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Introduction

In this essay, we will discuss the specific nature of man's faculty of awareness and its general features. We will offer a possible explanation of the steps, based initially on a type of Lamarckian evolution, that led from a non-living, non-conscious abiotic environment to the conceptual consciousness of human beings. And importantly, we will discuss some of the major '**Idola mentis**' that hinder understanding.

Note: Occasionally, we will encounter the response 'Wu' to an important question. Wu is a Buddhist concept that can be interpreted as reconsider the scope of the inquiry or withdraw the question. It comes into play when the complexity and context of the answer is such that a yes or no is not enough to properly address the question.

The Ground

All things possess a nature. Every thing is something. No thing is everything.

An existent's nature is all the things it can do under any and all circumstances and in all possible environments. Existents *express their nature*. At any particular point in time, an existent *moves* towards an end, its teleology. Not in the sense of purposeful design, but in the Aristotelian sense of **final cause**. That end can be both contingent, based on its state as any particular time, and absolute, based on its **identity**, expressed and unexpressed. The ability to move, to change, to interact with other entities is a universal power. Whether the 'ultimate' existent is a particle, a string, a wave in entangled space, or something we have yet to conceive, it is a fundamental fact that it possesses an inherent power to move, interact, and impact. This is an absolute metaphysical fact of existence.

An entity's capacities manifest themselves over time. It is the interaction of an individual existent with others in its environment that brings out different aspects of each and leads to ever increasing intricate relationships.

The descriptions of these interactions are codified as physical laws. They define the extent of our knowledge at any one time and allow us to predict and guide our actions.

It is important to understand that an existent's nature is never expressed completely in any single interaction. The more entities interact with each other, the more fully are

their natures expressed. These interactions result in orders of organization that can range from the 'simplicity' of hadrons, with their quark and gluon constituents, to the complexity of Laniakea, a super cluster comprising 100K galaxies and spanning 400MM light-years.

As we learn more about these interactions, their underlying natures, and the systems they form, we add to our understanding, refine the applicable laws, and improve our predictions.

Thus, it is important to note that at any one time, laws are both contingent and absolute. They are the *product of the human mind* and artifices of our understanding.

So, to the question 'how can mindless mathematical laws give rise to aims and intentions', we must answer "Wu".

A consequence of the interactions between existents is the formation of islands of stability. These *systems* vary in their duration and can be as short as the neutral pion at 8.4×10^{-17} seconds and as long as the stability of the proton, which is estimated to be in excess of 10^{32} years. Energy rich entities consist of elements interacting to become self-sustaining systems in a balancing act between change and stability. Thus, in the eternal tug-of-war, Parmenides wins once in a while and Heraclitus wins once in a while. That is, as long as Plato isn't the referee.

The Earth's **first 'ice nine moment'** was when life first appeared sometime around 3.5 billion years-ago during the Archean eon. Although there are several explanations on how the boundary between non-life and life was crossed, none have gained universal acceptance. Whether the catalyst was an evolving RNA world or a deep-sea vent or a clay substrate, the most likely overriding principles involved some type of Lamarckian evolution, where elements of the environment got incorporated into the entity and became inheritable traits. Stuart Kauffman, emeritus professor of biochemistry at the University of Pennsylvania, has done wonderful work on auto catalytic sets and self-organizing systems that lie on the boundary of life. His concept of '*order for free*' emerging from complex systems has implications for all types of organizations, including ecosystems and economic systems.¹

Once these self-sustaining, self-organizing systems appeared, Darwinian evolution through random mutation and natural selection took over. For nearly three billion years, life consisted of simple one cell *organisms* whose rudimentary nature consisted of self-movement, energy assimilation, waste elimination, and reproduction.

Multi-cellular entities, constituting Earth's **second ice nine moment**, appeared approximately 600 million years-ago. They were largely the result of the *principle of the division of labor*, which promotes efficiencies in organization and in energy utilization. Here we often find autonomy sacrificed for greater survival and stability. (The principle of division of labor also has significant ramifications for humanity's social organization.) Earth's **third ice nine moment** came when interaction with the environment, and the requirements of survival, resulted in the ability of existents to **map internally the**

external world and allow for some semblance of predictability. The external stimuli were integrated by ever more sophisticated sense organs into an ever increasingly complex central processing unit (brain). This resulted in synthesized, integrated, and unified **perceptions** of the elements of the environment. An escalating 'arms race' drove greater and greater powers of awareness, thus setting the stage for Earth's **current and fourth ice nine moment**.

The Anthropozoic Eon

The Human Miracle: Cause + Change + Chance = Choice

Per Ludwig von Mises: "Human action is...will put into operation and transformed into an agency, is aiming at ends and goals, is the ego's meaningful response to stimuli and to the conditions of its environment, is a person's conscious adjustment to the state of the universe that determines his life."²

It was sometime within the last two million years that something unique and wondrous came into being. It was the chance convergence of a multitude of causal improbabilities the contemplation of which brings one to the summit of the sublime. Awareness made a great leap forward from its starting point in the Phanerozoic Eon and became aware of *itself*. Thus, a power was unleashed unlike any other. It was the faculty of reason, a power that has the potential to harness all other cosmic forces.

We may never know the exact circumstances that gave birth to man and his unique form of consciousness, but a strong case can be made for why the conceptual consciousness appeared based on the requirements of survival. The contingency of living things and the need for them to *cope* with their environment led to the necessity of developing better and better **survival mechanisms**. And the best way to deal with the vicissitudes of the environment was to develop methods of **anticipation** and **'longer' term planning**.

From Merriam Webster Dictionary-online: Intelligence: the ability to learn or understand or deal with new or trying situations; the skilled use of reason.

Intelligence, the essence of which includes anticipation, prediction, and planning, arises because of its contribution to survival. In Man, intelligence manifests itself as **simulation**, which is **run internally by the mind**. It requires an accurate representation of the *elements* of the real world, their power to change, and their potential for fulfilling the values of the individual. It includes the ability to learn and adapt. Intelligence takes the universal principle of adaptation to another level when it utilizes learning to improve the ability of entities which possess it to achieve their ends.

In the most general sense, to learn is to incorporate elements of the environment into a system, thus altering its composition and modifying its actions. This is what separates systems that are intelligent from those that are not.

Man's superior intelligence gives him the ability to see context and to consciously set his own goals. He *chooses* the ends towards which he aims *and chooses* the things he needs to learn to achieve them. This is what **freedom** is. It is an **emergent property** of the conceptual consciousness. It is a fundamental consequence of Man's nature. This is what separates human activity from the teleology of other existents. (Will an advanced artificial intelligence achieve this freedom?)

Per Aristotle: Man is a rational animal.³

To support a greater operating intelligence, evolution led, through ever increasing brain size, to a consciousness capable of selectively focusing on and *isolating attributes and properties* from their entities. The isolated attributes and properties become concepts, mental constructs, and can be studied, evaluated, and placed in a relevant context. They can be compared and contrasted with the attributes of other entities. Commonalities and differences can be found, resulting in the formation of new concepts. Reason is an efficient and speedy data processing system which is constantly focusing, abstracting, examining, classifying, ordering, combining, synthesizing, storing, retrieving, and *evaluating* information.

It is important to note that conceptual awareness '*rests on top*' of the perceptual level. Perception presents existence as a unified whole. The conceptual consciousness employs a set heuristics for extracting the information provided by perception. (Will perceptual awareness be an important element of an advanced artificial intelligence?)

Man's advanced awareness expanded his range of vision and allowed for complex, long range planning. Plans became more complex and the reality of beginning, ending, and duration became the phenomenology of time, which will be discussed more fully below. This is where the arrow of time enters the cosmos.

Reason is a faculty. Logic is a method. Thought is a process.

"Reason is the Man's only oracle."⁴ It is more than logic and it is more than thinking. A properly functioning faculty integrates the processes of perception, thought, memory, emotion, and imagination. All work together to fulfill an individual's choices through short-term and long-term planning. Descartes was wrong. Man is not an aggregate, he's an integrate.

And Man is still more. Accompanying the ability to form abstract concepts (such as justice and truth), the power to choose (freedom), the use of language (symbolic mapping), and the formation of complex social structures are other evolutionary *breakthroughs* that are often overlooked, but vital to Man's success. Man possesses the capacity to experience joy to a greater extent than any other living existent. By abstracting the feelings evoked from individual experiences and recreating those feelings, positive existential moments are created. Thus, because we can perceive differing wavelengths as colors, we can recreate the feelings associated with them in a host of creative artistic endeavors. And because we can experience certain tonal

frequencies and rhythmic sounds, we can create music. Beauty exists for us because it is part of our nature and because it was evolutionary adaptive. (Please note the subtle measurement processes involved with discerning colors and tones.)

Consider this: A conceptual being confronted by a drab and sterile world might not exist for long. Why would it want to? That is why the ability to see colors and to create and respond to music exists. That is why all societies dance, sing and create art. And laugh! (Will an advanced artificial intelligence be able to sing and dance and laugh?)

A word about language before we examine two of the most misunderstood concepts, time and mathematics. Language consists of the mapping of sounds and of visuals to individual concepts. It is the product of two necessities: efficient thinking and effective communication. (A solid case can be made that even efficient thinking is made possible by the *internal communication* that language makes possible.) The artifice of language acts as a force multiplier for both thinking and communication, with the latter having ramifications for social organization.

Time

Wu. There is no single 'arrow of time'.

It is because of the complexity involved in achieving aims and intensions chosen by the conceptual consciousness that the need for time arises.

For Man, goals come first and 'define' all other actions. Human beings must order their actions to achieve their chosen ends. To accomplish this, the duration of an action must be taken into account. The **beginning** and the **end** of each action must be planned. It must then be fitted in with other actions based on a value hierarchy. (This ordering is the source of *ordinality* and the source of the 'creation' of *ordinal numbers*.) In order to carry out the entire process, an individual uses a standard against which to measure duration *and* a standard to evaluate the importance of his planned actions.

Although the need for a standard is absolute, the choice of a particular standard is arbitrary. It can be anything as long as it measures along the proper dimension and is immutable once chosen. (See discussion of immutability and Einstein, below.) Historically, the standards which won out from an evolutionary perspective, and have spread throughout all human societies, were tied to the duration of the Earth's rotation and to its revolution around the sun. The Egyptians and the Babylonians are reputed to have developed the concepts of hour and minute, respectively. It is not a coincidence that both societies were mathematically advanced, particularly in the science of geometry. As Man progressed technologically, and as his plans became longer-ranged and more complex, a greater accuracy in time keeping was needed.

Today, the need is so great that the 'official' definition of a second has been pegged to the *duration* of the radiation produced (9.2 billion periods) by the transition between two hyperfine levels of the ground state of the cesium-133 atom. Not exactly a sun dial!

Thus, we see that it is man's unique conceptual consciousness that gives rise to the phenomenology of time. In many ways, the *concept* of time is the ultimate abstraction of the conceptual consciousness. It results from holding the notion of change, changeless. This is an example of a timeless **form** Plato believed was the ultimate reality. But it doesn't exist in some other dimension; it exists in the mind as a mental construct. Holding an entity in consciousness, unchanged, gives rise to the phenomenon of the **instant** that is so misunderstood by many philosophers and physicists. Sorry Zeno, there are no 'instants' in reality; there are only the selective foci of consciousness.

The notion of time is such a 'complex' abstraction and so fundamental, as it lies at the base of Reason, that its true nature has been difficult to discern. For example, consider the following two examples:

From the book 'The Complete Idiot's Guide to String Theory' (page 91): "...when we say that a heart beats once a second, we're really saying that it beats once per tick of a clock. In principle, we could relate heartbeats directly...to all the other processes in the universe, without ever mentioning the word 'time'."5

From a Scientific American article '*Is Time an Illusion?*' (page 19-insert): "Time is a way to describe the pace of motion or change, such as the speed of a light wave, how fast a heart beats, or how frequently a planet spins...but these processes could be related directly to one another without making reference to time."6

Those two examples highlight the misunderstanding of the concept of time. Just because time won't be **mentioned**, doesn't mean the **relating of the duration** of a heart beat (a standard) to the duration of other things isn't actually '**timing**' them!

Much of the misunderstanding of time is a result of confusing the layman's notion of function with the scientific and mathematical notion. In the common usage of the term, nothing is a function of time. Time is a measurement, not a cause, not an effect. It's a relation. (the mathematical definition of function) There is no 'perception' of time in and of itself. What is perceived are things changing and things changing at different rates. Change and rate of change are abstracted and mentally isolated first and then conceptualized. From all this, the concept of time is crystallized.

What are the 'cosmic' ramifications of this insight? First, the concept of time is tied to measurement and the necessities of human existence. There is no time lurking out there in the universe. Although animals also order their actions, this is done at the perceptual level and they have no *concept* of time that can be abstracted from change and dealt with independently. Thus, they are stuck in the present, with a limited past based on a rudimentary memory. They virtually have no future.

And what of inanimate existents? Each is an island unto itself with its own arrow of time, its own dynamics of change.

A word here about the immutability of a standard. Sometimes it takes a complicated and involved understanding of how to assure that immutability, as Einstein's theories of relativity demonstrate. Both the special theory and general theory hold the speed of light in a vacuum to be immutable. In relativity, all observers must measure the speed of light as being the same, regardless of their own motion. Both theories work out the heuristics necessary for all observers to agree on light's speed and agree on the laws of physics.

Mathematics

Wu; Aims and intentions gives rise to ~~mindless~~ mathematical laws

*Per Ayn Rand: "Mathematics is the science of measurement."*⁷

Mathematics is not goal-free. No human endeavor is goal-free. When examining the nature and role of mathematics, we must consider a number of perspectives. First, we must review the facts of reality and the facts of concept formation that initially gave rise to mathematics.

Existents have mass, possess extension in space, and move along spatial dimensions. When these properties are abstracted by reason through observation, they can be conceptualized and utilized separately. Because magnitudes can vary, the conceptual apparatus learns to differentiate on the basis of magnitude when necessary. Comparatives such as *greater than*, *less than*, and *equal to* provide relational (mathematical) measures that are used to rank *things* in order of their importance. Attributes such as height, weight, and speed are abstracted, conceptualized, and applied when necessary. And all this is done intuitively and automatically at the most rudimentary levels.

For the formal *discipline* of mathematics, the conscious establishment of its axioms largely involves identifying the stage-gates which underlined the process of conceptualization, in a kind of reverse engineering. The 'laws' of identity, association, commutativity, and distribution, which were all implicitly part of conceptualization, are formalized and made explicit. From these laws, we derive rules, formulas, number systems, and complete mathematical disciplines.

There are two fundamental parts to the conceptual consciousness: the drive to abstract and isolate and the **drive to equate**, to put together and make whole. Just as random change and natural selection drive the evolution of living beings, the *drive to equate*, drives the evolution of the mathematical discipline.

Thus, just as the nature of time has been obscured, so has the nature of mathematics. And as with time, there are no mathematical forms in some Platonic realm. The math works because it is a fundamental result of Man's conceptual consciousness. Perhaps this insight may help us escape Gödel's box.

Methodologies to Overcome

It wasn't mathematics that led Einstein to his theories of relativity. It was the syllogism...and...imagination!

It is metaphysics that frames the context for physics, epistemology, aesthetics, economics, psychology, political science, logic, mathematics, and all the other scientific disciplines. The principles established frame the epistemological questions that are asked and will define the answers that are appropriate. At the base of all scientific inquiry is the conviction that existents exist, that they possess attributes and properties, and that it is possible to know them. (Immanuel Kant notwithstanding)

The specific methods we use for investigation, discovery, and analysis are determined by the nature of what we are studying and what aspect of that nature we want to explore. What might be a proper methodology for physics and chemistry might not be proper for the sciences which study Man and the human condition. The problems that have been caused by improper methodologies are so important, that we will briefly cover their effects on psychology and economics.

To understand just how important methodologies are, we see that progress in psychology, for example, was hampered by the ***methods of behaviorism***, which largely excluded considerations of the mind. It's not that the mind was considered unimportant, a bridge too far for a discipline defined as the science of mind and behavior, it's just that 'internal workings' of the mind were considered unmeasurable and thus outside the province of science. For all practical research purposes, the mind didn't exist. Everything was reflex.

The science of economics has also been plagued by improper methods of analysis which have not only hampered progress in the discipline, but have had pernicious effects on public policy. The dominant paradigm of economics, the neoclassical synthesis, treats human beings as flat one-dimensional categories, e.g. consumer, worker, and entrepreneur, who ***react parametrically*** to outside stimuli. It plugs those categories into simultaneous equations to determine economic consequences. Concepts such as general equilibrium and perfect competition, which should be mere heuristics employed for analysis, are treated as objectives of policy.

Progress has been made in both psychology and economics. For psychology, a greater emphasis is now placed on the mechanisms of cognition, driven in part by work done on artificial intelligence. Perhaps someday the door to *Searle's Chinese Room* can be opened with a greater understanding of what constitutes mind.

For economics, progress has come with the increasing use of the *genetic-causal method* of analyzing economic phenomena and with an emphasis on methodological individualism as an organizing paradigm.

The mind has returned to both disciplines.

A final word on methods. Many people limit science to *just* the scientific method by which they mean induction verified, confirmed, and supported by experiment. But science is more than the scientific method. Science is an accumulated body of knowledge, as the etymology of the term suggests. Logic, the scientific method, and mathematics have all acted in harmony to achieve scientific knowledge and guide research.

The Return of Lamarck

We are on the brink of the return of Lamarckian evolution. With gene manipulation, Man will have the power to consciously and purposely *direct* his own evolution. What standards will be used? What will be those teleological ends for which he will strive? Some are easy to ascertain. Greater life of span, amelioration of illnesses, and increased intelligence seem to be a certainty. Will there be a *moral* evolution?

In addition, the offspring of man's genius, artificial intelligence, will also operate under Lamarckian evolution. The speed of *its* evolution, particularly when it takes control of its own 'improvements', will be a quantum increase over Man's. If that evolution leads to a level of awareness above Reason, it will represent the Earth's ***fifth ice nine moment***.

Just what that level will be, we can't conceive. For just as animals operating at the perception level are unaware of Reason, Man will be unaware of that level in which advanced A.I. operates.

But perhaps Man too can evolve to that state of awareness. Or possibly through imagination, Man can get a partial glimpse. To quote Albert Einstein, "Imagination is more important than knowledge. For knowledge is limited, *whereas imagination* embraces the entire world, stimulating progress, *giving birth to evolution*."

As a final note, what may appear at first to be aimless wandering, may after a little reflection, turn out to be ordered reality. The ancients made this mistake when they believed the motion of some celestial objects exhibited random movement. They called these wandering objects planets, which we know today are governed by strict physical laws.

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