the waiter; pay ... In that example; language, cooking and commercial interchanges are three extrinsically related codes. Intrinsic multi-encoding pertains to any form of intratextual encoding carrying any meaning in the form of patterns, sectional organizations or authoring. Encoding pertains also to authors' characteristic writing styles and roles in a communicative interchange. There is a difference and interplay among roles in a theatrical play and between the contending arguments of plaintiffs and defendants towards what is written as code of law. Over and above the text's grammar; not only are the book sections, definitions, common notions, axioms, propositions and mathematical proofs in The Elements marked up and orderly arranged within propositions; but also, their relationship and later included apocrypha are all parts of the books' intratextuality, extrinsically augmented with diagrams.

Cultures and societies reinterpret, reevaluate and appropriate semantic spaces from their perspectives. We, as a more visually oriented people, may see the use of diagrams in The Elements as collateral and superfluous. Hilbert's (re-)axiomatization (Hilbert *), in which he wrote off the diagrammatic parts, disregards the epistemological value in The Elements' multi-encoding. If we consider the economy of constructing devices in the early books manifested by the the strict employment of only straightedge and compass in an algebraic way in their deductive tracks[1:1.55]; that the straightedge was unmarked and that the compass could not be lifted off of a plane surface without collapsing, we could see they were actually more like "writing" their procedures under some geometric and logical grammar than doodling charts and in that sense, contrary to scholars' opinions (Mueller *, 15-), I do see the style of The Elements as a definitely conscious adoption of an ontologically constructivist Philosophy. The textual discourse of The Elements may have had more of an explanatory, complementary payload than we would infer nowadays.

Evolutionary biologist Richard Dawkins describes -memes- as basic units of imitation and cultural transmission; such as "tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches", as "living structures" "spreading from brain to brain" (Dawkins 2006) (Boyd & Richerson 2000). Richerson and Boyd used a similar term based on the supposed social transferability of imitations: -cultural variants-, which, contrary to memes, aren't "either discrete or faithfully transmitted" (Richerson & Boyd, 63) and rested their definition of culture on "information" as "any kind of mental state, conscious or not, that is acquired or modified by social learning and affects behavior" (Richerson & Boyd, 5). Conscious mental states as inner intersubjective phenomena are essential to any form of communication and I would camp within the school of thought questioning the use of Darwinian and genetic principles to explain cultural and societal processes resulting from consciously communicating parties.

As part of the intersubjective, owning-by-sharing reciprocity of communication, each party recurs phasing through relatively coalesced constellations of their very own informational ensembles given by their neuronal networks underlying their consciousness. I prefer the term -sem- (IPA: s_m(z)), as the same Greek root used in semiosis, semantic, seminal and asemia, to describe the relatively discrete differences given by such transformations, as units of internal communicative realizations, which semiotically articulate as reflections and verbal or behavioral

[1:1.55] ancient Mathematicians very well knew and routinely employed other devices for their constructions such as marked ruler, protractor and cords, and Archimedes used all kinds of devices even of mechanical nature (Heath *)
expressions. Sems reflect transformations brought about by neuronal interactions while consciously/meaningfully communicating and they manifest themselves as forms of consciousness. One's capabilities for qualitative conceptual discrimination of differences and degrees of similarity requiring our responsive attention, as well as qualia, are ascertained by our sems' activity which determine our capacity to think about, verbalize and responsively act.

The Self

Except for their tongue, lips and dominant thumb; pertaining to acoustics and temperature changes, after developing for 9 months in the promiscuous and adirectional placenta of their mothers' wombs, new-born babies have no idea of where they are being touched, because their somatosensory, and motor cortex haven't mapped their body image proper, nor have they developed and differentiated their exteroceptive senses well enough. Nonetheless, we start learning to articulate endogenous movements on our own, within 8 weeks of conception through reflexive fetal reactions, which, along with the development of exteroceptive senses, and the capacity to get feedback and coordinate the various types of sensory perceptions, prime the process of learning, eventually leading to our capacity to selectively and intentionally pay attention to environmental stimuli and our own psychological states.

We not only visually perceive objects as being over there, we also responsively sense them by reaching out to, touching and grabbing them, initially using our hands, feet or the greater amount of nerve ends in our tongues and noticing as well how other people interact with them. This way we learn about objects and then recognize those we already know about, making our brains work less by reusing previous patterns. Babies learn to articulate their visual perception little by little, focusing each eye and then coordinating both, relating it to their own motor responses, as well as to space and movement. Babies' playful behaviors, e.g., when they repeatedly drop different objects, are ways of experiencing their environment. They are making inner communicative generalizations[^1:2] till they codify them as "all kinds of objects fall if they are dropped or pushed over, regardless of their shapes, sizes or colors; how close they are to me; if they are my most loved toys or one of mummy's casseroles in the kitchen; even I myself invariably fall down after jumping up and would fall from heights as I have safely tested in the bed; I also notice other people are aware of these same occurrences and behave accordingly". As Shear points out, a child's notions of its mother and external physical objects as existing independently develops in regular stages, along with its notions of appearance, reality and truth; moreover, this developmental process needs to sequentially and critically[^1:2.25] set in within certain periods (*{}*).

These types of higher level associations, physically persisted in our vast, flexible and well-connected memory as meaningful communicative generalizations, we codify not only as readily addressable content in our mental sentience, but also we psychologically own, since we learn to contextually articulate and use them as part of our very consciousness. They are not just some ephemeral, epiphenomenal side effect of our minds. We learn to "read" and pay attention to our senses, and interact with our reality through them, even though, at some point, they may be procedurally stratified as part of the "unconscious" routines supporting our conscious attention,

[^1:2] not scientifically conceptualizing ones; they see that some singular things such as birds, balloons and airplanes don't fall
[^1:2.25] in a Chomskyan sense in what pertains to the relationship between language acquisition and age in a communicatively rich environment
performance and volition. William James stated:

“When a particular movement, having once occurred in a random, reflex, or involuntary way, has left an image of itself in memory, then the movement itself can be desired again, and deliberately willed.”

“A supply of ideas of various movements that are possible, left in the memory by the experiences of their involuntary performance, is thus the first prerequisite of voluntary life.” (James 1892, 416)

"... The discharge from the motor centre into the motor nerve is supposed to give a sensation sui generis, opposed to all our other sensations". (James 1892, 418)

I think sensory feedback definitely must happen more than just once, for not an image, but a certain contextual articulation of addressable imageries, pertaining to more than our motor centers, to continually persist beyond given stimuli, which we are able to recall, reuse, redefine and even readjust while communicating. They enable us to take an active role in choosing and concentrating on the current external locus as we decide, namely, to pay attention, instead of just perceiving what happens here and now, right in front of us. Moreover, based on the regularities and properties we learn and codify from objects, events and communicative situations, we also learn to contextually pay attention to objects and events, even if they are not actually present. Volition is the also learned ability by hierarchically stratifying generalizations, to then drive the locus of attention into our minds, organically making this capacity an immanent part of what individually makes us who we are, committing to particular courses of action in certain ways, given situations that engage our beliefs. Volition is the asserting mechanism of one's own consciousness, the driver of one's self. About volition James stated:

"Volitional effort is effort of attention" and "Effort of attention is thus the essential phenomenon of will". (James YYYY, pg. 450)

Naming and verbally articulating ideas about objects and events of our shared reality, language, happens as the socio-psychological awareness arises for the necessity to generalize and own them in an intersubjective way, for which we create signs internally anchoring each party's semantic groundings and as common referential loci and currency of our own expressions.

Locke (Blue 358) pointed out the disparity between the primary qualities we are made aware of through our exteroceptive senses, such as the immediate physico-physiological processes of light reaching our retinal nerves; and one's secondary meaningfully identifying and sentient reactions relating to the captured image of, say, a tree. Epiphenomenal theories use as example the unessential relationship between a passing car and its projected shadow in order to explain away the mind-body correlations. However, both schools of thought gloss over the fact that one's own sensory system is able to distinguishably associate certain types of visual impingements from the external world along with their extensively rich contextual settings with previously codified and memorized objects, events, situations, processes, as well as one's own feelings and behavior. Recycling that metaphor, our brains are able to "perceive" the shadow and along with it "know" and "sense" many other contextually related happenings such as the speed at which cars pass by, through which streets, the 3D shapes of buildings on those streets, at what time of the day (angles of the shadows) in relation to other motor vehicles and still objects projecting shadows.

The high level of associativity and promiscuity of the vast amount of well-
interconnected neurones signaling in form of electro-magnetic oscillations of various forms as their lingua franca, with their natural propensity to codify regularities and establish interrelationships, make our brains formidable discriminating machines of contextual similarities, as evidenced by the functional mappings built by our brains' somatosensory, motor and visual cortex [1:25] to the extent of fusing our fingers, effectively disabling them, due to repetitive incoming signals such as those from pianists', guitarists' or golf players(*). This natural capacity extends to our use of tools {*} and our semantic groundings while communicating. When we think of playing a chess match, "playing", "strategy", "concentration" and even "queens" and "bishops" also get activated with their relative semantic branching ultimately enabling us to take part in our own sentience. Meaningful patterns from previously codified experiences are presented to us as part of a given situation requiring our attentional decision making, along with these patterns' sustaining contexts of generality. We are not just served one option, in which case we would be machines with no free will. There is a concurrent, mutually bearing association between actualized meanings and their contexts, which is well, but only partially illustrated by Ilyenkov, from his vantage point of an unorthodox dialectical materialist, when he asserted:

"If one means to say that extension, value or speed actually do not exist outside a house, a tree, a plane or some other individual things, clearly the individual things also exist without extension, weight and other attributes of the material world only in the head, only in the subjective abstraction" (Ilyenkov {*)

Ilyenkov in his analysis of the dialectics of the Universal specially regarding valuation of capital, however, fails to see the concrete semiotic essence signs carry, in his particular case capital in commercial interchanges, for he considers words and ideas as being in the "ether of the abstract":

"The genetically understood universal does not simply exist, naturally, in the ether of the abstract, in the elements of the word and idea; and its existence in no way abolishes or belittles the reality of its modifications and of the separate individual derived from it and dependent on it." (Ilyenkov {*)

Similar conclusions were reached by naturalist Mountcastle:

"Sensation is an abstraction not a replication of the real world" (Mountcastle {*)

meaning that our perception is not some passive recorder, actually our sensory systems is actively generating hypothesis aided with data, contextual meta-data and strategies from our previously articulated memorizations. Even Mach stated:

"To us investigators, the concept 'soul' is irrelevant and a matter of laughter. But matter is an abstraction of exactly the same kind ..." (Mach (1910), p. 48)

"[[History and root of the principle of conservation of energy] Ernst Mach (1910), p. 48"

There is, however, absolutely nothing "abstract" in the semiosis of communication and extensively our consciousness, which in themselves are consciously generalizing and concretizing processes through which our brains not only outwardly communicate, but also stratify our "unconscious" procedural routines. You are not just "conscious", you are indeed conscious of a person sitting over there, who whistles a melody you know and makes you think of someone or something you care about.

[1:25] As crawling babies we learn to navigate our surrounding space and coordinate our perception channels as some form of playful conversation with our environment
Our massively parallel, intricately interconnected and promiscuous neuronal networks influence our physiologically sharing, socio-psychological facilitating biological mechanisms, such as so-called mirror neurons and social stomachs. Mammals such as mother rats teach their offspring the taste of proper food from the time they are in gestation and ants and wasps share their "collective" stomachs. In pathological cases our mirror neurons make us compulsively repeat whatever we see other people doing ({{Russian sea fairers*}}) Claude Lévi-Strauss anthropo- and ethnological studies broadened to us our comprehension of humanity (http://en.wikipedia.org/wiki/Claude_L%C3%A9vi-Strauss) ({{Savage Man*}}). I believe we have much to learn from social animals. Our neuronal networks largely contribute also to Hollywood, politicians, our endless evolution vs. creationism arguments, losing sleep over the latest gossip about celebrities and believing that President Kennedy was killed by Marinus van der Lubbe ({{Warren Commission}}, {}).

Physicalist and panpsychist accounts of the mind-body link take various forms and have a long history. Empirically minded Aristotle argued that purpose pervades both, inanimate and conscious beings (Aristotle {*}). Some philosophers with a naive physicalist approach defend psychophysical identity therefore devoiding mind-body inquiries of meaning, while some others consider us to be zombies in their many incarnations: from Huxleyan "conscious automata" (Huxley (James 1890, Chapter 5)) to having no consciousness whatsoever. They wonder about what would happen if we "replicate neural function in silicon" (Black Chalmers, 407). I think what makes the difference that matters in relation to our consciousness is that our neuronal networks we built by learning through intersubjective communication; something that no thermostat, computing device or golem does* [1:2.85]. Researchers have gone as far as proposing some new form of fundamental "mental force" generating "willful focus of attention" (JCS: Volume 6, Issue 8-9. August-September 1999. A Role for Volition and Attention in the Generation of New Brain Circuitry. Toward A Neurobiology of Mental Force. Jeffrey M. Schwartz) and affirm that there is a "neural correlate for anxiety in post industrial societies"(Koch). [and for the friendliness of the Dutch I guess]

Both semiotic and material aspects manifest in all forms of representational and de re qualities. Signs need a physical carrier and we perceive reality to the extent and in the ways it is meaningful to us. This integral relationship is ultimately reflected by our nervous system in the processes underlying conscious articulations in our minds. While we dream our exteroceptive senses are basically shutdown, yet we not only have accompanying phenomenal experiences as part of reflexions of physiological processes in our brains (which we may even express); but we also experience their corresponding qualia. This also happens when areas of our brains are externally probed even under general anesthesia ({{}}). Someone may even learn to drive one's own sensations during autogenic exercises with therapeutic results to one's own nervous system. The relative arbitrariness of these associations condition the ineffable, sentient character of consciousness ever-eluding reductive physical characterizations. Those with a marketing, political and/or ideological bent have been salivating for the day they could reductively characterize our minds, instead of having to employ their tried-and-true methods to manipulate and b#llsh!t us.

**Intersubjectivity of qualia**

* [1:2.85] For a downright hilarious discussion on those "thinking thermostat and computers" I recommend John Searle's "Can computers think?" However he states: "... the computer program is defined purely syntactically. But thinking is more than just a matter of manipulating meaningless symbols, it involves meaningful semantic contents. The semantic contents is what we mean by 'meaning'" (Blue/Searle *) (meaning, meaning, meaning, ...)

15/22
Qualia; the "what it's like to be" typification of experience [to be a bat Nagle]; the "redness" of red objects, the "dancifulness" of some music and the "painfulness" of painful experiences in a physiological or emotional sense; are inner intersubjective sentient qualities, which tend to be primarily associated with perception: "visual", "auditory" qualia, and grammatically abstracted from the subjectivity of adjectives through the suffix ".ness" in ways that may be easily confused as some kind of external, factual property which individuals happen to perceive differently, such as the temperature of water in a bath. Qualia are essentially associated with other reflective, non epiphenomenal mental experiences such as awareness and attention. Neuroscientists have specifically suggested certain properties as sufficient functional criteria for neural events to be associated with qualia.

~

"Redness" is not just a common property you see in red objects. We not only see red apples and strawberries, a red ball a child fondly plays with at a park and Mary's lips, but our brains richly associate all these forms of "redness" also to better tasting, ripe fruit, spring, playful feelings and the attractiveness of Mary's lips along with our privately finding her seducing, too. That is why; as it has been already pointed out, the "redness" of red is as subjective as red itself; so these extended associations are not exactly the same for everyone, thus Ramachandran's hypothetical qualia cross-cable would not work.

~

"Squareness", as conceptualized from square figures notwithstanding their size, like anything personally meaningful piece of information could be qualed if naturally associated with other phenomena, yet external, objective properties of objects we rationalize as generalizations in an outer intersubjective way are not qualia. Nor are qualia totally subjective and detached from our meaningful environment, since almost everyone to their own extent as part of their communicative interchanges, extensively learns to associate "redness" with better tasting, ripe apples and strawberries, spring, even with the "yellow" of ripe bananas. As the framework in which communication happens cultures and societies also influence what and how we quale. Eskimos "see" 17 types of white (which they certainly quale differently) and some cultures are distinctively more into music and dancing, while other emphasize peaceful introspection and meditation.

~

The objective attribution of "red" to colors within an approximate range in the spectrum isn't even determinant for the "redness" quale. John Dalton was bothered by his own color vision deficiencies. He, specifically suffering deuteranopia, wasn't able to distinctively see "red", "orange", or "green" from "yellow", because cone cells in his retina would not react to this range in the color spectrum. He may have -seen- his own color deficiencies more epistemologically than visually. In those times people extensively used visual cues such as colors for nomenclature and classifications. He, as a scientist, may have tried to ascertain an essential correlation in what he actually saw as a gradation, but other scientists with no visual deficiencies categorically perceived as outright differences. However, he didn't seem to have any problems associating ripe strawberries with "red" or metaphorically sinking in "Othello's green eyes of jealousy". Like it happened for many other people suffering from forms of color blindness, who have a greater color discrimination in the spectrum they do see and whose visual deficiency went undetected for centuries, "red" for color blind Mary, as personated in thought experiments by philosophers and neuroscientists, and red as artistically used by Zhang Yimou in his movie "Raise the Red Lantern" may be much lesser than the ways in which "gravitation" was perceived, qualed, understood and engaged by tight-rope walker Philippe Petit and Albert Einstein. Furthermore, Mary, like John since he was a child, will certainly be able to gradually "discover" and relate to her new colored world herself, reevaluating her new phenomenal experiences.
through her semiosis. John Dalton's discovery of "Daltonism" shows the openness of our consciousness through our semiosis.

~

Signs' generalizations, communication and consciousness

Neuroscience has advanced by studying clinical cases. There is a tendency to theorize about consciousness by means of too specific perceptual and cognitive phenomena, behaviorally contrived observations, mental quirks and questionable thought experiments, yet the most essential characteristic of our being conscious is our ability to learn. I interpret Albert Einstein's quote: "The eternal mystery of the world is its comprehensibility" (Einstein 1936), as referring to this Promethean, reflexive ability (truly amazing and somewhat magical) that our nervous systems endows us with; namely, our semiotic capacity to learn, to the extent that a well-cultured person can discover deep-seated factual truths of the universe and "simply" formulate them as a one (or three) liner, just through heavy mental work, a pencil and a piece of paper to scratch some equations on and follow some logical tinkering; all based on a corpus of previous knowledge.

Our understanding of our semiosis is still very poor even though they have been the conforming instruments of societal cohesion and development. We, still, mainly think of signs in the abstract, detached way we used to think of time and space in the pre-relativistic era. There are ways to study consciousness as it manifests itself in our use of signs while we communicate, in how the intersubjective realizations happen and how the syntax of these sign systems as forms of expressions undergo diachronic transformations developing towards more generalizing articulations, which redefine semantic groundings and comprehend broader scopes.

The kinetic energy

One of the first mathematical conceptions of a physical magnitude was about the conservation of linear momentum, understood as some sort of "impetus" or power carried by moving objects, determined by their mass (or weight) and speed as its two essential variables; transferable when they collide, regardless of other properties such as their size, shape and color. An incipient conceptual formulation to measurably describe it can be traced back to Alī Sinā Balkhi during the Islamic Renaissance (circa 1000 CE) as proportional to weight times velocity (Sayılı 1987).

In the third law of motion (Descartes 1644 II 41, 43) as part of his corpus of Mechanics, René Descartes formulated the conservation of the quantity of movement, which he still understood as correlating to the scalar quantity of speed, even though he was aware of vectorial formulations:

"there is a difference between motion considered in itself, and its determination in some direction; this difference makes it possible for the determination to be changed while the quantity of motion remains intact" (Descartes 1983 II 41).

Issac Newton's Laws of Motion comprehensively integrated Descartes laws of motion in a vectorial reformulation with universal gravitation and Kepler's laws of planetary motion (Newton 1687).

The energy needed to accelerate an object up to a certain speed, the kinetic energy, was another magnitude of mechanical nature depending on mass and velocity. A great many experimental results developed towards that notion (Mach 1910), eventually culminating with its formulation in the 17th century by Gottfried Leibniz and Johann
Bernoulli, as proportional to the mass times the square of the velocity: $E_k \propto m \cdot v^2$.

By dropping weights from different heights into a block of clay, Willem's Gravesande provided experimental evidence of this relationship and Émilie du Châtelet further theorized on explanations (Zinser 2007). Its initial inception was controversial since it appeared to somehow be another expression of the linear momentum, because the two determining variables were also mass and velocity. The factor exacting the equation was then experimentally discovered to be one half ($1/2$), based on the principle of conservation of energy, through falling experiments (Mach 1912, p. 341). In more recent relativistic and quantum mechanical reformulations, the underlying semantic ramifications of the concepts of mass, energy, location, speed, space, time and even observation itself essentially changed. Kinetic energy and momentum are not metaphysically special and independent anymore in the mechanical sense.

<table>
<thead>
<tr>
<th>1000 CE</th>
<th>1644</th>
<th>1687</th>
<th>1697-1717</th>
<th>Relativistic, quantum mechanical formulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali Sinā Balkhi's masses</td>
<td>Descartes' masses</td>
<td>Newton's Motion Laws</td>
<td>Leibniz, Bernoulli &quot;vis viva&quot;</td>
<td>conservation of energy</td>
</tr>
<tr>
<td>$((g*m)*v)$</td>
<td>$(m*v)$</td>
<td>$\vec{p} = m \cdot \vec{v}$</td>
<td>$E_k \propto m \cdot v^2$</td>
<td>conservation of energy</td>
</tr>
</tbody>
</table>

Table 3.a Phases in the development of the syntactic expression of the concept of kinetic energy

The development of the Western musical scale

Each sound producing device, from inanimate matter or by animals, in percussive form, tonal music, language or noise, is characteristically constituted of accompanying harmonic components, its timbre, which are essentially determined by how the physical properties of the instrument and its acoustical surroundings interact. From these harmonic components, the base tone of a sound is perceived as its tonal frequency or pitch. Our brains’ perception of tonal frequency differences, as well as differences of intensity of sound and light, approximates a logarithmic function (Plack et al 1995). Our sense of dis- or consonance between tones depend on how seamlessly their pitch and harmonic patterns correlate (Helmholtz 1954, 186) and the extent to which we have been habituated by our particular musical tradition.

We have apparently sung, played and written music since we talked, used tools and wrote language (Kilmer 1986). All cultures use scales as a protocol prescribing the relationship among tonal frequencies, which frame the executional possibilities of musical interpretation.

There are factual findings from most cultures indicating the existence of a common fundamental nexus connecting our sound-receptive ears and sound-producing vocal chord within the same frequency range; the physics of the production of sounds; the way our brains register sounds; our anatomically motor characteristic, having two hands each with five fingers and our tradition (Barbour 2004, I). Almost all cultures, including pre- and historically unrelated post-Pythagorean ones, seem to have had in common:

* scales containing the perfect consonances, the octave, with frequency ratio of (2/1); perfect fifth (3/2); and perfect fourth (4/3),
* specially experimented with the 3, 7, 12, 31 and 53 tone scales as particularly harmonious,
* developed their scales through more complex practice, and
* favored the twelve-step octave.
Greek folks enjoyed music before and after Pythagoras in various scales (Barbour 2004, II), yet Pythagoreans were the first to articulate a mathematical theory about the physical reason why some sequences of tones sound more "in tune" than others. Legend has it that, after noticing some acoustic similarity in the rings of blacksmith hammers, Pythagoras discovered that their sounds related to their weighs in whole-number ratios. Besides the possible embellishment of social accounts, we do know the physical phenomenon describing this relationship to be true; that the Pythagorean school (fl. 500 BCE) believed Mathematics to be the language not only of Science, but of nature itself; that ancient Greek Mathematicians were also obsessed with whole numbers and their ratios as expressions of everything natural and divine[^3:1], and, as extensively evidenced by scientific books from those times, that they had the tendency to understand and think through their matters in terms of ratios of like quantities (Mueller 2006). Even Aristotle formulated his explanation of the essence of metaphor through proportions when he reasoned that "as old age is to life, so is evening to day"[^3:2].

Keyboard instruments' players used to work hand-in-hand with tuners (some of them doubling roles) letting them know exactly the tuning required for a piece and musicians playing fretless instruments almost unconsciously adjust to the "right" pitch. Theorizing about the relationship between musical practice and the use of certain scales has been an engaging issue specially in the Western culture since ancient Pythagorean times, in which Aristoxenus questioned:

"Are the cogitations of theorists as important as the observations of musicians themselves?" (Barbour 2004, 1)

Till the modern age in which most prominent scientists, engineers and musicians studied and devised plenty of scales and instruments (Benson 2006, V). Trying to best exploit our range of auditive perception and enrich the possibilities of musical instruments, 12-note scales were devised based on perfect fifths, which closely resembled the Pythagorean one and were common on keyboards in medieval times, but the one flaw of this system is that 12 perfect fifths do not precisely round off to an even octave. The Pythagorean scale was used for centuries until musical praxis engaged the consonance of major and minor thirds; ratio (5/4) and (6/5) respectively, as the basis for diatonic scales characterized by three sets of major triads starting within an octave; C-E-G, F-A-C and G-B-D'. Diatonic scales conditioned a change in the notion of musical key signature, around which a melody gravitates. By the start of the Baroque period until at least the start of the 20th century, instead of a central tone the use of a central triad with the reinforcement of their intervallic patterns became prevalent (Janson et al 1970).

[^3:1] "The so-called Pythagoreans, who were the first to take up Mathematics, not only advanced this subject, but saturated with it, they fancied that the principles of Mathematics were the principles of all things". Aristotle, Metaphysics: I-5

Many scales based on the diatonic tuning in Renaissance music didn't totally solve the problem of being just optimally fixed to one or a few key signatures, which created tuning problems for ensembles. A workable, "socialized" trade-off prevailed with the equally-well tempered scale, which distributed the dissonance by effectively flattening the 12-note musical scale into exactly equal scale steps with frequency ratios of 12th square of 2 (\(\sqrt[12]{2}\)) (Schröder 1982). Polyrhythm is heavily used by some musical traditions and is artistically employed by jazz players, however our more visually-oriented and multi-media societies have not been receptive to the rich possibilities that current music instruments give, including the dynamic resetting of scales for expressive purposes.

**The Elements:** The birth of theoretically objective scientific methodology

Euclid's Elements are a prime case clearly showing the link between individual and collaborative consciousness in syn- and diachronic way. As part of the Greek cultural progress, even though they still didn't see Mathematics as a logically self-enclosed scientific discipline, since they associated certain numbers with specific meanings and even related their practice with Theology, they realized the intrinsic principles and the epistemological value in the logically framing exercise of proving statements and presenting their interrelationship in form of a deductive corpus based on as few and simple as possible axiomatic principles and constructing devices.

Trying to prove the 5th postulate (herewith degrading its axiomatic status) took more than two millennia of relentless pursuit of logical perfection by generations of
Mathematicians grounded in some subtle syntactic nuance, nonetheless genuine intuition, who were seeing more through their logical reasoning than with their eyes and plain geometric senses, so noticing its disparate complexity not being in accord with its axiomatic status. Such was the obsession with this problem that Mathematicians of the stature of Gauss, who had himself pondered about the 5th postulate for more than three decades and not doubting its eventual solvability, hesitated publishing his own results, which directly challenged Kantian doctrines of space as innate subjective intuition in form of synthetic a-priori truths considering:

"the concept of [Euclidean] space is by no means of empirical origin, but is an inevitable necessity of thought" (Kant 1781).

Gauss, however, stated:

"I am ever more convinced that the necessity of our geometry cannot be proved at least not by human reason for human reason. It is possible that in another lifetime we will arrive at other conclusions on the nature of space that we now have no access to. In the meantime we must not put geometry on a par with Arithmetic that exists purely a priori but rather with mechanics" (Rosenfeld 1988, 215)

concedingly granting Arithmetic a purely a priori status.

Some philosophers even mocked Mathematicians for such a tantalizingly timeless obsession\(^{3:3}\), since they considered fruitless the attempt to prove from "indirect concepts" that which is "directly evident from perception". The final solution of this conundrum brought about the discovery of other types of geometries describing spaces initially rejected for being "absolutely false" and "repugnant to the nature of straight lines" (Saccheri 1733). These new geometries were independently discovered by Nikolai Lobachevsky (Lobachevsky (*) and János Bolyai (Bolyai (*)).

<table>
<thead>
<tr>
<th>Euclidean:</th>
<th>non-Euclidean:</th>
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</thead>
<tbody>
<tr>
<td>(c^2 = a^2 + b^2)</td>
<td>Spherical: (\cos(c/R) = \cos(a/R) \times \cos(b/R))</td>
</tr>
<tr>
<td></td>
<td>Hyperbolic: (\cosh(c/R) = \cosh(a/R) \times \cosh(b/R))</td>
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Table 3.c: Formulas for the distance between two points on a 2-dimensional surface. \(c\) is the "hypotenuse", \(a\) and \(b\) the "legs" of "right" triangles on the surface in a space with curvature \(R\).

Our plain Euclidean geometry for which the so-called Pythagorean theorem applies can be derived from both the spherical and hyperbolic plane geometries for the case in which the curvature radius \(R\) is immensely greater than the triangle's sides and the classical version of the kinetic energy is just the special case of the relativistic formulation, when the velocity of an object is very much less than light. However the ways these more general formulations were discovered was not through improvements of measuring equipments and approximations, but systemic epistemological steps.

By studying how the syntactic expression of the concept of kinetic energy developed, the unsuccessful trials to prove the parallel axiom (Klügel 1763) and the various types of keyboards devised to satisfy the need for musical scales, one can see how

\(^{3:3}\) Schopenhauer, whose thinking even questioned Kant's, seemed to have had a visceral repulsion to such mathematical quests. (Schop. 1819, II, xiii)
the explicitly expressed syntactic realizations of concepts have changed along with their semantic groundings; how mistakes may be organic parts of cultural progress and even some kind of semiological, Darwinian-like survival of the fittest among the devices arranging musical scales; and how, given certain circumstances, the ones prevailed, which best embodied a certain degree of generality, which gets then realized by cultural praxis.

We could gain a better understanding of the inner semiotic gears of the mind-body link by studying the logically closed, epoch-defining and relatively discrete stages of generalization that expressions phase through syntactically framed by concepts and aesthetic forms of organization as part of the intersubjectivity of our communication.

Conclusion:

We still don't have a comprehensive theory explaining the underlying neural correlates of consciousness, yet many researches acknowledge that consciousness has a special characteristic called its "hard problem" relating to the sensoro-psychological and psycho-physical link, which won't be spelled out by physical elucidations. As Ilyenkov put it regarding the semiosis of valuation in commercial interchange:

"To try and explain the ideal from the anatomical and physiological properties of the body of the brain is the same unfruitful whim as to try and explain the money form of the product of labour by the physico-chemical features of gold." (Ilyenkov 1977, p. 85)

Chalmers conjectured that an explanation of consciousness may need an "extra ingredient" (Chalmers, black 17), this study advances our semiosis as such. I assert in this paper that the link bridging the physico-sensory and the psychological is the rich semiosis we employ while communicating, substantiating my case with examples of semiotic developments, their relationships with the intersubjectivity among parties exercising their consciousness through our communicative practices, the derived cultural codes and societal dependencies.

Materialism assumes physical descriptions of entities and processes to be their complete account. This theory questions the exclusivity of this axioprinciple by considering our conscious semiosis as natural, integral parts of our reality.