The Human Shape of Cosmological Structure:
Topological Association of Quantum Mechanics and Consciousness

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"We are measuring not nature itself, but nature exposed to our methods of inquiry."
– Werner Heisenberg

"The most profound distances are never geographical."
– John Fowles

Introduction

There continues a time-worn debate on whether patterns within the flows of the universe have an objective existence. Do these patterns appear because of our human eyes, and dogs or fish would see a different cosmos? Or, does the natural order demonstrate these patterns to all beings?

Regardless of the outcome of that debate, certain human-recognizable forms closely knit with awareness and information. So closely knit that attention to them offers the most effective means of rendering aspects of the natural order into wisdom. Particularly, wisdom capable of being sustained across the evolution of culture.

Scale is paramount to this process, as we know there exist larger and smaller things, than the naked senses of our body can observe. Tools and models facilitate awareness *beyond* the dimensions of our body, and in doing so influence the language of observation and cognition.
Consequently, *models become the governors of our reality*.

All models systematize and mediate awareness.
Models architect our awareness, organizing the sensory information that rests increasingly distant, physically and perceptually, from the body.
As developed in this paper, things of small and large scale have a *symmetry* that allows both of them to be considered together as a whole set, comprising an 'envelope' of scale rather than being independent.

This evokes the alchemical realization of "as above so below," which Kriegsmann & Davis infamously translated: [i]

> *"These things below with those above, and those with these join forces again so that they produce a single thing the most wonderful of all. And as the whole universe was brought forth from one by the word of one god, so also all things are regenerated perpetually from this one according to the disposition of nature."*

This alchemical principle drove the formulation of the high arts, and the resultant Science we have today. When the archetypal opposites are brought into conjunction, the result bears the identity of a divine channel for creating a new whole. Such wholeness presents itself as the stone foundation upon which greater works may come.

The wholeness of each envelope, comprised of symmetrical great and small, happens at many intervals of scale. These discrete points within the continuum of scale create context for the models respective to each. As cognition allows the context to form a network, perceptual linkages bring together the 'ways we know' to create a more comprehensive understanding.

Considering each model as an element of language[1] infers that *there exists a grammar to consciousness*. Such deeply-rooted structure would predicate how we see and communicate about the world.
By developing an understanding of this structure we may utilize it, rather than blindly bump into its walls.

Integral to realizing this structure is the idea of a *'Macroscope*,' a conceptual device that allows one to look outward to see greater range detail in context, rather than inward toward the separation of one thing from another. In juxtaposition, looking past context to view the nuances of detail is the function of a microscope / telescope.

The two, in fact, bear a relationship. Microscopes and telescopes operate on an isolation (reduction) model of observation that is bound by resolution. A *macroscope* would allow one to see a wider context at a smaller scale, and from integration and conjugation derive forms of iteration and interaction.

Scattered and semi-orchestrated aspects of our technology already stand as components of a macroscope. By peeking through these embryonic macroscopes, our culture has already begun to see the very large relative to our own scale. We have found that despite our ability to view the large, we are confounded at understanding its whole.

As is the case when we approach measurement of the sub-atomic, or the cosmic[2], the limitations of our methods for perception unavoidably propagate uncertainty. The propagation of uncertainty is based in current models of investigation that are founded on subdivision and context removal.

Thus, we find uncertainty bound together with superposition and other subatomic quantum mechanics. Perhaps unnecessarily so. Similarly, 'quantized' phenomena – things that are whole units – are the forms that occur within all complex and dynamical systems, and their models use statistic or stochastic measurements to characterize uncertainty.
Such quantized phenomena include bifurcations, emergence phase transitions, stress precipitation, and other spatio-temporal forms.

It is considered here that quantum mechanics relate to a discrete range of functioning *based upon the discrimination and orientation of our senses*. Quantum mechanisms may thus be thought of as the fuzzy 'shape' of our perceptual system. The quantum 'scale' would thereby happen universally, invariant of scale. It would be a measure of precision relative to our perception, both innate and technological. Quantum mechanics may be seen to operate at any degree of smallness or largeness.

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[1] semiotic, or more specifically *semasiological*
[2] The cosmic, we may argue, has a lesser degree of 'corruption' from context isolation, particular with the development of accessible parallel processing, and ambitious data projects like COBE and WMAP.

Using approaches consistent with ancient practices and latent human capacities, we may endeavor to encode knowledge that has been made available only recently via modern tools and technologies.

Scale & Metaphor

In order to define and understand notions of scale, let us review the common metric (base-10) system, but mixed with a concept of symmetry. In scientific measurement, scale is composed by powers of **10**. Many may recall the *Powers of 10* animation by Demetrios[ii]. Symmetry is the concept of similarity; it means that things move, or are structured, in the same way.

The central unit in this system is the meter. Our first understanding of scale, *the human body*, also holds this base unit. Though when born we are just more than half this size, and as adults we can grow to more than 2 meters, the adult torso – the majority of our mass – generally holds the range of 1 meter, or 3 feet. In a scientific form, 1 meter is written as 10^0, where the raised '0' can be any number, and represents the number of zeros to follow the '1'.
Thus $10^0 = 1$, and $10^2 = 100$, and $10^4 = 10{,}000$.

A series of envelopes develops in this way, each envelope of scale as an exponent of the previous envelope, originating from the base 'unit' of our body. That is also to say that no matter how large or small a thing we experience, our understanding of it is based on the 'unit' of our body.

If we reduce this scale by an order of magnitude to $\mathbf{10^{-1}}$ (1/10th of a meter, ~4 inches) we have measurements on the scale of the human hand. If we go up in scale to 10^1 (10 meters, ~30 ft) we have measurements on the scale of a house. Every power of 10 represents more than an order of scale, it represents a filter. It sets and choreographs our perception of nature. However, the base-10 scale may not arbitrary originate from anthropocentrism. Factors in the physical cosmos may predicate the human scale, or our scale may influence what we have the capacity to perceive.

Both of these scales, 10^1 and 10^{-1}, are intimately relevant to our human experience, as the things we design at one scale have a *reciprocal* relationship to the other. Most tools, or parts thereof, are designed on the scale of 10^{-1} because we use these tools with our hands. Paper, dinnerware, books, etc. are all on this scale. As well, most leaves and nutritious plants parts are also of this scale.

Most buildings, or spaces of human interaction are on the scale of $\mathbf{10^1}$ because this is a comfortable envelope of experience.[iii] Houses, dining & dancing halls, courtyards, gardens, street intersections, etc are all on this scale – a comfortable distance for interacting with the personal space of others.
In wild nature we also find this scale present in ponds, any given line of sight portion of streams and trees – many of which grow to a scale of 30-60 feet (10-20 meters). It is perhaps no leap of the imagination that most houses are also built at this scale, but it does reinforce this understanding of how our lives are influenced by patterns in nature.

We can see the symmetry of these scales in the relationship between objects within each. Light switches, door knobs, window latches, thermostats and handles, all 10^{-1}, are the mechanisms that we use to operate the 10^{1} scale of the building – such as a home. As well, each sub-division of the house has a distinct cluster of hand-sized objects; kitchen utensils, lamps, yard / garden, office, bathroom, etc. We may see this in nature, too, where fish, frogs, rocks, most fruits and vegetables, grasses and insects are the 10^{-1} pieces that make a 10^{1} pond. Let us call this symmetry between 10^{1} and 10^{-1} an *envelope*.

Our interaction with each envelope is perceptually 'framed,' or filtered, through a model. The model formulates awareness of our relationship to both scales of the envelope, envelopes that may precede it, and envelopes that are subsequent. Thus, our experiences at any scale are filtered through the series of models for each envelope beyond the body. These models also constrain the dimensions of our awareness, however, as they set the structure and boundaries by which our innate faculties know the world. Complementarily, that structure is the *affordance* of a model – that which grants its capacities.

At the next envelope of experience we have $\mathbf{10^{-2}}$ (1/100 of a meter, about half an inch) measurements just relating to the fingertips, or other similar sizes. At this size we experience jewelry elements, the width of pencils and other delicate hand tools, buttons (on our clothes or to operate our technology, *i.e.* phones). Much of our smallest food (above ground granules) is on this scale; peas, beans, seeds, grains, etc. This is the scale of delicacy, and certain amount more attention and carefulness is paid to this scale than to a hand-scale.

At $\mathbf{10^{2}}$ meters (100 meters, ~300 ft) we have a scale of human experience where rules are used to mediate interaction. This is the scale of arenas, fields, factories, ships, etc. Each of these venues requires rules – a model – in order to have an experience. Games/sports are played in arenas, crops are systematically planted (and fairs are held) in fields, buildings have floor plans, and there is an order of operations to factories, ships, or airplanes.

In wild nature this scale is represented by minor lakes or rivers, or large trees like giant sequoias. Rivers and lakes, in particular, or coastal harbors, are often vital elements in the organization of human social activity at the scale of villages and towns. Towns also have a close connection with the small scale of this envelope. Jewelry and ornamentation denote social standing and function. Pencils and marking tools record resources and financial records. Beans and seeds have their greatest value in multitude, where they can feed a community.

Both 'directions' of scale at the second envelope require some model, or set of rules, to understand our interactions and relationships. Without these conventions, the interactions of people in this scale of space can become chaotic, as in a mob, or other hive-like mentality. If beans are not in sacks, buttons not in drawers, accounts not carefully recorded, gemstones left unpolished, etc., all things 10^{-2} in scale, they are regarded as "*clutter*".

At the next envelope we have $\mathbf{10^{-3}}$, which represents the approximate diameter of a grain of sand. Operation at this scale can be closer linked with its

inverse **10^3** – 1 kilometer or 3000 feet. A material can be ground into sand or granules, but doing so requires the labor of many people, and is an operation that usually benefits an even larger number. Involving this number of people, the scale of interaction is often the size of a town, or larger. A large town and its surrounding clusters has a scale in the thousands of feet; nearly a mile. Appropriately, at this scale unorganized human interaction can become a *riot*, or worse, similar to how scattered sands can become a sandstorm.

At the next envelope we have **10^{-4}** meters - the diameter of a hair, a thread, or plant fibers. Our sense of touch can be trained to feel the difference between subtle thickness differences in hair, etc. Arguably though, measurements at this scale are difficult – mostly requiring the assistance of precision tools, pre-processing, or bulk measurements.

The inverse of this, **10^4** meters (10 kilometers, or 30,000 feet) is a scale at which coordinated planning is required to have a distinct envelope beyond the previous village scale. This scale can be associated with a small city or political unit. A cessation of organization at this scale could be related to border disputes and other matters that, like a cancer, take on their own sub-organization (*i.e.* militia).

There may be some value to the developing perspective to consider that there are five classical senses, and that each one can be well-associated to one of the first five (0-4) envelopes. The tactile sense ("touch") is the base scale, that of the body. The sense of *taste* is that which we can put in our hand, the *first* 'envelope'. The sense of *smell* is the *second* envelope, few people can smell more than 300 ft without a wind, hunger, or other augmentation – and few things smaller than one-half inch emit an odor discernible to humans. The sense of *sound* correlates with the *third* envelope, as only a small range of sounds commonly travel farther than 3000 ft, and granule-sized things only produce discernible sounds in limited ways. Our sense of *sight* generally has difficultly observing things as small as a single hair or as far as 30,000 feet – to have regular observation over such distances was, especially in the past, the definition of realms or political boundaries.

For consciousness, each envelope is a filter; in its symmetry of scales, correlation with a sensory organ, and physical morphology. The words 'envelope' and 'filter' can be used interchangeably throughout – though we use the term 'envelope' for its conventional ease in conveying a concept of nesting.

Beyond the Basic Senses

The fifth power is the first scale in which perception occurs almost entirely via an abstract model: **10^{-5}**, 1/100th of a millimeter, is a cellular scale. Tissues and organs of the body can be differentiated by their constituents and layers, but without the precision of 10^{-5} measurements we only understand such things in terms of aggregates. Indistinguishably aggregate to the naked eye, 'vision' in this realm is usually accessible only with magnifying technology like lens optics or chemical analyses.

Inversely, **10^5** is 100 kilometers or 60 miles. This is the scale of a city area or a county. Both require a model or organizational structure in order to conceive of their wholeness. The city scale is comparable to the cellular scale of the

body, constituents exist but they cannot survive outside of their system. This is the first appearance of climatological zones; forest, deserts, or great lakes.

At the sixth orders we cross another envelope. **10^{-6}** is 1 micron, a sub-cellular scale which references the size of cellular components, and the length of an entire DNA strand. Energy with this wavelength is referred to as the Near Infrared. We feel it as heat, particularly in the sense of body temperature, as heat energy takes this wavelength because of the vibration of cellular and sub-cellular things that have this size. Some creatures, such as birds or insects, which identify when plants are nutritious or susceptible based on cellular activity. Optical magnification of this scale is only so effective - energy dynamics, such as light scattering, must be employed to 'magnify' micron-scale events. Medical models of this scale become more complex, and incorporate herbs and other remedies, where plant components undergo a process (boiling, crushing, salves, etc.) in order to become incorporated into the model.

10^{6} is 1000 kilometers, or 600 miles. This scale encompasses an entire region, island or small nation. For humans, statehood occurs at this scale, as an organizational unit above city and county. Models for human interaction increasingly involve representation and mediation. Our models of organismic functioning on the small scale match closely for organismic functioning at the large scale. As well, the medical and technological models that address the small scale f this envelope are used as platforms by which political parties positions themselves in the large scale. It may be possible to give sufficiently rigorous demonstration that the majority of issues affecting 10^{6} organismic activity are primarily driven by illness at 10^{-6}. Climatological zones form regional weather patterns at this scale.

10^{-7} is 1/10 of a micron. This scale is populated by viruses and complete protein components. In all their varied 'species' and configurations, proteins build the sub-cellular components, while viruses work to infect or corrupt them. Regardless of how they make up the bigger organism, healthy or sick, these are the building blocks to the building blocks. Cancerous mutations occur at this scale, in large part due to malformed or corrupted proteins. For scientific models this scale may be very analogous to the previous scale, though it is a small step away from molecular dynamics. Medical models have slight divergence here; new models take to laser tools and radiation for breaking up cancers, etc.; old (shamanic) models of this scale go beyond herbs and address psychological problems. Both, at times, employ drugs in one form or another. Energy wavelengths of this scale are generally in the visible light spectrum.

10^{7} is 10,000 kilometers, or 6000 miles - the scale of continents. For human organization this is the scale of large nations, or a council of smaller nations. Complementarily to the preceding envelope, health trends are differential between regions of this scale. Interaction between sub-national groups, and inter-nationally, is increasingly complex. Arguably, humans are still working at developing effective models for this scale. In nature, continental weather conveyors appear out of the regional patterns.

10^{-8} is 1/100th of a micron, or 10 nanometers. This is the size of the regularity in a crystal lattice and basic protein structures - both of which operate on similar molecular principles. The concept of nanotechnology drives our vision, here. This is also the wavelength of Ultra Violet light - which is related to why

such wavelengths are used to measure things at this scale. Some creatures on earth can see and feel into the UV spectrum. Common medical models generally do not address this scale, while shamanic medical models take an emotional approach to healing.[3]

10^8 is 100,000 kilometers, or 60,000 miles. The primary reference we have to this scale is the circumference of the Earth (40,000 miles). Our models spanning the whole Earth are in their infancy, and encompass human rights, cultural memory and ecological functioning. Ecological awareness at this scale is an international effort, as patterns cover polar weather migration, earthquake dynamics, oceanic changes, as well as global warming and cooling cycles.

> Of note is the correlation between 4th and 8th envelopes, the 4th envelope being the extents of sensory perceptions by an individual and the 8th envelope being the extents of direct perception by a large community or a global organism. We shall also write an envelope number with vertical-bars, as |1|, in the same way absolute values are written in mathematics. In a complementary fashion, the organization of the |5| - |8| envelopes follows the same pattern as the |1| - |4| envelopes. As individuals gather their home, community, neighbors and become a county[4] – so do these counties gather together as regions, states, and countries to form the whole planet. We say that envelopes |1| - |4| are thus *homeomorphic* to |5| - |8|, (meaning they have the same pattern) and together would form a *unit identity* that we see develop into the next set of envelopes.

"One Small Step..."

The next envelope of scale is the 9th power.
10^{-9} is one nanometer. This is the scale atomic structure direct translates into the most elementary molecules: the base pairs of DNA and other crystal formations. . Wavelengths of this scale are x-rays, which are most often used to perform measurements here. Shamanic medical models feel that healing at this level happens spiritually. Modern medical science uses direct genetic techniques on the body, such as stem cell therapies.

10^9 is 1 million kilometers, and almost 1 million miles. This is the orbital 'distance' the Moon travels around the Earth. This 'distance' can generally be thought of as a circumferential measure. Humans have no strong bureaucratic models for this scale. We have rough accords that cover space law and an international / planetary reserve.

This scale begins the threshold where mythological models holding equal or greater weight to people worldwide than scientific or bureaucratic frameworks. As the moon is our closest celestial object, and a satellite, these mythological models include stories which encompass cyclical information and generally govern human ritual. Like the small scale of the ninth envelope, our models are almost entirely representational. The mythological framework used to represent each large and small scale of this envelope is often the same. Recent technological developments have also created a beautiful symmetry between

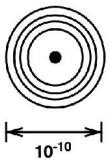
[3] Some anthropology asserts that shamanic medical practitioners had insight into the helical shape of DNA prior to its description by medical laboratories. (Narby, *Cosmic Serpent.* Tarcher, 1999)

[4] borough, prefecture, etc.

scales at this envelope: increasing proficiency over the nano-scale is yielding carbon nanotubes that suggest themselves to be critical in our move to orbital space - namely in being the lynchpin to the development of a Space Elevator.

The scale-symmetry within an envelope shows itself here again in the similarity of form & dynamics between the nucleus & electron of an atom, and planet / moon orbitals of a planetary system. Moreover, the geometric boundary of orbit helps us to see that objects & phenomena at each scale are best defined through a boundary, rather than a length or distance. As an example of how the large scale may tell us about the symmetrically-small, we may find that atoms bonded as a molecule experience their neighbors as though they were in motion due to the atom's own internal dynamics.

The tenth envelope of scale contains **10^{-10}**. This measure is also known as an Angstrom, and is the size of an atom, including its electron layers. Since we have no tools for measuring this scale directly, all of our visualizations are based completely on constructed models, represented graphically or pictorially. Coincidentally, as the scale we measure continues to get smaller, our apparatus for measuring get larger - cyclotrons, particle colliders, other new mechanisms and the systems needed to operate them.



10^{10} is a distance of 10 million km, or 6 million miles. It is the scale of measure between planetary orbital radii in the inner solar system (Mercury, Venus and Mars). The general accessibility and relevance of our models becomes increasingly skewed toward the mythological, as various systems of metaphor begin to arise based on the movement of planets in the night sky. Precise measure, of position, etc., is overshadowed by multi-bod problems.

The eleventh envelope begins the first significant gaps for the small scale. **10^{-11}** is comparable to the outer of three general electron orbital distances (from the nucleus of the atom). Our scientific models are further representational, based on the aspects of crystal formations. Matter composed of atoms bearing this scale are generally metals, and are often radioactive.

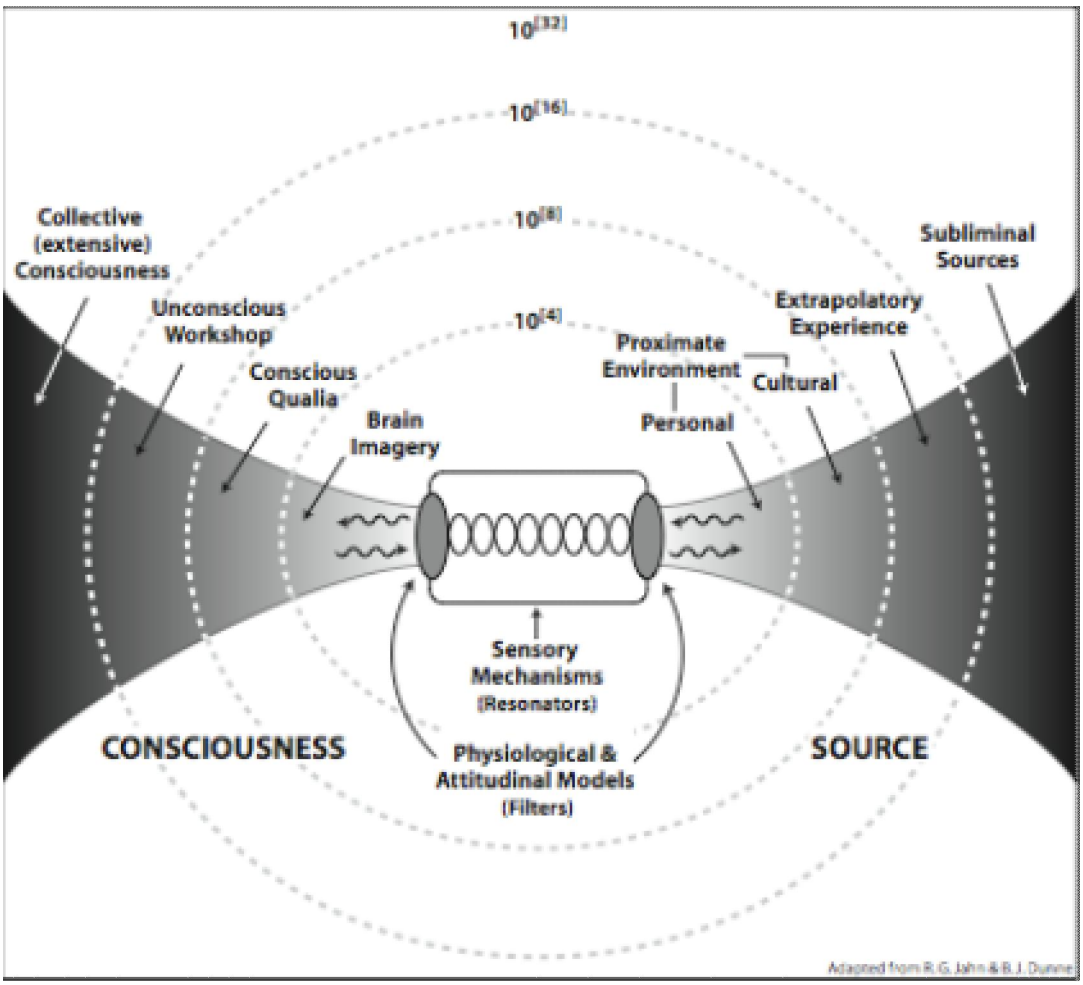
10^{11} is referred to as 1 Astronomical Unit (AU), since it is the distance between the Earth and the Sun. This is also the rough scale of distance between the Earth and any of the other planets in the inner solar system.

10^{-12} is called a picometer, and is the scale of the inner electron orbitals. Matter composed of these atoms can be metal or mineral.

10^{12} is 10 AU, is a scale for measuring Jupiter's orbital distance from the Sun. This is the first scale to represent the outer solar system. As with the identity relationship formed by the coupling of envelope sets |1| - |4| and |5| - |8|, the scales of Jupiter also form part of an identity relationship of scale in the solar system. In this identity we see Jupiter as a boundary. Scientifically we know it to be as well, as its gravity governs & protects the inner solar system, and is hypothesized to create conditions for a fertile Earth. Mythologically, Jupiter / Zeus is the ruler of the gods and governor over all the Earth.

$10^{|12|}$ is a special scale, like $10^{|4|}$.
It is the edge of the larger world of $10^{|5|}$ - $10^{|8|}$.

Formally, we call the relationship of ($10^{|1|}$ - $10^{|4|}$) and ($10^{|5|}$ - $10^{|8|}$) a unit identity. What we are exploring here beyond $10^{|8|}$ is that a similar unit identity exists from ($10^{|9|}$ - $10^{|12|}$) to ($10^{|13|}$ - $10^{|16|}$).



10^{-13} is the scale of the inner electron orbits of the atomic nucleus. More specifically it's the *Compton wavelength*; i.e. the orbital measure that an electron travels around the nucleus, analogous to the moon's orbit around the Earth. Matter arising from this scale are minerals and non-metal elements which are the building blocks of organic life. These characterize the earliest stage of cosmic development, when hydrogen-burning stars make basic elements.

10^{13} is 100 AU, and is the distance from the Sun to a sheath of material known as the Heliosphere. The Heliosphere, heliopause, and bow shock all are a 'skin' of stellar material which is produce by our solar system and buffers us from the interstellar medium. It is generally accepted as the leading edge, or envelope, of our solar system. As a symmetry between large and small scales we may consider the cloudy structure of cosmic nebulae, and the electron cloud density.

10^{-14} is a scale which is represented by the nucleus of every atom. Our models of this scale are increasingly faint, and in our attempt to gain a glimpse of particles properties we use ever larger machinery.

10^{14} is 1000 AU, and is the scale which we have only rudimentary understanding. Many comets have orbits that span this distance. A special place exists for comets in mythological models, naming them the heralds of

great change — understandable even today considering that they travel outside of our solar system and return.

10^{-15} is called a *femtometer*, and is the classical size of an electron, proton, or neutron,[iv] though at this scale all effects in the domain of 'quantum' are most commonly measured in terms of energy, and not size. At best, our representations are uncertain, and our methods of measuring the effects of sub-atomic particles are constantly being re-thought.

10^{15} is 10,000 AU, and is the longest orbital distance of any comet we know. It is almost the distance to the nearest star.

> The common trend of symmetry between the scales remains through the 9th to 15th envelope, in an inexorably intertwined measurement. Particle physics increasingly becomes a matter of astrophysical observation, wherein we watch the dynamics of celestial events in order to deduce the inter-particle forces that underlay them.

The power that deities are assigned is over a realm that is a fundamental as atomic and sub-atomic forces. That is, were forces of the scales 10^{-9} to 10^{-15} to suddenly operate differently, the macroscopic effect to the human mind would be extremely mythological. It becomes increasingly clear that the large and the small scales of a given order are formulary envelopes. The mythologies are no less intertwined. Pantheistic forces are commonly identified with stellar structures of 10^{9} - 10^{15} scale.

"...One Giant Leap..."

What lies beyond this envelope of scale? On the small scale we know very little, with subatomic particles dotting landscape seen only through mathematical calculation. After the electron at 10^{-15} we have the lepton, calculated to be no larger than **10^{-18}** in size. Neutrinos have been estimated around 10^{-30} in diameter - a debated measurement.[v] By proposition, somewhere smaller than all of this is a vacuum state, of which little is known.

On the large scale we know only slightly more. We can see structures at this scale, but the things they're made of cannot be clearly seen given our technologies. $10^{|16|}$, the 16th envelope, is the distance from our star to other stars. **10^{21}** is the radius of the Milky Way. At 10^{21} we have the diameter of our Milky Way galaxy, which hold all of the stars that we can see with the naked eye. Among the models for this scale most accessible to the mind are stories about the constellations and their movement. In our concept of $10^{|4|}$ being a 'unit identity,' $10^{|20|}$ is another such 'envelope of envelopes' where $10^{|4|}$ is a human limit, and $10^{|20|}$ is a galactic limit.

Beyond our galaxy, at **10^{22}**, we have the distance to the Andromeda Galaxy, our closest galactic neighbor. In fact, 10^{22} is the average measure of separation between all galaxies. **10^{24}**, or 100 million light years, is a rough scale between our solar system and the center of the Universe.

> Following our pattern of identity, $10^{|24|}$ is a 'unit identity,' and again we see a scale-pattern of center to edge / boundary. Beyond this, in the range of 10^{30}, is the most recent estimates for the diameter of the universe. Including

developments from modern science, few human models have any framework for a number of this scale (the Maya of ancient Meso-America having created the primary other).[5]

Let us consider a metaphorical relationship of the symmetry between smallest and largest scale.
Within the universe there appears a great axis around which all things move. In the night sky from the Earth this axis is drawn through the constellations Sextans and Aquilla.[6] The axis is called a 'cosmological anisotropy,' and reveals itself in light and other electromagnetic waves like a needle-orientation of a cosmic compass.[7] By the way we measure this axis, we are left with a single plausible reason for its existence, that it is a property to the electromagnetic vacuum.[8] Here again we see a bridge of symmetry between what looks like things in the range of 10^{32} and 10^{-32} – yielding the envelope $10^{|32|}$.

Let us reconsider that the largest and smallest computable scales that we have to deal with are each on the order of 10^{32} and 10^{-32} respectively. The proposition being made in light of such scientific data is that structure on the largest scale we can measure arises directly with that of the smallest scale that we can envision. A 'spin' in the vacuum, like a whirling, brings an image of a vortex. This same shape has been proposed as the 'shape'[vi] of the cosmos. This irrevocable connectedness between large things and small things, the above and the below, the world within and the world beyond, is rendered by the alchemical realization of "as above, so below."

Perception of Quantum States

Now that we have a foundation of the symmetry of scale present throughout nature, we may look to understand the role of consciousness in it.
Let us begin again from the base scale of the human body.
Our interaction with each envelope of experience is 'framed' through a model. The model formulates awareness of our relationship to all scales, present or represented. From this each envelope of scale is an order of the previous envelope[9] originating from the base 'unit' of our body. That is to say that all of our experience is based on the 'unit' of our body. Experiences at any scale beyond the body are filtered through layers of envelopes, with each of these envelopes being composed of symmetrical scales.

The envelopes distant from our own are accompanied by models for perceiving and interacting with them. Each new envelope is composed of objects & models the size of the previous envelope. These models may

[5] The MesoAmericans recorded a number on the order 10^{100}

[6] The constellation *Sextans* represents the sextant, the ancient navigational instrument by which seafarers would orient themselves. *Aquila* is the messenger from Heaven - the mythological Eagle leading souls on their journey. Their association via the 'poles' of the cosmic anisotropy 'axis' are metaphorical analogs of our scientific knowledge, as the 'axis' orients light and all electromagnetic waves.

[7] An axis around which the polarization plane of electromagnetic radiation becomes the most twisted as it journeys across the fabric of space.

[8] Since the polarization rotation we observe has such a systematic dependence on the direction of travel of the radiation, it is posed as implausible that it is generated by anything other than a vacuum property. (Arxiv ref)

[9] like eigenfunction

constrain the dimensions of our awareness, causing our innate faculties to lose touch with the world.

It is no small statement to say that we experience envelopes because of their physical structure. This would mean that physical reality has these dimensions – rather than the more casual notion that we see this structure because it matches our own dimensions (anthropomorphism). Such a notion calls into question the origin of complementary pairs: which came first? With reference to the filters concept of Jahn & Dunne,[vii] any model acts as a filter in this regard.
Each physically real thing, and the perception of it, directly affects each other.
A model's bias or neutrality to information is the discrimination of our mind.

These models are like sensory organs, in this way. Considering models as discrete modes, we may reflect upon their consonance with the concept of filters. The structure, of a model / filter when employed directly by an individual is correlated with their apperception of phenomena. Without filters, the source stimulus is an unintelligible chaos – yet, at the moment of apperception, the liberties of that chaos are those afforded by one's model / filter.

Consider that the models and the 1st - 4th envelopes (including the 0th, the body) are experienced in tandem with the basic senses, and thus require no abstract 'cognitive modeling.' They are a direct transduction of the environment.
At the fifth envelope none of our base senses suffice to directly experience the world, and *we must rely upon models for perception and interaction*.

Cultures have chosen to approach this initial 'envelope of the envelopes' in various ways. Material methods, as in the case with a lens, are most often applied when addressing the small scale; i.e. tools are constructed based on models of light, heat or other energy. These tools allow the 'small' to be 'enlarged' - all self-consistent with the models that gave rise to them. As discussed, systems of medicine also applied to conceive of these scales, and reciprocally define the demographics of the large scale. 'Immaterial' ways are generally used; i.e. social systems, governance and their associated material paperwork. Each of these carries a 'particle' metaphor - papers documenting points of data in the system, and lenses expanding the motion of smaller things. In this light, particularly, the fifth envelope can be seen as the *cellular* threshold of technology.

The model that gives rise to a technological tool is organized around a biological sense. It is into this sensory mode that measurements, from the direct source at more removed envelopes, are being transduced. The transmission, albeit whole, does not come absolute. It has been structured – rectified – by the model used to build the technology for sensation. The structuring of the *source* into 'signal' has the potential to make the 'signal' look most like the model itself, rather than the source having an inherent structure in the *form* of the model.[10]

That is to say, our awareness of information from the first five envelopes is multifaceted. It occurs in as multifaceted a manner as we have trained our

[10] One one regard this stymies total immediate knowing, allowing at best fragmentary images or prophetically-broad awareness; on another it speaks to multi-dimensional observation as the method of rendering insight.

senses. Yet the transduction of information from envelopes beyond the first five is generally focused upon visual information, and occasionally auditory. For instance, we smell the health or rot of food, the way our body reacts when it is ill, and sense that things 'may not taste right.' These are measures of cellular activity. Only in metaphor do we say that something 'smells funny' in the affairs of politics. (10^5 - 10^8)

When using a tool or instrument, the reduction of information via the tool's model bears a direct dimensional relationship to the uncertainty in our measurement. As our sensation becomes increasingly mediated through models, our uncertainty grows. Our experience in these situations can open to creativity, association, imagination, and metaphor. These, rather than being *baseless* mystery, may in fact be observations of phenomena that have *circumvented mediation* in the same envelope.

Consider viewing something smaller than the eye can see. Often we use light expanded through the glass lens of a microscope, making it cover enough area for the eye to see. In this case, we are limited to the precision that our model specifies for the lens material and the properties of the light. More generally speaking, when the model (*e.g. light dispersion*) is used to create a tool (*e.g. a microscope*), observation may reach the tool's limit *(energy density, absorption, refraction, etc.)* to conduct sensory information. That is, the limits of the model govern the information density of a tool.

As the scale between models of material and energy approaches equivalence we reach a boundary.
The diminishing difference in scale between matter and energy has a direct relationship to the diminution of the certainty of our measurements. We extrapolate our models to the edge of the atomic scale, where we reach the classical threshold of quantum mechanical operation. The quantum mechanical uncertainty inherent in the data of this scale, however, is integral to the model we have conceived – it is integral with our state of consciousness. Thus, the characteristics[11] of a model's uncertainty are those of consciousness itself.

With this, we can consider the 'quantum scale', and the uncertainty inherent in it, to be a measure of precision relative to our perception, both innate and technological. As such, it would be a discrete range of functioning *only relative to the discrimination and orientation of our senses* - our filters, or the 'shape' of our own perception. Some aspects of quantum mechanics may therefore be relevant to scales of smallness and largeness. In actuality, any 'quantized mechanics' may operate invariant of scale, or at certain intervals of scale. If these systems truly have similarities, they will exhibit homeomorphism — though they look different, they operate on the same rules set[12] – and *quantum mechanics would thus be isomorphic to them.*

The interdependence of quantum mechanics and uncertainty may be a characteristic of any system in which a sufficient threshold of information is indistinguishable, disallowing discrete awareness. The operations and boundaries of quantum mechanics would hold true for systems that are 'large' to the atomic, even human or galactic, and those mechanisms of astronomic

[11] dimensional and topological

[12] topology

scale would be equally true for the miniscule scale. The quantum and the non-linear, originating together from the configuration of our consciousness, could each be used to create models for studying the other.

The notion presented here, and in the work of Jahn and Dunne, is that quantum states may occur over personal and social dimensions. Models 'at quantum scale' *begin to take on a new light in the interaction of consciousness* with phenomena or concepts relating to any scale.

Models of particular interest would include observation-based wave functions, dimensional properties of state change, and other aspects that are difficult to realize when dealing with phenomena that are confounded by the models we have instrumented. At large scale, we still have model limitations, namely the collection of sufficient data. Rather than not being able to collect enough (or requiring exotic energies to do so), however, we face *achievable* methodologies of sensor nets, and other distributed data collection.

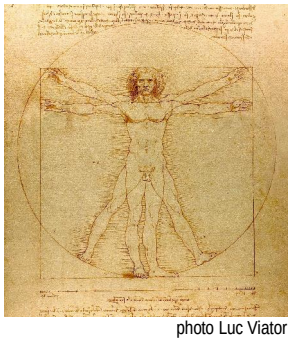


photo Luc Viator

From the consideration of large-scale quantum domains we may reconsider our 'envelope' model. As photo-electric wave functions are modeled as sub-divisions of the atomic domain space, so may the envelopes presented through our perception be sub-divisions within consciousness. We may even consider the 4th, 8th, 16th and 32nd envelopes as metaphorical corollaries to electron orbital shells[viii]. Given the established impact of observation upon wave function, we may, humbly, consider the role of consciousness – and its filters – in the realization of physical envelopes of scale.

Conclusions, and the Conceptual Macroscope

The main point of this paper is the proposition that all models serve the purpose of systematizing awareness, and data derived from them as such are, as yet indistinguishably, the constructions of consciousness. As models are contextualized in relation to other models, the overlaps and differences create a map for navigating our state of awareness and communicating with others and with our environment. The contextualization process allows many facets of our perception to be linked, and the many ways in which we learn can be interconnected synergistically to create a more comprehensive understanding. Upon a foundation of many cornerstones can occur true accord and traversal of the source.

Association, *broad scope,* and *discrimination* are paramount to any systemic exploration of natural phenomena. The development of modern instrumentation has focused heavily upon increasing resolution in order to

better discriminate details. Without context, these details begin to lose all association to the environment that more richly informs them. As that association is lost, so is our ability to model them, and thus arises uncertainty – along with quantum mechanics. As constructions of consciousness, these mechanics may be operative at any scale, given sufficient context.

The functionality of a macroscope, perhaps like the mind itself, allows a smooth contextual ramp for exploring new areas of knowledge, as bridges are built between varied perspectives based on their symmetry. The structure of this model would allow us to navigate through the lesser known domains and toward realms of new insight.

Metaphor and mythology are representations of the structure in this space. Metaphor is an inevitable facet of human consciousness that represents an increasing absence of articulation *at the given scale*. We may consider again that metaphor delivers data from beyond a specific model in order to make a whole perception at the given scale. Far from being irrelevant, the mythological maps the terrain of general awareness, "the big picture." Such a *broad domain*, shedding light on the characteristics of complex systems, is the hallmark of a macroscope. Systems modeling, risk management, political planning, and other attempts at a comprehensive investigation gain extended 'reach' through the use of macroscopic perception.

Also, by framing the structure of our knowledge across scales we gain the advantage of describing it mathematically. Generalizing the properties of physical occurrences allows for symbolic representation of the relationships between them. The collected wisdom of stories can be 'mined' based on structural relationships to understand more deeply the directions of human growth.

Considering that the relationships in these stories emerge from natural observation, they have the capacity to encode phenomenological functions that cross scales, existing as they do beyond the ways we are used to looking at the world. The nature of many mythological identities is *chimeric*, multi-faceted, and multi-dimensional.[ix] Plainly, these identities represent that which is unlike our usual sense of humanness and unlike our customary envelopes or filters. Yet, these stories have emerged from our world, and therefore they hold important keys for its understanding.

As we encounter a growing array of scientific anomalies and instabilities in our global system, we need new approaches for our future. The potential for articulating the 'anomalous' offers one method of providing continuity to the PEAR (now ICRL) work that gave birth to the "Sensors, Filters and the Source of Reality" paper to a new generation. The use of metaphor as a research tool for explorations across the scales of human activity enhances our ability to articulate the anomalies and subtle patterns that hold the keys to our growing understanding of nature and ourselves.

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