Speculations and Physics

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C O N T E N T S

PHYSICS

SPECULATIONS

GOD

PHYSICS

Time Asymmetry Re-Visited

Abstract

Time does not feature in the equations describing the world of elementary particles and in some border astrophysical conditions. There, there is time symmetry.

The world of the macro, on the other hand, is time asymmetric.

Time is, therefore, an epiphenomenon: it does not characterize the parts – though it emerges as a main property of the whole, as an extensive parameter of macro systems.

In my doctoral dissertation (Ph.D. Thesis available on Microfiche in UMI and from the Library of Congress), I postulate the existence of a particle (Chronon). Time is the result of the interaction of Chronons, very much as other forces in nature are "transferred" in such interactions.

The Chronon is a time "atom" (actually, an elementary particle, a time "quark"). We can postulate the existence of various time quarks (up, down, colors, etc.) whose properties cancel each other (in pairs, etc.) and thus derive the time arrow (time asymmetry).

Read Other Essays:

Psychophysics

Negentropic Agents and the Increase of Entropy

Superstring and Membrane Theories

Return

Negentropic Agents and the Increase of Entropy

The Second Law of Thermodynamics predicts the gradual energetic decay of physical closed systems ("entropy"). Arguably, the Universe as a whole is precisely such a system.

Locally, though, order is often fighting disorder for dominance. In other words, in localized, open systems, order sometimes tends to increase and, by definition, statistical entropy tends to decrease. This is the orthodoxy. Personally, I believe otherwise.

Some physical systems increase disorder, either by decaying or by actively spreading disorder onto other systems. Such vectors we call "Entropic Agents".

Conversely, some physical systems increase order or decrease disorder either in themselves or in their environment. We call these vectors "Negentropic Agents".

Human Beings are Negentropic Agents gone awry. Now, through its excesses, Mankind is slowly being transformed into an Entropic Agent.

Antibiotics, herbicides, insecticides, pollution, deforestation, etc. are all detrimental to the environment and reduce the amount of order in the open system that is Earth.

Nature must balance this shift of allegiance, this deviation from equilibrium, by constraining the number of other Entropic Agents on Earth – or by reducing the numbers of humans.

To achieve the latter (which is the path of least resistance and a typical self-regulatory mechanism), Nature causes humans to begin to internalize and assimilate the Entropy that they themselves generate. This is done through a series of intricate and intertwined mechanisms:

The Malthusian Mechanism – Limited resources lead to wars, famine, diseases and to a decrease in the populace (and, thus, in the number of human Entropic Agents).

The Assimilative Mechanism – Diseases, old and new, and other phenomena yield negative demographic effects directly related to the entropic actions of humans.

Examples: excessive use of antibiotics leads to drug-resistant strains of pathogens, cancer and deteriorating sperm counts are caused by pollution, heart ailments are related to modern Western diet, AIDS, avian flu, SARS, swine flu, and other diseases are a result of hitherto unknown or mutated strains of viruses.

The Cognitive Mechanism – Humans limit their own propagation, using "rational", cognitive arguments, devices, and procedures: abortion, birth control, the pill.

Thus, combining these three mechanisms, nature controls the damage and disorder that Mankind spreads and restores equilibrium to the terrestrial ecosystem.

Appendix - Order and the Universe

The role of chance in evolution has long been recognized and increasing structural and functional adaptability has been attributed to random-stochastic processes (such as environmentally-induced genetic mutations). This view,

of course, evades the far more important question of ***why*** do organisms and species react the way they do to changes in their surroundings?

Earth is a complex, orderly, and open system. If it were an intelligent being, we would have been compelled to say that it had "chosen" to preserve and locally increase form (structure), order and complexity. This would explain why evolution did not stop at the protozoa level. After all, these mono-cellular organisms were (and still are, hundreds of millions of years later) superbly adapted to their environment. It was Bergson who posed the question: why did nature prefer the risk of unstable complexity over predictable and reliable and durable simplicity?

The answer seems to be that Nature has a predilection (not confined to the biological realm) to increase complexity and order and that this principle takes precedence over "utilitarian" calculations of stability. The battle between the entropic arrow and the negentropic one is more important than any other (in-built) "consideration". Time and the Third Law of Thermodynamics are pitted against Life (as an integral and ubiquitous part of the Universe) and Order (a systemic, extensive parameter) against Disorder.

In this context, natural selection is no more "blind" or "random" than its subjects. It is discriminating, encourages structure, complexity and order and rewards cooperation. The contrast that Bergson stipulated between Natural Selection and Élan Vitale is misplaced: Natural Selection ***IS*** the vital power itself.

Modern Physics is converging with Philosophy (possibly with the philosophical side of Religion as well) and the convergence is precisely where concepts of order and disorder emerge. String theories, for instance, come in numerous versions which describe many possible different worlds (though, admittedly, they may all be facets of the same Being - distant echoes of the new versions of the Many Worlds Interpretation of Quantum Mechanics).

Still, why do we, intelligent conscious observers, see (why are we exposed to) only one kind of world? How is our world as we know it "selected"? The Universe is constrained in this "selection process" by its own history, but its history is not synonymous with the Laws of Nature. We know that the latter determine the former - but did the former also determine the latter? In other words: were the Laws of Nature "selected" as well and, if so, how?

The answer seems self evident: the Universe "selected" both the Natural Laws and, as a result, its own history, in a process akin to Natural Selection. Whatever increased order, complexity, and structure - survived. Our Universe - having itself survived - must be have been naturally selected.

We can assume that only order-increasing Universes do not succumb to entropy and death (the weak hypothesis). It could even be argued (as we do here) that our Universe is the only possible kind of Universe (the semi-strong hypothesis) or even the only Universe (the strong hypothesis). This is the essence of the Anthropic Principle.

By definition, universal rules pervade all the realms of existence. Biological systems obey the same order-increasing (natural) laws as do physical and social ones. We are part of the Universe in the sense that we are subject to the same discipline and adhere to the same "religion". We are an inevitable result - not a chance happening.

We are the culmination of orderly processes - not the outcome of random events. The Universe enables us and our world because - and only for as long as - we increase order. That is not to imply that there is an "intention" involved on the part of the Universe (or the existence of a "higher being" or a "higher power"). There is no conscious or God-like spirit. All I am saying is that a system founded on order as a fundamental principle will tend to favor order and opt for it, to proactively select its proponents and deselect its opponents, and to give birth to increasingly more sophisticated weapons in the pro-order arsenal. We, humans, were such an order-increasing weapon until recently.

These intuitive assertions can be easily converted into a formalism. In Quantum Mechanics, the State Vector can be constrained to collapse to the most order-enhancing event. If we had a computer the size of the Universe that could infallibly model it, we would have been able to predict which events will increase order in the Universe overall. These, then, would be the likeliest events.

It is easy to prove that events follow a path of maximum order, simply because the world is orderly and getting ever more so. Had this not been the case, statistically evenly-scattered events would have led to an increase in

entropy (thermodynamic laws are the offspring of statistical mechanics). But this simply does not happen.

And it is wrong to think that order increases only in isolated "pockets", in local regions of our universe.

It is increasing everywhere, all the time, on all scales of measurement. Therefore, we are forced to conclude that quantum events are guided by some non-random principle (such as the increase in order). This, exactly, is the case in biology. There is no reason in principle why not to construct a life wavefunction which will always collapse to the most order increasing event. If we were to construct and apply this wave function to our world we, humans, would probably have found ourselves as one of the events selected by its collapse.

More traditionally, though, the recent “discovery” (rather, postulation) of dark energy seems to restore entropy on the scale of the entire Universe. Actually, the traits of dark energy (homogeneity, isotropy, lack of interaction with other forms of energy and matter, infinitesimal density, negative pressure) suggest that dark energy, the Cosmological Constant (Lambda) and quintessence fields are merely other names for entropy and are not related to vacuum energy.

Thus, a Big Rip as the outcome of cosmic acceleration would merely be the culmination of the Second Law of Thermodynamics. This is definitely true for our local supercluster. Dark energy also compensates for the entropy gap (between actual cosmic entropy and maximum potential cosmic entropy which grows as the Universe expands): it transforms the whole Universe into a single black hole with an infinite cosmic event horizon.

Appendix - Live and Let Live, Nature's Message

Epigenetics aside, both the now-discarded strong form of Lamarckism (the inheritance of all acquired characteristics as the sole vehicle of evolution) and Evolution Theory postulate that function determines form. Natural selection rewards those forms best suited to carry out the function of survival ("survival of the fittest") in each and every habitat (through the mechanism of adaptive radiation).

But whose survival is natural selection concerned with? Is it the survival of the individual? Of the species? Of the habitat or ecosystem? These three - individual, species, habitat - are not necessarily compatible or mutually reinforcing in their goals and actions.

If we set aside the dewy-eyed arguments of altruism, we are compelled to accept that individual survival sometimes threatens and endangers the survival of the species (for instance, if the individual is sick, weak, or evil). As every environmental scientist can attest, the thriving of some species puts at risk the existence of whole habitats and ecological niches and leads other species to extinction.

To prevent the potential excesses of egotistic self-propagation, survival is self-limiting and self-regulating. Consider epidemics: rather than go on forever, they abate after a certain number of hosts have been infected. It is a kind of Nash equilibrium. Macroevolution (the coordinated emergence of entire groups of organisms) trumps microevolution (the selective dynamics of species, races, and subspecies) every time.

This delicate and self-correcting balance between the needs and pressures of competing populations is manifest even in the single organism or species. Different parts of the phenotype invariably develop at different rates, thus preventing an all-out scramble for resources and maladaptive changes.

This is known as "mosaic evolution". It is reminiscent of the "invisible hand of the market" that allegedly allocates resources optimally among various players and agents. Martin Nowak, a Harvard professor, argues that emergent cooperation is a fundamental principle of evolution, as basic as natural selection and mutation.

Moreover, evolution favors organisms whose rate of reproduction is such that their populations expand to no more than the number of individuals that the habitat can support (the habitat's carrying capacity). These are called K-selection species, or K-strategists and are considered the poster children of adaptation.

Live and let live is what evolution is all about - not the law of the jungle. The survival of all the species that are fit to survive is preferred to the hegemony of a few rapacious, highly-adapted, belligerent predators. Nature is about compromise, not about conquest.

Also Read:

On Dis-ease

Psychophysics

The Complexity of Simplicity

Time Asymmetry Re-Visited?

Nature - The False Dichotomy

Superstring and Membrane Theories

The Fine-tuned Universe and the Emergence of Life

Return

The Complexity of Simplicity

"Everything is simpler than you think and at the same time more complex than you imagine."
(Johann Wolfgang von Goethe)

Complexity rises spontaneously in nature through processes such as self-organization. Emergent phenomena are common as are emergent traits, not reducible to basic components, interactions, or properties.

Complexity does not, therefore, imply the existence of a designer or a design. Complexity does not imply the existence of intelligence and sentient beings. On the contrary, complexity usually points towards a natural source and a random origin. Complexity and artificiality are often incompatible.

Artificial designs and objects are found only in unexpected ("unnatural") contexts and environments. Natural objects are totally predictable and expected. Artificial creations are efficient and, therefore, simple and parsimonious. Natural objects and processes are not.

As Seth Shostak notes in his excellent essay, titled "SETI and Intelligent Design", evolution experiments with numerous dead ends before it yields a single adapted biological entity. DNA is far from optimized: it contains inordinate amounts of junk. Our bodies come replete with dysfunctional appendages and redundant organs. Lightning bolts emit energy all over the electromagnetic spectrum. Pulsars and interstellar gas clouds spew radiation over the entire radio spectrum. The energy of the Sun is ubiquitous over the entire optical and thermal

range. No intelligent engineer - human or not - would be so wasteful.

Confusing artificiality with complexity is not the only terminological conundrum.

Complexity and simplicity are often, and intuitively, regarded as two extremes of the same continuum, or spectrum. Yet, this may be a simplistic view, indeed.

Simple procedures (codes, programs), in nature as well as in computing, often yield the most complex results. Where does the complexity reside, if not in the simple program that created it? A minimal number of primitive interactions occur in a primordial soup and, presto, life. Was life somehow embedded in the primordial soup all along? Or in the interactions? Or in the combination of substrate and interactions?

Complex processes yield simple products (think about products of thinking such as a newspaper article, or a poem, or manufactured goods such as a sewing thread). What happened to the complexity? Was it somehow reduced, "absorbed, digested, or assimilated"? Is it a general rule that, given sufficient time and resources, the simple can become complex and the complex reduced to the simple? Is it only a matter of computation?

We can resolve these apparent contradictions by closely examining the categories we use.

Perhaps simplicity and complexity are categorical illusions, the outcomes of limitations inherent in our system of symbols (in our language).

We label something "complex" when we use a great number of symbols to describe it. But, surely, the choices we make (regarding the number of symbols we use) teach us nothing about complexity, a real phenomenon!

A straight line can be described with three symbols (A, B, and the distance between them) - or with three billion symbols (a subset of the discrete points which make up the line and their inter-relatedness, their function). But whatever the number of symbols we choose to employ, however complex our level of description, it has nothing to do with the straight line or with its "real world" traits. The straight line is not rendered more (or less) complex or orderly by our choice of level of (meta) description and language elements.

The simple (and ordered) can be regarded as the tip of the complexity iceberg, or as part of a complex, interconnected whole, or hologramically, as encompassing the complex (the same way all particles are contained in all other particles). Still, these models merely reflect choices of descriptive language, with no bearing on reality.

Perhaps complexity and simplicity are not related at all, either quantitatively, or qualitatively. Perhaps complexity is not simply more simplicity. Perhaps there is no organizational principle tying them to one another. Complexity is often an emergent phenomenon, not reducible to simplicity.

The third possibility is that somehow, perhaps through human intervention, complexity yields simplicity and simplicity yields complexity (via pattern identification, the application of rules, classification, and other human

pursuits). This dependence on human input would explain the convergence of the behaviors of all complex systems on to a tiny sliver of the state (or phase) space (sort of a mega attractor basin). According to this view, Man is the creator of simplicity and complexity alike but they do have a real and independent existence thereafter (the Copenhagen interpretation of a Quantum Mechanics).

Still, these twin notions of simplicity and complexity give rise to numerous theoretical and philosophical complications.

Consider life.

In human (artificial and intelligent) technology, every thing and every action has a function within a "scheme of things". Goals are set, plans made, designs help to implement the plans.

Not so with life. Living things seem to be prone to disorientated thoughts, or the absorption and processing of absolutely irrelevant and inconsequential data. Moreover, these laboriously accumulated databases vanish instantaneously with death. The organism is akin to a computer which processes data using elaborate software and then turns itself off after 15-80 years, erasing all its work.

Most of us believe that what appears to be meaningless and functionless supports the meaningful and functional and leads to them. The complex and the meaningless (or at least the incomprehensible) always seem to resolve to the simple and the meaningful. Thus, if the complex is meaningless and disordered then order must somehow be

connected to meaning and to simplicity (through the principles of organization and interaction).

Moreover, complex systems are inseparable from their environment whose feedback induces their self-organization. Our discrete, observer-observed, approach to the Universe is, thus, deeply inadequate when applied to complex systems. These systems cannot be defined, described, or understood in isolation from their environment. They are one with their surroundings.

Many complex systems display emergent properties. These cannot be predicted even with perfect knowledge about said systems. We can say that the complex systems are creative and intuitive, even when not sentient, or intelligent. Must intuition and creativity be predicated on intelligence, consciousness, or sentience?

Thus, ultimately, complexity touches upon very essential questions of who we, what are we for, how we create, and how we evolve. It is not a simple matter, that...

Note on Learning

There are two types of learning: natural and sapient (or intelligent).

Natural learning is based on feedback. When water waves hit rocks and retreat, they communicate to the ocean at large information about the obstacles they have encountered (their shape, size, texture, location, etc.). This information modifies the form and angle of attack (among other physical properties) of future waves.

Natural learning is limited in its repertory. For all practical purposes, the data processed are invariable, the feedback immutable, and the outcomes predictable (though this may not hold true over eons). Natural learning is also limited in time and place (local and temporal and weakly communicable).

Sapient or Intelligent Learning is similarly based on feedback, but it involves other mechanisms, most of them self-recursive (introspective). It alters the essence of the learning entities (i.e., the way they function), not only their physical parameters. The input, processing procedures, and output are all interdependent, adaptive, ever-changing, and, often, unpredictable. Sapient learning is nonlocal and nontemporal. It is, therefore, highly communicable (akin to an extensive parameter): learning in one part of a system is efficiently conveyed to all other divisions.

TECHNICAL NOTE - Complexity Theory and Ambiguity or Vagueness

A Glossary of the terms used here

Ambiguity (or indeterminacy, in deconstructivist parlance) is when a statement or string (word, sentence, theorem, or expression) has two or more distinct meanings either lexically (e.g., homonyms), or because of its grammar or syntax (e.g., amphiboly). It is the context, which helps us to choose the right or intended meaning ("contextual disambiguating" which often leads to a focal meaning).

Vagueness arises when there are "borderline cases" of the existing application of a concept (or a predicate). When is

a person tall? When does a collection of sand grains become a heap (the sorites or heap paradox)?, etc. Fuzzy logic truth values do not eliminate vagueness - they only assign continuous values ("fuzzy sets") to concepts ("prototypes").

Open texture is when there may be "borderline cases" in the future application of a concept (or a predicate). While vagueness can be minimized by specifying rules (through precisifaction, or supervaluation) - open texture cannot because we cannot predict future "borderline cases".

It would seem that a complexity theory formalism can accurately describe both ambiguity and vagueness:

Language can be construed as a self-organizing network, replete with self-organized criticality.

Language can also be viewed as a Production System (Iterated Function Systems coupled with Lindenmeyer L-Systems and Schemas to yield Classifiers Systems). To use Holland's vocabulary, language is a set of Constrained Generating Procedures.

"Vague objects" (with vague spatial or temporal boundaries) are, actually, best represented by fractals. They are not indeterminate (only their boundaries are). Moreover, self-similarity is maintained. Consider a mountain - where does it start or end and what, precisely, does it include? A fractal curve (boundary) is an apt mathematical treatment of this question.

Indeterminacy can be described as the result of bifurcation leading to competing, distinct, but equally valid, meanings.

Borderline cases (and vagueness) arise at the "edge of chaos" - in concepts and predicates with co-evolving static and chaotic elements.

(Focal) meanings can be thought of as attractors.

Contexts can be thought of as attractor landscapes in the phase space of language. They can also be described as fitness landscapes with optimum epistasis (interdependence of values assigned to meanings).

The process of deriving meaning (or disambiguating) is akin to tracing a basin of attraction. It can be described as a perturbation in a transient, leading to a stable state.

Also read:

Intuition

Parsimony - the Fourth Substance

Bestowed Existence

Anthropic Agents and the Increase of Entropy (Abstract Only)

Return

Bestowed Existence

Knives and forks are objects external to us. They have an objective - or at least an intersubjective - existence. Presumably, they will be there even if no one watches or uses them ever again. We can safely call them "Objective Entities".

Our emotions and thoughts can be communicated - but they are ***NOT*** the communication itself or its contents. They are "Subjective Entities", internal, dependent upon our existence as observers.

But what about numbers? The number one, for instance, has no objective, observer-independent status. I am not referring to the number one as adjective, as in "one apple". I am referring to it as a stand-alone entity. As an entity it seems to stand alone in some way (it's out there), yet be subjective in other ways (dependent upon observers). Numbers belong to a third category: "Bestowed Entities". These are entities whose existence is bestowed upon them by social agreement between conscious agents.

But this definition is so wide that it might well be useless. Religion and money are two examples of entities which owe their existence to a social agreement between conscious entities - yet they don't strike us as universal and out there (objective) as numbers do.

Indeed, this distinction is pertinent and our definition should be refined accordingly.

We must distinguish "Social Entities" (like money or religion) from "Bestowed Entities". Social Entities are not

universal, they are dependent on the society, culture and period that gave them birth. In contrast, numbers are Platonic ideas which come into existence through an act of conscious agreement between ***ALL*** the agents capable of reaching such an accord. While conscious agents can argue about the value of money (i.e., about its attributes) and about the existence of God - no rational, conscious agent can have an argument regarding the number one.

Apparently, the category of bestowed entities is free from the eternal dichotomy of internal versus external. It is both and comfortably so. But this is only an illusion. The dichotomy does persist. The bestowed entity is internal to the group of consenting conscious-rational agents - but it is external to any single agent (individual).

In other words, a group of rational conscious agents is certain to bestow existence on the number one. But to each and every member in the group the number one is external. It is through the power of the ***GROUP*** that existence is bestowed. From the individual's point of view, this existence emanates from outside him (from the group) and, therefore, is external. Existence is bestowed by changing the frame of reference (from individual to group).

But this is precisely how we attribute meaning to something!!! We change our frame of reference and meaning emerges. The death of the soldier is meaningful from the point of view of the state and the rituals of the church are meaningful from the point of view of God. By shifting among frames of reference, we elicit and extract and derive meaning.

If we bestow existence and derive meaning using the same mental (cognitive) mechanism, does this mean that the two processes are one and the same? Perhaps bestowing existence is a fancy term for the more prosaic attribution of meaning? Perhaps we give meaning to a number and thereby bestow existence upon it? Perhaps the number's existence is only its meaning and no more?

If so, all bestowed entities must be meaning-ful. In other words: all of them must depend for their existence on observers (rational-conscious agents). In such a scenario, if all humans were to disappear (as well as all other intelligent observers), numbers would cease to exist.

Intuitively, we know this is not true. To prove that it is untrue is, however, difficult. Still, numbers are acknowledged to have an independent, universal quality. Their existence does depend on intelligent observers in agreement. But they exist as potentialities, as Platonic ideas, as tendencies. They materialize through the agreement of intelligent agents rather the same way that ectoplasm was supposed to have materialized through spiritualist mediums. The agreement of the group is the ***CHANNEL*** through which numbers (and other bestowed entities, such as the laws of physics) are materialized, come into being.

We are creators. In creation, one derives the new from the old. There are laws of conservation that all entities, no matter how supreme, are subject to. We can rearrange, redefine, recombine physical and other substrates. But we cannot create substrates ex nihilo. Thus, everything MUST exist one way or another before we allow it existence as we define it. This rule equally applies bestowed entities.

BUT

Wherever humans are involved, springs the eternal dichotomy of internal and external. Art makes use of a physical substrate but it succumbs to external laws of interpretation and thus derives its meaning (its existence as *ART*). The physical world, in contrast (similar to computer programmes) contains both the substrate and the operational procedures to be applied, also known as the laws of nature.

This is the source of the conceptual confusion. In creating, we materialize that which is already there, we give it venue and allow it expression. But we are also forever bound to the dichotomy of internal and external: a ***HUMAN*** dichotomy which has to do with our false position as observers and with our ability to introspect. So, we mistakenly confuse the two issues by applying this dichotomy where it does not belong.

When we bestow existence upon a number it is not that the number is external to us and we internalize it or that it is internal and we merely externalize it. It is both external and internal. By bestowing existence upon it, we merely recognize it. In other words, it cannot be that, through interaction with us, the number changes its nature (from external to internal or the converse).

By merely realizing something and acknowledging this newfound knowledge, we do not change its nature. This is why meaning has nothing to do with existence, bestowed or not. Meaning is a human category. It is the name we give to the cognitive experience of shifting frames of reference. It has nothing to do with entities, only with us.

The world has no internal and external to it. Only we do. And when we bestow existence upon a number we only acknowledge its existence. It exists either as neural networks in our brains, or as some other entity (Platonic Idea). But, it exists and no amount of interactions with us, humans, is ever going to change this.

Why is Mathematics so Successful?

In earlier epochs, people used myths and religious narratives to encode all knowledge, even of a scientific and technological character. Words and sentences are still widely deployed in many branches of the Humanities, the encroachment of mathematical modeling and statistics notwithstanding. Yet, mathematics reigns supreme and unchallenged in the natural sciences. Why is that? What has catapulted mathematics (as distinct from traditional logic) to this august position within three centuries?

Mathematics is a language like no other. Still, it suffers from the drawbacks that afflict other languages. The structure of our language, its inter-relatedness with the world, and its inherent limitations dictate our worldview and determine how we understand, describe and explain Nature and our place in it. Granted, languages are living things and develop constantly (consider slang, or the emergence of infinite numbers theories in mathematics). But, they evolve within a formal grammar and syntax, a logic, a straitjacket that inhibits thinking "outside the box"

and renders impossible the faithful perception of "objective" reality.

So, what made mathematics so different and so triumphant?

1. It is a universal, portable, immediately accessible language that requires no translation. Idealists would say that it is intersubjectively shared. This may be because, as Kant and others have suggested, mathematics somehow relates to or is derived from a-priori structures embedded in the human mind.

2. It provides high information density, akin to stenography. Just a few symbols arranged in formulas and equations account for a wealth of experiences and encapsulate numerous observations. Mathematical concepts and symbols do not correspond to material objects or cause them, nor do they alter reality or affect it in any way, shape, or form. One cannot map a mathematical structure or construct or number or concept into the observed universe. This is because mathematics is not confined to describing what is, or what is necessarily so - it also limns what is possible, or provable.

3. Mathematics deals with patterns and laws. It can, therefore, yield predictions. Mathematics deals with forms and structures: some of these are in the material world, others merely in the mind of the mathematician.

4. Mathematics is a flexible, "open-source", responsive, and expandable language. Consider, for instance, how the introduction of the concept of the infinite and of infinite numbers was accommodated with relative ease despite the controversy and the threat this posed to the very foundations of traditional mathematics - or how mathematics ably progressed to deal with fuzziness and uncertainty.

5. Despite its aforementioned transigence, mathematics is invariant. A mathematical advance, regardless of how arcane or revolutionary, is instantly recognizable as such and can be flawlessly incorporated in the extant body of knowledge. Thus, the fluidity of mathematics does not come at the expense of its coherence and nature.

6. There is a widespread intuition or perception that mathematics is certain because it deals with a-priori knowledge and necessary truths (either objective and "out there", or mental, in the mind) and because it is aesthetic (like the mind of the Creator, the religious would add).

7. Finally, mathematics is useful: it works. It underlies modern science and technology unerringly and unfailingly. In time, all branches of mathematics, however obscure, prove to possess practical applications.

Return

The Decoherence of Measurement

Arguably the most intractable philosophical question attached to Quantum Mechanics (QM) is that of Measurement. The accepted (a.k.a. Copenhagen) Interpretation of QM says that the very act of sentient measurement determines the outcome of the measurement in the quantum (microcosmic) realm. The wave function (which describes the co-existing, superpositioned, states of the system) "collapses" following an act of measurement.

It seems that just by knowing the results of a measurement we determine its outcome, determine the state of the system and, by implication, the state of the Universe as a whole. This notion is so counter-intuitive that it fostered a raging debate which has been on going for more than 7 decades now.

But, can we turn the question (and, inevitably, the answer) on its head? Is it the measurement that brings about the collapse – or, maybe, we are capable of measuring only collapsed results? Maybe our very ability to measure, to design measurement methods and instrumentation, to conceptualize and formalize the act of measurement and so on – are thus limited and "designed" as to yield only the "collapsible" solutions of the wave function which are macrocosmically stable and "objective" (known as the "pointer states")? Indeed, pointer States are reminiscent of the "strange attractors" of chaos theory!

Most measurements are indirect - they tally the effects of the system on a minute segment of its environment. Wojciech Zurek and others proved that even partial and

roundabout measurements are sufficient to induce einselection (or environment-induced superselection). In other words, even the most rudimentary act of measurement is likely to probe pointer states.

Superpositions are notoriously unstable. Even in the quantum realm they last an infinitesimal moment of time. Our measurement apparatus is not sufficiently sensitive to capture superpositions. By contrast, collapsed (or pointer) states are relatively stable and lasting and, thus, can be observed and measured. This is why we measure only collapsed states.

But in which sense (excluding their longevity) are collapsed states measurable, what makes them so? Collapse events are not necessarily the most highly probable – some of them are associated with low probabilities, yet they still they occur and are measured.

By definition, the more probable states tend to occur and be measured more often (the wave function collapses more frequently into high probability states). But this does not exclude the less probable states of the quantum system from materializing upon measurement.

Pointer states are carefully "selected" for some purpose, within a certain pattern and in a certain sequence. What could that purpose be? Probably, the extension and enhancement of order in the Universe. That this is so can be easily substantiated by the fact that it is so. Order increases all the time.

The anthropocentric (and anthropic) view of the Copenhagen Interpretation (conscious, intelligent observers determine the outcomes of measurements in the

quantum realm) associates humans with negentropy (the decrease of entropy and the increase of order).

This is not to say that entropy cannot increase locally (and order decreased or low energy states attained). But it is to say that low energy states and local entropy increases are perturbations and that overall order in the Universe tends to increase even as local pockets of disorder are created. The overall increase of order in the Universe should be introduced, therefore, as a constraint into any QM formalism.

Yet, surely we cannot attribute an inevitable and invariable increase in order to each and every measurement (collapse). To say that a given collapse event contributed to an increase in order (as an extensive parameter) in the Universe – we must assume the existence of some "Grand Design" within which this statement would make sense.

Such a Grand Design (a mechanism) must be able to gauge the level of orderliness at any given moment (for instance, before and after the collapse). It must have "at its disposal" sensors of increasing or decreasing local and nonlocal order. Human observers are such order-sensitive instruments.

Still, even assuming that quantum states are naturally selected for their robustness and stability (in other words, for their orderliness), how does the quantum system "know" about the Grand Design and about its place within it? How does it "know" to select the pointer states time an again? How does the quantum realm give rise to the world as we know it - objective, stable, certain, robust, predictable, and intuitive?

If the quantum system has no a-priori "awareness" of how it fits into an ever more ordered Universe – how is the information transferred from the Universe to the entangled quantum system and measurement system at the moment of measurement?

Such information must be communicated superluminally (at a speed greater than the speed of light). Quantum "decisions" are instantaneous and simultaneous – while the information about the quantum system's environment emanates from near and far.

But, what are the transmission and reception mechanisms and channels? Which is the receiver, where is the transmitter, what is the form of the information, what is its carrier (we will probably have to postulate yet another particle to account for this last one...)?

Another, no less crucial, question relates to the apparent arbitrariness of the selection process. All the "parts" of a superposition constitute potential collapse events and, therefore, can, in principle, be measured. Why is only one event measured in any given measurement? How is it "selected" to be the collapse event? Why does it retain a privileged status versus the measurement apparatus or act?

It seems that preferred states have to do with the inexorable process of the increase in the overall amount of order in the Universe. If other states were to have been selected, order would have diminished. The proof is again in the pudding: order does increase all the time – therefore, measurable collapse events and pointer states tend to increase order. There is a process of negative, order-orientated, selection: collapse events and states

which tend to increase entropy are filtered out and statistically "avoided". They are measured less.

There seems to be a guiding principle (that of the statistical increase of order in the Universe). This guiding principle cannot be communicated to quantum systems with each and every measurement because such communication would have to be superluminal. The only logical conclusion is that all the information relevant to the decrease of entropy and to the increase of order in the Universe is stored in each and every part of the Universe, no matter how minuscule and how fundamental.

It is safe to assume that, very much like in living organisms, all the relevant information regarding the preferred (order-favoring) quantum states is stored in a kind of Physical DNA (PDNA). The unfolding of this PDNA takes place in the physical world, during interactions between physical systems (one of which is the measurement apparatus).

The Biological DNA contains all the information about the living organism and is replicated trillions of times over, stored in the basic units of the organism, the cell. What reason is there to assume that nature deviated from this (very pragmatic) principle in other realms of existence? Why not repeat this winning design in quarks?

The Biological variant of DNA requires a biochemical context (environment) to translate itself into an organism – an environment made up of amino acids, etc. The PDNA probably also requires some type of context: the physical world as revealed through the act of measurement.

The information stored in the physical particle is structural because order has to do with structure. Very much like a fractal (or a hologram), every particle reflects the whole Universe accurately and the same laws of nature apply to both. Consider the startling similarities between the formalisms and the laws that pertain to subatomic particles and black holes.

Moreover, the distinction between functional (operational) and structural information is superfluous and artificial. There is a magnitude bias here: being creatures of the macrocosm, form and function look to us distinct. But if we accept that "function" is merely what we call an increase in order then the distinction is cancelled because the only way to measure the increase in order is structurally. We measure functioning (=the increase in order) using structural methods (the alignment or arrangement of instruments).

Still, the information contained in each particle should encompass, at least, the relevant (close, non-negligible and non-cancelable) parts of the Universe. This is a tremendous amount of data. How is it stored in tiny corpuscles?

Either utilizing methods and processes which we are far even from guessing – or else the relevant information is infinitesimally (almost vanishingly) small.

The extent of necessary information contained in each and every physical particle could be somehow linked to (even equal to) the number of possible quantum states, to the superposition itself, or to the collapse event. It may well be that the whole Universe can be adequately encompassed in an unbelievably minute, negligibly tiny,

amount of data which is incorporated in those quantum supercomputers that today, for lack of better understanding, we call "particles".

Technical Note

Our Universe can be mathematically described as a "matched" or PLL filter whose properties let through the collapsed outcomes of wave functions (when measured) - or the "signal". The rest of the superposition (or the other "Universes" in a Multiverse) can be represented as "noise". Our Universe, therefore, enhances the signal-to-noise ratio through acts of measurement (a generalization of the anthropic principle).

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The Quantum of Continuity

The problem of continuum versus discreteness seems to be related to the issue of infinity and finiteness. The number of points in a line served as the logical floodgate which led to the development of Set Theory by Cantor at the end of the 19th century. It took almost another century to demonstrate the problematic nature of some of Cantor's thinking (Cohen completed Godel's work in 1963). But continuity can be finite and the connection is, most times, misleading rather than illuminating.

Intuition tells us that the world is continuous and contiguous. This seems to be a state of things which is devoid of characteristics other than its very existence. And yet, whenever we direct the microscope of scientific discipline at the world, we encounter quantized, segregated, distinct and discrete pictures. This atomization seems to be the natural state of things - why did evolution resort to the false perception of continuum? And how can a machine which is bound to be discrete by virtue of its "naturalness" - the brain - perceive a continuum?

The continuum is an external, mental category which is imposed by us on our observations and on the resulting data. It serves as an idealized approximation of reality, a model which is asymptotic to the Universe "as it is". It gives rise to the concepts of quality, emergence, function, derivation, influence (force), interaction, fields, (quantum) measurement, processes and a host of other holistic ways of relating to our environment. The other pole, the quantized model of the world conveniently gives rise to the complementary set of concepts: quantity, causality,

observation, (classic) measurement, language, events, quants, units and so on.

The private, macroscopic, low velocity instances of our physical descriptions of the universe (theories) tend to be continuous. Newtonian time is equated to a river. Space is a yarn. Einstein was the last classicist (relativity just means that no classical observer has any preference over another in formulating the laws of physics and in performing measurements). His space-time is a four dimensional continuum. What commenced as a matter of mathematical convenience was transformed into a hallowed doctrine: homogeneity, isotropy, symmetry became enshrined as the cornerstones of an almost religious outlook ("God does not play dice"). These were assumed to be "objective", "observer independent" qualities of the Universe. There was supposed to be no preferred direction, no clustering of mass or of energy, no time, charge, or parity asymmetry in elementary particles. The notion of continuum was somehow inter-related. A continuum does not have to be symmetric, homogenous or isotropic - and, yet, somehow, we will be surprised if it turns out not to be.

As physical knowledge deepened, a distressful mood prevailed. The smooth curves of Einstein gave way to the radiating singularities of Hawking's black holes. These black holes might eventually violate conservation laws by permanently losing all the information stored in them (which pertained to the masses and energies that they assimilated). Singularities imply a tear in the fabric of spacetime and the ubiquity of these creature completely annuls its continuous character. Modern superstrings and supermembranes theories (like Witten's M-Theory) talk about dimensions which curl upon themselves and, thus

become non discernible. Particles, singularities and curled up dimensions are close relatives and together seriously erode the tranquil continuity of yore.

But the first serious crack in the classical (intuitive) weltanschauung was opened long ago with the invention of the quantum theoretical device by Max Planck. The energy levels of particles no longer lay along an unhindered continuum. A particle emitted energy in discrete units, called quanta. Others developed a model of the atom, in which particles did not roam the entire inter-atomic space. Rather, they "circled" the nucleus in paths which represented discrete energy levels. No two particles could occupy the same energy level simultaneously and the space between these levels (orbits) was not inhabitable (non existent, actually).

The counter-continuum revolution spread into most fields of science. Phase transitions were introduced to explain the behaviour of materials when parameters such as pressure and temperature are changed. All the materials behave the same in the critical level of phase transition. Yet, phase transitions are discrete, rather surprising, events of emergent order. There is no continuum which can accommodate phase transitions.

The theory of dynamical systems (better known as "Chaos Theory") has also violated long held notions of mathematical continuity. The sets of solutions of many mathematical theories were proven to be distributed among discrete values (called attractors). Functions behave "catastrophically" in that minute changes in the values of the parameters result in gigantic, divergent changes in where the system "settles down" (finds a solution). In biology Gould and others have modified the

theory of evolution to incorporate qualitative, non-gradual "jumps" from one step of the ladder to another. The Darwinian notion of continuous, smooth development with strewn remnants ("missing links") attesting to each incremental shift – has all but expired. Psychology, on the other hand, has always assumed that the difference between "normal" and deranged is a qualitative one and that the two do not lie along a continuous line. A psychological disorder is not a normal state exaggerated.

The continuum way of seeing things is totally inapplicable philosophically and practically. There is a continuum of intelligence quotients (I.Q.s) and, yet, the gifted person is not an enhanced version of the mentally retarded. There is a non-continuous difference between 70 IQ and 170 IQ. They are utterly distinct and not reducible to one another. Another example: "many" and "few" are value judgements or cultural judgements of elements of a language used (and so are "big" and "small"). Though, theoretically, both are points on a continuous line – they are qualitatively disparate. We cannot deduce what is big by studying the small unless we have access to some rules of derivation and decision making. The same applies to the couplets: order / disorder, element / system, evolution / revolution and "not alive" / alive. The latter is at the heart of the applied ethical issue of abortion: when should a foetus begin to be considered a live thing? Life springs suddenly. It is not "more of the same". It is not a matter of quantity of matter. It is a qualitative issue, almost in the eye of the beholder. All these are problems that call for a non-continuum approach, for the discrete emergence of new phases (order, life, system). The epiphenomenal aspect (properties that characterize the whole that are nowhere to be found when the parts comprising the whole are studied) is accidental to the main issue. The main issue

being the fact that the world behaves in a sudden, emergent, surprising, discrete manner. There is no continuum out there, except in some of our descriptions of nature and even this seems to be for the sake of convenience and aesthetics.

But renaming or redefining a problem can hardly be called a solution. We selected the continuum idealization to make our lives easier. But WHY does it achieve this effect? In which ways does it simplify our quest to know the world in order to control it and thus enhance our chances to survive?

There are two types of continuum: spatial and temporal. All the other notions of continuum are reducible to these two. Take a wooden stick. It is continuous (though finite – the two, we said, are not mutually exclusive or mutually exhaustive). Yet, if I were to break it in two – its continuity will have vanished. Why? What in my action made continuity disappear and how can my action influence what seems to be an inherent, extensive property of the stick?

We are forced to accept that continuity is a property of the system that is contingent and dependent on external actions. This is normal, most properties are like this (temperature and pressure, to mention two). But what made the log continuous BEFORE I broke it – and discontinuous following my action and (so it would seem) because of it? It is the identical response to the outside world. All the points in the (macroscopic) stick would have reacted identically to outside pressure, torsion, twisting, temperature, etc. It is this identical reaction that augments, defines and supports the mental category of "continuum". Where it ends – discontinuity begins. This is

the boundary or threshold. Breaking the wooden stick created new boundaries. Now, pressure applied to one part of the stick will not influence the other. The requirement of identical reaction will not be satisfied and the two (newly broken) parts of the stick are no longer part of the continuum.

The existence of a boundary or threshold is intuitively assumed even for infinite systems, like the Universe. This plus the identical reaction principle are what give the impression of continuity. The pre-broken wooden stick satisfied these two requirements: it had a boundary and all its points reacted simultaneously to the outside world.

Yet, these are necessary but insufficient conditions. Discrete entities can have boundaries and react simultaneously (as a group) and still be highly discontinuous. Take a set of the first 10 integers. This set has a boundary and will react in the same way, simultaneously, to a mathematical action (say, to a multiplication by a constant). But here arises the crucial difference:

All the points in the Stick will retain their identity under any transformation and under any physical action. If burnt – they will all turn into ash, to take a radical example.

All the points in the stick will also retain their relationship to one another, the structure of the stick, the mutual arrangement of the points, the channels between them.

The integers in the set will not. Each will produce a result and the results will be disparate and will form a set of discrete numbers which is absolutely distinct from the

original set. The second generation set will have no resemblance whatsoever to the first generation set.

An example: heating the wooden stick will not influence our ability to instantly recognize it as a wooden stick and as THE wooden stick. If burnt, we will be able to say with assuredness that a wooden stick has been burnt (at least, that wood has been burnt).

But a set of integers in itself does not contain the information needed to tell us whence it came, what was the set that preceded it. Here, additional knowledge will be required: the exact laws of transformation, the function which was used to derive this set.

The wooden stick conserves and preserves the information relating to itself – the set of integers does not. We can generalize and say that a continuum preserves its information content under transformations while discrete entities or values behave idiosyncratically and, thus, do not. In the case of a continuum, no knowledge of the laws of transformation is needed in order to extract the information content of the continuum. The converse is true in the case of discrete entities or values.

These conditions: the existence of a boundary or threshold, the preservation of local information and the uniform reaction to transformation or action – are what made the continuum such a useful tool in scientific thought. Paradoxically, the very theory that introduced non-continuous thinking to physics (quantum mechanics) is the one that is trying to reintroduce it now. The notion of "fields" is manifestly continuous (the field exists everywhere, simultaneously). Action at a distance (which implies a unity of the Universe and its continuity) was

supposedly exorcised by quantum mechanics – only to reappear in "space-like" interactions. Elaborate – and implausible – theoretical constructs are dreamt up in order to get rid of the "contamination" of continuity. But it is a primordial sin, not so easily atoned for. The measurement problem (see: "The Decoherence of Measurement") is at the very heart of Quantum Mechanics: if the observer actively participates in the determination of the state of the observed system (which, admittedly, is only one possible interpretation) – then we are all (observer and observed) members of one and the same continuum and it is discreteness which is imposed on the true, continuous, nature of the Universe.

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Interpretations of Quantum Mechanics And Superstring Theories

Strings

Strings are described as probabilistic ripples (waves) of spacetime (NOT in a quantum field) propagating through spacetime at the speed of light. From the point of view of an observer in a gravitational field, strings will appear to be point particles (Special Relativity). The same formalism used to describe ripples in quantum fields (i.e., elementary particles) is, therefore, applied.

Strings collapse (are resolved) and "stabilize" as folds, wrinkles, knots, or flaps of spacetime.

The vibrations of strings in string theories are their probabilities in this theory (described in a wave function).

The allowed, netted resonances (vibrations) of the strings are derived from sub-Planck length quantum fluctuations ("quantum foam"). One of these resonances yields the graviton.

Strings probabilistically vibrate in ALL modes at the same time (superposition) and their endpoints are interference patterns.

D-branes are the probability fields of all possible vibrations.

The Universe

A 12 dimensional universe is postulated, with 9 space dimensions and 3 time dimensions.

Every "packet" of 3 spatial dimensions and 1 temporal dimension curls up and creates a Planck length size "curled Universe".

At every point, there are 2 curled up Universes and 1 expressed Universe (=the Universe as we know it).

The theory is symmetric in relation to all curled Universe ("curl-symmetric").

All the dimensions - whether in the expressed Universe (ours) or in the curled ones - are identical. But the curled Universes are the "branches", the worlds in the Many Worlds interpretation of Quantum Mechanics.

Such a 12 dimensional Universe is reducible to an 11 dimensional M Theory and, from there, to 10 dimensional string theories.

In the Appendix we study an alternative approach to Time:

A time quantum field theory is suggested. Time is produced in a non-scalar field by the exchange of a particle ("Chronon").

The Multiverse

As a universe tunnels through the landscape (of string theory), from (mathematically modeled) "hill" to "valley", it retains (conserves) the entire information regarding the volume of (mathematically modeled) "space" (or of the space-like volume) of the portion of the landscape that it has traversed. These data are holographically encoded and can be fully captured by specifying the information regarding the universe's (lightlike) boundary (e.g., its gravitational horizon).

As the universe's entropy grows (and energy density falls), it "decays" and its inflation stops. This event determines its nature (its physical constants and laws of Nature). Eternal inflation is, therefore, a feature of the entire landscape of string theory, not of any single "place" or space-time (universe) within it.

Note of caution:

What is interpreted to imply the existence of multiple universes may be merely an artefact, enumerating all the ways that a four-dimensional

surface can be folded, using supersymmetric formalism.

BY WAY OF INTRODUCTION

"There was a time when the newspapers said that only twelve men understood the theory of relativity. I do not believe that there ever was such a time... On the other hand, I think it is safe to say that no one understands quantum mechanics... Do not keep saying to yourself, if you can possibly avoid it, 'But how can it be like that?', because you will get 'down the drain' into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that."
R. P. Feynman (1967)

"The first processes, therefore, in the effectual studies of the sciences, must be ones of simplification and reduction of the results of previous investigations to a form in which the mind can grasp them."
J.C. Maxwell, On Faraday's lines of force

" ...conventional formulations of quantum theory, and of quantum field theory in particular, are unprofessionally vague and ambiguous. Professional theoretical physicists ought to be able to do better. Bohm has shown us a way."
John S. Bell, Speakable and Unspeakable in Quantum Mechanics

"It would seem that the theory [quantum mechanics] is exclusively concerned about 'results of measurement', and has nothing to say about anything else. What exactly qualifies some physical systems to play the role of 'measurer'? Was the wavefunction of the world waiting to jump for thousands of millions of years until a single-celled living creature appeared? Or did it have to wait a little longer, for some better qualified system ... with a Ph.D.? If the theory is to apply to anything but highly idealized laboratory operations, are we not obliged to admit that more or less 'measurement-like' processes are going on more or less all the time, more or less everywhere. Do we not have jumping then all the time?

The first charge against 'measurement', in the fundamental axioms of quantum mechanics, is that it anchors the shifty split of the world into 'system' and 'apparatus'. A second charge is that the word comes loaded with meaning from everyday life, meaning which is entirely inappropriate in the quantum context. When it is said that something is 'measured' it is difficult not to think of the result as referring to some pre-existing property of the object in question. This is to disregard Bohr's insistence that in quantum phenomena the apparatus as well as the system is essentially involved. If it were not so, how could we understand, for example, that 'measurement' of a component of 'angular momentum' ... in an arbitrarily chosen direction ... yields one of a discrete set of values? When one

forgets the role of the apparatus, as the word 'measurement' makes all too likely, one despairs of ordinary logic ... hence 'quantum logic'. When one remembers the role of the apparatus, ordinary logic is just fine.
In other contexts, physicists have been able to take words from ordinary language and use them as technical terms with no great harm done. Take for example the 'strangeness', 'charm', and 'beauty' of elementary particle physics. No one is taken in by this 'baby talk' ... Would that it were so with 'measurement'. But in fact the word has had such a damaging effect on the discussion, that I think it should now be banned altogether in quantum mechanics."
J. S. Bell, Against "Measurement"

"Is it not clear from the smallness of the scintillation on the screen that we have to do with a particle? And is it not clear, from the diffraction and interference patterns, that the motion of the particle is directed by a wave? De Broglie showed in detail how the motion of a particle, passing through just one of two holes in screen, could be influenced by waves propagating through both holes. And so influenced that the particle does not go where the waves cancel out, but is attracted to where they cooperate. This idea seems to me so natural and simple, to resolve the wave-particle dilemma in such a clear and ordinary way, that it is a great mystery to me that it was so generally

ignored."
J. S. Bell, Speakable and Unspeakable in Quantum Mechanics

"...in physics the only observations we must consider are position observations, if only the positions of instrument pointers. It is a great merit of the de Broglie-Bohm picture to force us to consider this fact. If you make axioms, rather than definitions and theorems, about the "measurement" of anything else, then you commit redundancy and risk inconsistency."
J. S. Bell, Speakable and Unspeakable in Quantum Mechanics

"To outward appearance, the modern world was born of an anti religious movement: man becoming self-sufficient and reason supplanting belief. Our generation and the two that preceded it have heard little of but talk of the conflict between science and faith; indeed it seemed at one moment a foregone conclusion that the former was destined to take the place of the latter. ... After close on two centuries of passionate struggles, neither science nor faith has succeeded in discrediting its adversary.
On the contrary, it becomes obvious that neither can develop normally without the other. And the reason is simple: the same life animates both. Neither in its impetus nor its achievements can science go to its limits without becoming tinged with mysticism and charged with faith."

Pierre Thierry de Chardin, "The Phenomenon of Man"

A. *OVERVIEW OF STRING AND SUPERSTRING THEORIES*

String theories aim to unify two apparently disparate physical theories: QFT (Quantum Field Theory) and the General Relativity Theory GRT). QFT stipulates the exchange of point-like particles. These exchanges result in the emergence of the four physical forces (weak, strong, electromagnetic and gravity). As the energy of these interactions increases, the forces tend to merge until they become a single, unified force at very high energies. The pursuit of a Grand Unified Theory or, even, a Theory of Everything - is not a new phenomenon. Einstein's Special Theory of Relativity (SRT) (preceded by Maxwell) unified the electromagnetic forces. Glashow, Salam and Weinberg unified the electroweak forces. In the Standard Model (SM), the strong and electroweak forces attain the same values (i.e., are the same) at high energy and gravitation joins in at even higher energies.

GRT and QFT are mathematically interfaced. Macro-objects (dealt with in the GRT) tend to create infinite spacetime curvature when infinitely compressed (to become point particles). The result

is a "quantum foam" which really reflects the probabilities of point particles. But relativistic QFT fails to account for gravity. It copes well with elementary particles but only in an environment with a vanishingly weak force of gravity. Some physicists tried to add a "graviton" (gravity force carrying particle) to QFT - and ended up with numerous singularities (particle interactions at a single point and at a zero distance).

Enter the strings. These are 1-dimensional (length) entities (compared to zero-dimensional points). They move across the surface their "worldsheet". They vibrate and each type of vibration is characterized by a number which we otherwise know as a quantum number (such as spin or mass). Thus, reach vibrational modes, with its distinct set of quantum number corresponds to a specific particle.

String theories strive to get rid of infinities and singularities (such as the aforementioned infinite curvature, or the infinities in the Feynman diagrams). They postulate the existence of matter-forming, minuscule, open or closed, strings with a given - and finite - length. The vibrations of these entities yields both the four elementary forces and four corresponding particles. in other words, particles are excitatory modes of these strings, which otherwise only float in spacetime. The string tension being related to its length, strings need to

have a Planck length to be able to account for quantum gravity. One of these states of excitation is a particle with zero mass and 2 spin units - known in Quantum Theory of Gravity (QTG) as "graviton". Moreover, strings tend to curl (though, counterintuitively, they are wrapped around space rather than in it - very much like the topological chimeras the Mobius strip, or the Klein bottle). Mathematics dictate an 11-dimensional universe. Four of its dimensions have "opened" and become accessible to us. The other 7 remain curled up in a "Calabi-Yau space" in which strings vibrate. In later version of string theory (like the M-Theory), there is a 7-dimensional, curled up Calabi-Yau space wrapped on every 4-dimensional point in our universe. But Calabi-Yau spaces are not fixed entities. New ones can be created every time space is "torn" and "repairs" itself in a different curvature. Lastly, strings merge when they interact, which is very useful mathematically-speaking. Technically speaking, one of 2 interacting strings "opens up" in an intermediate phase - and then closes up again.

But what is the contribution of this hidden, strange world and of the curling up solution to our understanding of the world?

String theories do not deal with the world as we know it. They apply in the Planck scale (where quantum gravity prevails). On the other hand, to be of any use, even conceptually, they must

encompass matter (fermions). Originally, fermions are thought to have been paired with bosons (force conveying particles) in a super-symmetric, superstring world. Supersymmetry broke down and vanished from our expanding Universe. This necessitated the "elimination" of the extra-dimensions and hence their "compactification" (curling up).

Moreover, some string theories describe closed but openable strings - while others describe closed and NON-openable ones. To incorporate Quantum Mechanics (QM) fully, one needs to resort to outlandish 26 dimensional universes, etc.

Still, string theories are both mathematically simpler than anything else we have to offer - and powerfully explanatory.

We use Perturbation Theory (PT) To compute QM amplitudes. We simply add up contributions from all the orders of quantum processes. To be effective, contributions need to get smaller (until they become negligible) the "higher" we climb the order hierarchy. The computation of the first few diagrams should be yield an outcome asymptotic to "reality". This is necessary because in point-like particle field theories, the number of diagrams required to describe higher orders grows exponentially and demands awesome computing power.

Not so in string theories. Holes and "handles" (protrusions) in the worldsheet replace the diagrams. Each PT order has one diagram - the worldsheet. This does not alleviate the mathematical complexity - solving a 2-handle worldsheet is no less excruciating than solving a classic PT diagram. But if we want to obtain complete knowledge about a quantum system, we need a non-perturbative theory. PT is good only as an approximation in certain circumstances (such as weak coupling).

B. *MORE ON THE INNER WORKINGS OF STRING THEORIES*

String vibrate. In other words, they change shape - but revert to their original form. Closed strings are bound by boundary conditions (such as the period of their vibration). Open strings also succumb to boundary conditions known as the Neumann and Dirichlet boundary conditions. Neumann allowed the end point of a string free movement - but with no loss of momentum to the outside. Dirichlet constrained its movement to one "plane" (or manifold) known as a D-brane or Dp-brane (the "p" stands for the number of spatial dimensions of the manifold). Thus, if a spacetime has 11 dimensions - of which 10 are spatial - it would have a D10 D-brane as its upper limit. p could be negative (-1) if all space and time coordinates are fixed (and "instanton"). When p=0, all the spatial coordinates

are fixed, the endpoint is at a single spatial point (i.e., a particle). A D0-brane is what we know as a particle and a D1-brane would be a string. D-branes are mobile and interact with closed strings (and particles). Strings (such as the graviton) may open and "affix" their endpoints on a D2-brane (during the interaction).

But these interactions are confined to bosons. When we add fermions to the cocktail, we get supersymmetry and pairs of fermions and bosons. When we try to construct a "supersymmetric" QFT, we need to add 6 dimensions to the 4 we are acquainted with. This contraption cancel the anomalous results we otherwise obtain. In terms of PT, we get only five consistent string theories: I, IIA, IIB, E8XE8 Heterotic, SO(32) Heterotic. In terms of weakly coupled PT, they appear very different. But, in reality, they are all aspects of a single string theory and are related by "string dualities" (i.e., different formalisms that describe the same physical phenomena).

C. ***A LITTLE HISTORY***

From its very inception in 1987, it was clear one of the gauge groups at the heart of E8XE8 is identical to the gauge group of the Standard Model (SM). Thus, matter in one E8 interacted through all the forces and their particles - and matter in the other E8 interacted only through gravity. This did

nothing to explain why the breakdown of supersymmetry - and why the SM is so complex and muti-generational. Six of the 10 dimensions curled up into (non-observable) Planck length and compact 6-d balls attached to every 4-d point in our observable universe. This was a throwback to the neat mathematics of Kaluza-Klein. By compactifying 1 dimension in a 5-d universe, they were able to derive both GRT and electromagnetism (as a U(1) gauge theory of rotation around a circle).

We need to compactify the extra dimensions of (10-d and 11-d alike) superstring theories to get to our familiar universe. Various methods of doing this still leave us with a lot of supersymmetry. A few physicists believe that supersymmetry is likely to emerge - even in our pedestrian 4-d world - at ultra high energies. Thus, in order to preserve a minimum of supersymmetry in our 4-d universe, we use Calabi-Yau (CY) manifolds (on which the extra dimensions are compactified) for low energies. A certain CY manifold even yields the transition from the big bang (10 or 11 dimensional) universe to our dimensions-poorer one.

D. ***DUALITIES***

The various string theories are facets of one underlying theory. Dualities are the "translation mechanisms" that bind them together. The T-

duality relates theories with dimensions compactified on a circle with the radius R to theories whose dimensions are compactified on a circle with the radius 1/R. Thus, one's curled dimension is the other's uncurled one. The S-duality relates the coupling limits of the various theories. One's upper (strong coupling) limit becomes another's weak coupling limit. The celebrated M Theory is also a duality, in a way.

M Theory is not a string theory, strictly speaking. It is an 11-d supergravity with membranes and solitons (its 5-branes). Only when compactified does it yield a 10-d string theory (the IIA version, to be precise). It is not as counterintuitive as it sounds. If the 11th dimension is of finite length, the endpoints of a line segment define 9-dimensional boundaries (the 10th dimension is time). The intersection of an open membrane with these boundaries creates strings. We can safely say that the five string theories, on the one hand, and M Theory on the other hand constitute classical LIMITS. Perturbation theory was used to derive their corresponding quantum theories - but to little effect. the study of non-perturbative attributes (dualities, supersymmetry and so on) yielded much more and led us to the conviction that a unified quantum theory underlies these myriad manifestations.

E. ***PARTICLES***

Every physical theory postulates physical entities, which are really nothing more than conventions of its formalism. The Standard Model (SM) uses fields. The physical properties of these fields (electric, magnetic, etc.) are very reminiscent of the physical properties of the now defunct pre-relativistic ether. Quantized momenta and energy (i.e., elementary particles) are conveyed as ripples in the field. A distinct field is assigned to each particle. Fields are directional. The SM adds scalar fields (=fields without direction) to account for the (directionless) masses of the particles. But scalar fields are as much a field as their non-scalar brethren. Hence the need to assign to them Higgs particles (bosons) as their quanta. SM is, therefore, an isotropy-preserving Quantum Field Theory (QFT).

The problem is that gravity is negligibly weak compared to the enormous energies (masses) of the Higgs, W, Z and Gluon particles. Their interactions with other fields are beyond the coupling strengths (measurement energies) of today's laboratories. The strong and electroweak forces get unified only at 10 to the 16th power GeV. Gravity - at 10 to the 18th power (though some theories suggest a lower limit). This is almost at the Planck scale of energy. There is an enormous gap between the mass of the Higgs particles (200 Gev) and these energies. No one

knows why. Supersymmetric and "Technicolor" solutions suggest the existence of additional forces and particles that do not interact with the SM "zoo" at low energies.

But otherwise SM is one of the more successful theories in the history of physics. It renormalized QFT and, thus, re-defined many physical constants. It also eliminated the infinities yielded by QFT calculations. Yet, it failed to renormalize a gravitational QFT.

The result is a schism between the physics of low energies and the physics of high and ultra-high energies. Particle theories look totally disparate depending on the energies of the reactions they study. But, luckily, the reactions of massive particles are negligible in low energies - so renormalizable QFT (e.g., SM) is a fair approximation, althesame. At low energies, the combination of Special Relativity Theory (SRT) and any quantum theory is indistinguishable from a renormalizable QFT. These are the fundaments of a possible unification. Unfortunately, these theories break down at high energy and, though very effective, they are far from being simple or aesthetic (i.e., classic). Too many interactions yielded by the formalism are arbitrarily suppressed below this or that energy threshold. Most of these suppressed interactions are figments of the imagination at the energy scales we are accustomed

to or which are attainable in our labs. Not so gravitation - also a non-renormalizable, suppressed (though extremely weak) interaction. Other suppressed reactions threaten to unsettle the whole edifice - yielding such oddities as unstable photons, or neutrinos with masses.

Hence the intuitive appeal of string theories. The vibratory modes of strings appear to us as particles. Gravitation is finally made a part of a finite theory. The drawbacks are the extra-dimensions, which seem to unparsimoniously run contra to Occam's razor - and the outlandishly high energies in which they are supposed to reveal themselves (uncurl). M Theory tries to merge QFT with the classic string theories - but this alleviates only a few marginal issues.

The more philosophically and aesthetically inclined reject the operationalism which characterizes modern physics ("if it works - I am not interested to know WHY it works or even HOW it works"). They demand to know what is the underlying PHYSICAL reality (or at least, physical PRINCIPLE). The great pre-QM (Quantum Mechanics) theories always sprang from such a principle. The general Relativity Theory (GRT) was founded on the principle of the equivalence (i.e., indistinguishability) of gravity and inertia. Even the SM is based on a gauge symmetry. Special Relativity Theory (space-time) constrains QFTs and

is, therefore, their "principle". No one is quite sure about string theories.

Arguably, their most important contribution is to have dispensed with Perturbation Theory (PT). PT broke down quantum processes into intermediate stages and generated an "order of complexity". The contributions from simpler phases were computed and added up first, then the same treatment was accorded to the contributions of the more complex phases and so on. It worked with weak forces and many theories which postulate stronger forces (like some string theories) are reducible to PT-solvable theories. But, in general, PT is useless for intermediate and strong forces.

Another possible contribution - though highly theoretical at this stage - is that adding dimensions may act to reduce the energy levels at which grand unification (including gravity) is to be expected. But this is really speculative stuff. No one know how large these extra dimensions are. If too small, particles will be unable to vibrate in them. Admittedly, if sufficiently large, new particles may be discovered as well as new force conveyance modes (including the way gravity is transmitted). But the mathematical fact is that the geometrical form of the curled dimensions determines the possible modes of vibration (i.e., which particle masses and charges are possible).

Strings also constitute a lower limit on quantum fluctuations. This, in due time and with a lot more work (and possibly a new formalism), may explain why our universe is the way it is. Unconstrained quantum fluctuations should have yielded a different universe with a different cosmological constant.

F. ***THE MICRO AND THE MACRO***

Strings have two types of energy states, depending on the shape of space time. If curled (cylindrical) space-time is "fat" (let's say, the whole universe) there will be closely spaced energy states, which correspond to the number of waves (vibrations) of the string and its length, and widely spaced energy states, which correspond to the number of loops a string makes around curled (cylindrical) space-time (winding modes). If the curled (cylindrical) space time is "thin" (let's say a molecule), a mirror picture emerges. Obviously, in both cases - "fat" space-time and "thin" space-time - the same vibrations and winding states are observed. In other words, the microcosm yields the same physics as the macrocosm.

G. ***BLACK HOLES***

String theory, which is supposed to incorporate quantum gravity, should offer insights regarding black holes. String theories make use of the General

Relativity Theory (GRT) formalism and add to it specific matter fields. Thus, many classical black hole solutions satisfy string equations of motion. In an effort to preserve some supersymmetry, superstring theory has devised its own black hole solutions (with D-branes, or "black branes", as the description of certain supersymmetric black holes). A match was even found between types of supersymmetric black holes and supergravity including greybody factors (frequency dependent corrections). String theorists have derived most of Hawking's (and Bekenstein's) work regarding the entropy of black holes from string theories.

This led to novel ways of thinking about strings. What if "open" strings were really closed ones with one part "hidden" behind a black brane? What if intersecting black branes wrapped around seven curled dimensions gave rise to black holes? The vanishing masses of black branes delineate a cosmological evolutionary tree - from a universe with one topology to another, with another topology. Our world may be the "default" universe on the path of least resistance and minimum energy from one universe to another.

H. ***FROM SUPERGRAVITY TO MEMBRANES - A RECAP***

The particles with half integer spins predicted by supersymmetry are nowhere to be found. Either

supersymmetry is a wrong idea or the particles are too heavy (or too something) to be detected by us with our current equipment. The latter (particles too heavy) is possible only if supersymmetry has broken down (which is almost the same as saying that it is wrong). Had it existed, it would probably have encompassed gravity (as does the General Theory of Relativity) in the form of "supergravity". The non-supersymmetric equivalent of supergravity can be gravity as we know it. In terms of particles, supersymmetry in an 11-dimensional universe talks about a supersymmetric gravitino and a spin 2 graviton.

Supersymmetric supergravity was supplanted by 10-dimensional superstring theory because it could not account for handedness in nature (i.e., the preference of left or right in spin direction and in other physical phenomena) and for many quantum effects. From there it was a short - and inevitable - way to membrane theories. Branes with "p" dimensions moved in worldvolumes with p+1 dimensions and wrapped around curled dimensions to produce strings. Strings are, therefore, the equivalents of branes. To be more precise, strongly interacting (10-dimensional) strings are the dual equivalent of weakly interacting five-branes (solitons) (Duff, Scientific American, February 1998). Later, a duality between solitonic and fundamental strings in 6 dimensions (the other 4 curled and the five-brane wrapped around them)

was established and then dualities between strings from the 5 string theories. Duff's "duality of dualities" states that the T-duality of a solitonic string is the S-duality of the fundamental string and vice versa. In other words, what appears as the charge of one object can also be construed as the inversion of the length of another (and, hence, the size of the dimension). All these insights - pulled together by Witten - led to M Theory in 11 dimensions. Later on, matrix theories replaced traditional coordinates in space time with non-commutable matrices. In other words, in an effort to rigorously define M Theory (that is, merge quantum physics with gravity), space time itself has been "sacrificed" or "quantum theorized".

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SPECULATIONS

Psychophysics

The Structure of the Psyche And the Fundamentals of Everyday Psychodynamics

It is impossible to rigorously prove or substantiate the existence of a soul, a psyche.

Numerous explanations have been hitherto offered:

- That what we, humans, call a soul is the way that we experience the workings of our brain (introspection experienced). This often leads to infinite regressions.

- That the soul is an epiphenomenon, the software result of a hardware complexity (much the same way as temperature, volume and pressure are the epiphenomena of a large number of gas molecules).

- That the soul does exist and that it is distinct from the body in substance (or lack of it), in form (or lack of it) and in the set of laws that it obeys ("spiritual" rather than physical). The supporters of this camp say that correlation is not causation.

In other words, the electrochemical activity in the brain, which corresponds to mental phenomena does not mean that it IS the mental phenomena. Mental phenomena do have brain (hardware) correlates – but these correlates need not be confused with the mental phenomena themselves.

Still, very few will dispute the strong connection between body and soul. Our psychic activity was attributed to the heart, the liver, even to some glands. Nowadays it is attributed to the brain, apparently with better reasons.

Since the body is a physical object, subject to physical laws, it follows that at least the connection between the two (body and soul) must obey the laws of physics.

Another question is what is the currency used by the two in their communication. Physical forces are mediated by subatomic particles. What serves to mediate between body and soul?

Language could be the medium and the mediating currency. It has both an internal, psychic representation and an objective, external one. It serves as a bridge between our inner emotions and cognition and the outside, physical world. It originates almost non-physically (a mere thought) and has profound physical impacts and effects. It has quantum aspects combined with classical determinism.

We propose that what we call the Subconscious and the Pre-Conscious (Threshold of Consciousness) are but Fields of Potentials organized in Lattices.

Potentials of what?

To represent realities (internal and external alike), we use language. Language seems to be the only thing able to consistently link our internal world with our physical surroundings. Thus, the potentials ought to be Lingual Energy Potentials.

When one of the potentials is charged with Lingual Energy – in Freud's language, when cathexis happens – it becomes a Structure. The "atoms" of the Structures, their most basic units, are the Clusters.

The Cluster constitutes a full cross cut of the soul: instinct, affect and cognition. It is holographic and fractalic in that it reflects – though only a part – the whole. It is charged with the lingual energy which created it in the first place. The cluster is highly unstable (excited) and its lingual energy must be discharged.

This lingual energy can be released only in certain levels of energy (excitation) according to an Exclusion Principle. This is reminiscent of the rules governing the world of subatomic particles. The release of the lingual energy is Freud's anti-cathexis.

The lingual energy being what it is – it can be discharged only as language elements (its excitation levels are lingual). Put differently: the cluster will lose energy to the environment (=to the soul) in the shape of language (images, words, associations).

The defence mechanisms, known to us from classical psychology – projection, identification, projective identification, regression, denial, conversion reaction, displacement, rationalization, intellectualization, sublimation, repression, inhibition, anxiety and a host of other defensive reactions – are but sentences in the language (valid strings or theorems). Projection, for instance, is the sentence: "It is not my trait – it is his trait". Some mechanisms – the notable examples are rationalization and intellectualization – make conscious use of language.

Whereas the levels of excitation (lingual discharge) are discrete (highly specific) – the discharged energy is limited to certain, specific, language representations. These are the "Allowed Representations". They are the only ones allowed (or enabled, to borrow from computers) in the "Allowed Levels of Excitation".

This is the reason for the principles of Disguise (camouflage) and Substitution.

An excitation is achieved only through specific (visual or verbal) representations (the Allowed Representations). If two potentials occupy the same Representational levels – they will be interchangeable. Thus, one lingual potential is able to assume the role of another.

Each cluster can be described by its own function (Eigenfunktion). This explains the variance between humans and among the intra-psychic representations. When a cluster is realized – when its energy has been discharged in the form of an allowed lingual representation – it reverts to the state of a lingual potential. This is a constant, bi-directional flow: from potential to cluster and from cluster to potential.

The initial source of energy, as we said, is what we absorbed together with lingual representations from the outside. Lingual representations ARE energy and they are thus assimilated by us. An exogenic event, for this purpose, is also a language element (consisting of a visual, three dimensional representation, an audio component and other sensa - see "The Manifold of Sense").

So, everything around us infuses us with energy which is converted into allowed representations. On the other hand,

language potentials are charged with energy, become clusters, discharge the lingual energy through an allowed representation of the specific lingual energy that they possess and become potentials once more.

When a potential materializes – that is, when it becomes a cluster after being charged with lingual energy – a "Potential Singularity" remains where once the materialized potential "existed".

The person experiences this singularity as an anxiety and does his utmost to convert the cluster back into a potential. This effort is the Repression Defence Mechanism.

So, the energy used during repression is also of the lingual kind.

When the energy with which the cluster is charged is discharged, at the allowed levels of representation (that is to say, through the allowed lingual representations), the cluster is turned back into a potential. This, in effect, is repression. The anxiety signifies a state of schism in the field of potentials. It, therefore, deserves the name:

Signal Anxiety, used in the professional literature.

The signal anxiety designates not only a hole in the field of potentials but also a Conflict. How come?

The materialization of the potential (its transformation into a cluster) creates a change in the Language Field. Such a change can lead to a conflict with a social norm, for instance, or with a norm, a personal value, or an inhibition – all being lingual representations. Such a

conflict ostensibly violates the conditions of the field and leads to anxiety and to repression.

Freud's Id, Ego and Superego are now easily recognizable as various states of the language field.

The Id represents all the potentials in the field. It is the principle by which the potentials are charged with lingual energy. Id is, in other words, a field equation which dictates the potential in every point of the field.

The Ego is the interaction between the language field and the world. This interaction sometimes assumes the form of a conscious dialogue.

The Superego is the interaction between the language field and the representations of the world in the language field (that is to say, the consequences of repression).

All three are, therefore, Activation Modes.

Each act of repression leaves traces. The field is altered by the act of repression and, this way, preserves the information related to it. The sum of all repressions creates a representation of the world (both internal and external) in the field. This is the Superego, the functional pattern of the field of potentials (the subconscious or the regulatory system).

The field plays constant host to materializing potentials (=the intrusion of content upon consciousness), excitation of allowed lingual (=representational) levels (=allowed representations) and realization of structures (their reversal to a state of being potentials). It is reality which

determines which excitation and representation levels are the allowed ones.

The complex of these processes is Consciousness and all these functions together constitute the Ego or the Administrative System. The Ego is the functional mode of consciousness. The activities in reality are dictated both by the field of potentials and by the materializing structures – but the materialization of a structure is not a prerequisite for action.

The Id is a wave function, the equation describing the state of the field. It details the location of the potentials that can materialize into structures. It also lists the anxiety producing "potential singularities" into which a structure can be realized and then revert to being a potential.

An Association is the reconstruction of all the allowed levels of excitation (=the allowed representations of the lingual energy) of a specific structure. Different structures will have common excitation levels at disparate times. Once structures are realized and thus become potentials – they go through the excitation level common to them and to other structures. This way they alter the field (stamp it) in an identical manner. In other words: the field "remembers" similarly those structures which pass through a common excitation level in an identical manner. The next time that the potential materializes and becomes one of these structures – all the other "twin" structures are charged with an identical lingual energy. They are all be evoked together as a Hypercluster.

Another angle: when a structure is realized and reverts to being a potential, the field is "stamped". When the same Stamp is shared by a few structures – they form a

Potential Hypercluster. From then on, whenever one of the potentials, which is a member in the Potential Hypercluster, materializes and becomes a structures – it "drags" with it all the other potentials which also become structures (simultaneously).

Potential Hyperclusters materialize into Hyperclusters whereas single Potentials materialize into Clusters.

The next phase of complexity is the Network (a few Hyperclusters together). This is what we call the Memory operations.

Memorizing is really the stamping of the field with the specific stamps of the structures (actually, with the specific stamps of their levels of excitation).

Our memory uses lingual representations. When we read or see something, we absorb it into the Field of Potentials (the Language Field). The absorbed energy fosters, out of the Field of Potentials, a structure or a hypercluster.

This is the process of Imprinting.

The resultant structure is realized in our brain through the allowed levels of excitation (=using the allowed lingual representations), is repressed, stamps the field (=creates a memory) and rejoins the field as a potential. The levels of excitation are like Strings that tie the potentials to each other. All the potentials that participate in a given level of excitation (=of representation) of the language - become a hypercluster during the phase of materialization.

This also is the field's organizational principle:

The potentials are aligned along the field lines (=the levels of excitation specific to these potentials). The connection between them is through lingual energy but it is devoid of any specific formal logic (mechanic or algorithmic). Thus, if potential P1 and potential P2 pass through the same excitation level on their way to becoming structures, they will organize themselves along the same line in the field and will become a hypercluster or a network when they materialize. They can, however, relate to each other a-logically (negation or contradiction) – and still constitute a part of the same hypercluster. Tis capacity is reminiscent of superposition in quantum mechanics.

Memory is the stamping of the excitation levels upon the language field. It is complex and contains lingual representations which are the only correct representations (=the only correct solutions or the only allowed levels of excitation) of a certain structure. It can be, therefore, said that the process of stamping the field (=memory) represents a "registration" or a "catalogue" of the allowed levels of excitation.

The field equations are non-temporal and non-local. The field has no time or space characteristics. The Id (=the field state function or the wave function) has solutions which do not entail the use of spatial or temporal language elements.

The asymmetry of the time arrow is derived from the Superego, which preserves the representations of the outside world. It thus records an informational asymmetry of the field itself (=memory). We possess access to past information – and no access to information pertaining to the future. The Superego is strongly related to data

processing (=representations of reality) and, as a result, to informational and thermodynamic (=time) asymmetries.

The feeling of the present, on the other hand, is yielded by the Ego. It surveys the activities in the field which, by definition, take place "concurrently". The Ego feels "simultaneous", "concurrent" and current.

We could envisage a situation of partial repression of a structure. Certain elements in a structure (let's say, only the ideas) will degrade into potentials – while others (the affect, for instance) – will remain in the form of a structure. This situation could lead to pathologies – and often does (see "The Interrupted Self").

Pathologies and Symptoms

A schism is formed in the transition from potential to structure (=in the materialization process). It is a hole in the field of language which provokes anxiety. The realization of the structure brings about a structural change in the field and conflicts with other representations (=parts) of the field. This conflict in itself is anxiety provoking.

This combined anxiety forces the individual to use lingual energy to achieve repression.

A pathology occurs when only partial repression is achieved and a part structure-part potential hybrid results. This happens when the wrong levels of excitation were selected because of previous deformations in the language field. In classical psychology, the terms: "complexes" or "primary repression" are used.

The selection of wrong (=forbidden) excitation levels has two effects:

Partial repression and the materialization of other potentials into structures linked by the same (wrong) levels of excitation.

Put differently: a Pathological Hypercluster is thus formed. The members in such a cluster are all the structures that are aligned along a field line (=the erroneously selected level of excitation) plus the partial structure whose realization was blocked because of this wrong selection. This makes it difficult for the hypercluster to be realized and a Repetition Complex or an Obsessive Compulsive Disorder (OCD) ensues.

These obsessive-compulsive behaviours are an effort to use lingual representations to consummate the realization of a pathological, "stuck", hypercluster.

A structure can occupy only one level of excitation at a time. This is why our attention span is limited and why we have to concentrate on one event or subject at a time. But there is no limit on the number of simultaneously materialized and realized clusters.

Sometimes, there are events possessed of such tremendous amounts of energy that no corresponding levels of excitation (=of language) can be found for them. This energy remains trapped in the field of potentials and detaches (Dissociation) the part of the field in which it is trapped from the field itself. This is a variety of Stamping (=the memory of the event) which is wide (it incorporates strong affective elements), direct and irreversible. Only an outside lingual (=energetic) manipulation – such as

therapy – can bridge such an abyss. The earlier the event, the more engtrenched the dissociation as a trait of an ever changing field. In cases of multiple personality (Dissociative Identity Disorder), the dissociation can become a "field all its own", or a pole of the field.

Stamping of the field is achieved also by a persistent repetition of an external event.

A relevant hypercluster is materialized, is realized through predetermined levels of excitation and reverts to being a collection of potentials, thus enhancing previous, identical stampings. Ultimately, no mediation of a structure would be needed between the field and the outside event. Automatic activities – such as driving – are prime examples of this mechanism.

Hypnosis similarly involves numerous repetitions of external events – yet, here the whole field of potentials (=of language) is dissociated. The reason is that all levels of excitation are occupied by the hypnotist. To achieve this, he uses a full concentration of attention and a calculated choice of vocabulary and intonation.

Structures cannot be realized during hypnosis and the energy of the event (in this case, unadulterated lingual energy) remains confined and creates dissociations which are evoked by the hypnotist, correspond and respond to his instructions. A structure cannot be materialized when its level of excitation is occupied. This is why no conscious memory of the hypnotic session is available. Such a memory, however, is available in the field of potentials. This is Direct Stamping acheived without going through the a structure and without the materialization process.

In a way, the hypnotist is a kind of "Ultimate Hypercluster". His lingual energy is absorbed in the field of potentials and remains trapped, generating dissociations and stamping the field of potentials without resorting to a mediation of a structure (=of consciousness). The role of stamping (=memorizing) is relegated to the hypnotist and the whole process of realization is imputed to him and to the language that he uses.

A distinction between endogenous and exogenous events is essential. Both types operate on the field of potentials and bring about the materialization of structures or dissociations. Examples: dreams and hallucinations are endogenic events which lead to dissociations.

Automatism (automatic writing) and Distributed Attention

Automatic writing is an endogenous event. It is induced exclusively under hypnosis or trance. The lingual energy of the hypnotist remains trapped in the field of potentials and causes automatic writing. Because it never materializes into a structure, it never reaches consciousness. No language representations which pass through allowed levels of excitation are generated. Conversely, all other exogenous events run their normal course – even when their results conflicted with the results of the endogenous event.

Thus, for instance, the subject can write something (which is the result of the trapped energy) – and provide, verbally, when asked, an answer which starkly contradicts the written message. The question asked is an exogenous event which influences the field of potentials. It affects the materialization of a structure which is realized through

allowed levels of excitation. These levels of excitation constitute the answer provided by the subject.

This constitutes a vertical dissociation (between the written and the verbal messages, between the exogenous event and the endogenous one). At the same time, it is a horizontal dissociation (between the motor function and the regulatory or the critical function).

The written word – which contradicts the verbal answer – turns, by its very writing, into an exogenous event and a conflict erupts.

The trapped energy is probably organized in a coherent, atructural, manner. This could be Hilgard's "Hidden Observer".

When two exogenous events influence the field of potentials simultaneously, a structure materializes. But two structures cannot be realized through the same allowed level of excitation.

How is the status (allowed or disallowed) of a level of excitation determined?

A level of excitation is allowed under the following two cumulative conditions:

1. When the energy that it represents corresponds to the energy of the structure (When they "speak the same language").

2. When it is not occupied by another structure at the exact, infinitesimal, moment of realization.

The consequence: only one of two exogenous events, which share the same level of excitation (=the same lingual representation) materializes into a structure. The second, non-materialized, event remains trapped in the field of potentials. Thus, only one of them reaches consciousness, awareness.

Homeostasis and Equilibrium of the Field of Potentials

The field aspires to a state of energetic equilibrium (entropy) and to homeostasis (a functionality which is independent of environmental conditions). When these are violated, energy has to be traded (normally, exported) to restore them. This is achieved by the materialization of structures in such levels of excitation as to compensate for deficiencies, offset surpluses and, in general, balance the internal energy of the field. The materializing structures are "chosen" under the constraint that their levels of excitation bring the field to a state of equilibrium and / or homeostasis.

They use lingual energy in the allowed levels of excitation.

This, admittedly, is a rigid and restraining choice. In other words: this is a defence mechanism.

Alternatively, energy is imported by the stamping of the field of potentials by exogenous events. Only the events whose energy balances the internal energy of the field are "selected". Events whose energy does not comply with this restraint – are rejected or distorted. This selectivity also characterizes defence mechanisms.

Patterns, Structures, Shapes

Patterns are an attribute of networks (which are composed of interconnected and interacting hyperclusters). The field of potentials is stamped by all manner of events – endogenous as well as exogenous. The events are immediately classified in accordance with their energy content. They become part of hyperclusters or networks through the process of realization (in which lingual energy decays through the allowed levels of excitation).

These are the processes known as Assimilation (in a network) and Accommodation (the response of the network to assimilation, its alteration as a result). Every event belongs to a hypercluster or to a network. If its level of excitation is not "recognized" (from the past) – the brain first checks the most active hyperclusters and networks (those of the recent past and immediate present). Finally, it examines those hyperclusters and networks which are rarely used (primitive). Upon detecting an energetically appropriate hypercluster or network – the event is incorporated into them. This, again, is Assimilation. Later on, the hypercluster or the network adapt to the event. This is Accommodation which leads to equilibrium.

Assimilation is possible which is not followed by accommodation. This leads to regression and to the extensive use of Primitive Defence Mechanisms.

Compatibility with Current Knowledge

Fisk (1980)

A person tends to maintain some correspondence between his Fixed Level of Energy and his level of energy at any given moment.

External events change the field equation (=the fixed level of energy) and activate calibration and regulation mechanisms that reduce or increase the level of activity. This restores the individual to his normal plateau of activity and to a balance of energy. These energetic changes are considered in advance and the level of activity is updated even before the gap is formed.

When stimuli recur they lose some of their effectiveness and they require less energy in relating to them. Dynamics such as excitement, differentiation and development provoke such an excited state that it can disintegrate the field. A downward calibration mechanism is activated, the Integration.

When an event cannot be attributed to a hypercluster, to a network, or to a string (a field line) – a new structure is invented to incorporate it. As a result, the very shape of the field is altered. If the required alteration is sizeable, it calls for the dismantling of hyperstructures on various levels and for a forced experimentation with the construction of alternative hyperstructures.

The parsimonious path of least resistance calls for an investment of minimum energy to contain maximum energy (coherence and cohesiveness).

Structures whose level of energy (excitation) is less than the new structure are detached from the new hyperstructures created in order to accommodate it (Denial) or are incorporated into other hyperstructures (Forced Matching). A hyperstructure which contains at least one structure attached to it in a process of forced matching is a Forced Hyperstructure. The new hyperstructure is energetically stable – while the forced hyperstructure is energetically unstable. This is why the forced hyperstructure pops into consciousness (is excited) more often than other hyperstructures, including new ones.

This is the essence of a defence mechanism: an automatic pattern of thinking or acting which is characterized by its rigidity, repetitiveness, compulsiveness and behavioural and mental contraction effects. The constant instability is experienced as tension and anxiety. A lack of internal consistency and limited connections are the results.

Myers (1982)

Distinguishes between 3 components: emotions (=potentials), cognitions (=structures) and interpretations (hyperstructures) and memory (the stamping process).

Minsky (1980)

Memory is a complete conscious state and it is reconstructed as such.

In our terminology: the structure is hologramic and fractal-like.

Lazarus

Cognition (=the structure) leads to emotions (=decays into a potential).

This is a partial description of the second leg of the process.

Zajonc (1980)

Emotions (=potentials) precede cognitions (=structures). Emotion is based on an element of energy – and cognition is based on an element of information.

This distinction seems superfluous. Information is also energy – packed and ordered in a manner which enables the (appropriately trained) human brain to identify it as such. "Information", therefore, is the name that we give to a particular mode of delivery of energy.

Eisen (1987)

Emotions influence the organization of cognitions and allow for further inter-cognitive flexibility by encouraging their interconnectedness.

My interpretation is different. Emotions (=potentials) which organize themselves in structures are cognitions. The apparent distinction between emotions and cognition is deceiving.

This also renders meaningless the question of what preceded which.

See also: Piaget, Hays (1977), Marcus, Nurius, Loewenthal (1979).

Greenberg and Safran

Emotions are automatic responses to events. The primordial emotion is a biological (that is to say physical) mechanism. It reacts to events and endows them with meaning and sense. It, therefore, assists in the processing of information.

The processing is speedy and based on responses to a limited set of attributes. The emotional reaction is the raw material for the formation of cognitions.

As opposed to Loewenthal, I distinguish the processing of data within the field of potentials (=processing of potentials) from the processing of data through structures (=structural processing). Laws of transformation and conservation of energy prevail within the two types of processing. The energy is of the informational or lingual type.

The processing of potentials is poor and stereotypical and its influence is mainly motoric. Structural processing, on the other hand, is rich and spawns additional structures and alterations to the field itself.

Horowitz (1988)

All states of consciousness act in concert. When transition between these states occurs, all the components change simultaneously.

Gestalt

The organism tends to organize the stimuli in its awareness in the best possible manner (the euformic or eumorphic principle).

The characteristics of the organization are: simplicity, regularity, coordination, continuity, proximity between components, clarity. In short, it adopts the optimal Path of Least Resistance (PLR), or path of minimum energy (PME).

Epstein (1983)

The processes of integration (assimilation) and differentiation (accommodation) foster harmony. Disharmony is generated by repeating a fixed pattern without any corresponding accommodative or assimilative change.

Filter – is a situation wherein a structure in PLR/PME materializes every time as the default structure. It, therefore, permanently occupies certain levels of excitation, preventing other structures from materializing through them. This also weakens the stamping process.

The Bauer Model of Memory Organization (1981)

Our memory is made of units (=representations, which are the stampings of structures on the field). When one unit is activated, it activates other units, linked to it by way of association. There are also inhibitory mechanisms which apply to some of these links.

A memory unit activates certain units while simultaneously inhibiting others.

The stamped portion of the field of potentials which materializes into a structure does so within a hyperstructure and along a string which connects similar or identical stamped areas. All the stamped areas which are connected to a hyperstructure materialize simultaneously and occupy allowed levels of excitation. This way, other structures are prevented from using the same levels of excitation. Activation and inhibition, or prevention are simultaneous.

The Model of Internal Compatibility

A coherent experience has an affective dimension (=potential), a dimension of meaning (=structure) and of memory (=stamping). Awareness is created when there is compatibility between these dimensions (=when the structures materialize and de-materialize, are realized, without undergoing changes). The subconscious is a state of incompatibility. This forces the structures to change, it provokes denial, or forced adjustment until compatibility is obtained.

Emotions relate to appropriate meanings and memories (=potentials become structures which are, as we said, holographic and of fractal nature). There are also inter-experiential knots: emotions, meanings and / or memories which interlink. A constant dynamics is at play. Repressions, denials and forced adjustments break structures apart and detach them from each other. This reduces the inner complexity and "internal poverty" results.

The Pathology according to Epstein (1983)

1. When mental content (events) is rejected from consciousness (=a potential which does not materialize).

2. Mental content which cannot be assimilated because it does not fit in. There is no structure appropriate to it and this entails rewiring and the formation of unstable interim structures. The latter are highly excitable and tend to get materialized and realized in constant, default, levels of excitation. This, in turn, blocks these levels of excitation to other structures. These are the mental defence mechanisms.

3. Pre-verbal and a-verbal (=no structure materializes) processing.

In this article, (1) and (3) are assumed to be facets of the same thing.

Kilstrom (1984)

A trauma tears apart the emotional side of the experience from its verbal-cognitive one (=the potential never materializes and does not turn into a structure).

Bauer (1981)

Learning and memory are situational context dependent. The more the learning is conducted in surroundings which remind the student of the original situation – the more effective it proves to be.

A context is an exogenic event whose energy evokes hyperstructures/networks along a string. The more the energy of the situation resembles (or is identical to) the energy of the original situation – the more effectively will the right string resonate. This would lead to an Optimal Situational Resonance.

Eisen

It is the similarity of meanings which encourages memorizing.

In my terminology: structures belong to the same hyperstructures or networks along a common string in the field of potentials.

Bartlett (1932) and Nacer (1967)

Memory does not reflect reality. It is its reconstruction in light of attitudes towards it and it changes according to circumstances. The stamping is reconstructed and is transformed into a structure whose energies are influenced by its environment.

Kilstrom (1984)

Data processing is a process in which stimuli from the outer world are absorbed, go through an interpretative system, are classified, stored and reconstructed in memory.

The subconscious is part of the conscious world and it participates in its design through the processing of the incoming stimuli and their analyses. These processing and

analysis are mostly unconscious, but they exert influence over the conscious.

Data is stored in three loci:

The first one is in the Sensuous Storage Centre. This is a subconscious registry and it keeps in touch with higher cognitive processes (=the imprinting of events in the field of potentials). This is where events are analysed to their components and patterns and acquire meaning.

Primary (short term) Memory – is characterized by the focusing of attention, conscious processing (=the materialization of a structure) and repetition of the material stored.

Long Term Storage – readily available to consciousness.

We distinguish three types of memory: not reconstructible (=no stamping was made), reconstructible from one of the storage areas (=is within a structure post stamping) and memory on the level of sensual reception and processing. The latter is left as a potential, does not materialize into a structure and the imprinting is also the stamping.

The data processing is partly conscious and partly subconscious. When the structure is realized, a part of it remains a potential. Material which was processed in the subconscious cannot be consciously reconstructed in its subconscious form. A potential, after all, is not a structure. The stimuli, having passed through sensual data processing and having been transformed into processed material – constitute a series of assumptions concerning the essence of the received stimulus. Imprinting the field of potentials creates structures using lingual energy.

Meichenbaum and Gilmore (1984)

They divide the cognitive activity to three components:

Events, processes and cognitive structures.

An event means activity (=the materialization of potentials into structures). A process is the principle according to which data are organized, stored and reconstructed, or the laws of energetic transition from potential to structure. A cognitive structure is a structure or pattern which receives data and alters both the data and itself (thus influencing the whole field).

External data are absorbed by internal structures (=imprinting) and are influenced by cognitive processes. They become cognitive events (=the excitation of a structure, the materialization into one). In all these, there is a subconscious part. Subconscious processes design received data and change them according to pre-determined principles: the data storage mechanisms, the reconstruction of memory, conclusiveness, searching and review of information.

Three principles shape the interpretation of information. The principle of availability is the first one. The individual relates to available information and not necessarily to relevant data (the defaulting of structures). The principle of representation: relating to information only if it matches conscious data. This principle is another rendition of the PLR/PME principle. It does take less energy and it does provoke less resistance to relate only to conforming data. The last principle is that of affirmation: the search for an affirmation of a theory or a hypothesis

concerning reality, bringing about, in this way, the affirmation of the theory's predictions.

Bauers (1984)

Distinguishes between two kinds of knowledge and two types of deficiency: Distinction, Lack of Distinction, Understanding, Lack of Understanding.

Perception is the processing of information and consciousness is being aware of perception. The focusing of attention transforms perception (=imprinting and the evocation of a structure) into a conscious experience (=the materialization of a structure). Perception antecedes awareness.

The subconscious can be divided to four departments:

Sub-threshold perception, Memory/Forgetfulness, Repression and Dissociation.

There is no full segregation between them and there are cross-influences.

The distinction between repression and dissociation: in repression there is no notice of anxiety producing content. In dissociation, the internal ties between mental or behavioural systems is not noted (and there is no obscuring or erasure of content).

Intuition is intellectual sensitivity to information coming from the external or from the internal surroundings – though this information was not yet clearly registered. It channels the study of the world and the observations which must lead to deep insights. This, in effect, is

awareness of the process of materialization. Attention is focused on the materialization rather on the structure being materialized.

Also Read:

The Interrupted Self

Being John Malkovich

Return

Parapsychology and the Paranormal

I. Introduction

The words "supernatural", "paranormal", and "parapsychology" are prime examples of oxymorons. Nature, by its extended definition, is all-inclusive and all-pervasive. Nothing is outside its orbit and everything that is logically and physically possible is within its purview. If something exists and occurs then, ipso facto, it is normal (or abnormal, but never para or "beyond" the normal). Psychology is the science of human cognition, emotion, and behavior. No human phenomenon evades its remit.

As if in belated recognition of this truism, PEAR (the Princeton Engineering Anomalies Research laboratory), the ESP (Extra-Sensory Perception) research outfit at Princeton University, established in 1979, closed down in February 2007.

The arguments of the proponents of the esoteric "sciences", Parapsychology included, boil down to these:

(1) That the human mind can alter the course of events and affect objects (including other people's brains) voluntarily (e.g., telekinesis or telepathy) or involuntarily (e.g., poltergeist);

(2) That current science is limited (for instance, by its commitment to causation) and therefore is structurally unable to discern, let alone explain, the existence of certain phenomena (such as remote viewing or precognition). This implies that everything has natural

causes and that we are in a perpetual state of receding ignorance, in the throes of an asymptotic quest for the truth. Sooner or later, that which is now perplexing, extraordinary, "miraculous", and unexplained (protoscience) will be incorporated into science and be fully accounted for;

(3) That science is dogmatically biased against and, therefore, delinquent in its investigation of certain phenomena, objects, and occurrences (such as Voodoo, magic, and UFOs - Unidentified Flying Objects).

These claims of Parapsychology echo the schism that opened in the monotheistic religions (and in early Buddhism) between the profane and the sacred, the here and the beyond. Not surprisingly, many of the first spiritualists were ministers and other functionaries of Christian Churches.

Three historic developments contributed to the propagation and popularity of psychical research:

(1) The introduction into Parapsychology of scientific methods of observation, experimentation, and analysis (e.g., the use of statistics and probability in the studies conducted at the Parapsychology Laboratory of North Carolina's Duke University by the American psychologist Joseph Banks Rhine and in the more recent remote viewing ganzfeld sensory deprivation experiments);

(2) The emergence of counter-intuitive models of reality, especially in physics, incorporating such concepts as nonlocal action-at-a-distance (e.g., Bell's theorem), emergentism, multiverses, hidden dimensions, observer effects ("mind over matter"), and creation ex nihilo. These

models are badly understood by laymen and have led to the ostensible merger of physics and metaphysics;

(3) The eventual acceptance by the scientific community and incorporation into the mainstream of science of phenomena that were once considered paranormal and then perinormal (e.g., hypnotism).

As many scholars noted, psi (psychic) and other anomalous phenomena and related experiments can rarely be reproduced in rigorous laboratory settings. Though at least 130 years old, the field generated no theories replete with falsifiable predictions. Additionally, the deviation of finite sets of data (e.g., the number of cards correctly guessed by subjects) from predictions yielded by the laws of probability - presented as the field's trump card - is nothing out of the ordinary. Furthermore, statistical significance and correlation should not be misconstrued as proofs of cause and effect.

Consequently, there is no agreement as to what constitutes a psi event.

Still, these are weak refutations. They apply with equal force to the social "sciences" (e.g., to economics and psychology) and even to more robust fields like biology or medicine. Yet no one disputes the existence of economic behavior or the human psyche.

II. Scientific Theories

All theories - scientific or not - start with a problem. They aim to solve it by proving that what appears to be "problematic" is not. They re-state the conundrum, or introduce new data, new variables, a new classification, or

new organizing principles. They incorporate the problem in a larger body of knowledge, or in a conjecture ("solution"). They explain why we thought we had an issue on our hands - and how it can be avoided, vitiated, or resolved.

Scientific theories invite constant criticism and revision. They yield new problems. They are proven erroneous and are replaced by new models which offer better explanations and a more profound sense of understanding - often by solving these new problems. From time to time, the successor theories constitute a break with everything known and done till then. These seismic convulsions are known as "paradigm shifts".

Contrary to widespread opinion - even among scientists - science is not only about "facts". It is not merely about quantifying, measuring, describing, classifying, and organizing "things" (entities). It is not even concerned with finding out the "truth". Science is about providing us with concepts, explanations, and predictions (collectively known as "theories") and thus endowing us with a sense of understanding of our world.

Scientific theories are allegorical or metaphoric. They revolve around symbols and theoretical constructs, concepts and substantive assumptions, axioms and hypotheses - most of which can never, even in principle, be computed, observed, quantified, measured, or correlated with the world "out there". By appealing to our imagination, scientific theories reveal what David Deutsch calls "the fabric of reality".

Like any other system of knowledge, science has its fanatics, heretics, and deviants.

Instrumentalists, for instance, insist that scientific theories should be concerned exclusively with predicting the outcomes of appropriately designed experiments. Their explanatory powers are of no consequence. Positivists ascribe meaning only to statements that deal with observables and observations.

Instrumentalists and positivists ignore the fact that predictions are derived from models, narratives, and organizing principles. In short: it is the theory's explanatory dimensions that determine which experiments are relevant and which are not. Forecasts - and experiments - that are not embedded in an understanding of the world (in an explanation) do not constitute science.

Granted, predictions and experiments are crucial to the growth of scientific knowledge and the winnowing out of erroneous or inadequate theories. But they are not the only mechanisms of natural selection. There are other criteria that help us decide whether to adopt and place confidence in a scientific theory or not. Is the theory aesthetic (parsimonious), logical, does it provide a reasonable explanation and, thus, does it further our understanding of the world?

David Deutsch in "The Fabric of Reality" (p. 11):

"... (I)t is hard to give a precise definition of 'explanation' or 'understanding'. Roughly speaking, they are about 'why' rather than 'what'; about the inner workings of things; about how things really are, not just how they appear to be; about what must be so, rather than what merely happens to be so; about laws of nature rather than rules of thumb. They are also about

coherence, elegance, and simplicity, as opposed to arbitrariness and complexity ..."

Reductionists and emergentists ignore the existence of a hierarchy of scientific theories and meta-languages. They believe - and it is an article of faith, not of science - that complex phenomena (such as the human mind) can be reduced to simple ones (such as the physics and chemistry of the brain). Furthermore, to them the act of reduction is, in itself, an explanation and a form of pertinent understanding. Human thought, fantasy, imagination, and emotions ***are*** nothing but electric currents and spurts of chemicals in the brain, they say.

Holists, on the other hand, refuse to consider the possibility that some higher-level phenomena can, indeed, be fully reduced to base components and primitive interactions. They ignore the fact that reductionism sometimes does provide explanations and understanding. The properties of water, for instance, do spring forth from its chemical and physical composition and from the interactions between its constituent atoms and subatomic particles.

Still, there is a general agreement that scientific theories must be abstract (independent of specific time or place), intersubjectively explicit (contain detailed descriptions of the subject matter in unambiguous terms), logically rigorous (make use of logical systems shared and accepted by the practitioners in the field), empirically relevant (correspond to results of empirical research), useful (in describing and/or explaining the world), and provide typologies and predictions.

A scientific theory should resort to primitive (atomic) terminology and all its complex (derived) terms and concepts should be defined in these indivisible terms. It should offer a map unequivocally and consistently connecting operational definitions to theoretical concepts.

Operational definitions that connect to the same theoretical concept should not contradict each other (be negatively correlated). They should yield agreement on measurement conducted independently by trained experimenters. But investigation of the theory of its implication can proceed even without quantification.

Theoretical concepts need not necessarily be measurable or quantifiable or observable. But a scientific theory should afford at least four levels of quantification of its operational and theoretical definitions of concepts: nominal (labeling), ordinal (ranking), interval and ratio.

As we said, scientific theories are not confined to quantified definitions or to a classificatory apparatus. To qualify as scientific they must contain statements about relationships (mostly causal) between concepts - empirically-supported laws and/or propositions (statements derived from axioms).

Philosophers like Carl Hempel and Ernest Nagel regard a theory as scientific if it is hypothetico-deductive. To them, scientific theories are sets of inter-related laws. We know that they are inter-related because a minimum number of axioms and hypotheses yield, in an inexorable deductive sequence, everything else known in the field the theory pertains to.

Explanation is about retrodiction - using the laws to show how things happened. Prediction is using the laws to show how things ***will*** happen. Understanding is explanation and prediction combined.

William Whewell augmented this somewhat simplistic point of view with his principle of "consilience of inductions". Often, he observed, inductive explanations of disparate phenomena are unexpectedly traced to one underlying cause. This is what scientific theorizing is about - finding the common source of the apparently separate.

This omnipotent view of the scientific endeavor competes with a more modest, semantic school of philosophy of science.

Many theories - especially ones with breadth, width, and profundity, such as Darwin's theory of evolution - are not deductively integrated and are very difficult to test (falsify) conclusively. Their predictions are either scant or ambiguous.

Scientific theories, goes the semantic view, are amalgams of models of reality. These are empirically meaningful only inasmuch as they are empirically (directly and therefore semantically) applicable to a limited area. A typical scientific theory is not constructed with explanatory and predictive aims in mind. Quite the opposite: the choice of models incorporated in it dictates its ultimate success in explaining the Universe and predicting the outcomes of experiments.

III. Parapsychology as anti-science

Science deals with generalizations (the generation of universal statements known as laws) based on singular existential statements (founded, in turn, on observations). Every scientific law is open to falsification: even one observation that contravenes it is sufficient to render it invalid (a process known in formal logic as modus tollens).

In contrast, Parapsychology deals exclusively with anomalous phenomena - observations that invalidate and falsify scientific laws. By definition these don't lend themselves to the process of generation of testable hypotheses. One cannot come up with a scientific theory of exceptions.

Parapsychological phenomena - once convincingly demonstrated in laboratory settings - can help to upset current scientific laws and theories. They cannot however yield either because they cannot be generalized and they do not need to be falsified (they are already falsified by the prevailing paradigms, laws, and theories of science). These shortcomings render deficient and superfluous the only construct that comes close to a Parapsychological hypothesis - the psi assumption.

Across the fence, pseudo-skeptics are trying to prove (to produce evidence) that psi phenomena do not exist. But, while it is trivial to demonstrate that some thing or event exists or existed - it is impossible to show that some thing or event does not exist or was never extant. The skeptics' anti-Parapsychology agenda is, therefore, fraught with many of the difficulties that bedevil the work of psychic researchers.

IV. The Problem of Human Subjects

Can Parapsychology generate a scientific theory (either prescriptive or descriptive)?

Let us examine closely the mental phenomena collectively known as ESP - extrasensory perception (telepathy, clairvoyance, precognition, retrocognition, remote viewing, psychometry, xenoglossy, mediumism, channeling, clairaudience, clairsentience, and possession).

The study of these alleged phenomena is not an exact "science", nor can it ever be. This is because the "raw material" (human beings and their behavior as individuals and en masse) is fuzzy. Such a discipline will never yield natural laws or universal constants (like in physics).

Experimentation in the field is constrained by legal and ethical rules. Human subjects tend to be opinionated, develop resistance, and become self-conscious when observed. Even ESP proponents admit that results depend on the subject's mental state and on the significance attributed by him to events and people he communicates with.

These core issues cannot be solved by designing less flawed, better controlled, and more rigorous experiments or by using more powerful statistical evaluation techniques.

To qualify as meaningful and instrumental, any Parapsychological explanation (or "theory") must be:

a. ***All-inclusive (anamnetic)*** – It must encompass, integrate and incorporate all the facts known.

b. ***Coherent*** – It must be chronological, structured and causal.

c. ***Consistent*** – Self-consistent (its sub-units cannot contradict one another or go against the grain of the main explication) and consistent with the observed phenomena (both those related to the event or subject and those pertaining to the rest of the universe).

d. ***Logically compatible*** – It must not violate the laws of logic both internally (the explanation must abide by some internally imposed logic) and externally (the Aristotelian logic which is applicable to the observable world).

e. ***Insightful*** – It must inspire a sense of awe and astonishment which is the result of seeing something familiar in a new light or the result of seeing a pattern emerging out of a big body of data. The insights must constitute the inevitable conclusion of the logic, the language, and of the unfolding of the explanation.

f. ***Aesthetic*** – The explanation must be both plausible and "right", beautiful, not cumbersome, not awkward, not discontinuous, smooth, parsimonious, simple, and so on.

g. ***Parsimonious*** – The explanation must employ the minimum numbers of assumptions and entities in order to satisfy all the above conditions.

h. ***Explanatory*** – The explanation must elucidate the behavior of other elements, including the subject's

decisions and behavior and why events developed the way they did.

i. ***Predictive (prognostic)*** – The explanation must possess the ability to predict future events, including the future behavior of the subject.
j.
k. ***Elastic*** – The explanation must possess the intrinsic abilities to self organize, reorganize, give room to emerging order, accommodate new data comfortably, and react flexibly to attacks from within and from without.

In all these respects, Parapsychological explanations can qualify as scientific theories: they both satisfy most of the above conditions. But this apparent similarity is misleading.

Scientific theories must also be testable, verifiable, and refutable (falsifiable). The experiments that test their predictions must be repeatable and replicable in tightly controlled laboratory settings. All these elements are largely missing from Parapsychological "theories" and explanations. No experiment could be designed to test the statements within such explanations, to establish their truth-value and, thus, to convert them to theorems or hypotheses in a theory.

There are four reasons to account for this inability to test and prove (or falsify) Parapsychological theories:

1. ***Ethical*** – To achieve results, subjects have to be ignorant of the reasons for experiments and their aims. Sometimes even the very fact that an experiment is taking place has to remain a secret

(double blind experiments). Some experiments may involve unpleasant or even traumatic experiences. This is ethically unacceptable.

2. ***The Psychological Uncertainty Principle*** – The initial state of a human subject in an experiment is usually fully established. But the very act of experimentation, the very processes of measurement and observation invariably influence and affect the participants and render this knowledge irrelevant.

3. ***Uniqueness*** – Parapsychological experiments are, therefore, bound to be unique. They cannot be repeated or replicated elsewhere and at other times even when they are conducted with the ***SAME*** subjects (who are no longer the same owing to the effects of their participation). This is due to the aforementioned psychological uncertainty principle. Repeating the experiments with other subjects adversely affects the scientific value of the results.

4. ***The undergeneration of testable hypotheses*** – Parapsychology does not generate a sufficient number of hypotheses, which can be subjected to scientific testing. This has to do with its fabulous (i.e., storytelling) nature. In a way, Parapsychology has affinity with some private languages. It is a form of art and, as such, is self-sufficient and self-contained. If structural, internal constraints are met, a statement is deemed true within the Parapsychology "canon" even if it does not satisfy external scientific requirements.

Also Read:

Intuition

The Science of Superstitions

The Complexity of Simplicity
And Technical Note about Ambiguity and Vagueness

The Basic Dilemma of the Artist

Turing Machines and Universes

Born Aliens

The Manifold of Sense

Surpassing Man - An Epistolary Dialogue

Bestowed Existence

Being John Malkovich

The Shattered Identity

The Matrix

Return

Turing Machines and Universes

In 1936 an American (Alonzo Church) and a Briton (Alan M. Turing) published independently (as is often the coincidence in science) the basics of a new branch in Mathematics (and logic): computability or recursive functions (later to be developed into Automata Theory).

The authors confined themselves to dealing with computations which involved "effective" or "mechanical" methods for finding results (which could also be expressed as solutions (values) to formulae). These methods were so called because they could, in principle, be performed by simple machines (or human-computers or human-calculators, to use Turing's unfortunate phrases). The emphasis was on finiteness: a finite number of instructions, a finite number of symbols in each instruction, a finite number of steps to the result. This is why these methods were usable by humans without the aid of an apparatus (with the exception of pencil and paper as memory aids). Moreover: no insight or ingenuity were allowed to "interfere" or to be part of the solution seeking process.

What Church and Turing did was to construct a set of all the functions whose values could be obtained by applying effective or mechanical calculation methods. Turing went further down Church's road and designed the "Turing Machine" – a machine

which can calculate the values of all the functions whose values can be found using effective or mechanical methods. Thus, the program running the TM (=Turing Machine in the rest of this text) was really an effective or mechanical method. For the initiated readers: Church solved the decision-problem for propositional calculus and Turing proved that there is no solution to the decision problem relating to the predicate calculus. Put more simply, it is possible to "prove" the truth value (or the theorem status) of an expression in the propositional calculus – but not in the predicate calculus. Later it was shown that many functions (even in number theory itself) were not recursive, meaning that they could not be solved by a Turing Machine.

No one succeeded to prove that a function must be recursive in order to be effectively calculable. This is (as Post noted) a "working hypothesis" supported by overwhelming evidence. We don't know of any effectively calculable function which is not recursive, by designing new TMs from existing ones we can obtain new effectively calculable functions from existing ones and TM computability stars in every attempt to understand effective calculability (or these attempts are reducible or equivalent to TM computable functions).

The Turing Machine itself, though abstract, has many "real world" features. It is a blueprint for a

computing device with one "ideal" exception: its unbounded memory (the tape is infinite). Despite its hardware appearance (a read/write head which scans a two-dimensional tape inscribed with ones and zeroes, etc.) – it is really a software application, in today's terminology. It carries out instructions, reads and writes, counts and so on. It is an automaton designed to implement an effective or mechanical method of solving functions (determining the truth value of propositions). If the transition from input to output is deterministic we have a classical automaton – if it is determined by a table of probabilities – we have a probabilistic automaton.

With time and hype, the limitations of TMs were forgotten. No one can say that the Mind is a TM because no one can prove that it is engaged in solving only recursive functions. We can say that TMs can do whatever digital computers are doing – but not that digital computers are TMs by definition. Maybe they are – maybe they are not. We do not know enough about them and about their future.

Moreover, the demand that recursive functions be computable by an UNAIDED human seems to restrict possible equivalents. Inasmuch as computers emulate human computation (Turing did believe so when he helped construct the ACE, at the time the fastest computer in the world) – they

are TMs. Functions whose values are calculated by AIDED humans with the contribution of a computer are still recursive. It is when humans are aided by other kinds of instruments that we have a problem. If we use measuring devices to determine the values of a function it does not seem to conform to the definition of a recursive function. So, we can generalize and say that functions whose values are calculated by an AIDED human could be recursive, depending on the apparatus used and on the lack of ingenuity or insight (the latter being, anyhow, a weak, non-rigorous requirement which cannot be formalized).

Quantum mechanics is the branch of physics which describes the microcosm. It is governed by the Schrodinger Equation (SE). This SE is an amalgamation of smaller equations, each with its own space coordinates as variables, each describing a separate physical system. The SE has numerous possible solutions, each pertaining to a possible state of the atom in question. These solutions are in the form of wavefunctions (which depend, again, on the coordinates of the systems and on their associated energies). The wavefunction describes the probability of a particle (originally, the electron) to be inside a small volume of space defined by the aforementioned coordinates. This probability is proportional to the square of the wavefunction. This is a way of saying: "we cannot really predict what will exactly happen to every

single particle. However, we can foresee (with a great measure of accuracy) what will happen if to a large population of particles (where will they be found, for instance)."

This is where the first of two major difficulties arose:

To determine what will happen in a specific experiment involving a specific particle and experimental setting – an observation must be made. This means that, in the absence of an observing and measuring human, flanked by all the necessary measurement instrumentation – the outcome of the wavefunction cannot be settled. It just continues to evolve in time, describing a dizzyingly growing repertoire of options. Only a measurement (=the involvement of a human or, at least, a measuring device which can be read by a human) reduces the wavefunction to a single solution, collapses it.

A wavefunction is a function. Its REAL result (the selection in reality of one of its values) is determined by a human, equipped with an apparatus. Is it recursive (TM computable and compatible)? In a way, it is. Its values can be effectively and mechanically computed. The value selected by measurement (thus terminating the propagation of the function and its evolution in time by zeroing its the other terms, bar the one

selected) is one of the values which can be determined by an effective-mechanical method. So, how should we treat the measurement? No interpretation of quantum mechanics gives us a satisfactory answer. It seems that a probabilistic automaton which will deal with semi recursive functions will tackle the wavefunction without any discernible difficulties – but a new element must be introduced to account for the measurement and the resulting collapse. Perhaps a "boundary" or a "catastrophic" automaton will do the trick.

The view that the quantum process is computable seems to be further supported by the mathematical techniques which were developed to deal with the application of the Schrodinger equation to a multi-electron system (atoms more complex than hydrogen and helium). The Hartree-Fok method assumes that electrons move independent of each other and of the nucleus. They are allowed to interact only through the average electrical field (which is the charge of the nucleus and the charge distribution of the other electrons). Each electron has its own wavefunction (known as: "orbital") – which is a rendition of the Pauli Exclusion Principle.

The problem starts with the fact that the electric field is unknown. It depends on the charge distribution of the electrons which, in turn, can be learnt from the wavefunctions. But the solutions of

the wavefunctions require a proper knowledge of the field itself!

Thus, the SE is solved by successive approximations. First, a field is guessed, the wavefunctions are calculated, the charge distribution is derived and fed into the same equation in an ITERATIVE process to yield a better approximation of the field. This process is repeated until the final charge and the electrical field distribution agree with the input to the SE.

Recursion and iteration are close cousins. The Hartree-Fok method demonstrates the recursive nature of the functions involved. We can say the SE is a partial differential equation which is solvable (asymptotically) by iterations which can be run on a computer. Whatever computers can do – TMs can do. Therefore, the Hartree-Fok method is effective and mechanical. There is no reason, in principle, why a Quantum Turing Machine could not be constructed to solve SEs or the resulting wavefunctions. Its special nature will set it apart from a classical TM: it will be a probabilistic automaton with catastrophic behaviour or very strong boundary conditions (akin, perhaps, to the mathematics of phase transitions).

Classical TMs (CTMs, Turing called them Logical Computing Machines) are macroscopic, Quantum TMs (QTMs) will be microscopic. Perhaps, while

CTMs will deal exclusively with recursive functions (effective or mechanical methods of calculation) – QTMs could deal with half-effective, semi-recursive, probabilistic, catastrophic and other methods of calculations (other types of functions).

The third level is the Universe itself, where all the functions have their values. From the point of view of the Universe (the equivalent of an infinite TM), all the functions are recursive, for all of them there are effective-mechanical methods of solution. The Universe is the domain or set of all the values of all the functions and its very existence guarantees that there are effective and mechanical methods to solve them all. No decision problem can exist on this scale (or all decision problems are positively solved). The Universe is made up only of proven, provable propositions and of theorems. This is a reminder of our finiteness and to say otherwise would, surely, be intellectual vanity.

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The Science of Superstitions

"The most beautiful experience we can have is the mysterious. It is the fundamental emotion that stands at the cradle of true art and true science." Albert Einstein, The World as I See It, 1931

The debate between realism and anti-realism is, at least, a century old. Does Science describe the real world - or are its theories true only within a certain conceptual framework? Is science only instrumental or empirically adequate or is there more to it than that?

The current - mythological - image of scientific enquiry is as follows:

Without resorting to reality, one can, given infinite time and resources, produce all conceivable theories. One of these theories is bound to be the "truth". To decide among them, scientists conduct experiments and compare their results to predictions yielded by the theories. A theory is falsified when one or more of its predictions fails. No amount of positive results - i.e., outcomes that confirm the theory's predictions - can "prove right" a theory. Theories can only be proven false by that great arbiter, reality.

Jose Ortega y Gasset said (in an unrelated exchange) that all ideas stem from pre-rational beliefs. William James concurred by saying that accepting a truth often requires an act of will which goes beyond facts and into the realm of feelings. Maybe so, but there is little doubt today that beliefs are somehow involved in the formation of many scientific ideas, if not of the very endeavor of Science.

After all, Science is a human activity and humans always believe that things exist (=are true) or could be true.

A distinction is traditionally made between believing in something's existence, truth, value of appropriateness (this is the way that it ought to be) - and believing that something. The latter is a propositional attitude: we think that something, we wish that something, we feel that something and we believe that something. Believing in A and believing that A - are different.

It is reasonable to assume that belief is a limited affair. Few of us would tend to believe in contradictions and falsehoods. Catholic theologians talk about explicit belief (in something which is known to the believer to be true) versus implicit one (in the known consequences of something whose truth cannot be known). Truly, we believe in the probability of something (we, thus, express an opinion) - or in its certain existence (truth).

All humans believe in the existence of connections or relationships between things. This is not something which can be proven or proven false (to use Popper's test). That things consistently follow each other does not prove they are related in any objective, "real", manner - except in our minds. This belief in some order (if we define order as permanent relations between separate physical or abstract entities) permeates both Science and Superstition. They both believe that there must be - and is - a connection between things out there.

Science limits itself and believes that only certain entities inter-relate within well defined conceptual frames (called theories). Not everything has the potential to connect to everything else. Entities are discriminated, differentiated,

classified and assimilated in worldviews in accordance with the types of connections that they forge with each other.

Moreover, Science believes that it has a set of very effective tools to diagnose, distinguish, observe and describe these relationships. It proves its point by issuing highly accurate predictions based on the relationships discerned through the use of said tools. Science (mostly) claims that these connections are "true" in the sense that they are certain - not probable.

The cycle of formulation, prediction and falsification (or proof) is the core of the human scientific activity. Alleged connections that cannot be captured in these nets of reasoning are cast out either as "hypothetical" or as "false". In other words: Science defines "relations between entities" as "relations between entities which have been established and tested using the scientific apparatus and arsenal of tools". This, admittedly, is a very cyclical argument, as close to tautology as it gets.

Superstition is a much simpler matter: everything is connected to everything in ways unbeknown to us. We can only witness the results of these subterranean currents and deduce the existence of such currents from the observable flotsam. The planets influence our lives, dry coffee sediments contain information about the future, black cats portend disasters, certain dates are propitious, certain numbers are to be avoided. The world is unsafe because it can never be fathomed. But the fact that we - limited as we are - cannot learn about a hidden connection - should not imply that it does not exist.

Science believes in two categories of relationships between entities (physical and abstract alike). The one is the category of direct links - the other that of links through a third entity. In the first case, A and B are seen to be directly related. In the second case, there is no apparent link between A and B, but a third entity, C could well provide such a connection (for instance, if A and B are parts of C or are separately, but concurrently somehow influenced by it).

Each of these two categories is divided to three subcategories: causal relationships, functional relationships and correlative relationship.

A and B will be said to be causally related if A precedes B, B never occurs if A does not precede it and always occurs after A occurs. To the discerning eye, this would seem to be a relationship of correlation ("whenever A happens B happens") and this is true. Causation is subsumed by a the 1.0 correlation relationship category. In other words: it is a private case of the more general case of correlation.

A and B are functionally related if B can be predicted by assuming A but we have no way of establishing the truth value of A. The latter is a postulate or axiom. The time dependent Schrödinger Equation is a postulate (cannot be derived, it is only reasonable). Still, it is the dynamic laws underlying wave mechanics, an integral part of quantum mechanics, the most accurate scientific theory that we have. An unproved, non-derivable equation is related functionally to a host of exceedingly precise statements about the real world (observed experimental results).

A and B are correlated if A explains a considerable part of the existence or the nature of B. It is then clear that A and B are related. Evolution has equipped us with highly developed correlation mechanisms because they are efficient in insuring survival. To see a tiger and to associate the awesome sight with a sound is very useful.

Still, we cannot state with any modicum of certainty that we possess all the conceivable tools for the detection, description, analysis and utilization of relations between entities. Put differently: we cannot say that there are no connections that escape the tight nets that we cast in order to capture them. We cannot, for instance, say with any degree of certainty that there are no hyper-structures which would provide new, surprising insights into the interconnectedness of objects in the real world or in our mind. We cannot even say that the epistemological structures with which we were endowed are final or satisfactory. We do not know enough about knowing.

Consider the cases of Non-Aristotelian logic formalisms, Non-Euclidean geometries, Newtonian Mechanics and non classical physical theories (the relativity theories and, more so, quantum mechanics and its various interpretations). All of them revealed to us connections which we could not have imagined prior to their appearance. All of them created new tools for the capture of interconnectivity and inter-relatedness. All of them suggested one kind or the other of mental hyper-structures in which new links between entities (hitherto considered disparate) could be established.

So far, so good for superstitions. Today's superstition could well become tomorrow's Science given the right theoretical developments. The source of the clash lies

elsewhere, in the insistence of superstitions upon a causal relation.

The general structure of a superstition is: A is caused by B. The causation propagates through unknown (one or more) mechanisms. These mechanisms are unidentified (empirically) or unidentifiable (in principle). For instance, al the mechanisms of causal propagation which are somehow connected to divine powers can never, in principle, be understood (because the true nature of divinity is sealed to human understanding).

Thus, superstitions incorporate mechanisms of action which are, either, unknown to Science – or are impossible to know, as far as Science goes. All the "action-at-a-distance" mechanisms are of the latter type (unknowable). Parapsychological mechanisms are more of the first kind (unknown).

The philosophical argument behind superstitions is pretty straightforward and appealing. Perhaps this is the source of their appeal. It goes as follows:

- There is nothing that can be thought of that is impossible (in all the Universes);
- There is nothing impossible (in all the Universes) that can be thought of;
- Everything that can be thought about – is, therefore, possible (somewhere in the Universes);
- Everything that is possible exists (somewhere in the Universes).

If something can be thought of (=is possible) and is not known (=proven or observed) yet - it is most probably due

to the shortcomings of Science and not because it does not exist.

Some of these propositions can be easily attacked. For instance: we can think about contradictions and falsehoods but (apart from a form of mental representation) no one will claim that they exist in reality or that they are possible. These statements, though, apply very well to entities, the existence of which has yet to be disproved (=not known as false, or whose truth value is uncertain) and to improbable (though possible) things. It is in these formal logical niches that superstition thrives.

Continue to Science and Religion

Appendix - Interview granted by Sam Vaknin to Adam Anderson

1. Do you believe that superstitions have affected American culture? And if so, how?

A. In its treatment of nature, Western culture is based on realism and rationalism and purports to be devoid of superstitions. Granted, many Westerners - perhaps the majority - are still into esoteric practices, such as Astrology. But the official culture and its bearers - scientists, for instance - disavow such throwbacks to a darker past.

Today, superstitions are less concerned with the physical Universe and more with human affairs. Political falsities -

such as anti-Semitism - supplanted magic and alchemy. Fantastic beliefs permeate the fields of economics, sociology, and psychology, for instance. The effects of progressive taxation, the usefulness of social welfare, the role of the media, the objectivity of science, the mechanism of democracy, and the function of psychotherapy - are six examples of such groundless fables.

Indeed, one oft-neglected aspect of superstitions is their pernicious economic cost. Irrational action carries a price tag. It is impossible to optimize one's economic activity by making the right decisions and then acting on them in a society or culture permeated by the occult. Esotericism skews the proper allocation of scarce resources.

2. Are there any superstitions that exist today that you believe could become facts tomorrow, or that you believe have more fact than fiction hidden in them?

A. Superstitions stem from one of these four premises:

- That there is nothing that can be thought of that is impossible (in all possible Universes);
- That there is nothing impossible (in all possible Universes) that can be thought of;
- That everything that can be thought of – is, therefore, possible (somewhere in these Universes);

- That everything that is possible exists (somewhere in these Universes).

As long as our knowledge is imperfect (asymptotic to the truth), everything is possible. As Arthur Clark, the British scientist and renowned author of science fiction, said: ***"Any sufficiently advanced technology is indistinguishable from magic".***

Still, regardless of how "magical" it becomes, positive science is increasingly challenged by the esoteric. The emergence of pseudo-science is the sad outcome of the blurring of contemporary distinctions between physics and metaphysics. Modern science borders on speculation and attempts, to its disadvantage, to tackle questions that once were the exclusive preserve of religion or philosophy. The scientific method is ill-built to cope with such quests and is inferior to the tools developed over centuries by philosophers, theologians, and mystics.

Moreover, scientists often confuse language of representation with meaning and knowledge represented. That a discipline of knowledge uses quantitative methods and the symbol system of mathematics does not make it a science. The phrase "social sciences" is an oxymoron - and it misleads the layman into thinking that science is not that different to literature, religion, astrology, numerology, or other esoteric "systems".

The emergence of "relative", New Age, and politically correct philosophies rendered science merely one option among many. Knowledge, people believe, can be gleaned either directly (mysticism and spirituality) or indirectly (scientific practice). Both paths are equivalent and equipotent. Who is to say that science is superior to other "bodies of wisdom"? Self-interested scientific chauvinism is out - indiscriminate "pluralism" is in.

3. I have found one definition of the word "superstition" that states that it is "a belief or practice resulting from ignorance, fear of the unknown, trust in magic or chance, or a false conception of causation." What is your opinion about said definition?

A. It describes what motivates people to adopt superstitions - ignorance and fear of the unknown. Superstitions are, indeed, a "false conception of causation" which inevitably leads to "trust in magic". the only part I disagree with is the trust in chance. Superstitions are organizing principles. They serve as alternatives to other worldviews, such as religion or science. Superstitions seek to replace chance with an "explanation" replete with the power to predict future events and establish chains of causes and effects.

4. Many people believe that superstitions were created to simply teach a lesson, like the old superstition that "the girl that takes the last cookie will be an old maid" was made to teach little girls manners. Do you think that all superstitions derive from some lesson trying to be taught that today's society has simply forgotten or cannot connect to anymore?

A. Jose Ortega y Gasset said (in an unrelated exchange) that all ideas stem from pre-rational beliefs. William James concurred by saying that accepting a truth often requires an act of will which goes beyond facts and into the realm of feelings. Superstitions permeate our world. Some superstitions are intended to convey useful lessons, others form a part of the process of socialization, yet others are abused by various elites to control the masses. But most of them are there to comfort us by proffering "instant" causal explanations and by rendering our Universe more meaningful.

5. Do you believe that superstitions change with the changes in culture?

A. The content of superstitions and the metaphors we use change from culture to culture - but not the underlying shock and awe that yielded them in the first place. Man feels dwarfed in a Cosmos beyond his comprehension. He seeks meaning, direction, safety, and guidance. Superstitions purport to provide all these the easy way. To be superstitious one does not to study or to toil.

Superstitions are readily accessible and unequivocal. In troubled times, they are an irresistible proposition.

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GOD

God and Science

Introduction

"If a man would follow, today, the teachings of the Old Testament, he would be a criminal. If he would strictly follow the teachings of the New, he would be insane"

(Robert Ingersoll)

If neurons were capable of introspection and world-representation, would they have developed an idea of "Brain" (i.e., of God)? Would they have become aware that they are mere intertwined components of a larger whole? Would they have considered themselves agents of the Brain - or its masters? When a neuron fires, is it instructed to do so by the Brain or is the Brain an emergent phenomenon, the combined and rather accidental outcome of millions of individual neural actions and pathways?

There are many kinds of narratives and organizing principles. Science is driven by evidence gathered in experiments, and by the falsification of extant theories and their replacement with newer, asymptotically truer, ones. Other systems - religion, nationalism, paranoid ideation, or art - are based on personal experiences (faith, inspiration, paranoia, etc.).

Experiential narratives can and do interact with evidential narratives and vice versa.

For instance: belief in God inspires some scientists who regard science as a method to "sneak a peek at God's cards" and to get closer to Him. Another example: the pursuit of scientific endeavors enhances one's national pride and is motivated by it. Science is often corrupted in order to support nationalistic and racist claims.

The basic units of all narratives are known by their effects on the environment. God, in this sense, is no different from electrons, quarks, and black holes. All four constructs cannot be directly observed, but the fact of their existence is derived from their effects.

Granted, God's effects are discernible only in the social and psychological (or psychopathological) realms. But this observed constraint doesn't render Him less "real". The hypothesized existence of God parsimoniously explains a myriad ostensibly unrelated phenomena and, therefore, conforms to the rules governing the formulation of scientific theories.

The locus of God's hypothesized existence is, clearly and exclusively, in the minds of believers. But this again does not make Him less real. The contents of our minds are as real as anything "out there". Actually, the very distinction between epistemology and ontology is blurred.

But is God's existence "true" - or is He just a figment of our neediness and imagination?

Truth is the measure of the ability of our models to describe phenomena and predict them. God's existence (in people's minds) succeeds to do both. For instance, assuming that God exists allows us to predict many of the behaviors of people who profess to believe in Him. The

existence of God is, therefore, undoubtedly true (in this formal and strict sense).

But does God exist outside people's minds? Is He an objective entity, independent of what people may or may not think about Him? After all, if all sentient beings were to perish in a horrible calamity, the Sun would still be there, revolving as it has done from time immemorial.

If all sentient beings were to perish in a horrible calamity, would God still exist? If all sentient beings, including all humans, stop believing that there is God - would He survive this renunciation? Does God "out there" inspire the belief in God in religious folks' minds?

Known things are independent of the existence of observers (although the Copenhagen interpretation of Quantum Mechanics disputes this). Believed things are dependent on the existence of believers.

We know that the Sun exists. We don't know that God exists. We believe that God exists - but we don't and cannot know it, in the scientific sense of the word.

We can design experiments to falsify (prove wrong) the existence of electrons, quarks, and black holes (and, thus, if all these experiments fail, prove that electrons, quarks, and black holes exist). We can also design experiments to prove that electrons, quarks, and black holes exist.

But we cannot design even one experiment to falsify the existence of a God who is outside the minds of believers (and, thus, if the experiment fails, prove that God exists "out there"). Additionally, we cannot design even one

experiment to prove that God exists outside the minds of believers.

What about the "argument from design"? The universe is so complex and diverse that surely it entails the existence of a supreme intelligence, the world's designer and creator, known by some as "God". On the other hand, the world's richness and variety can be fully accounted for using modern scientific theories such as evolution and the big bang. There is no need to introduce God into the equations.

Still, it is possible that God is responsible for it all. The problem is that we cannot design even one experiment to falsify this theory, that God created the Universe (and, thus, if the experiment fails, prove that God is, indeed, the world's originator). Additionally, we cannot design even one experiment to prove that God created the world.

We can, however, design numerous experiments to falsify the scientific theories that explain the creation of the Universe (and, thus, if these experiments fail, lend these theories substantial support). We can also design experiments to prove the scientific theories that explain the creation of the Universe.

It does not mean that these theories are absolutely true and immutable. They are not. Our current scientific theories are partly true and are bound to change with new knowledge gained by experimentation. Our current scientific theories will be replaced by newer, truer theories. But any and all future scientific theories will be falsifiable and testable.

Knowledge and belief are like oil and water. They don't mix. Knowledge doesn't lead to belief and belief does not yield knowledge. Belief can yield conviction or strongly-felt opinions. But belief cannot result in knowledge.

Still, both known things and believed things exist. The former exist "out there" and the latter "in our minds" and only there. But they are no less real for that.

Read Note on Complexity and Simplicity

Read Note on Scientific Theories and the Life Cycles of Science

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God and Science

II. Is God Necessary?

Could God have failed to exist (especially considering His omnipotence)? Could He have been a contingent being rather than a necessary one? Would the World have existed without Him and, more importantly, would it have existed in the same way? For instance: would it have allowed for the existence of human beings?

To say that God is a necessary being means to accept that He exists (with His attributes intact) in every possible world. It is not enough to say that He exists only in our world: this kind of claim will render Him contingent (present in some worlds - possibly in none! - and absent in others).

We cannot conceive of the World without numbers, relations, and properties, for instance. These are necessary entities because without them the World as we known and perceive it would not exist. Is this equally true when we contemplate God? Can we conceive of a God-less World?

Moreover: numbers, relations, and properties are abstracts. Yet, God is often thought of as a concrete being. Can a concrete being, regardless of the properties imputed to it, ever be necessary? Is there a single concrete being - God - without which the Universe would have perished, or not existed in the first place? If so, what makes God a privileged concrete entity?

Additionally, numbers, relations, and properties depend for their existence (and utility) on other beings, entities,

and quantities. Relations subsist between objects; properties are attributes of things; numbers are invariably either preceded by other numbers or followed by them.

Does God depend for His existence on other beings, entities, quantities, properties, or on the World as a whole? If He is a dependent entity, is He also a derivative one? If He is dependent and derivative, in which sense is He necessary?

Many philosophers confuse the issue of existence with that of necessity. Kant and, to some extent, Frege, argued that existence is not even a logical predicate (or at least not a first-order logical predicate). But, far more crucially, that something exists does not make it a necessary being. Thus, contingent beings exist, but they are not necessary (hence their "contingency").

At best, ontological arguments deal with the question: does God necessarily exist? They fail to negotiate the more tricky: can God exist ***only*** as a Necessary Being (in all possible worlds)?

Modal ontological arguments even postulate as a premise that God is a necessary being and use that very assumption as a building block in proving that He exists! Even a rigorous logician like Gödel fell in this trap when he attempted to prove God's necessity. In his posthumous ontological argument, he adopted several dubious definitions and axioms:

(1) God's essential properties are all positive (Definition 1); (2) God necessarily exists if and only if every essence of His is necessarily exemplified (Definition 3); (3) The property of being God is positive (Axiom 3); (4) Necessary existence is positive (Axiom 5).

These led to highly-debatable outcomes:

(1) For God, the property of being God is essential (Theorem 2); (2) The property of being God is necessarily exemplified.

Gödel assumed that there is one universal closed set of essential positive properties, of which necessary existence is a member. He was wrong, of course. There may be many such sets (or none whatsoever) and necessary existence may not be a (positive) property (or a member of some of the sets) after all.

Worst of all, Gödel's "proof" falls apart if God does not exist (Axiom 3's veracity depends on the existence of a God-like creature). Plantinga has committed the very same error a decade earlier (1974). His ontological argument incredibly relies on the premise: "There is a possible world in which there is God!"

Veering away from these tautological forays, we can attempt to capture God's alleged necessity by formulating this ***Axiom Number 1***:

"God is necessary (i.e. necessarily exists in every possible world) if there are objects or entities that would not have existed in any possible world in His absence."

We should complement Axiom 1 with ***Axiom Number 2***:

"God is necessary (i.e. necessarily exists in every possible world) even if there are objects or entities that do not exist in any possible world (despite His existence)."

The reverse sentences would be:

Axiom Number 3: "God is ***not*** necessary (i.e. does not necessarily exist in every possible world) if there are objects or entities that exist in any possible world in His absence."

Axiom Number 4: "God is ***not*** necessary (i.e. does not necessarily exist in every possible world) if there are no objects or entities that exist in any possible world (despite His existence)."

Now consider this sentence:

Axiom Number 5: "Objects and entities are necessary (i.e. necessarily exist in every possible world) if they exist in every possible world even in God's absence."

Consider abstracta, such as numbers. Does their existence depend on God's? Not if we insist on the language above. Clearly, numbers are not dependent on the existence of God, let alone on His necessity.

Yet, because God is all-encompassing, surely it must incorporate all possible worlds as well as all ***impossible*** ones! What if we were to modify the language and recast the axioms thus:

Axiom Number 1:

"God is necessary (i.e. necessarily exists in every possible ***and impossible*** world) if there are objects or entities that would not have existed in any possible world in His absence."

We should complement Axiom 1 with ***Axiom Number 2***:

"God is necessary (i.e. necessarily exists in every possible ***and impossible*** world) even if there are objects or entities that do not exist in any possible world (despite His existence)."

The reverse sentences would be:

Axiom Number 3: "God is ***not*** necessary (i.e. does not necessarily exist in every possible ***and impossible*** world) if there are objects or entities that exist in any possible world in His absence."

Axiom Number 4: "God is ***not*** necessary (i.e. does not necessarily exist in every possible ***and impossible*** world) if there are no objects or entities that exist in any possible world (despite His existence)."

Now consider this sentence:

Axiom Number 5: "Objects and entities are necessary (i.e. necessarily exist in every possible ***and impossible*** world) if they exist in every possible world even in God's absence."

According to the Vander Laan modification (2004) of the Lewis counterfactuals semantics, impossible worlds are

worlds in which the number of propositions is maximal. Inevitably, in such worlds, propositions contradict each other (are inconsistent with each other). In impossible worlds, some counterpossibles (counterfactuals with a necessarily false antecedent) are true or non-trivially true. Put simply: with certain counterpossibles, even when the premise (the antecedent) is patently false, one can agree that the conditional is true because of the (true, formally correct) relationship between the antecedent and the consequent.

Thus, if we adopt an expansive view of God - one that covers all possibilities ***and impossibilities*** - we can argue that God's existence is necessary.

Appendix: Ontological Arguments regarding God's Existence

As Lewis (In his book "Anselm and Actuality", 1970) and Sobel ("Logic and Theism", 2004) noted, philosophers and theologians who argued in favor of God's existence have traditionally proffered tautological (question-begging) arguments to support their contentious contention (or are formally invalid). Thus, St. Anselm proposed (in his much-celebrated "Proslogion", 1078) that since God is the Ultimate Being, it essentially and necessarily comprises all modes of perfection, including necessary existence (a form of perfection).

Anselm's was a prototypical ontological argument: God must exist because we can conceive of a being than which no greater can be conceived. It is an "end-of-the-line" God. Descartes concurred: it is contradictory to conceive of a Supreme Being and then to question its very existence.

That we do not ***have*** to conceive of such a being is irrelevant. First: clearly, we have conceived of Him repeatedly and second, our ability to conceive is sufficient. That we fail to realize a potential act does not vitiate its existence.

But, how do we know that the God we conceive of is even possible? Can we conceive of impossible entities? For instance, can we conceive of a two-dimensional triangle whose interior angles amount to less than 180 degrees? Is the concept of a God that comprises all compossible perfections at all possible? Leibnitz said that we cannot prove that such a God is impossible because perfections are not amenable to analysis. But that hardly amounts to any kind of proof!

Read Note on Abstract Entities and Objects

Read Note on Complexity and Simplicity

Read Note on Scientific Theories and the Life Cycles of Science

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III. Is the World Necessary?

"The more I examine the universe, and the details of its architecture, the more evidence I find that the Universe in some sense must have known we were coming." — Freeman Dyson

"A bottom-up approach to cosmology either requires one to postulate an initial state of the Universe that is carefully fine-tuned — as if prescribed by an outside agency — or it requires one to invoke the notion of eternal inflation, a mighty speculative notion to the generation of many different Universes, which prevents one from predicting what a typical observer would see." — Stephen Hawking

"A commonsense interpretation of the facts suggests that a super-intellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts seem to me so overwhelming as to put this conclusion almost beyond question." - Fred Hoyle

(Taken from the BioLogos Website)

I. The Fine-tuned Universe and the Anthropic Principle

The Universe we live in (possibly one of many that make up the Multiverse) is "fine-tuned" to allow for our existence. Its initial conditions and constants are such that their values are calibrated to yield Life as we know it (by

aiding and abetting the appearance, structure, and diversity of matter). Had these initial conditions and/or constants deviated from their current levels, even infinitesimally, we would not have been here. Any theory of the Universe has to account for the existence of sapient and sentient observers. This is known as the "Anthropic Principle".

These incredible facts immediately raise two questions:

(i) Is such outstanding compatibility a coincidence? Are we here to observe it by mere chance?

(ii) If not a coincidence, is this intricate calibration an indication of (if not an outright proof for) the existence of a Creator or a Designer, aka God?

It is useful to disentangle two seemingly inextricable issues: the fact that the Universe allows for Life (which is a highly improbable event) and the fact that we are here to notice it (which is trivial, given the first fact). Once the parameters of the universe have been "decided" and "set", Life has been inevitable.

But, who, or what set the parameters of the Universe?

If our Universe is one of many, random chance could account for its initial conditions and constants. In such a cosmos, our particular Universe, with its unique parameters, encourages life while an infinity of other worlds, with other initial states and other constants of nature, do not. Modern physics - from certain interpretations of quantum mechanics to string theories - now seriously entertains the notion of a Multiverse (if not yet its exact contours and nature): a plurality of

minimally-interacting universes being spawned repeatedly.

Yet, it is important to understand that even in a Multiverse with an infinite number of worlds, there is no "guarantee" or necessity that a world such as ours will have arisen. There can exist an infinite set of worlds in which there is no equivalent to our type of world and in which Life will not appear.

As philosopher of science Jesus Mosterín put it:

"The suggestion that an infinity of objects characterized by certain numbers or properties implies the existence among them of objects with any combination of those numbers or characteristics [...] is mistaken. An infinity does not imply at all that any arrangement is present or repeated. [...] The assumption that all possible worlds are realized in an infinite universe is equivalent to the assertion that any infinite set of numbers contains all numbers (or at least all Gödel numbers of the [defining] sequences), which is obviously false."

But rather than weaken the Anthropic Principle as Mosterín claims, this criticism strengthens it. If even the existence of a Multiverse cannot lead inexorably to the emergence of a world such as ours, its formation appears to be even more miraculous and "unnatural" (in short: designed).

Still, the classic - and prevailing - view allows for only one, all-encompassing Universe. How did it turn out to be so accommodating? Is it the outcome of random action? Is Life a happy accident involving the confluence of

hundreds of just-right quantities, constants, and conditions?

As a matter of principle, can we derive all these numbers from a Theory of Everything? In other words: are these values the inevitable outcomes of the inherent nature of the world? But, if so, why does the world possess an inherent nature that gives rise inevitably to these specific initial state and constants and not to others, more inimical to Life?

To say that we (as Life-forms) can observe only a universe that is compatible with and yielding Life is begging the question (or a truism). Such a flippant and content-free response is best avoided. Paul Davies calls this approach ("the Universe is the way it is and that's it"): "The Absurd Universe" (in his book "The Goldilocks Enigma", 2006).

In all these deliberations, there are four implicit assumptions we better make explicit:

(i) That Life - and, more specifically: Intelligent Life, or Observers - is somehow not an integral part of the Universe. Yielded by natural processes, it then stands aside and observes its surroundings;

(ii) That Life is the culmination of Nature, simply because it is the last to have appeared (an example of the logical fallacy known as "post hoc, ergo propter hoc"). This temporal asymmetry also implies an Intelligent Designer or Creator in the throes of implementing a master plan;

(iii) That the Universe would not have existed had it not been for the existence of Life (or of observers). This is

known as the Participatory Anthropic Principle and is consistent with some interpretations of Quantum Mechanics;

(iv) That Life will materialize and spring forth in each and every Universe that is compatible with Life. The strong version of this assumption is that "there is an underlying principle that constrains the universe to evolve towards life and mind." The Universe is partial to life, not indifferent to it.

All four are forms of teleological reasoning (that nature has a purpose) masquerading as eutaxiological reasoning (that order has a cause). To say that the Universe was made the way it is ***in order*** to accommodate Life is teleological. Science is opposed to teleological arguments. Therefore, to say that the Universe was made the way it is ***in order*** to accommodate Life is not a ***scientific*** statement.

But, could it be a ***valid*** and ***factual*** statement? To answer this question, we need to delve further into the nature of teleology.

II. System-wide Teleological Arguments

A teleological explanation is one that explains things and features by relating to their contribution to optimal situations, or to a normal mode of functioning, or to the attainment of goals by a whole or by a system to which the said things or features belong. It often involves the confusion or reversal of causes and effects and the existence of some "intelligence" at work (either self-aware or not).

Socrates tried to understand things in terms of what good they do or bring about. Yet, there are many cases when the contribution of a thing towards a desired result does not account for its occurrence. Snow does not fall ***IN ORDER*** to allow people to ski, for instance.

But it is different when we invoke an intelligent creator. It can be convincingly shown that intelligent creators (human beings, for instance) design and maintain the features of an object in order to allow it to achieve an aim. In such a case, the very occurrence, the very existence of the object is explained by grasping its contribution to the attainment of its function.

An intelligent agent (creator) need not necessarily be a single, sharply bounded, entity. A more fuzzy collective may qualify as long as its behaviour patterns are cohesive and identifiably goal oriented. Thus, teleological explanations could well be applied to organisms (collections of cells), communities, nations and other ensembles.

To justify a teleological explanation, one needs to analyze the function of the item to be thus explained, on the one hand and to provide an etiological account, on the other hand. The functional account must strive to elucidate what the item contributes to the main activity of the system, the object, or the organism, a part of which it constitutes, or to their proper functioning, well-being, preservation, propagation, integration (within larger systems), explanation, justification, or prediction.

The reverse should also be possible. Given information regarding the functioning, integration, etc. of the whole, the function of any element within it should be derivable

from its contribution to the functioning whole. Though the practical ascription of goals (and functions) is problematic, it is, in principle, doable.

But it is not sufficient. That something is both functional and necessarily so does not yet explain ***HOW*** it happened to have so suitably and conveniently materialized. This is where the etiological account comes in. A good etiological account explains both the mechanisms through which the article (to be explained) has transpired and what aspects of the structure of the world it was able to take advantage of in its preservation, propagation, or functioning.

The most famous and obvious example is evolution. The etiological account of natural selection deals both with the mechanisms of genetic transfer and with the mechanisms of selection. The latter bestow upon the organism whose features we seek to explain a better chance at reproducing (a higher chance than the one possessed by specimen without the feature).

Hitherto, we have confined ourselves to items, parts, elements, and objects ***within*** a system. The system provides the context within which goals make sense and etiological accounts are possible. What happens when we try to apply the same teleological reasoning to the system ***as a whole***, to the Universe itself? In the absence of a context, will such cerebrations not break down?

Theists will avoid this conundrum by positing God as the context in which the Universe operates. But this is unprecedented and logically weak: the designer-creator can hardly also serve as the context within which his creation operates. Creators create and designers design

because they ***need*** to achieve something; because they ***miss*** something; and because they ***want*** something. Their creation is intended (its goal is) to satisfy said need and remedy said want. Yet, if one is one's own context, if one contains oneself, one surely cannot miss, need, or want anything whatsoever!

III. The Issue of Context

If the Universe does have an intelligent Creator-Designer, He must have used language to formulate His design. His language must have consisted of the Laws of Nature, the Initial State of the Universe, and its Constants. To have used language, the Creator-Designer must have been possessed of a mind. The combination of His mind and His language has served as the context within which He operated.

The debate between science and religion boils down to this question: Did the Laws of Nature (the language of God) precede Nature or were they created with it, in the Big Bang? In other words, did they provide Nature with the context in which it unfolded?

Some, like Max Tegmark, an MIT cosmologist, go as far as to say that mathematics is not merely the language which we use to describe the Universe - it is the Universe itself. The world is an amalgam of mathematical structures, according to him. The context is the meaning is the context ad infinitum.

By now, it is a trite observation that meaning is context-dependent and, therefore, not invariant or immutable. Contextualists in aesthetics study a work of art's historical and cultural background in order to appreciate it.

Philosophers of science have convincingly demonstrated that theoretical constructs (such as the electron or dark matter) derive their meaning from their place in complex deductive systems of empirically-testable theorems. Ethicists repeat that values are rendered instrumental and moral problems solvable by their relationships with a-priori moral principles. In all these cases, context precedes meaning and gives interactive birth to it.

However, the reverse is also true: context emerges from meaning and is preceded by it. This is evident in a surprising array of fields: from language to social norms, from semiotics to computer programming, and from logic to animal behavior.

In 1700, the English empiricist philosopher, John Locke, was the first to describe how meaning is derived from context in a chapter titled "Of the Association of Ideas" in the second edition of his seminal "Essay Concerning Human Understanding". Almost a century later, the philosopher James Mill and his son, John Stuart Mill, came up with a calculus of contexts: mental elements that are habitually proximate, either spatially or temporally, become associated (contiguity law) as do ideas that co-occur frequently (frequency law), or that are similar (similarity law).

But the Mills failed to realize that their laws relied heavily on and derived from two organizing principles: time and space. These meta principles lend meaning to ideas by rendering their associations comprehensible. Thus, the contiguity and frequency laws leverage meaningful spatial and temporal relations to form the context within which ideas associate. Context-effects and Gestalt and other vision grouping laws, promulgated in the 20th century by

the likes of Max Wertheimer, Irvin Rock, and Stephen Palmer, also rely on the pre-existence of space for their operation.

Contexts can have empirical or exegetic properties. In other words: they can act as webs or matrices and merely associate discrete elements; or they can provide an interpretation to these recurrent associations, they can render them meaningful. The principle of causation is an example of such interpretative faculties in action: A is invariably followed by B and a mechanism or process C can be demonstrated that links them both. Thereafter, it is safe to say that A causes B. Space-time provides the backdrop of meaning to the context (the recurrent association of A and B) which, in turn, gives rise to more meaning (causation).

But are space and time "real", objective entities - or are they instruments of the mind, mere conventions, tools it uses to order the world? Surely the latter. It is possible to construct theories to describe the world and yield falsifiable predictions without using space or time or by using counterintuitive and even "counterfactual' variants of space and time.

Another Scottish philosopher, Alexander Bains, observed, in the 19th century, that ideas form close associations also with behaviors and actions. This insight is at the basis for most modern learning and conditioning (behaviorist) theories and for connectionism (the design of neural networks where knowledge items are represented by patterns of activated ensembles of units).

Similarly, memory has been proven to be state-dependent: information learnt in specific mental, physical, or

emotional states is most easily recalled in similar states. Conversely, in a process known as redintegration, mental and emotional states are completely invoked and restored when only a single element is encountered and experienced (a smell, a taste, a sight).

It seems that the occult organizing mega-principle is the mind (or "self"). Ideas, concepts, behaviors, actions, memories, and patterns presuppose the existence of minds that render them meaningful. Again, meaning (the mind or the self) breeds context, not the other way around. This does not negate the views expounded by externalist theories: that thoughts and utterances depend on factors external to the mind of the thinker or speaker (factors such as the way language is used by experts or by society). Even avowed externalists, such as Kripke, Burge, and Davidson admit that the perception of objects and events (by an observing mind) is a prerequisite for thinking about or discussing them. Again, the mind takes precedence.

But what is meaning and why is it thought to be determined by or dependent on context?

Many theories of meaning are contextualist and proffer rules that connect sentence type and context of use to referents of singular terms (such as egocentric particulars), truth-values of sentences and the force of utterances and other linguistic acts. Meaning, in other words, is regarded by most theorists as inextricably intertwined with language. Language is always context-determined: words depend on other words and on the world to which they refer and relate. Inevitably, meaning came to be described as context-dependent, too. The study of meaning was reduced to an exercise in semantics. Few

noticed that the context in which words operate depends on the individual meanings of these words.

Gottlob Frege coined the term Bedeutung (reference) to describe the mapping of words, predicates, and sentences onto real-world objects, concepts (or functions, in the mathematical sense) and truth-values, respectively. The truthfulness or falsehood of a sentence are determined by the interactions and relationships between the references of the various components of the sentence. Meaning relies on the overall values of the references involved and on something that Frege called Sinn (sense): the way or "mode" an object or concept is referred to by an expression. The senses of the parts of the sentence combine to form the "thoughts" (senses of whole sentences).

Yet, this is an incomplete and mechanical picture that fails to capture the essence of human communication. It is meaning (the mind of the person composing the sentence) that breeds context and not the other way around. Even J. S. Mill postulated that a term's connotation (its meaning and attributes) determines its denotation (the objects or concepts it applies to, the term's universe of applicability).

As the **Oxford Companion to Philosophy** puts it (p. 411):

"A context of a form of words is intensional if its truth is dependent on the meaning, and not just the reference, of its component words, or on the meanings, and not just the truth-value, of any of its sub-clauses."

It is the thinker, or the speaker (the user of the expression) that does the referring, not the expression itself!

Moreover, as Kaplan and Kripke have noted, in many cases, Frege's contraption of "sense" is, well, senseless and utterly unnecessary: demonstratives, proper names, and natural-kind terms, for example, refer directly, through the agency of the speaker. Frege intentionally avoided the vexing question of why and how words refer to objects and concepts because he was weary of the intuitive answer, later alluded to by H. P. Grice, that users (minds) determine these linkages and their corresponding truth-values. Speakers use language to manipulate their listeners into believing in the manifest intentions behind their utterances. Cognitive, emotive, and descriptive meanings all emanate from speakers and their minds.

Initially, W. V. Quine put context before meaning: he not only linked meaning to experience, but also to empirically-vetted (non-introspective) world-theories. It is the context of the observed behaviors of speakers and listeners that determines what words mean, he said. Thus, Quine and others attacked Carnap's meaning postulates (logical connections as postulates governing predicates) by demonstrating that they are not necessary unless one possesses a separate account of the status of logic (i.e., the context).

Yet, this context-driven approach led to so many problems that soon Quine abandoned it and relented: translation - he conceded in his seminal tome, "Word and Object" - is indeterminate and reference is inscrutable. There are no facts when it comes to what words and sentences mean. What subjects say has no single meaning or determinately correct interpretation (when the various interpretations on offer are not equivalent and do not share the same truth value).

As the **Oxford Dictionary of Philosophy** summarily puts it (p. 194):

"Inscrutability (Quine later called it indeterminacy - SV) of reference (is) (t)he doctrine ... that no empirical evidence relevant to interpreting a speaker's utterances can decide among alternative and incompatible ways of assigning referents to the words used; hence there is no fact that the words have one reference or another" - even if all the interpretations are equivalent (have the same truth value).

Meaning comes before context and is not determined by it. Wittgenstein, in his later work, concurred.

Inevitably, such a solipsistic view of meaning led to an attempt to introduce a more rigorous calculus, based on concept of truth rather than on the more nebulous construct of "meaning". Both Donald Davidson and Alfred Tarski suggested that truth exists where sequences of objects satisfy parts of sentences. The meanings of sentences are their truth-conditions: the conditions under which they are true.

But, this reversion to a meaning (truth)-determined-by-context results in bizarre outcomes, bordering on tautologies: (1) every sentence has to be paired with another sentence (or even with itself!) which endows it with meaning and (2) every part of every sentence has to make a systematic semantic contribution to the sentences in which they occur.

Thus, to determine if a sentence is truthful (i.e., meaningful) one has to find another sentence that gives it meaning. Yet, how do we know that the sentence that

gives it meaning is, in itself, truthful? This kind of ratiocination leads to infinite regression. And how to we measure the contribution of each part of the sentence to the sentence if we don't know the a-priori meaning of the sentence itself?! Finally, what is this "contribution" if not another name for .... meaning?!

Moreover, in generating a truth-theory based on the specific utterances of a particular speaker, one must assume that the speaker is telling the truth ("the principle of charity"). Thus, belief, language, and meaning appear to be the facets of a single phenomenon. One cannot have either of these three without the others. It, indeed, is all in the mind.

We are back to the minds of the interlocutors as the source of both context and meaning. The mind as a field of potential meanings gives rise to the various contexts in which sentences can and are proven true (i.e., meaningful). Again, meaning precedes context and, in turn, fosters it. Proponents of Epistemic or Attributor Contextualism link the propositions expressed even in knowledge sentences (X knows or doesn't know that Y) to the attributor's psychology (in this case, as the context that endows them with meaning and truth value).

On the one hand, to derive meaning in our lives, we frequently resort to social or cosmological contexts: to entities larger than ourselves and in which we can safely feel subsumed, such as God, the state, or our Earth. Religious people believe that God has a plan into which they fit and in which they are destined to play a role; nationalists believe in the permanence that nations and states afford their own transient projects and ideas (they equate permanence with worth, truth, and meaning);

environmentalists implicitly regard survival as the fount of meaning that is explicitly dependent on the preservation of a diversified and functioning ecosystem (the context).

Robert Nozick posited that finite beings ("conditions") derive meaning from "larger" meaningful beings (conditions) and so ad infinitum. The buck stops with an infinite and all-encompassing being who is the source of all meaning (God).

On the other hand, Sidgwick and other philosophers pointed out that only conscious beings can appreciate life and its rewards and that, therefore, the mind (consciousness) is the ultimate fount of all values and meaning: minds make value judgments and then proceed to regard certain situations and achievements as desirable, valuable, and meaningful. Of course, this presupposes that happiness is somehow intimately connected with rendering one's life meaningful.

So, which is the ultimate contextual fount of meaning: the subject's mind or his/her (mainly social) environment?

This apparent dichotomy is false. As Richard Rorty and David Annis noted, one can't safely divorce epistemic processes, such as justification, from the social contexts in which they take place. As Sosa, Harman, and, later, John Pollock and Michael Williams remarked, social expectations determine not only the standards of what constitutes knowledge but also what is it that we know (the contents). The mind is a social construct as much as a neurological or psychological one.

To derive meaning from utterances, we need to have asymptotically perfect information about ***both*** the subject discussed and the knowledge attributor's psychology and social milieu. This is because the attributor's choice of language and ensuing justification are rooted in and responsive to both his psychology and his environment (including his personal history).

Thomas Nagel suggested that we perceive the world from a series of concentric expanding perspectives (which he divides into internal and external). The ultimate point of view is that of the Universe itself (as Sidgwick put it). Some people find it intimidating - others, exhilarating. Here, too, context, mediated by the mind, determines meaning.

To revert to our original and main theme:

Based on the discussion above, it would seem that a Creator-Designer (God) needs to have had a mind and needs to have used language in order to generate the context within which he had created. In the absence of a mind and a language, His creation would have been meaningless and, among other things, it would have lacked a clear aim or goal.

IV. Goals and Goal-orientation as Proof of Design

Throughout this discourse, it would seem that postulating the existence of a goal necessarily implies the prior forming of an intention (to realize it). A lack of intent leaves only one plausible course of action: automatism. Any action taken in the absence of a manifest intention to act is, by definition, an automatic action.

The converse is also true: automatism prescribes the existence of a sole possible mode of action, a sole possible Nature. With an automatic action, no choice is available, there are no degrees of freedom, or freedom of action. Automatic actions are, ipso facto, deterministic.

But both statements may be false. The distinction between volitional and automatic actions is not clear-cut. Surely we can conceive of a goal-oriented act behind which there is no intent of the first or second order. An intent of the second order is, for example, the intentions of the programmer as enshrined and expressed in a software application. An intent of the first order would be the intentions of the same programmer which directly lead to the composition of said software.

Consider, for instance, house pets. They engage in a variety of acts. They are goal oriented (seek food, drink, etc.). Are they possessed of a conscious, directional, volition (intent)? Many philosophers argued against such a supposition. Moreover, sometimes end-results and by-products are mistaken for goals. Is the goal of objects to fall down? Gravity is a function of the structure of space-time. When we roll a ball down a slope (which is really what gravitation is all about, according to the General Theory of Relativity) is its "goal" to come to a rest at the bottom? Evidently not.

Still, some natural processes are much less clear-cut. Natural processes are considered to be witless reactions. No intent can be attributed to them because no intelligence can be ascribed to them. This is true, but only at times.

Intelligence is hard to define. The most comprehensive approach would be to describe it as the synergetic sum of a host of processes (some conscious or mental, some not). These processes are concerned with information: its gathering, its accumulation, classification, inter-relation, association, analysis, synthesis, integration, and all other modes of processing and manipulation.

But isn't the manipulation of information what natural processes are all about? And if Nature is the sum total of all natural processes, aren't we forced to admit that Nature is (intrinsically, inherently, of itself) intelligent? The intuitive reaction to these suggestions is bound to be negative.

When we use the term "intelligence", we seem not to be concerned with just any kind of intelligence, but with intelligence that is separate from and external to what is being observed and has to be explained. If both the intelligence and the item that needs explaining are members of the same set, we tend to disregard the intelligence involved and label it as "natural" and, therefore, irrelevant.

Moreover, not everything that is created by an intelligence (however "relevant", or external) is intelligent in itself. Some products of intelligent beings are automatic and non-intelligent. On the other hand, as any Artificial Intelligence buff would confirm, automata can become intelligent, having crossed a certain quantitative or qualitative level of complexity. The weaker form of this statement is that, beyond a certain quantitative or qualitative level of complexity, it is impossible to tell the automatic from the intelligent. Is Nature automatic, is it

intelligent, or on the seam between automata and intelligence?

Nature contains everything and, therefore, contains multiple intelligences. That which contains intelligence is not necessarily intelligent, unless the intelligences contained are functional determinants of the container. Quantum mechanics (rather, its Copenhagen interpretation) implies that this, precisely, is the case. Intelligent, conscious, observers determine the very existence of subatomic particles, the constituents of all matter-energy. Human (intelligent) activity determines the shape, contents and functioning of the habitat Earth. If other intelligent races populate the universe, this could be the rule, rather than the exception. Nature may, indeed, be intelligent.

Jewish mysticism believes that humans have a major role to play: to fix the results of a cosmic catastrophe, the shattering of the divine vessels through which the infinite divine light poured forth to create our finite world. If Nature is determined to a predominant extent by its contained intelligences, then it may well be teleological.

Indeed, goal-orientated behaviour (or behavior that could be explained as goal-orientated) is Nature's hallmark. The question whether automatic or intelligent mechanisms are at work really deals with an underlying issue, that of consciousness. Are these mechanisms self-aware, introspective? Is intelligence possible without such self-awareness, without the internalized understanding of what it is doing?

Kant's third and fourth dynamic antinomies deal with this apparent duality: automatism versus intelligent acts.

The third thesis relates to causation which is the result of free will as opposed to causation which is the result of the laws of nature (nomic causation). The antithesis is that freedom is an illusion and everything is pre-determined. So, the third antinomy is really about intelligence that is intrinsic to Nature (deterministic) versus intelligence that is extrinsic to it (free will).

The fourth thesis deals with a related subject: God, the ultimate intelligent creator. It states that there must exist, either as part of the world or as its cause a Necessary Being. There are compelling arguments to support both the theses and the antitheses of the antinomies.

The opposition in the antinomies is not analytic (no contradiction is involved) - it is dialectic. A method is chosen for answering a certain type of questions. That method generates another question of the same type. "The unconditioned", the final answer that logic demands is, thus, never found and endows the antinomy with its disturbing power. Both thesis and antithesis seem true.

Perhaps it is the fact that we are constrained by experience that entangles us in these intractable questions. The fact that the causation involved in free action is beyond possible experience does not mean that the idea of such a causality is meaningless.

Experience is not the best guide in other respects, as well. An effect can be caused by many causes or many causes can lead to the same effect. Analytic tools - rather than experiential ones - are called for to expose the "true" causal relations (one cause-one effect).

Experience also involves mnemic causation rather than the conventional kind. In the former, the proximate cause is composed not only of a current event but also of a past event. Richard Semon said that mnemic phenomena (such as memory) entail the postulation of engrams or intervening traces. The past cannot have a direct effect without such mediation.

Russell rejected this and did not refrain from proposing what effectively turned out to be action at a distance involving backward causation. A confession is perceived by many to annul past sins. This is the Aristotelian teleological causation. A goal generates a behaviour. A product of Nature develops as a cause of a process which ends in it (a tulip and a bulb).

Finally, the distinction between reasons and causes is not sufficiently developed to really tell apart teleological from scientific explanations. Both are relations between phenomena ordained in such a way so that other parts of the world are effected by them. If those effected parts of the world are conscious beings (not necessarily rational or free), then we have "reasons" rather than "causes".

But are reasons causal? At least, are they concerned with the causes of what is being explained? There is a myriad of answers to these questions. Even the phrase: "Are reasons causes?" may be considered to be a misleading choice of words. Mental causation is a foggy subject, to put it mildly.

Perhaps the only safe thing to say would be that causes and goals need not be confused. One is objective (and, in most cases, material), the other mental. A person can act in order to achieve some future thing but it is not a future

cause that generates his actions as an effect. The immediate causes absolutely precede them. It is the past that he is influenced by, a past in which he formed a ***VISION*** of the future.

The contents of mental imagery are not subject to the laws of physics and to the asymmetry of time. The physical world and its temporal causal order are. The argument between teleologists and scientist may, all said and done, be merely semantic. Where one claims an ontological, ***REAL*** status for mental states (reasons) - one is a teleologist. Where one denies this and regards the mental as ***UNREAL***, one is a scientist.

But, regardless of what type of arguments we adopt, physical (scientific) or metaphysical (e.g. teleological), do we ***need*** a Creator-Designer to explain the existence of the Universe? Is it parsimonious to introduce such a Supreme and Necessary Being into the calculus of the world?

V. Parsimonious Considerations regarding the Existence of God

Occasionalism is a variation upon Cartesian metaphysics. The latter is the most notorious case of dualism (mind and body, for instance). The mind is a "mental substance". The body – a "material substance". What permits the complex interactions which happen between these two disparate "substances"? The "unextended mind" and the "extended body" surely cannot interact without a mediating agency, God. The appearance is that of direct interaction but this is an illusion maintained by Him. He moves the body when the mind is willing and places ideas in the mind when the body comes across other bodies.

Descartes postulated that the mind is an active, unextended, thought while the body is a passive, unthinking extension. The First Substance and the Second Substance combine to form the Third Substance, Man. God – the Fourth, uncreated Substance – facilitates the direct interaction among the two within the third.

Foucher raised the question: how can God – a mental substance – interact with a material substance, the body. The answer offered was that God created the body (probably so that He will be able to interact with it). Leibniz carried this further: his Monads, the units of reality, do not really react and interact. They just seem to be doing so because God created them with a pre-established harmony. The constant divine mediation was, thus, reduced to a one-time act of creation. This was considered to be both a logical result of occasionalism and its refutation by a reductio ad absurdum argument.

But, was the fourth substance necessary at all? Could not an explanation to all the known facts be provided without it? The ratio between the number of known facts (the outcomes of observations) and the number of theory elements and entities employed in order to explain them is the parsimony ratio. Every newly discovered fact either reinforces the existing worldview or forces the introduction of a new one, through a "crisis" or a "revolution" (a "paradigm shift" in Kuhn's abandoned phrase).

The new worldview need not necessarily be more parsimonious. It could be that a single new fact precipitates the introduction of a dozen new theoretical entities, axioms and functions (curves between data points). The very delineation of the field of study serves to

limit the number of facts, which could exercise such an influence upon the existing worldview and still be considered pertinent. Parsimony is achieved, therefore, also by affixing the boundaries of the intellectual arena and / or by declaring quantitative or qualitative limits of relevance and negligibility. The world is thus simplified through idealization. Yet, if this is carried too far, the whole edifice collapses. It is a fine balance that should be maintained between the relevant and the irrelevant, what matters and what could be neglected, the comprehensiveness of the explanation and the partiality of the pre-defined limitations on the field of research.

This does not address the more basic issue of why do we prefer simplicity to complexity. This preference runs through history: Aristotle, William of Ockham, Newton, Pascal – all praised parsimony and embraced it as a guiding principle of work scientific. Biologically and spiritually, we are inclined to prefer things needed to things not needed. Moreover, we prefer things needed to admixtures of things needed and not needed. This is so, because things needed are needed, encourage survival and enhance its chances. Survival is also assisted by the construction of economic theories. We all engage in theory building as a mundane routine. A tiger beheld means danger – is one such theory. Theories which incorporated fewer assumptions were quicker to process and enhanced the chances of survival. In the aforementioned feline example, the virtue of the theory and its efficacy lie in its simplicity (one observation, one prediction). Had the theory been less parsimonious, it would have entailed a longer time to process and this would have rendered the prediction wholly unnecessary. The tiger would have prevailed.

Thus, humans are Parsimony Machines (Ockham Machines): they select the shortest (and, thereby, most efficient) path to the production of true theorems, given a set of facts (observations) and a set of theories. Another way to describe the activity of Ockham Machines: they produce the maximal number of true theorems in any given period of time, given a set of facts and a set of theories.

Poincare, the French mathematician and philosopher, thought that Nature itself, this metaphysical entity which encompasses all, is parsimonious. He believed that mathematical simplicity must be a sign of truth. A simple Nature would, indeed, appear this way (mathematically simple) despite the filters of theory and language. The "sufficient reason" (why the world exists rather than not exist) should then be transformed to read: "because it is the simplest of all possible worlds". That is to say: the world exists and THIS world exists (rather than another) because it is the most parsimonious – not the best, as Leibniz put it – of all possible worlds.

Parsimony is a necessary (though not sufficient) condition for a theory to be labeled "scientific". But a scientific theory is neither a necessary nor a sufficient condition to parsimony. In other words: parsimony is possible within and can be applied to a non-scientific framework and parsimony cannot be guaranteed by the fact that a theory is scientific (it could be scientific and not parsimonious). Parsimony is an extra-theoretical tool. Theories are under-determined by data. An infinite number of theories fits any finite number of data. This happens because of the gap between the infinite number of cases dealt with by the theory (the application set) and the finiteness of the data set, which is a subset of the application set. Parsimony is a

rule of thumb. It allows us to concentrate our efforts on those theories most likely to succeed. Ultimately, it allows us to select THE theory that will constitute the prevailing worldview, until it is upset by new data.

Another question arises which was not hitherto addressed: how do we know that we are implementing some mode of parsimony? In other words, which are the FORMAL requirements of parsimony?

The following conditions must be satisfied by any law or method of selection before it can be labeled "parsimonious":

a. Exploration of a higher level of causality: the law must lead to a level of causality, which will include the previous one and other, hitherto apparently unrelated phenomena. It must lead to a cause, a reason which will account for the set of data previously accounted for by another cause or reason AND for additional data. William of Ockham was, after all a Franciscan monk and constantly in search for a Prima Causa.

b. The law should either lead to, or be part of, an integrative process. This means that as previous theories or models are rigorously and correctly combined, certain entities or theory elements should be made redundant. Only those, which we cannot dispense with, should be left incorporated in the new worldview.

c. The outcomes of any law of parsimony should be successfully subjected to scientific tests. These results should correspond with observations and

with predictions yielded by the worldviews fostered by the law of parsimony under scrutiny.

d. Laws of parsimony should be semantically correct. Their continuous application should bring about an evolution (or a punctuated evolution) of the very language used to convey the worldview, or at least of important language elements. The phrasing of the questions to be answered by the worldview should be influenced, as well. In extreme cases, a whole new language has to emerge, elaborated and formulated in accordance with the law of parsimony. But, in most cases, there is just a replacement of a weaker language with a more powerful meta-language. Einstein's Special Theory of Relativity and Newtonian dynamics are a prime example of such an orderly lingual transition, which was the direct result of the courageous application of a law of parsimony.

e. Laws of parsimony should be totally subjected (actually, subsumed) by the laws of Logic and by the laws of Nature. They must not lead to, or entail, a contradiction, for instance, or a tautology. In physics, they must adhere to laws of causality or correlation and refrain from teleology.

f. Laws of parsimony must accommodate paradoxes. Paradox Accommodation means that theories, theory elements, the language, a whole worldview will have to be adapted to avoid paradoxes. The goals of a theory or its domain, for instance, could be minimized to avoid paradoxes. But the mechanism of adaptation is complemented by a mechanism of adoption. A law of parsimony could

lead to the inevitable adoption of a paradox. Both the horns of a dilemma are, then, adopted. This, inevitably, leads to a crisis whose resolution is obtained through the introduction of a new worldview. New assumptions are parsimoniously adopted and the paradox disappears.

g. Paradox accommodation is an important hallmark of a true law of parsimony in operation. Paradox Intolerance is another. Laws of parsimony give theories and worldviews a "licence" to ignore paradoxes, which lie outside the domain covered by the parsimonious set of data and rules. It is normal to have a conflict between the non-parsimonious sets and the parsimonious one. Paradoxes are the results of these conflicts and the most potent weapons of the non-parsimonious sets. But the law of parsimony, to deserve it name, should tell us clearly and unequivocally, when to adopt a paradox and when to exclude it. To be able to achieve this formidable task, every law of parsimony comes equipped with a metaphysical interpretation whose aim it is to plausibly keep nagging paradoxes and questions at a distance. The interpretation puts the results of the formalism in the context of a meaningful universe and provides a sense of direction, causality, order and even "intent". The Copenhagen interpretation of Quantum Mechanics is an important member of this species.

h. The law of parsimony must apply both to the theory entities AND to observable results, both part of a coherent, internally and externally consistent, logical (in short: scientific) theory. It is

divergent-convergent: it diverges from strict correspondence to reality while theorizing, only to converge with it when testing the predictions yielded by the theory. Quarks may or may not exist – but their effects do, and these effects are observable.

i. A law of parsimony has to be invariant under all transformations and permutations of the theory entities. It is almost tempting to say that it should demand symmetry – had this not been merely an aesthetic requirement and often violated.

j. The law of parsimony should aspire to a minimization of the number of postulates, axioms, curves between data points, theory entities, etc. This is the principle of the maximization of uncertainty. The more uncertainty introduced by NOT postulating explicitly – the more powerful and rigorous the theory / worldview. A theory with one assumption and one theoretical entity – renders a lot of the world an uncertain place. The uncertainty is expelled by using the theory and its rules and applying them to observational data or to other theoretical constructs and entities. The Grand Unified Theories of physics want to get rid of four disparate powers and to gain one instead.

k. A sense of beauty, of aesthetic superiority, of acceptability and of simplicity should be the by-products of the application of a law of parsimony. These sensations have been often been cited, by practitioners of science, as influential factors in weighing in favor of a particular theory.

l. Laws of parsimony entail the arbitrary selection of facts, observations and experimental results to be related to and included in the parsimonious set. This is the parsimonious selection process and it is closely tied with the concepts of negligibility and with the methodology of idealization and reduction. The process of parsimonious selection is very much like a strategy in a game in which both the number of players and the rules of the game are finite. The entry of a new player (an observation, the result of an experiment) sometimes transforms the game and, at other times, creates a whole new game. All the players are then moved into the new game, positioned there and subjected to its new rules. This, of course, can lead to an infinite regression. To effect a parsimonious selection, a theory must be available whose rules will dictate the selection. But such a theory must also be subordinated to a law of parsimony (which means that it has to parsimoniously select its own facts, etc.). a meta-theory must, therefore, exist, which will inform the lower-level theory how to implement its own parsimonious selection and so on and so forth, ad infinitum.

m. A law of parsimony falsifies everything that does not adhere to its tenets. Superfluous entities are not only unnecessary – they are, in all likelihood, false. Theories, which were not subjected to the tests of parsimony are, probably, not only non-rigorous but also positively false.

n. A law of parsimony must apply the principle of redundant identity. Two facets, two aspects, two

dimensions of the same thing – must be construed as one and devoid of an autonomous standing, not as separate and independent.

o. The laws of parsimony are "back determined" and, consequently, enforce "back determination" on all the theories and worldviews to which they apply. For any given data set and set of rules, a number of parsimony sets can be postulated. To decide between them, additional facts are needed. These will be discovered in the future and, thus, the future "back determines" the right parsimony set. Either there is a finite parsimony group from which all the temporary groups are derived – or no such group exists and an infinity of parsimony sets is possible, the results of an infinity of data sets. This, of course, is thinly veiled pluralism. In the former alternative, the number of facts / observations / experiments that are required in order to determine the right parsimony set is finite. But, there is a third possibility: that there is an eternal, single parsimony set and all our current parsimony sets are its asymptotic approximations. This is monism in disguise. Also, there seems to be an inherent (though solely intuitive) conflict between parsimony and infinity.

p. A law of parsimony must seen to be at conflict with the principle of multiplicity of substitutes. This is the result of an empirical and pragmatic observation: The removal of one theory element or entity from a theory – precipitates its substitution by two or more theory elements or entities (if the preservation of the theory is sought). It is this principle that is the driving force behind scientific

crises and revolutions. Entities do multiply and Ockham's Razor is rarely used until it is too late and the theory has to be replaced in its entirety. This is a psychological and social phenomenon, not an inevitable feature of scientific progress. Worldviews collapse under the mere weight of their substituting, multiplying elements. Ptolemy's cosmology fell prey to the Copernican model not because it was more efficient, but because it contained less theory elements, axioms, equations. A law of parsimony must warn against such behaviour and restrain it or, finally, provide the ailing theory with a coup de grace.

q. A law of parsimony must allow for full convertibility of the phenomenal to the nuomenal and of the universal to the particular. Put more simply: no law of parsimony can allow a distinction between our data and the "real" world to be upheld. Nor can it tolerate the postulation of Platonic "Forms" and "Ideas" which are not entirely reflected in the particular.

r. A law of parsimony implies necessity. To assume that the world is contingent is to postulate the existence of yet another entity upon which the world is dependent for its existence. It is to theorize on yet another principle of action. Contingency is the source of entity multiplication and goes against the grain of parsimony. Of course, causality should not be confused with contingency. The former is deterministic – the latter the result of some kind of free will.

s. The explicit, stated, parsimony, the one formulated, formalized and analyzed, is connected to an implicit, less evident sort and to latent parsimony. Implicit parsimony is the set of rules and assumptions about the world that are known as formal logic. The latent parsimony is the set of rules that allows for a (relatively) smooth transition to be effected between theories and worldviews in times of crisis. Those are the rules of parsimony, which govern scientific revolutions. The rule stated in article (a) above is a latent one: that in order for the transition between old theories and new to be valid, it must also be a transition between a lower level of causality – and a higher one.

Efficient, workable, parsimony is either obstructed, or merely not achieved through the following venues of action:

a. Association – the formation of networks of ideas, which are linked by way of verbal, intuitive, or structural association, does not lead to more parsimonious results. Naturally, a syntactic, grammatical, structural, or other theoretical rule can be made evident by the results of this technique. But to discern such a rule, the scientist must distance himself from the associative chains, to acquire a bird's eye view , or, on the contrary, to isolate, arbitrarily or not, a part of the chain for closer inspection. Association often leads to profusion and to embarrassment of riches. The same observations apply to other forms of chaining, flowing and networking.

b. Incorporation without integration (that is, without elimination of redundancies) leads to the formation of hybrid theories. These cannot survive long. Incorporation is motivated by conflict between entities, postulates or theory elements. It is through incorporation that the protectors of the "old truth" hope to prevail. It is an interim stage between old and new. The conflict blows up in the perpetrators' face and a new theory is invented. Incorporation is the sworn enemy of parsimony because it is politically motivated. It keeps everyone happy by not giving up anything and accumulating entities. This entity hoarding is poisonous and undoes the whole hyper-structure.

c. Contingency – see (r) above.

d. Strict monism or pluralism – see (o) above.

e. Comprehensiveness prevents parsimony. To obtain a description of the world, which complies with a law of parsimony, one has to ignore and neglect many elements, facts and observations. Gödel demonstrated the paradoxality inherent in a comprehensive formal logical system. To fully describe the world, however, one would need an infinite amount of assumptions, axioms, theoretical entities, elements, functions and variables. This is anathema to parsimony.

f. The previous excludes the reconcilement of parsimony and monovalent correspondence. An isomorphic mapping of the world to the worldview, a realistic rendering of the universe using theoretical entities and other language

elements would hardly be expected to be parsimonious. Sticking to facts (without the employ of theory elements) would generate a pluralistic multiplication of entities. Realism is like using a machine language to run a supercomputer. The path of convergence (with the world) – convergence (with predictions yielded by the theory) leads to a proliferation of categories, each one populated by sparse specimen. Species and genera abound. The worldview is marred by too many details, crowded by too many apparently unrelated observations.

g. Finally, if the field of research is wrongly – too narrowly – defined, this could be detrimental to the positing of meaningful questions and to the expectation of receiving meaningful replies to them (experimental outcomes). This lands us where we started: the psychophysical problem is, perhaps, too narrowly defined. Dominated by Physics, questions are biased or excluded altogether. Perhaps a Fourth Substance IS the parsimonious answer, after all.

It would seem, therefore, that parsimony should rule out the existence of a Necessary and Supreme Being or Intelligence (God). But is Nature really parsimonious, as Poincare believed? Our World is so complex and includes so many redundancies that it seems to abhor parsimony. Doesn't this ubiquitous complexity indicate the existence of a Mind-in-Chief, a Designer-Creator?

VI. Complexity as Proof of Design

"Everything is simpler than you think and at the same time more complex than you imagine."
(Johann Wolfgang von Goethe)

Complexity rises spontaneously in nature through processes such as self-organization. Emergent phenomena are common as are emergent traits, not reducible to basic components, interactions, or properties.

Complexity does not, therefore, imply the existence of a designer or a design. Complexity does not imply the existence of intelligence and sentient beings. On the contrary, complexity usually points towards a natural source and a random origin. Complexity and artificiality are often incompatible.

Artificial designs and objects are found only in unexpected ("unnatural") contexts and environments. Natural objects are totally predictable and expected. Artificial creations are efficient and, therefore, simple and parsimonious. Natural objects and processes are not.

As Seth Shostak notes in his excellent essay, titled "SETI and Intelligent Design", evolution experiments with numerous dead ends before it yields a single adapted biological entity. DNA is far from optimized: it contains inordinate amounts of junk. Our bodies come replete with dysfunctional appendages and redundant organs. Lightning bolts emit energy all over the electromagnetic spectrum. Pulsars and interstellar gas clouds spew radiation over the entire radio spectrum. The energy of the Sun is ubiquitous over the entire optical and thermal range. No intelligent engineer - human or not - would be so wasteful.

Confusing artificiality with complexity is not the only terminological conundrum.

Complexity and simplicity are often, and intuitively, regarded as two extremes of the same continuum, or spectrum. Yet, this may be a simplistic view, indeed.

Simple procedures (codes, programs), in nature as well as in computing, often yield the most complex results. Where does the complexity reside, if not in the simple program that created it? A minimal number of primitive interactions occur in a primordial soup and, presto, life. Was life somehow embedded in the primordial soup all along? Or in the interactions? Or in the combination of substrate and interactions?

Complex processes yield simple products (think about products of thinking such as a newspaper article, or a poem, or manufactured goods such as a sewing thread). What happened to the complexity? Was it somehow reduced, "absorbed, digested, or assimilated"? Is it a general rule that, given sufficient time and resources, the simple can become complex and the complex reduced to the simple? Is it only a matter of computation?

We can resolve these apparent contradictions by closely examining the categories we use.

Perhaps simplicity and complexity are categorical illusions, the outcomes of limitations inherent in our system of symbols (in our language).

We label something "complex" when we use a great number of symbols to describe it. But, surely, the choices

we make (regarding the number of symbols we use) teach us nothing about complexity, a real phenomenon!

A straight line can be described with three symbols (A, B, and the distance between them) - or with three billion symbols (a subset of the discrete points which make up the line and their inter-relatedness, their function). But whatever the number of symbols we choose to employ, however complex our level of description, it has nothing to do with the straight line or with its "real world" traits. The straight line is not rendered more (or less) complex or orderly by our choice of level of (meta) description and language elements.

The simple (and ordered) can be regarded as the tip of the complexity iceberg, or as part of a complex, interconnected whole, or holagramically, as encompassing the complex (the same way all particles are contained in all other particles). Still, these models merely reflect choices of descriptive language, with no bearing on reality.

Perhaps complexity and simplicity are not related at all, either quantitatively, or qualitatively. Perhaps complexity is not simply more simplicity. Perhaps there is no organizational principle tying them to one another. Complexity is often an emergent phenomenon, not reducible to simplicity.

The third possibility is that somehow, perhaps through human intervention, complexity yields simplicity and simplicity yields complexity (via pattern identification, the application of rules, classification, and other human pursuits). This dependence on human input would explain the convergence of the behaviors of all complex systems

on to a tiny sliver of the state (or phase) space (sort of a mega attractor basin). According to this view, Man is the creator of simplicity and complexity alike but they do have a real and independent existence thereafter (the Copenhagen interpretation of a Quantum Mechanics).

Still, these twin notions of simplicity and complexity give rise to numerous theoretical and philosophical complications.

Consider life.

In human (artificial and intelligent) technology, every thing and every action has a function within a "scheme of things". Goals are set, plans made, designs help to implement the plans.

Not so with life. Living things seem to be prone to disorientated thoughts, or the absorption and processing of absolutely irrelevant and inconsequential data. Moreover, these laboriously accumulated databases vanish instantaneously with death. The organism is akin to a computer which processes data using elaborate software and then turns itself off after 15-80 years, erasing all its work.

Most of us believe that what appears to be meaningless and functionless supports the meaningful and functional and leads to them. The complex and the meaningless (or at least the incomprehensible) always seem to resolve to the simple and the meaningful. Thus, if the complex is meaningless and disordered then order must somehow be connected to meaning and to simplicity (through the principles of organization and interaction).

Moreover, complex systems are inseparable from their environment whose feedback induces their self-organization. Our discrete, observer-observed, approach to the Universe is, thus, deeply inadequate when applied to complex systems. These systems cannot be defined, described, or understood in isolation from their environment. They are one with their surroundings.

Many complex systems display emergent properties. These cannot be predicted even with perfect knowledge about said systems. We can say that the complex systems are creative and intuitive, even when not sentient, or intelligent. Must intuition and creativity be predicated on intelligence, consciousness, or sentience?

Thus, ultimately, complexity touches upon very essential questions of who we, what are we for, how we create, and how we evolve. It is not a simple matter, that...

VII. Summary

The fact that the Universe is "fine-tuned" to allow for Life to emerge and evolve does not necessarily imply the existence of a Designer-Creator (although this cannot be ruled out conclusively). All forms and manner of Anthropic Principles are teleological and therefore non-scientific. This, though, does not ipso facto render them invalid or counterfactual.

Still, teleological explanations operate only within a context within which they acquire meaning. God cannot serve as His own context because he cannot be contained in anything and cannot be imperfect or incomplete. But, to have designed the Universe, He must have had a mind and must have used a language. His mind and His language

combined can serve as the context within which he had labored to create the cosmos.

The rule of parsimony applies to theories about the World, but not to the World itself. Nature is not parsimonious. On the contrary: it is redundant. Parsimony, therefore, does not rule out the existence of an intelligent Designer-Creator (though it does rule out His incorporation as an element in a scientific theory of the world or in a Theory of Everything).

Finally, complexity is merely a semantic (language) element that does not denote anything in reality. It is therefore meaningless (or at the very least doubtful) to claim the complexity of the Universe implies (let alone proves) the existence of an intelligent (or even non-intelligent) Creator-Designer.

Read Note on Teleology: Legitimizing Final Causes

Read Note on Context, Background, Meaning

Read Note on Parsimony – The Fourth Substance

Read Note on Complexity and Simplicity

Read Note on Scientific Theories and the Life Cycles of Science

Return

God and Science

IV. Theodicy: The Problem of Evil

''There is nothing that an omnipotent God could not do.' 'No.' 'Then, can God do evil?' 'No.' 'So that evil is nothing, since that is what He cannot do who can do anything.'

Anicius Manlius Severinus Boethius (480? - 524?), **Roman philosopher and statesman,** *The Consolation of Philosophy*

"An implication of intelligent design may be that the designer is benevolent and, as such, the constants and structures of the universe are 'life-friendly'. However such intelligent designer may conceivably be malevolent … (I)t is reasonable to conclude that God does not exist, since God is omnipotent, omniscient and perfectly good and thereby would not permit any gratuitous natural evil. But since gratuitous natural evils are precisely what we would expect if a malevolent spirit created the universe … If any spirit created the universe, it is malevolent, not benevolent."

Quentin Smith, *The Anthropic Coincidences, Evil and the Disconfirmation of Theism*

Nequaquam nobis divinitus esse creatum
Naturam mundi, quæ tanta est prædita culpa.

Lucretius (De Rerum Natura)

I. The Logical Problem of Evil

God is omniscient, omnipotent and good (we do not discuss here more "limited" versions of a divine Designer or Creator). Why, therefore won't he eliminate Evil? If he cannot do so, then he is not all-powerful (or not all-knowing). If he will not do so, then surely he is not good! Epicurus is said to have been the first to offer this simplistic formulation of the ***Logical (a-priori, deductive) Problem of Evil***, later expounded on by David Hume in his "Dialogues Concerning Natural Religion" (1779).

Evil is a value judgment, a plainly human, culture-bound, period-specific construct. St. Thomas Aquinas called it "ens rationis", the subjective perception of relationships between objects and persons, or persons and persons. Some religions (Hinduism, Christian Science) shrug it off as an illusion, the outcome of our intellectual limitations and our mortality. As St. Augustine explained in his seminal "The City of God" (5th century AD), what to us appears heinous and atrocious may merely be an integral part of a long-term divine plan whose aim is to preponderate good. Leibniz postulated in his Theodicy (1710) that Evil (moral, physical, and metaphysical) is an inevitable part of the best logically possible world, a cosmos of plenitude and the greatest possible number of "compatible perfections".

But, what about acts such as murder or rape (at least in peace time)? What about "horrendous evil" (coined by Marilyn Adams to refer to unspeakable horrors)? There is no belief system that condones them. They are universally considered to be evil. It is hard to come up with a moral calculus that would justify them, no matter how broad the

temporal and spatial frame of reference and how many degrees of freedom we allow.

The Augustinian etiology of evil (that it is the outcome of bad choices by creatures endowed with a free will) is of little help. It fails to explain ***why*** would a sentient, sapient being, fully aware of the consequences of his actions and their adverse impacts on himself and on others, ***choose*** evil? When misdeeds are aligned with the furtherance of one's self-interest, evil, narrowly considered, appears to be a rational choice. But, as William Rowe observed, many gratuitously wicked acts are self-defeating, self-destructive, irrational, and purposeless. They do not give rise to any good, nor do they prevent a greater evil. They increase the sum of misery in the world.

As Alvin Plantinga suggested (1974, 1977) and Bardesanes and St. Thomas Aquinas centuries before him, Evil may be an inevitable (and tolerated) by-product of free will. God has made Himself absent from a human volition that is free, non-deterministic, and non-determined. This divine withdrawal is the process known as "self-limitation", or, as the Kabbalah calls it: tsimtsum, minimization. Where there's no God, the door to Evil is wide open. God, therefore, can be perceived as having absconded and having let Evil in so as to facilitate Man's ability to make truly free choices. It can even be argued that God inflicts pain and ignores (if not leverages) Evil in order to engender growth, learning, and maturation. It is a God not of indifference (as proposed by theologians and philosophers from Lactantius to Paul Draper), but of "tough love". Isaiah puts it plainly: "I make peace and create evil" (45:7).

Back to the issue of Free Will.

The ability to choose between options is the hallmark of intelligence. The entire edifice of human civilization rests on the assumption that people's decisions unerringly express and reflect their unique set of preferences, needs, priorities, and wishes. Our individuality is inextricably intermeshed with our ability ***not*** to act predictably and ***not*** to succumb to peer pressure or group dynamics. The capacity to choose Evil is what makes us human.

Things are different with ***natural evil***: disasters, diseases, premature death. These have very little to do with human choices and human agency, unless we accept Richard Swinburne's anthropocentric - or, should I say: Anthropic? - belief that they are meant to foster virtuous behaviors, teach survival skills, and enhance positive human traits, including the propensity for a spiritual bond with God and "soul-making" (a belief shared by the Mu'tazili school of Islam and by theologians from Irenaeus of Lyons and St. Basil to John Hick).

Natural calamities are not the results of free will. Why would a benevolent God allow them to happen?

Because Nature sports its own version of "free will" (indeterminacy). As Leibniz and Malebranche noted, the Laws of Nature are pretty simple. Not so their permutations and combinations. Unforeseeable, emergent complexity characterizes a myriad beneficial natural phenomena and makes them possible. The degrees of freedom inherent in all advantageous natural processes come with a price tag: catastrophes (Reichenbach). Genetic mutations drive biological evolution, but also give rise to cancer. Plate tectonics yielded our continents and biodiversity, but often lead to fatal earthquakes and

tsunamis. Physical evil is the price we pay for a smoothly-functioning and a fine-tuned universe.

II. The Evidential Problem of Evil

Some philosophers (for instance, William Rowe and Paul Draper) suggested that the preponderance of (specific, horrific, gratuitous types of) Evil does not necessarily render God logically ***impossible*** (in other words, that the Problem of Evil is not a logical problem), merely highly ***unlikely***. This is known as the ***Evidential*** or ***Probabilistic*** (***a-posteriori, inductive***) ***Problem of Evil***.

As opposed to the logical version of the Problem of Evil, the evidential variant relies on our (fallible and limited) judgment. It goes like this: upon deep reflection, we, human beings, cannot find a good reason for God to tolerate and to not act against intrinsic Evil (i.e. gratuitous evil that can be prevented without either vanquishing some greater good or permitting some evil equally bad or worse). Since intrinsic evil abounds, it is highly unlikely that He exists.

Skeptic Theists counter by deriding such thinkers: How can we, with our finite intellect ever hope to grasp God's motives and plan, His reasons for action and inaction? To attempt to explicate and justify God (theodicy) is not only blasphemous, it is also presumptuous, futile, and, in all likelihood, wrong, leading to fallacies and falsities.

Yet, even if our intelligence were perfect and omniscient, it would not necessarily have been identical to or coextensive with God's. As we well know from experience, multiple intelligences with the same attributes often obtain completely different behaviors and traits.

Two omniscient intellects can reach diametrically-opposed conclusions, even given the same set of data.

We can turn the evidential argument from evil on its head and, following Swinburne, paraphrase Rowe:

If there is an omnipotent and omniscient being, then there are ***specific cases*** of such a being's intentionally allowing evil occurrences that have wrongmaking properties such that there are rightmaking characteristics that it is reasonable to believe exist (or unreasonable to believe do not exist) and that both apply to the cases in question and are sufficiently serious to counterbalance the relevant wrongmaking characteristics.

Therefore it is likely that (here comes the inductive leap from theodicy to defense):

If there is an omnipotent and omniscient being, then there is the case of such a being intentionally allowing ***specific or even all*** evil occurrences that have wrongmaking properties such that there are rightmaking characteristics that it is reasonable to believe exist (or unreasonable to believe do not exist) — ***including ones that we are not aware of*** — that both apply to the cases in question, or to all Evil and are sufficiently serious to counterbalance the relevant wrongmaking characteristics.

Back to reality: given our limitations, what to us may appear evil and gratuitous, He may regard as necessary and even beneficial (Alston, Wykstra, Plantinga).

Even worse: we cannot fathom God's mind because we cannot fathom any mind other than our own. This doubly applies to God, whose mind is infinite and omniscient: if

He does exist, His mind is alien and inaccessible to us. There is no possible intersubjectivity between God and ourselves. We cannot empathize with Him. God and Man have no common ground or language. It is not Hick's "epistemic distance", which can be bridged by learning to love God and worship Him. Rather, it is an unbridgeable chasm.

This inaccessibility may cut both ways. Open Theists (harking back to the Socinians in the 17th century) say that God cannot predict our moves. Deists say that He doesn't care to: having created the Universe, He has moved on, leaving the world and its inhabitants to their own devices. Perhaps He doesn't care about us because He ***cannot*** possibly know what it is to be human, He does not feel our pain, and is incapable of empathizing with us. But this view of an indifferent God negates his imputed benevolence and omnipotence.

This raises two questions:

(i) If His mind is inaccessible to us, how could we positively know anything about Him? The answer is that maybe we don't. Maybe our knowledge about God actually pertains to someone else. The Gnostics said that we are praying to the wrong divinity: the entity that created the Universe is the Demiurge, not God.

(ii) If our minds are inaccessible to Him, how does He make Himself known to us? Again, the answer may well be that He does not and that all our "knowledge" is sheer confabulation. This would explain the fact that what we think we know about God doesn't sit well with the plenitude of wickedness around us and with nature's brutality.

Be that as it may, we seem to have come back full circle to the issue of free will. God cannot foresee our choices, decisions, and behaviors because He has made us libertarian free moral agents. We are out of His control and determination and, thus, out of His comprehension. We can choose Evil and there is little He can do about it.

III. Aseity and Evil

Both formulations of the Problem of Evil assume, sotto voce, that God maintains an intimate relationship with His creation, or even that the essence of God would have been different without the World. This runs contra to the divine attribute of aseity which states flatly that God is self-sufficient and does not depend for His existence, attributes, or functioning on any thing outside Himself. God, therefore, by definition, cannot be concerned with the cosmos and with any of its characteristics, including the manifestations of good and evil. Moreover, the principle of aseity, taken to its logical conclusion, implies that God does not interact with the World and does not change it. This means that God cannot or will not either prevent Evil or bring it about.

IV. God as a Malicious Being

A universe that gives rise to gratuitous Evil may indicate the existence of an omnipotent, omniscient, but also supremely malevolent creator. Again, turning on its head the familiar consequentialist attempt to refute the evidential argument from evil, we get (quoting from the Stanford Encyclopedia of Philosophy's article about The Problem of Evil):

"(1) An action is, by definition, morally right if and only if it is, among the actions that one could have performed, an action that produces at least as much value as every alternative action;

(2) An action is morally wrong if and only if it is not morally right;

(3) If one is an omnipotent and omniscient being, then for any action whatever, there is always some (alternative) action that produces greater value."

In other words, the actions of an omnipotent and omniscient being are always morally wrong and never morally right. This is because among the actions that such a being could have performed (instead of the action that he did perform) there is an infinity of alternatives that produce greater value.

Moreover, an omnibenevolent, merciful, and just God is hardly likely to have instituted an infinite Hell for nonbelievers. This is more in tune with a wicked, vicious divinity. To suggest the Hell is the sinner's personal choice not to be with God (i.e. to sin and to renounce His grace) doesn't solve the problem: for why would a being such as God allow mere ignorant defective mortals a choice that may lead them straight to Hell? Why doesn't He protect them from the terrifying outcomes of their nescience and imperfection? And what kind of "choice" is it, anyway? Believe in me, or else ... (burn in Hell, or be annihilated).

V. Mankind Usurping God - or Fulfilling His Plan?

A morally perfect God (and even a morally imperfect one) would surely wish to minimize certain, horrendous types of gratuitous Evil albeit without sacrificing the greater good and while forestalling even greater evils. How can God achieve these admirable and "ego"-syntonic goals without micromanaging the World and without ridding it of the twin gifts of free will and indeterminacy?

If there is a God, He may have placed us on this Earth to function as "moral policeman". It may be ***our*** role to fight Evil and to do our best to eradicate it (this is the view of the Kabbalah and, to some extent, Hegel). We are God's rightmaking agents, his long arm, and his extension. Gradually, Mankind acquires abilities hitherto regarded as the exclusive domain of God. We can cure diseases; eliminate pain; overcome poverty; extend life, fight crime, do justice. In the not too distant future we are likely to be able to retard ageing; ameliorate natural catastrophes; eradicate delinquency (remember the film "Clockwork Orange"?).

Imagine a future world in which, due to human ingenuity and efforts, Evil is no more. Will free will vanish with it and become a relic of a long-forgotten past? Will we lose our incentive and capacity to learn, improve, develop, and grow? Will we perish of "too much good" as in H. G. Wells' dystopia "The Time Machine"? Why is it that God tolerates Evil and we seek to dispose of it? In trying to resist Evil and limit it, are we acting against the Divine Plan, or in full compliance with it? Are we risking His wrath every time we temper with Nature and counter our propensity for wickedness, or is this precisely what He has in store for us and why He made us?

Many of these questions resolve as if by magic once we hold God to be merely a psychological construct, a cultural artifact, and an invention. The new science of neuro-religion traces faith to specific genes and neurons. Indeed, God strikes some as a glorified psychological defense mechanism: intended to fend off intimations of a Universe that is random, meaningless and, ipso facto, profoundly unjust by human criteria. By limiting God's omnipotence (since He is not capable of Evil thoughts or deeds) even as we trumpet ours (in the libertarian view of free will), we have rendered His creation less threatening and the world more habitable and welcoming. If He is up there, He may be smiling upon our accomplishments against all odds.

Read Note about Narcissism and Evil

Read Note on Teleology: Legitimizing Final Causes

Read Note on Context, Background, Meaning

Read Note on Parsimony – The Fourth Substance

Read Note on Complexity and Simplicity

Read Note on Scientific Theories and the Life Cycles of Science

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VI. Miracles, Wonders, Signs: God's Interactions with the World

"And from the great and well-known miracles a man comes to admit to hidden miracles which are the foundation of the whole Torah. A person has no portion in the Torah of Moses unless he believes that all our matters and circumstances are miracles and they do not follow nature or the general custom of the world …rather, if one does mitzvoth he will succeed due to the reward he merits …" (Nachmanides, or Ramba"n on Exodus 13:16)

"This Universe remains perpetually with the same properties with which the Creator has endowed it… none of these will ever be changed except by way of miracle in some individual instances…." (Maimonides, Ramba"m, Guide for the Perplexed, 2:29).

"(N)othing then, comes to pass in nature in contravention to her universal laws, nay, nothing does not agree with them and follow from them, for . . . she keeps a fixed and immutable order... (A) miracle, whether in contravention to, or beyond, nature, is a mere absurdity ... We may, then, be absolutely certain that every event which is truly described in Scripture necessarily happened, like everything else, according to

natural laws." (Baruch Spinoza, Tractatus Theologica-Politicus)

"Those whose judgment in these matters is so inclined that they suppose themselves to be helpless without miracles, believe that they soften the blow which reason suffers from them by holding that they happen but seldom ... How seldom? Once in a hundred years? . . . Here we can determine nothing on the basis of knowledge of the object . . . but only on the basis of the maxims which are necessary to the use of our reason. Thus, miracles must be admitted as (occurring) daily (though indeed hidden under the guise of natural events) or else never . . . Since the former alternative is not at all compatible with reason, nothing remains but to adopt the later maxim - for this principle remains ever a mere maxim for making judgments, not a theoretical assertion ... (For example: the) admirable conservation of the species in the plant and animal kingdoms, . . . no one, indeed, can claim to comprehend whether or not the direct influence of the Creator is required on each occasion ... (T)hey are for us, . . . nothing but natural effects and ought never to be adjudged otherwise . . . To venture beyond these limits is rashness and immodesty . . . In the affairs of life, therefore, it is impossible for us to count on miracles or to take them into consideration at all in our use of reason." (Immanuel Kant, Religion Within the Limits of Reason Alone)

Can God suspend the Laws of Nature, or even change or "cancel" them?

I. Historical Overview

God has allegedly created the Universe, or, at least, as Aristotle postulated, he acted as the "Unmoved Mover". But Creation was a one-time interaction. Did God, like certain software developers, embed in the world some "backdoors" or "Easter eggs" that allow Him to intervene in exceptional circumstances and change the preordained and predestined course of events? If he did, out go the concepts of determinism and predestination, thus undermining (and upsetting) quite a few religious denominations and schools of philosophy.

The Stoics were pantheists. They (and Spinoza, much later) described God (not merely the emanation of the Holy Ghost, but the genuine article Himself) as all-pervasive, His unavoidable ubiquity akin to the all-penetrating presence of the soul in a corporeal body. If God ***is*** Nature, then surely He can do as He wishes with the Laws of Nature?

Not so. Philo from Alexandria convincingly demonstrated that a perfect being can hardly be expected to remain in direct touch with imperfection. Lacking volition, wanting nothing, and not in need of thought, God, suggested Philo, uses an emanation he called "Logos" (later identified by the Apologists with Christ) as an intermediary between Himself and His Creation.

The Neoplatonist Plotinus concurred: Nature may need God, but it was a pretty one-sided

relationship. God used emanations to act upon the World's stage: these were beings coming ***from*** Him, but not ***of*** Him. The Council of Nicea (325 AD) dispensed of this multiplication: the Father, the Son (Logos), and the Holy Ghost were all of the same substance, they were all God Himself. In modern times, Cartesian dualism neglected to explain by what transmission mechanisms God can and allegedly does affect the material cosmos.

Finally, as most monotheistic religions maintain, miracles are effected by God directly or via his envoys and messengers (angels, prophets, etc.) Acts that transgress against the laws of nature but are committed by other "invisible agents" are not miracles, but magick (in which we can include spiritualism, the occult, and "paranormal" phenomena).

II. Miracles and Natural Laws

Can we even contemplate a ***breach*** of the natural ***order***? Isn't this very juxtaposition meaningless, even nonsensical? Can Nature lapse? And how can we prove divine involvement in the ***un-natural*** when we are at a loss to conclusively demonstrate His contribution to the ***natural***? As David Hume observed, it is not enough for a miracle to run contra to immutable precedent; it must also evidently serve as an expression of divine "volition and interposition". Indeed, as R.F. Holland correctly noted, even perfectly natural events, whose coincidence yields religious (i.e. divine) significance, amount to miracles. Thus,

some miracles are actually ***signs*** from Heaven even where Nature is not violated.

Moreover, if God, or some other supernatural agency stand outside Nature, then when they effect miracles, they are not violating the Laws of Nature to which they are not subjected.

Hume is a skeptic: the evidence in favor of natural laws is so overwhelming that it is bound to outweigh any evidence (any number of testimonies included) produced in support of miracles. Yet, being the finite creatures that we are, can we ever get acquainted with ***all*** the evidence in favor of any given natural law? Our experience is never perfectly exhaustive, merely asymptotically so (Rousseau). Does this leave room for exceptions, as Richard Purtill suggested in "Thinking about Religion" (1978)? Hume emphatically denies this possibility. He gives this irrefutable examples: all of us must die, we cannot suspend lead in mid-air, wood is consumed by fire which is extinguished by water ("*Enquiry Concerning Human Understanding").* No exceptions here, not now, not ever.

In "Hume's Abject Failure" (2000), John Earman argues for the probability of miracles founded on multiple testimonies by independent and reliable observers. Yet, both Earman and Hume confine themselves to human witnesses. What if we were to obtain multiple readings from machines and testing equipment that imply the occurrence of a miracle? The occasional dysfunction aside, machines are not gullible, less fallible,

disinterested, and, therefore, more reliable than humans.

But machines operate in accordance with and are subject to the laws of nature. Can they record an event that is outside of Nature? Do miracles occur within Nature or outside it? If miracles transpire within Nature, shouldn't they be deemed ipso facto "natural" (though ill-understood)? If miracles emerge without Nature, how can anything and anyone within Nature's remit and ambit witness them?

Indeed, it is not possible to discuss miracles meaningfully. Such contemplation gives rise to the limitations of language itself. If one subscribes to the inviolable uniformity of Nature, one excludes the mere possibility (however remote) of miracles from the conversation. If one accepts that miracles may occur, one holds Nature to be mutable and essentially unpredictable. There is no reconciling these points of view: they reflect a fundamental chasm between two ways of perceiving our Universe and, especially, physical reality.

Moreover, Nature (and, by implication, Science) is the totality of what exists and of what happens. If miracles exist and happen then they are, by this definition, a part and parcel of Nature (i.e., they are natural, not supernatural). We do experience miracles and, as Hume correctly notes, we cannot experience that which happens outside of Nature. That some event is exceedingly improbable does not render it logically impossible, of course. Equally, that it is logically possible does not

guarantee its likelihood. But if a highly incredible event does occur it merely limns the limitations of our contemporary knowledge. To use Hume's terminology: it is never a miracle, merely a marvel (or an extraordinary event).

In summary:

Man-made laws are oft violated (ask any prosecutor) - why not natural ones? The very word "violation" is misleading. Criminals act according to their own set of rules. Thus, criminal activity is a violation of one body of edicts while upholding another. Similarly, what may appear to us to be miraculous (against the natural order) may merely be the manifestation of a law of nature that is as yet unrevealed to us (which was St. Augustine's view as well as Hume's and Huxley's and is today the view of the philosopher-physicist John Polkinghorne).

Modern science is saddled with metaphysical baggage (e.g., the assumptions that the Universe is isotropic and homogeneous; or that there is only one Universe; or that the constants of Nature do not change in time or in space; and so on). "Miracles" may help us rid ourselves of this quasi-religious ballast and drive science forward as catalysts of open-minded progress (Spinoza, McKinnon). In Popperian terms, "miracles" help us to falsify scientific theories and come up with better ones, closer to the "truth".

III. Miracles: nonrepeatable counterinstances, or repeatable events?

Jesus is reported to have walked on water. Is this ostensible counterinstance to natural law an isolated incident, or will it repeat itself? There is no reason in principle or in theology that this miracle should not recur. Actually, most "miracles" had multiple instances throughout history and thus are of dubious supernatural pedigree.

On the other hand, the magnitude of the challenge to the prevailing formulation of the relevant natural laws ***increases*** with every recurrence of a "miracle". While nonrepeatable counterinstances (violations) can be ignored (however inconveniently), repetitive apparent breaches cannot be overlooked without jeopardizing the entire scientific edifice. They must be incorporated in a ***new natural law***.

How can we tell miracles apart from merely unexplained or poorly understood events? How can we ascertain, regardless of the state of our knowledge, that a phenomenon is not natural in the sense that it can ***never*** be produced by Nature? How can we know for sure that it is nonrepeatable, a counterinstance, a true breach of Natural Laws? As Sir Arthur Clarke correctly observed: a sufficiently advanced technology is indistinguishable from magic. Antony Flew suggested that we are faced with a Problem of Identifying Miracles.

The Problem seems to emanate from three implicit assumptions:

(1) That God is somehow above or outside Nature and his actions (such as miracles wrought by Him) are, therefore, not natural (or supernatural);

(2) That every event (even a miracle) must have a cause, be it natural or supernatural; and

(3) That explanations and causes ought to be empirical concepts.

All three assertions are debatable:

(1) As pantheists and occasionalists who adhere to the principle of immanence demonstrate, God's place in the scheme of things depends on how we define Nature. They postulate that God and the World are one and the same. This requires God to have a material dimension or quality and to occupy the entirety of space and time, allowing Him to interact with the Universe (which is material and spatio-temporal).

(2) As for causality: now we know that the Laws of Nature and its Constants are not immutable nor permanent and that causes (as expressed in Laws of Nature) are mere statistical, true, and contingent generalizations with non-universal predictive powers (applicable only to a localized segment of space-time, or, at the maximum, to our Universe alone). Thus, we can definitely conceive of events and entities that have no causes (as these causes are perceived in our patch of the Cosmos).

(3) There is, however, a true problem with the empirical nature of causes and explanations: they require a body of observations which yield regularity based on events oft-repeated or repeatable in principle (capable of being retrodicted). Supernatural causes satisfy only one requirement (their effects are, arguably, observable), but not the other: they are, by definition, irregular (and, thus, cannot be repeated). Does this inherent irregularity and non-repeatability render specious the supernaturalness imputed to miracles?

Probably. If God pervades Nature (let alone if God, Himself ***is*** Nature), then no event is supernatural. All occurrences are natural and, thus, obey the Laws of Nature which are merely the manifestations of God's attributes (this is also the Muslim and Jewish points of view). And because the Laws of Nature and its Constants are changeable and not uniform across the Universe (and, possibly, the Multiverse), there is room for "spontaneous" (cause-less), ill-understood, and irregular (but objectively-observed) phenomena, such as "miracles". Nothing supernatural about it.

There is no contradiction in saying that miracles are natural events brought about by God, or even in saying that miracles are basic (or primitive, or immediate) actions of God (actions clearly attributable to God as an agent with a free will and for which we do not need to show a natural cause).

This leads us to the question of divine intervention and intent. Miracles serve God's plan and reflect

His volition. They are an interposition, not merely a happenstance. They are not random: they serve a purpose and accomplish goals (even when these are unknown to us and inscrutable). This holds true even if we reject Leibnitz's Principle of pre-established Harmony (in "Monadology") and disagree or the occasionalist's point of view that God is the direct and exclusive cause of ***all*** events, including natural events and that all other forms of purported causation ("Laws of Nature") are illusions.

If we believe in God's propensity to uphold Good against Evil; to encourage and support virtue while penalizing and suppressing sin (through the use of what Wittgenstein called "gestures"); and to respond to our most urgent needs - in short: if one accept Divine Providence - then a "Theory of God" would possess predictive powers: it would allow us to foresee the occurrence of miracles. For instance: whenever Evil seems on the brink of prevailing, we should expect a miracle to eventuate, restoring the supremacy of Good. There's the rudimentary regularity we have been seeking all along (Locke).

Admittedly, it is impossible to predict the exact nature of future miracles, merely their likelihood. This is reminiscent of the Uncertainty Principle that is at the basis of Quantum Mechanics. Miracles often consist of "divinely-ordained" confluences and coincidences of perfectly "natural" and even pedestrian events. We are awed by them all the same. The true miracle amounts to our sense of wonder and restored proportion in the

face of this humungous mystery that is our home: the Universe.

Read Note about Parapsychology and the Paranormal

Read Note about The Science of Superstitions

Read Note on Teleology: Legitimizing Final Causes

Read Note on Complexity and Simplicity

Read Note on Scientific Theories and the Life Cycles of Science

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God and Science

Appendix: Scientific Theories and Science's Life Cycles

I. Scientific Theories

All theories - scientific or not - start with a problem. They aim to solve it by proving that what appears to be "problematic" is not. They re-state the conundrum, or introduce new data, new variables, a new classification, or new organizing principles. They incorporate the problem in a larger body of knowledge, or in a conjecture ("solution"). They explain why we thought we had an issue on our hands - and how it can be avoided, vitiated, or resolved.

Scientific theories invite constant criticism and revision. They yield new problems. They are proven erroneous and are replaced by new models which offer better explanations and a more profound sense of understanding - often by solving these new problems. From time to time, the successor theories constitute a break with everything known and done till then. These seismic convulsions are known as "paradigm shifts".

Contrary to widespread opinion - even among scientists - science is not only about "facts". It is not merely about quantifying, measuring, describing, classifying, and organizing "things" (entities). It is not even concerned with finding out the "truth". Science is about providing us with concepts, explanations, and predictions (collectively known as "theories") and thus endowing us with a sense of understanding of our world.

Scientific theories are allegorical or metaphoric. They revolve around symbols and theoretical constructs, concepts and substantive assumptions, axioms and hypotheses - most of which can never, even in principle, be computed, observed, quantified, measured, or correlated with the world "out there". By appealing to our imagination, scientific theories reveal what David Deutsch calls "the fabric of reality".

Like any other system of knowledge, science has its fanatics, heretics, and deviants.

Instrumentalists, for instance, insist that scientific theories should be concerned exclusively with predicting the outcomes of appropriately designed experiments. Their explanatory powers are of no consequence. Positivists ascribe meaning only to statements that deal with observables and observations.

Instrumentalists and positivists ignore the fact that predictions are derived from models, narratives, and organizing principles. In short: it is the theory's explanatory dimensions that determine which experiments are relevant and which are not. Forecasts - and experiments - that are not embedded in an understanding of the world (in an explanation) do not constitute science.

Granted, predictions and experiments are crucial to the growth of scientific knowledge and the winnowing out of erroneous or inadequate theories. But they are not the only mechanisms of natural selection. There are other criteria that help us decide whether to adopt and place confidence in a scientific theory or not. Is the theory aesthetic (parsimonious), logical, does it provide a reasonable

explanation and, thus, does it further our understanding of the world?

David Deutsch in "The Fabric of Reality" (p. 11):

"... (I)t is hard to give a precise definition of 'explanation' or 'understanding'. Roughly speaking, they are about 'why' rather than 'what'; about the inner workings of things; about how things really are, not just how they appear to be; about what must be so, rather than what merely happens to be so; about laws of nature rather than rules of thumb. They are also about coherence, elegance, and simplicity, as opposed to arbitrariness and complexity ..."

Reductionists and emergentists ignore the existence of a hierarchy of scientific theories and meta-languages. They believe - and it is an article of faith, not of science - that complex phenomena (such as the human mind) can be reduced to simple ones (such as the physics and chemistry of the brain). Furthermore, to them the act of reduction is, in itself, an explanation and a form of pertinent understanding. Human thought, fantasy, imagination, and emotions ***are*** nothing but electric currents and spurts of chemicals in the brain, they say.

Holists, on the other hand, refuse to consider the possibility that some higher-level phenomena can, indeed, be fully reduced to base components and primitive interactions. They ignore the fact that reductionism sometimes does provide explanations and understanding. The properties of water, for instance, do spring forth from its chemical and physical composition and from the interactions between its constituent atoms and subatomic particles.

Still, there is a general agreement that scientific theories must be abstract (independent of specific time or place), intersubjectively explicit (contain detailed descriptions of the subject matter in unambiguous terms), logically rigorous (make use of logical systems shared and accepted by the practitioners in the field), empirically relevant (correspond to results of empirical research), useful (in describing and/or explaining the world), and provide typologies and predictions.

A scientific theory should resort to primitive (atomic) terminology and all its complex (derived) terms and concepts should be defined in these indivisible terms. It should offer a map unequivocally and consistently connecting operational definitions to theoretical concepts.

Operational definitions that connect to the same theoretical concept should not contradict each other (be negatively correlated). They should yield agreement on measurement conducted independently by trained experimenters. But investigation of the theory of its implication can proceed even without quantification.

Theoretical concepts need not necessarily be measurable or quantifiable or observable. But a scientific theory should afford at least four levels of quantification of its operational and theoretical definitions of concepts: nominal (labeling), ordinal (ranking), interval and ratio.

As we said, scientific theories are not confined to quantified definitions or to a classificatory apparatus. To qualify as scientific they must contain statements about relationships (mostly causal) between concepts - empirically-supported laws and/or propositions (statements derived from axioms).

Philosophers like Carl Hempel and Ernest Nagel regard a theory as scientific if it is hypothetico-deductive. To them, scientific theories are sets of inter-related laws. We know that they are inter-related because a minimum number of axioms and hypotheses yield, in an inexorable deductive sequence, everything else known in the field the theory pertains to.

Explanation is about retrodiction - using the laws to show how things happened. Prediction is using the laws to show how things ***will*** happen. Understanding is explanation and prediction combined.

William Whewell augmented this somewhat simplistic point of view with his principle of "consilience of inductions". Often, he observed, inductive explanations of disparate phenomena are unexpectedly traced to one underlying cause. This is what scientific theorizing is about - finding the common source of the apparently separate.

This omnipotent view of the scientific endeavor competes with a more modest, semantic school of philosophy of science.

Many theories - especially ones with breadth, width, and profundity, such as Darwin's theory of evolution - are not deductively integrated and are very difficult to test (falsify) conclusively. Their predictions are either scant or ambiguous.

Scientific theories, goes the semantic view, are amalgams of models of reality. These are empirically meaningful only inasmuch as they are empirically (directly and therefore semantically) applicable to a limited area. A

typical scientific theory is not constructed with explanatory and predictive aims in mind. Quite the opposite: the choice of models incorporated in it dictates its ultimate success in explaining the Universe and predicting the outcomes of experiments.

To qualify as meaningful and instrumental, a scientific explanation (or "theory") must be:

a. ***All-inclusive (anamnetic)*** – It must encompass, integrate and incorporate all the facts known.

b. ***Coherent*** – It must be chronological, structured and causal.

c. ***Consistent*** – Self-consistent (its sub-units cannot contradict one another or go against the grain of the main explication) and consistent with the observed phenomena (both those related to the event or subject and those pertaining to the rest of the universe).

d. ***Logically compatible*** – It must not violate the laws of logic both internally (the explanation must abide by some internally imposed logic) and externally (the Aristotelian logic which is applicable to the observable world).

e. ***Insightful*** – It must inspire a sense of awe and astonishment which is the result of seeing something familiar in a new light or the result of seeing a pattern emerging out of a big body of data. The insights must constitute the inevitable conclusion of the logic, the language, and of the unfolding of the explanation.

f. ***Aesthetic*** – The explanation must be both plausible and "right", beautiful, not cumbersome, not awkward, not discontinuous, smooth, parsimonious, simple, and so on.

g. ***Parsimonious*** – The explanation must employ the minimum numbers of assumptions and entities in order to satisfy all the above conditions.

h. ***Explanatory*** – The explanation must elucidate the behavior of other elements, including the subject's decisions and behavior and why events developed the way they did.

i. ***Predictive (prognostic)*** – The explanation must possess the ability to predict future events, including the future behavior of the subject.

j.

k. ***Elastic*** – The explanation must possess the intrinsic abilities to self organize, reorganize, give room to emerging order, accommodate new data comfortably, and react flexibly to attacks from within and from without.

Scientific theories must also be testable, verifiable, and refutable (falsifiable). The experiments that test their predictions must be repeatable and replicable in tightly controlled laboratory settings. All these elements are largely missing from creationist and intelligent design "theories" and explanations. No experiment could be designed to test the statements within such explanations, to establish their truth-value and, thus, to convert them to theorems or hypotheses in a theory.

This is mainly because of a problem known as ***the undergeneration of testable hypotheses:*** Creationism and intelligent Design do not generate a sufficient number of hypotheses, which can be subjected to scientific testing. This has to do with their fabulous (i.e., storytelling) nature and the resort to an untestable, omnipotent, omniscient, and omnipresent Supreme Being.

In a way, Creationism and Intelligent Design show affinity with some private languages. They are forms of art and, as such, are self-sufficient and self-contained. If structural, internal constraints are met, a statement is deemed true within the "canon" even if it does not satisfy external scientific requirements.

II. The Life Cycle of Scientific Theories

"There was a time when the newspapers said that only twelve men understood the theory of relativity. I do not believe that there ever was such a time... On the other hand, I think it is safe to say that no one understands quantum mechanics... Do not keep saying to yourself, if you can possibly avoid it, 'But how can it be like that?', because you will get 'down the drain' into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that."
R. P. Feynman (1967)

"The first processes, therefore, in the effectual studies of the sciences, must be ones of simplification and reduction of the results of previous investigations to a form in which the mind can grasp them."
J. C. Maxwell, On Faraday's lines of force

" ...conventional formulations of quantum theory, and of quantum field theory in particular, are unprofessionally vague and ambiguous. Professional theoretical physicists ought to be able to do better. Bohm has shown us a way."
John S. Bell, Speakable and Unspeakable in Quantum Mechanics

"It would seem that the theory [quantum mechanics] is exclusively concerned about 'results of measurement', and has nothing to say about anything else. What exactly qualifies some physical systems to play the role of 'measurer'? Was the wavefunction of the world waiting to jump for thousands of millions of years until a single-celled living creature appeared? Or did it have to wait a little longer, for some better qualified system ... with a Ph.D.? If the theory is to apply to anything but highly idealized laboratory operations, are we not obliged to admit that more or less 'measurement-like' processes are going on more or less all the time, more or less everywhere. Do we not have jumping then all the time?

The first charge against 'measurement', in the fundamental axioms of quantum mechanics, is that it anchors the shifty split of the world into 'system' and 'apparatus'. A second charge is that the word comes loaded with meaning from everyday life, meaning which is entirely inappropriate in the quantum context. When it is said that something is 'measured' it is difficult not to think of the result as referring to some pre-existing property of the object in question. This is to disregard Bohr's insistence that in quantum phenomena the apparatus as well as the system is essentially involved. If it were not so, how could we understand, for example,

that 'measurement' of a component of 'angular momentum' ... in an arbitrarily chosen direction ... yields one of a discrete set of values? When one forgets the role of the apparatus, as the word 'measurement' makes all too likely, one despairs of ordinary logic ... hence 'quantum logic'. When one remembers the role of the apparatus, ordinary logic is just fine.

In other contexts, physicists have been able to take words from ordinary language and use them as technical terms with no great harm done. Take for example the 'strangeness', 'charm', and 'beauty' of elementary particle physics. No one is taken in by this 'baby talk'... Would that it were so with 'measurement'. But in fact the word has had such a damaging effect on the discussion, that I think it should now be banned altogether in quantum mechanics."
J. S. Bell, Against "Measurement"

"Is it not clear from the smallness of the scintillation on the screen that we have to do with a particle? And is it not clear, from the diffraction and interference patterns, that the motion of the particle is directed by a wave? De Broglie showed in detail how the motion of a particle, passing through just one of two holes in screen, could be influenced by waves propagating through both holes. And so influenced that the particle does not go where the waves cancel out, but is attracted to where they co-operate. This idea seems to me so natural and simple, to resolve the wave-particle dilemma in such a clear and ordinary way, that it is a great mystery to me that it was so generally ignored."
J. S. Bell, Speakable and Unspeakable in Quantum Mechanics

"...in physics the only observations we must consider are position observations, if only the positions of instrument pointers. It is a great merit of the de Broglie-Bohm picture to force us to consider this fact. If you make axioms, rather than definitions and theorems, about the "measurement" of anything else, then you commit redundancy and risk inconsistency."
J. S. Bell, Speakable and Unspeakable in Quantum Mechanics

"To outward appearance, the modern world was born of an anti religious movement: man becoming self-sufficient and reason supplanting belief. Our generation and the two that preceded it have heard little of but talk of the conflict between science and faith; indeed it seemed at one moment a foregone conclusion that the former was destined to take the place of the latter... After close on two centuries of passionate struggles, neither science nor faith has succeeded in discrediting its adversary.
On the contrary, it becomes obvious that neither can develop normally without the other. And the reason is simple: the same life animates both. Neither in its impetus nor its achievements can science go to its limits without becoming tinged with mysticism and charged with faith."
Pierre Thierry de Chardin, "The Phenomenon of Man"

I opened with lengthy quotations by John S. Bell, the main proponent of the Bohemian Mechanics interpretation of Quantum Mechanics (really, an alternative rather than an interpretation). The renowned physicist, David Bohm (in the 50s), basing himself on work done much earlier by de Broglie (the unwilling father of the wave-particle dualism), embedded the Schrödinger Equation (SE) in a

deterministic physical theory which postulated a non-Newtonian motion of particles.

This is a fine example of the life cycle of scientific theories, comprised of three phases: Growth, Transitional Pathology, and Ossification.

Witchcraft, Religion, Alchemy and Science succeeded one another and each such transition was characterized by transitional pathologies reminiscent of psychotic disorders. The exceptions are (arguably) the disciplines of medicine and biology. A phenomenology of ossified bodies of knowledge would make a fascinating read.

Science is currently in its Ossification Phase. It is soon to be succeeded by another discipline or magisterium. Other explanations to the current dismal state of science should be rejected: that human knowledge is limited by its very nature; that the world is inherently incomprehensible; that methods of thought and understanding tend to self-organize to form closed mythic systems; and that there is a problem with the language which we employ to make our inquiries of the world describable and communicable.

Kuhn's approach to Scientific Revolutions is but one of many that deal with theory and paradigm shifts in scientific thought and its resulting evolution. Scientific theories seem to be subject to a process of natural selection every bit as organisms in nature are.

Animals could be thought of as theorems (with a positive truth value) in the logical system "Nature". But species become extinct because nature itself changes (not nature as a set of potentials - but the relevant natural phenomena to which the species are exposed). Could we say the same

about scientific theories? Are they being selected and deselected partly due to a changing, shifting backdrop?

Indeed, the whole debate between "realists" and "anti-realists" in the philosophy of Science can be settled by adopting this single premise: that the Universe itself is not immutable. By contrasting the fixed subject of study ("The World") with the transient nature of Science anti-realists gained the upper hand.

Arguments such as the under-determination of theories by data and the pessimistic meta-inductions from past falsity (of scientific "knowledge") emphasize the transience and asymptotic nature of the fruits of the scientific endeavor. But such arguments rest on the implicit assumption that there is some universal, invariant, truth out there (which science strives to asymptotically approximate). This apparent problematic evaporates if we allow that both the observer and the observed, the theory and its subject, are alterable.

Science develops through reduction of miracles. Laws of nature are formulated. They are assumed to encompass all the (relevant) natural phenomena (that is, phenomena governed by natural forces and within nature). Ex definitio, nothing can exist outside nature: it is all-inclusive and all-pervasive, or omnipresent (formerly the attributes of the divine).

Supernatural forces, supernatural intervention, are contradictions in terms, oxymorons. If some thing or force exists, it is natural. That which is supernatural does not exist. Miracles do not only contravene (or violate) the laws of nature, they are impossible, not only physically,

but also logically. That which is logically possible and can be experienced (observed), is physically possible.

But, again, we are faced with the assumption of a "fixed background". What if nature itself changes in ways that are bound to confound ever-truer knowledge? Then, the very shifts of nature as a whole, as a system, could be called "supernatural" or "miraculous".

In a way, this is how science evolves. A law of nature is proposed or accepted. An event occurs or an observation made which are not described or predicted by it. It is, by definition, a violation of the suggested or accepted law which is, thus, falsified. Subsequently and consequently, the laws of nature are modified, or re-written entirely, in order to reflect and encompass this extraordinary event. Result: Hume's comforting distinction between "extraordinary" and "miraculous" events is upheld (the latter being ruled out).

Extraordinary events can be compared to previous experience - miraculous events entail some supernatural interference with the normal course of things (a "wonder" in Biblical terms). It is by confronting the extraordinary and eliminating its "abnormal" or "supernatural" attributes that science progresses as a miraculous activity. This, of course, is not the view of the likes of David Deutsch (see his book, "The Fabric of Reality").

Back to the last phase of this Life Cycle, to Ossification. The discipline degenerates and, following the "psychotic" transitional phase, it sinks into a paralytic state which is characterized by the following:

All the practical and technological aspects of the dying discipline are preserved and continue to be utilized. Gradually the conceptual and theoretical underpinnings vanish or are replaced by the tenets and postulates of a new discipline - but the inventions, processes and practical know-how do not evaporate. They are incorporated into the new discipline and, in time, are erroneously attributed to it, marking it as the legitimate successor of the now defunct, preceding discipline.

The practitioners of the old discipline confine themselves to copying and replicating the various aspects of the old discipline, mainly its intellectual property (writings, inventions, other theoretical material). This replication does not lead to the creation of new knowledge or even to the dissemination of old one. It is a hermetic process, limited to the ever decreasing circle of the initiated. Special institutions govern the rehashing of the materials related to the old discipline, their processing and copying. Institutions related to the dead discipline are often financed and supported by the state which is always an agent of conservation, preservation and conformity.

Thus, the creative-evolutionary dimension of the now-dead discipline is gone. No new paradigms or revolutions happen. The exegesis and replication of canonical writings become the predominant activities. Formalisms are not subjected to scrutiny and laws assume eternal, immutable, quality.

All the activities of the adherents of the old discipline become ritualized. The old discipline itself becomes a pillar of the extant power structures and, as such, is condoned and supported by them. The old discipline's practitioners synergistically collaborate with the powers

that be: with the industrial base, the military complex, the political elite, the intellectual cliques in vogue. Institutionalization inevitably leads to the formation of a (mostly bureaucratic) hierarchy.

Emerging rituals serve the purpose of diverting attention from subversive, "forbidden" thinking. These rigid ceremonies are reminiscent of obsessive-compulsive disorders in individuals who engage in ritualistic behavior patterns to deflect "wrong" or "corrupt" thoughts.

Practitioners of the old discipline seek to cement the power of its "clergy". Rituals are a specialized form of knowledge which can be obtained only by initiation ("rites of passage"). One's status in the hierarchy of the dead discipline is not the result of objectively quantifiable variables or even of judgment of merit. It is the outcome of politics and other power-related interactions.

The need to ensure conformity leads to doctrinarian dogmatism and to the establishment of enforcement mechanisms. Dissidents are subjected to both social and economic sanctions. They find themselves ex-communicated, harassed, imprisoned, tortured, their works banished or not published, ridiculed and so on.

This is really the triumph of text over the human spirit. At this late stage in the Life Cycle, the members of the old discipline's community are oblivious to the original reasons and causes for their pursuits. Why was the discipline developed in the first place? What were the original riddles, questions, queries it faced and tackled? Long gone are the moving forces behind the old discipline. Its cold ashes are the texts and their

preservation is an expression of longing and desire for things past.

The vacuum left by the absence of positive emotions is filled by negative ones. The discipline and its disciples become phobic, paranoid, defensive, and with a faulty reality test. Devoid of the ability to generate new, attractive content, the old discipline resorts to motivation by manipulation of negative emotions. People are frightened, threatened, herded, cajoled. The world is painted in an apocalyptic palette as ruled by irrationality, disorderly, chaotic, dangerous, or even lethal. Only the old discipline stands between its adherents and apocalypse.

New, emerging disciplines, are presented as heretic, fringe lunacies, inconsistent, reactionary and bound to regress humanity to some dark ages. This is the inter-disciplinary or inter-paradigm clash. It follows the Psychotic Phase. The old discipline resorts to some transcendental entity (God, Satan, or the conscious intelligent observer in the Copenhagen interpretation of the formalism of Quantum Mechanics). In this sense, the dying discipline is already psychotic and afoul of the test of reality. It develops messianic aspirations and is inspired by a missionary zeal and zest. The fight against new ideas and theories is bloody and ruthless and every possible device is employed.

But the very characteristics of the older nomenclature is in the old discipline's disfavor. It is closed, based on ritualistic initiation, and patronizing. It relies on intimidation. The numbers of the faithful dwindle the more the "church" needs them and the more it resorts to oppressive recruitment tactics. The emerging discipline

wins by default. Even the initiated, who stand most to lose, finally abandon the old discipline. Their belief unravels when confronted with the truth value, explanatory and predictive powers, and the comprehensiveness of the emerging discipline.

This, indeed, is the main presenting symptom, the distinguishing hallmark, of paralytic old disciplines. They deny reality. They are rendered mere belief-systems, myths. They require the suspension of judgment and disbelief, the voluntary limitation of one's quest for truth and beauty, the agreement to leave swathes of the map in a state of "terra incognita". This reductionism, this schizoid avoidance, the resort to hermeticism and transcendental authority mark the beginning of the end.

Read Note on Complexity and Simplicity

Return to "God and Science"

Also Read

Atheism in a Post-Religious World

The Science of Superstitions

Return

FREUD

In Defense of Psychoanalysis:
I. Introduction

Introduction

No social theory has been more influential and, later, more reviled than psychoanalysis. It burst upon the scene of modern thought, a fresh breath of revolutionary and daring imagination, a Herculean feat of model-construction, and a challenge to established morals and manners. It is now widely considered nothing better than a confabulation, a baseless narrative, a snapshot of Freud's tormented psyche and thwarted 19th century Mitteleuropa middle class prejudices.

Most of the criticism is hurled by mental health professionals and practitioners with large axes to grind. Few, if any, theories in psychology are supported by modern brain research. All therapies and treatment modalities - including medicating one's patients - are still forms of art and magic rather than scientific practices. The very existence of mental illness is in doubt - let alone what constitutes "healing". Psychoanalysis is in bad company all around.

Some criticism is offered by practicing scientists - mainly experimentalists - in the life and exact (physical) sciences. Such diatribes frequently offer a sad glimpse into the critics' own ignorance. They have little idea what makes a theory scientific and they confuse materialism with reductionism or instrumentalism and correlation with causation.

Few physicists, neuroscientists, biologists, and chemists seem to have plowed through the rich literature on the psychophysical problem. As a result of this obliviousness, they tend to proffer primitive arguments long rendered obsolete by centuries of philosophical debates.

Science frequently deals matter-of-factly with theoretical entities and concepts - quarks and black holes spring to mind - that have never been observed, measured, or quantified. These should not be confused with concrete entities. They have different roles in the theory. Yet, when they mock Freud's trilateral model of the psyche (the id, ego, and superego), his critics do just that - they relate to his theoretical constructs as though they were real, measurable, "things".

The medicalization of mental health hasn't helped either.

Certain mental health afflictions are either correlated with a statistically abnormal biochemical activity in the brain – or are ameliorated with medication. Yet the two ***facts*** are not ineludibly facets of ***the same*** underlying phenomenon. In other words, that a given medicine reduces or abolishes certain symptoms does not necessarily mean they were ***caused*** by the processes or substances affected by the drug administered. Causation is only one of many possible connections and chains of events.

To designate a pattern of behavior as a mental health disorder is a value judgment, or at best a statistical observation. Such designation is effected regardless of the facts of brain science. Moreover, correlation is not causation. Deviant brain or body biochemistry (once called "polluted animal spirits") do exist – but are they truly the roots of mental perversion? Nor is it clear which

triggers what: do the aberrant neurochemistry or biochemistry cause mental illness – or the other way around?

That psychoactive medication alters behavior and mood is indisputable. So do illicit and legal drugs, certain foods, and all interpersonal interactions. That the changes brought about by prescription are desirable – is debatable and involves tautological thinking. If a certain pattern of behavior is described as (socially) "dysfunctional" or (psychologically) "sick" – clearly, every change would be welcomed as "healing" and every agent of transformation would be called a "cure".

The same applies to the alleged heredity of mental illness. Single genes or gene complexes are frequently "associated" with mental health diagnoses, personality traits, or behavior patterns. But too little is known to establish irrefutable sequences of causes-and-effects. Even less is proven about the interaction of nature and nurture, genotype and phenotype, the plasticity of the brain and the psychological impact of trauma, abuse, upbringing, role models, peers, and other environmental elements.

Nor is the distinction between psychotropic substances and talk therapy that clear-cut. Words and the interaction with the therapist also affect the brain, its processes and chemistry - albeit more slowly and, perhaps, more profoundly and irreversibly. Medicines – as David Kaiser reminds us in ***"Against Biologic Psychiatry"*** (Psychiatric Times, Volume XIII, Issue 12, December 1996) – treat symptoms, not the underlying processes that yield them.

So, what is mental illness, the subject matter of Psychoanalysis?

Someone is considered mentally "ill" if:

1. His conduct rigidly and consistently deviates from the typical, average behavior of all other people in his culture and society that fit his profile (whether this conventional behavior is moral or rational is immaterial), or
2. His judgment and grasp of objective, physical reality is impaired, and
3. His conduct is not a matter of choice but is innate and irresistible, and
4. His behavior causes him or others discomfort, and is
5. Dysfunctional, self-defeating, and self-destructive even by his own yardsticks.

Descriptive criteria aside, what is the ***essence*** of mental disorders? Are they merely physiological disorders of the brain, or, more precisely of its chemistry? If so, can they be cured by restoring the balance of substances and secretions in that mysterious organ? And, once equilibrium is reinstated – is the illness "gone" or is it still lurking there, "under wraps", waiting to erupt? Are psychiatric problems inherited, rooted in faulty genes (though amplified by environmental factors) – or brought on by abusive or wrong nurturance?

These questions are the domain of the "medical" school of mental health.

Others cling to the spiritual view of the human psyche. They believe that mental ailments amount to the

metaphysical discomposure of an unknown medium – the soul. Theirs is a holistic approach, taking in the patient in his or her entirety, as well as his milieu.

The members of the functional school regard mental health disorders as perturbations in the proper, statistically "normal", behaviors and manifestations of "healthy" individuals, or as dysfunctions. The "sick" individual – ill at ease with himself (ego-dystonic) or making others unhappy (deviant) – is "mended" when rendered functional again by the prevailing standards of his social and cultural frame of reference.

In a way, the three schools are akin to the trio of blind men who render disparate descriptions of the very same elephant. Still, they share not only their subject matter – but, to a counter intuitively large degree, a faulty methodology.

As the renowned anti-psychiatrist, Thomas Szasz, of the State University of New York, notes in his article ***"The Lying Truths of Psychiatry"***, mental health scholars, regardless of academic predilection, infer the etiology of mental disorders from the success or failure of treatment modalities.

This form of "reverse engineering" of scientific models is not unknown in other fields of science, nor is it unacceptable if the experiments meet the criteria of the scientific method. The theory must be all-inclusive (anamnetic), consistent, falsifiable, logically compatible, monovalent, and parsimonious. Psychological "theories" – even the "medical" ones (the role of serotonin and dopamine in mood disorders, for instance) – are usually none of these things.

The outcome is a bewildering array of ever-shifting mental health "diagnoses" expressly centred around Western civilization and its standards (example: the ethical objection to suicide). Neurosis, a historically fundamental "condition" vanished after 1980. Homosexuality, according to the American Psychiatric Association, was a pathology prior to 1973. Seven years later, narcissism was declared a "personality disorder", almost seven decades after it was first described by Freud.

Also Read

On Disease

The Myth of Mental Illness

The Insanity of the Defense

In Defense of Psychoanalysis

he Metaphors of the Mind - Part I (The Brain)

The Metaphors of the Mind - Part II (Psychotherapy)

The Metaphors of the Mind - Part III (Dreams)

The Use and Abuse of Differential Diagnoses

Althusser, Competing Interpellations and the Third Text

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In Defense of Psychoanalysis

II. The Revolution of Psychoanalysis

"The more I became interested in psychoanalysis, the more I saw it as a road to the same kind of broad and deep understanding of human nature that writers possess."

Anna Freud

Towards the end of the 19th century, the new discipline of psychology became entrenched in both Europe and America. The study of the human mind, hitherto a preserve of philosophers and theologians, became a legitimate subject of scientific (some would say, pseudo-scientific) scrutiny.

The Structuralists - Wilhelm Wundt and Edward Bradford Titchener - embarked on a fashionable search for the "atoms" of consciousness: physical sensations, affections or feelings, and images (in both memories and dreams). Functionalists, headed by William James and, later, James Angell and John Dewey - derided the idea of a "pure", elemental sensation. They introduced the concept of mental association. Experience uses associations to alter the nervous system, they hypothesized.

Freud revolutionized the field (though, at first, his reputation was limited to the German-speaking parts of the dying Habsburg Empire). He dispensed with the unitary nature of the psyche and proposed instead a trichotomy, a tripartite or trilateral model (the id, ego, and superego). He suggested that our natural state is conflict,

that anxiety and tension are more prevalent than harmony. Equilibrium (compromise formation) is achieved by constantly investing mental energy. Hence "psychodynamics".

Most of our existence is unconscious, Freud theorized. The conscious is but the tip of an ever-increasing iceberg. He introduced the concepts of libido and Thanatos (the life and death forces), instincts (Triebe, or "drives", in German) or drives, the somatic-erotogenic phases of psychic (personality) development, trauma and fixation, manifest and latent content (in dreams). Even his intellectual adversaries used this vocabulary, often infused with new meanings.

The psychotherapy he invented, based on his insights, was less formidable. Many of its tenets and procedures have been discarded early on, even by its own proponents and practitioners. The rule of abstinence (the therapist as a blank and hidden screen upon which the patient projects or transfers his repressed emotions), free association as the exclusive technique used to gain access to and unlock the unconscious, dream interpretation with the mandatory latent and forbidden content symbolically transformed into the manifest - have all literally vanished within the first decades of practice.

Other postulates - most notably transference and counter-transference, ambivalence, resistance, regression, anxiety, and conversion symptoms - have survived to become cornerstones of modern therapeutic modalities, whatever their origin. So did, in various disguises, the idea that there is a clear path leading from unconscious (or conscious) conflict to signal anxiety, to repression, and to symptom formation (be it neuroses, rooted in current

deprivation, or psychoneuroses, the outcomes of childhood conflicts). The existence of anxiety-preventing defense mechanisms is also widely accepted.

Freud's initial obsession with sex as the sole driver of psychic exchange and evolution has earned him derision and diatribe aplenty. Clearly, a child of the repressed sexuality of Victorian times and the Viennese middle-class, he was fascinated with perversions and fantasies. The Oedipus and Electra complexes are reflections of these fixations. But their origin in Freud's own psychopathologies does not render them less revolutionary. Even a century later, child sexuality and incest fantasies are more or less taboo topics of serious study and discussion.

Ernst Kris said in 1947 that Psychoanalysis is:

"...(N)othing but human behavior considered from the standpoint of conflict. It is the picture of the mind divided against itself with attendant anxiety and other dysphoric effects, with adaptive and maladaptive defensive and coping strategies, and with symptomatic behaviors when the defense fail."

But Psychoanalysis is more than a theory of the mind. It is also a theory of the body and of the personality and of society. It is a Social Sciences Theory of Everything. It is a bold - and highly literate - attempt to tackle the psychophysical problem and the Cartesian body versus mind conundrum. Freud himself noted that the unconscious has both physiological (instinct) and mental (drive) aspects. He wrote:

"(The unconscious is) a concept on the frontier between the mental and the somatic, as the physical representative of the stimuli originating from within the organism and reaching the mind" (Standard Edition Volume XIV).

Psychoanalysis is, in many ways, the application of Darwin's theory of evolution in psychology and sociology. Survival is transformed into narcissism and the reproductive instincts assume the garb of the Freudian sex drive. But Freud went a daring step forward by suggesting that social structures and strictures (internalized as the superego) are concerned mainly with the repression and redirection of natural instincts. Signs and symbols replace reality and all manner of substitutes (such as money) stand in for primary objects in our early formative years.

To experience our true selves and to fulfill our wishes, we resort to Phantasies (e.g., dreams, "screen memories") where imagery and irrational narratives - displaced, condensed, rendered visually, revised to produce coherence, and censored to protect us from sleep disturbances - represent our suppressed desires. Current neuroscience tends to refute this "dreamwork" conjecture but its value is not to be found in its veracity (or lack thereof).

These musings about dreams, slips of tongue, forgetfulness, the psychopathology of everyday life, and associations were important because they were the first attempt at deconstruction, the first in-depth insight into human activities such as art, myth-making, propaganda, politics, business, and warfare, and the first coherent explanation of the convergence of the aesthetic with the "ethic" (i.e., the socially acceptable and condoned).

Ironically, Freud's contributions to cultural studies may far outlast his "scientific" "theory" of the mind.

It is ironic that Freud, a medical doctor (neurologist), the author of a "Project for a Scientific Psychology", should be so chastised by scientists in general and neuroscientists in particular. Psychoanalysis used to be practiced only by psychiatrists. But we live at an age when mental disorders are thought to have physiological-chemical-genetic origins. All psychological theories and talk therapies are disparaged by "hard" scientists.

Still, the pendulum had swung both ways many times before. Hippocrates ascribed mental afflictions to a balance of bodily humors (blood, phlegm, yellow and black bile) that is out of kilt. So did Galen, Bartholomeus Anglicus, Johan Weyer (1515-88). Paracelsus (1491-1541), and Thomas Willis, who attributed psychological disorders to a functional "fault of the brain".

The tide turned with Robert Burton who wrote "Anatomy of Melancholy" and published it in 1621. He forcefully propounded the theory that psychic problems are the sad outcomes of poverty, fear, and solitude.

A century later, Francis Gall (1758-1828) and Spurzheim (1776-1832) traced mental disorders to lesions of specific areas of the brain, the forerunner of the now-discredited discipline of phrenology. The logical chain was simple: the brain is the organ of the mind, thus, various faculties can be traced to its parts.

Morel, in 1809, proposed a compromise which has since ruled the discourse. The propensities for psychological dysfunctions, he suggested, are inherited but triggered by

adverse environmental conditions. A Lamarckist, he was convinced that acquired mental illnesses are handed down the generations. Esquirol concurred in 1845 as did Henry Maudsley in 1879 and Adolf Meyer soon thereafter. Heredity predisposes one to suffer from psychic malaise but psychological and "moral" (social) causes precipitate it.

And, yet, the debate was and is far from over. Wilhelm Greisinger published "The Pathology and Therapy of Mental Disorders" in 1845. In it he traced their etiology to "neuropathologies", physical disorders of the brain. He allowed for heredity and the environment to play their parts, though. He was also the first to point out the importance of one's experiences in one's first years of life.

Jean-Martin Charcot, a neurologist by training, claimed to have cured hysteria with hypnosis. But despite this demonstration of non-physiological intervention, he insisted that hysteroid symptoms were manifestations of brain dysfunction. Weir Mitchell coined the term "neurasthenia" to describe an exhaustion of the nervous system (depression). Pierre Janet discussed the variations in the strength of the nervous activity and said that they explained the narrowing field of consciousness (whatever that meant).

None of these "nervous" speculations was supported by scientific, experimental evidence. Both sides of the debate confined themselves to philosophizing and ruminating. Freud was actually among the first to base a theory on actual clinical observations. Gradually, though, his work - buttressed by the concept of sublimation - became increasingly metaphysical. Its conceptual pillars came to resemble Bergson's élan vital and Schopenhauer's Will.

French philosopher Paul Ricoeur called Psychoanalysis (depth psychology) "the hermeneutics of suspicion".

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In Defense of Psychoanalysis

III. The Fundamentals of Psychological Theories

All theories - scientific or not - start with a problem. They aim to solve it by proving that what appears to be "problematic" is not. They re-state the conundrum, or introduce new data, new variables, a new classification, or new organizing principles. They incorporate the problem in a larger body of knowledge, or in a conjecture ("solution"). They explain why we thought we had an issue on our hands - and how it can be avoided, vitiated, or resolved.

Scientific theories invite constant criticism and revision. They yield new problems. They are proven erroneous and are replaced by new models which offer better explanations and a more profound sense of understanding - often by solving these new problems. From time to time, the successor theories constitute a break with everything known and done till then. These seismic convulsions are known as "paradigm shifts".

Contrary to widespread opinion - even among scientists - science is not only about "facts". It is not merely about quantifying, measuring, describing, classifying, and organizing "things" (entities). It is not even concerned with finding out the "truth". Science is about providing us with concepts, explanations, and predictions (collectively known as "theories") and thus endowing us with a sense of understanding of our world.

Scientific theories are allegorical or metaphoric. They revolve around symbols and theoretical constructs, concepts and substantive assumptions, axioms and hypotheses - most of which can never, even in principle, be computed, observed, quantified, measured, or correlated with the world "out there". By appealing to our imagination, scientific theories reveal what David Deutsch calls "the fabric of reality".

Like any other system of knowledge, science has its fanatics, heretics, and deviants.

Instrumentalists, for instance, insist that scientific theories should be concerned exclusively with predicting the outcomes of appropriately designed experiments. Their explanatory powers are of no consequence. Positivists ascribe meaning only to statements that deal with observables and observations.

Instrumentalists and positivists ignore the fact that predictions are derived from models, narratives, and organizing principles. In short: it is the theory's explanatory dimensions that determine which experiments are relevant and which are not. Forecasts - and experiments - that are not embedded in an understanding of the world (in an explanation) do not constitute science.

Granted, predictions and experiments are crucial to the growth of scientific knowledge and the winnowing out of erroneous or inadequate theories. But they are not the only mechanisms of natural selection. There are other criteria that help us decide whether to adopt and place confidence in a scientific theory or not. Is the theory aesthetic (parsimonious), logical, does it provide a reasonable

explanation and, thus, does it further our understanding of the world?

David Deutsch in "The Fabric of Reality" (p. 11):

"... (I)t is hard to give a precise definition of 'explanation' or 'understanding'. Roughly speaking, they are about 'why' rather than 'what'; about the inner workings of things; about how things really are, not just how they appear to be; about what must be so, rather than what merely happens to be so; about laws of nature rather than rules of thumb. They are also about coherence, elegance, and simplicity, as opposed to arbitrariness and complexity ..."

Reductionists and emergentists ignore the existence of a hierarchy of scientific theories and meta-languages. They believe - and it is an article of faith, not of science - that complex phenomena (such as the human mind) can be reduced to simple ones (such as the physics and chemistry of the brain). Furthermore, to them the act of reduction is, in itself, an explanation and a form of pertinent understanding. Human thought, fantasy, imagination, and emotions ***are*** nothing but electric currents and spurts of chemicals in the brain, they say.

Holists, on the other hand, refuse to consider the possibility that some higher-level phenomena can, indeed, be fully reduced to base components and primitive interactions. They ignore the fact that reductionism sometimes does provide explanations and understanding. The properties of water, for instance, do spring forth from its chemical and physical composition and from the interactions between its constituent atoms and subatomic particles.

Still, there is a general agreement that scientific theories must be abstract (independent of specific time or place), intersubjectively explicit (contain detailed descriptions of the subject matter in unambiguous terms), logically rigorous (make use of logical systems shared and accepted by the practitioners in the field), empirically relevant (correspond to results of empirical research), useful (in describing and/or explaining the world), and provide typologies and predictions.

A scientific theory should resort to primitive (atomic) terminology and all its complex (derived) terms and concepts should be defined in these indivisible terms. It should offer a map unequivocally and consistently connecting operational definitions to theoretical concepts.

Operational definitions that connect to the same theoretical concept should not contradict each other (be negatively correlated). They should yield agreement on measurement conducted independently by trained experimenters. But investigation of the theory of its implication can proceed even without quantification.

Theoretical concepts need not necessarily be measurable or quantifiable or observable. But a scientific theory should afford at least four levels of quantification of its operational and theoretical definitions of concepts: nominal (labeling), ordinal (ranking), interval and ratio.

As we said, scientific theories are not confined to quantified definitions or to a classificatory apparatus. To qualify as scientific they must contain statements about relationships (mostly causal) between concepts - empirically-supported laws and/or propositions (statements derived from axioms).

Philosophers like Carl Hempel and Ernest Nagel regard a theory as scientific if it is hypothetico-deductive. To them, scientific theories are sets of inter-related laws. We know that they are inter-related because a minimum number of axioms and hypotheses yield, in an inexorable deductive sequence, everything else known in the field the theory pertains to.

Explanation is about retrodiction - using the laws to show how things happened. Prediction is using the laws to show how things ***will*** happen. Understanding is explanation and prediction combined.

William Whewell augmented this somewhat simplistic point of view with his principle of "consilience of inductions". Often, he observed, inductive explanations of disparate phenomena are unexpectedly traced to one underlying cause. This is what scientific theorizing is about - finding the common source of the apparently separate.

This omnipotent view of the scientific endeavor competes with a more modest, semantic school of philosophy of science.

Many theories - especially ones with breadth, width, and profundity, such as Darwin's theory of evolution - are not deductively integrated and are very difficult to test (falsify) conclusively. Their predictions are either scant or ambiguous.

Scientific theories, goes the semantic view, are amalgams of models of reality. These are empirically meaningful only inasmuch as they are empirically (directly and therefore semantically) applicable to a limited area. A

typical scientific theory is not constructed with explanatory and predictive aims in mind. Quite the opposite: the choice of models incorporated in it dictates its ultimate success in explaining the Universe and predicting the outcomes of experiments.

Are psychological theories scientific theories by any definition (prescriptive or descriptive)? Hardly.

First, we must distinguish between psychological theories and the way that some of them are applied (psychotherapy and psychological plots). Psychological plots are the narratives co-authored by the therapist and the patient during psychotherapy. These narratives are the outcomes of applying psychological theories and models to the patient's specific circumstances.

Psychological plots amount to storytelling - but they are still instances of the psychological theories used. The instances of theoretical concepts in concrete situations form part of every theory. Actually, the only way to test psychological theories - with their dearth of measurable entities and concepts - is by examining such instances (plots).

Storytelling has been with us since the days of campfire and besieging wild animals. It serves a number of important functions: amelioration of fears, communication of vital information (regarding survival tactics and the characteristics of animals, for instance), the satisfaction of a sense of order (predictability and justice), the development of the ability to hypothesize, predict and introduce new or additional theories and so on.

We are all endowed with a sense of wonder. The world around us in inexplicable, baffling in its diversity and myriad forms. We experience an urge to organize it, to "explain the wonder away", to order it so that we know what to expect next (predict). These are the essentials of survival. But while we have been successful at imposing our mind on the outside world – we have been much less successful when we tried to explain and comprehend our internal universe and our behavior.

Psychology is not an exact science, nor can it ever be. This is because its "raw material" (humans and their behavior as individuals and en masse) is not exact. It will never yield natural laws or universal constants (like in physics). Experimentation in the field is constrained by legal and ethical rules. Humans tend to be opinionated, develop resistance, and become self-conscious when observed.

The relationship between the structure and functioning of our (ephemeral) mind, the structure and modes of operation of our (physical) brain, and the structure and conduct of the outside world have been a matter for heated debate for millennia.

Broadly speaking, there are two schools of thought:

One camp identify the substrate (brain) with its product (mind). Some of these scholars postulate the existence of a lattice of preconceived, born, categorical knowledge about the universe – the vessels into which we pour our experience and which mould it.

Others within this group regard the mind as a black box. While it is possible in principle to know its input and

output, it is impossible, again in principle, to understand its internal functioning and management of information. To describe this input-output mechanism, Pavlov coined the word "conditioning", Watson adopted it and invented "behaviorism", Skinner came up with "reinforcement".

Epiphenomenologists (proponents of theories of emergent phenomena) regard the mind as the by-product of the complexity of the brain's "hardware" and "wiring". But all of them ignore the psychophysical question: what ***IS*** the mind and ***HOW*** is it linked to the brain?

The other camp assumes the airs of "scientific" and "positivist" thinking. It speculates that the mind (whether a physical entity, an epiphenomenon, a non-physical principle of organization, or the result of introspection) has a structure and a limited set of functions. It is argued that a "mind owner's manual" could be composed, replete with engineering and maintenance instructions. It proffers a dynamics of the psyche.

The most prominent of these "psychodynamists" was, of course, Freud. Though his disciples (Adler, Horney, the object-relations lot) diverged wildly from his initial theories, they all shared his belief in the need to "scientify" and objectify psychology.

Freud, a medical doctor by profession (neurologist) - preceded by another M.D., Josef Breuer – put forth a theory regarding the structure of the mind and its mechanics: (suppressed) energies and (reactive) forces. Flow charts were provided together with a method of analysis, a mathematical physics of the mind.

Many hold all psychodynamic theories to be a mirage. An essential part is missing, they observe: the ability to test the hypotheses, which derive from these "theories". Though very convincing and, surprisingly, possessed of great explanatory powers, being non-verifiable and non-falsifiable as they are – psychodynamic models of the mind cannot be deemed to possess the redeeming features of scientific theories.

Deciding between the two camps was and is a crucial matter. Consider the clash - however repressed - between psychiatry and psychology. The former regards "mental disorders" as euphemisms - it acknowledges only the reality of brain dysfunctions (such as biochemical or electric imbalances) and of hereditary factors. The latter (psychology) implicitly assumes that something exists (the "mind", the "psyche") which cannot be reduced to hardware or to wiring diagrams. Talk therapy is aimed at that something and supposedly interacts with it.

But perhaps the distinction is artificial. Perhaps the mind is simply the way we experience our brains. Endowed with the gift (or curse) of introspection, we experience a duality, a split, constantly being both observer and observed. Moreover, talk therapy involves ***TALKING*** - which is the transfer of energy from one brain to another through the air. This is a directed, specifically formed energy, intended to trigger certain circuits in the recipient brain. It should come as no surprise if it were to be discovered that talk therapy has clear physiological effects upon the brain of the patient (blood volume, electrical activity, discharge and absorption of hormones, etc.).

All this would be doubly true if the mind were, indeed, only an emergent phenomenon of the complex brain - two sides of the same coin.

Psychological theories of the mind are metaphors of the mind. They are fables and myths, narratives, stories, hypotheses, conjunctures. They play (exceedingly) important roles in the psychotherapeutic setting – but not in the laboratory. Their form is artistic, not rigorous, not testable, less structured than theories in the natural sciences. The language used is polyvalent, rich, effusive, ambiguous, evocative, and fuzzy – in short, metaphorical. These theories are suffused with value judgments, preferences, fears, post facto and ad hoc constructions. None of this has methodological, systematic, analytic and predictive merits.

Still, the theories in psychology are powerful instruments, admirable constructs, and they satisfy important needs to explain and understand ourselves, our interactions with others, and with our environment.

The attainment of peace of mind is a need, which was neglected by Maslow in his famous hierarchy. People sometimes sacrifice material wealth and welfare, resist temptations, forgo opportunities, and risk their lives – in order to secure it. There is, in other words, a preference of inner equilibrium over homeostasis. It is the fulfillment of this overwhelming need that psychological theories cater to. In this, they are no different to other collective narratives (myths, for instance).

Still, psychology is desperately trying to maintain contact with reality and to be thought of as a scientific discipline. It employs observation and measurement and organizes

the results, often presenting them in the language of mathematics. In some quarters, these practices lends it an air of credibility and rigorousness. Others snidely regard the as an elaborate camouflage and a sham. Psychology, they insist, is a pseudo-science. It has the trappings of science but not its substance.

Worse still, while historical narratives are rigid and immutable, the application of psychological theories (in the form of psychotherapy) is "tailored" and "customized" to the circumstances of each and every patient (client). The user or consumer is incorporated in the resulting narrative as the main hero (or anti-hero). This flexible "production line" seems to be the result of an age of increasing individualism.

True, the "language units" (large chunks of denotates and connotates) used in psychology and psychotherapy are one and the same, regardless of the identity of the patient and his therapist. In psychoanalysis, the analyst is likely to always employ the tripartite structure (Id, Ego, Superego). But these are merely the language elements and need not be confused with the idiosyncratic plots that are weaved in every encounter. Each client, each person, and his own, unique, irreplicable, plot.

To qualify as a "psychological" (both meaningful and instrumental) plot, the narrative, offered to the patient by the therapist, must be:

a. ***All-inclusive (anamnetic)*** – It must encompass, integrate and incorporate all the facts known about the protagonist.

b. ***Coherent*** – It must be chronological, structured and causal.

c. ***Consistent*** – Self-consistent (its subplots cannot contradict one another or go against the grain of the main plot) and consistent with the observed phenomena (both those related to the protagonist and those pertaining to the rest of the universe).

d. ***Logically compatible*** – It must not violate the laws of logic both internally (the plot must abide by some internally imposed logic) and externally (the Aristotelian logic which is applicable to the observable world).

e. ***Insightful (diagnostic)*** – It must inspire in the client a sense of awe and astonishment which is the result of seeing something familiar in a new light or the result of seeing a pattern emerging out of a big body of data. The insights must constitute the inevitable conclusion of the logic, the language, and of the unfolding of the plot.

f. ***Aesthetic*** – The plot must be both plausible and "right", beautiful, not cumbersome, not awkward, not discontinuous, smooth, parsimonious, simple, and so on.

g. ***Parsimonious*** – The plot must employ the minimum numbers of assumptions and entities in order to satisfy all the above conditions.

h. ***Explanatory*** – The plot must explain the behavior of other characters in the plot, the hero's decisions

and behavior, why events developed the way they did.

i. ***Predictive (prognostic)*** – The plot must possess the ability to predict future events, the future behavior of the hero and of other meaningful figures and the inner emotional and cognitive dynamics.

j. ***Therapeutic*** – With the power to induce change, encourage functionality, make the patient happier and more content with himself (ego-syntony), with others, and with his circumstances.

k. ***Imposing*** – The plot must be regarded by the client as the preferable organizing principle of his life's events and a torch to guide him in the dark (vade mecum).

l. ***Elastic*** – The plot must possess the intrinsic abilities to self organize, reorganize, give room to emerging order, accommodate new data comfortably, and react flexibly to attacks from within and from without.

In all these respects, a psychological plot is a theory in disguise. Scientific theories satisfy most of the above conditions as well. But this apparent identity is flawed. The important elements of testability, verifiability, refutability, falsifiability, and repeatability – are all largely missing from psychological theories and plots. No experiment could be designed to test the statements within the plot, to establish their truth-value and, thus, to convert them to theorems or hypotheses in a theory.

There are four reasons to account for this inability to test and prove (or falsify) psychological theories:

1. ***Ethical*** – Experiments would have to be conducted, involving the patient and others. To achieve the necessary result, the subjects will have to be ignorant of the reasons for the experiments and their aims. Sometimes even the very performance of an experiment will have to remain a secret (double blind experiments). Some experiments may involve unpleasant or even traumatic experiences. This is ethically unacceptable.

2. ***The Psychological Uncertainty Principle*** – The initial state of a human subject in an experiment is usually fully established. But both treatment and experimentation influence the subject and render this knowledge irrelevant. The very processes of measurement and observation influence the human subject and transform him or her - as do life's circumstances and vicissitudes.

3. ***Uniqueness*** – Psychological experiments are, therefore, bound to be unique, unrepeatable, cannot be replicated elsewhere and at other times even when they are conducted with the ***SAME*** subjects. This is because the subjects are never the same due to the aforementioned psychological uncertainty principle. Repeating the experiments with other subjects adversely affects the scientific value of the results.

4. ***The undergeneration of testable hypotheses*** – Psychology does not generate a sufficient number

of hypotheses, which can be subjected to scientific testing. This has to do with the fabulous (=storytelling) nature of psychology. In a way, psychology has affinity with some private languages. It is a form of art and, as such, is self-sufficient and self-contained. If structural, internal constraints are met – a statement is deemed true even if it does not satisfy external scientific requirements.

So, what are psychological theories and plots good for? They are the instruments used in the procedures which induce peace of mind (even happiness) in the client. This is done with the help of a few embedded mechanisms:

a. ***The Organizing Principle*** – Psychological plots offer the client an organizing principle, a sense of order, meaningfulness, and justice, an inexorable drive toward well defined (though, perhaps, hidden) goals, the feeling of being part of a whole. They strive to answer the "why's" and "how's" of life. They are dialogic. The client asks: "why am I (suffering from a syndrome) and how (can I successfully tackle it)". Then, the plot is spun: "you are like this not because the world is whimsically cruel but because your parents mistreated you when you were very young, or because a person important to you died, or was taken away from you when you were still impressionable, or because you were sexually abused and so on". The client is becalmed by the very fact that there is an explanation to that which until now monstrously taunted and haunted him, that he is not the plaything of vicious Gods, that there is a culprit (focusing his diffuse anger). His

belief in the existence of order and justice and their administration by some supreme, transcendental principle is restored. This sense of "law and order" is further enhanced when the plot yields predictions which come true (either because they are self-fulfilling or because some real, underlying "law" has been discovered).

b. ***The Integrative Principle*** – The client is offered, through the plot, access to the innermost, hitherto inaccessible, recesses of his mind. He feels that he is being reintegrated, that "things fall into place". In psychodynamic terms, the energy is released to do productive and positive work, rather than to induce distorted and destructive forces.

c. ***The Purgatory Principle*** – In most cases, the client feels sinful, debased, inhuman, decrepit, corrupting, guilty, punishable, hateful, alienated, strange, mocked and so on. The plot offers him absolution. The client's suffering expurgates, cleanses, absolves, and atones for his sins and handicaps. A feeling of hard won achievement accompanies a successful plot. The client sheds layers of functional, adaptive stratagems rendered dysfunctional and maladaptive. This is inordinately painful. The client feels dangerously naked, precariously exposed. He then assimilates the plot offered to him, thus enjoying the benefits emanating from the previous two principles and only then does he develop new mechanisms of coping. Therapy is a mental crucifixion and resurrection and atonement for the patient's sins. It is a religious experience. Psychological theories and plots are in the role of the scriptures from

which solace and consolation can be always gleaned.

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In Defense of Psychoanalysis

Critique and Defense of Psychoanalysis

"I am actually not a man of science at all. . . . I am nothing but a conquistador by temperament, an adventurer."

(Sigmund Freud, letter to Fleiss, 1900)

"If you bring forth that which is in you, that which you bring forth will be your salvation".

(The Gospel of Thomas)

"No, our science is no illusion. But an illusion it would be to suppose that what science cannot give us we cannot get elsewhere."

(Sigmund Freud, "The Future of an Illusion")

Harold Bloom called Freud "The central imagination of our age". That psychoanalysis is not a scientific theory in the strict, rigorous sense of the word has long been established. Yet, most criticisms of Freud's work (by the likes of Karl Popper, Adolf Grunbaum, Havelock Ellis, Malcolm Macmillan, and Frederick Crews) pertain to his - long-debunked - scientific pretensions.

Today it is widely accepted that psychoanalysis - though some of its tenets are testable and, indeed, have been experimentally tested and invariably found to be false or uncorroborated - is a system of ideas. It is a cultural construct, and a (suggested) deconstruction of the human

mind. Despite aspirations to the contrary, psychoanalysis is not - and never has been - a value-neutral physics or dynamics of the psyche.

Freud also stands accused of generalizing his own perversions and of reinterpreting his patients' accounts of their memories to fit his preconceived notions of the unconscious . The practice of psychoanalysis as a therapy has been castigated as a crude form of brainwashing within cult-like settings.

Feminists criticize Freud for casting women in the role of "defective" (naturally castrated and inferior) men. Scholars of culture expose the Victorian and middle-class roots of his theories about suppressed sexuality. Historians deride and decry his stifling authoritarianism and frequent and expedient conceptual reversals.

Freud himself would have attributed many of these diatribes to the defense mechanisms of his critics. Projection, resistance, and displacement do seem to be playing a prominent role. Psychologists are taunted by the lack of rigor of their profession, by its literary and artistic qualities, by the dearth of empirical support for its assertions and fundaments, by the ambiguity of its terminology and ontology, by the derision of "proper" scientists in the "hard" disciplines, and by the limitations imposed by their experimental subjects (humans). These are precisely the shortcomings that they attribute to psychoanalysis.

Indeed, psychological narratives - psychoanalysis first and foremost - are not "scientific theories" by any stretch of this much-bandied label. They are also unlikely to ever

become ones. Instead - like myths, religions, and ideologies - they are organizing principles.

Psychological "theories" do not explain the world. At best, they describe reality and give it "true", emotionally-resonant, heuristic and hermeneutic meaning. They are less concerned with predictive feats than with "healing" - the restoration of harmony among people and inside them.

Therapies - the practical applications of psychological "theories" - are more concerned with function, order, form, and ritual than with essence and replicable performance. The interaction between patient and therapist is a microcosm of society, an encapsulation and reification of all other forms of social intercourse. Granted, it is more structured and relies on a body of knowledge gleaned from millions of similar encounters. Still, the therapeutic process is nothing more than an insightful and informed dialog whose usefulness is well-attested to.

Both psychological and scientific theories are creatures of their times, children of the civilizations and societies in which they were conceived, context-dependent and culture-bound. As such, their validity and longevity are always suspect. Both hard-edged scientists and thinkers in the "softer" disciplines are influenced by contemporary values, mores, events, and interpellations.

The difference between "proper" theories of dynamics and psychodynamic theories is that the former asymptotically aspire to an objective "truth" "out there" - while the latter emerge and emanate from a kernel of inner, introspective, truth that is immediately familiar and is the bedrock of their speculations. Scientific theories - as opposed to

psychological "theories" - need, therefore, to be tested, falsified, and modified because their truth is not self-contained.

Still, psychoanalysis was, when elaborated, a Kuhnian paradigm shift. It broke with the past completely and dramatically. It generated an inordinate amount of new, unsolved, problems. It suggested new methodological procedures for gathering empirical evidence (research strategies). It was based on observations (however scant and biased). In other words, it was experimental in nature, not merely theoretical. It provided a framework of reference, a conceptual sphere within which new ideas developed.

That it failed to generate a wealth of testable hypotheses and to account for discoveries in neurology does not detract from its importance. Both relativity theories were and, today, string theories are, in exactly the same position in relation to their subject matter, physics.

In 1963, Karl Jaspers made an important distinction between the scientific activities of Erklaren and Verstehen. Erklaren is about finding pairs of causes and effects. Verstehen is about grasping connections between events, sometimes intuitively and non-causally. Psychoanalysis is about Verstehen, not about Erklaren. It is a hypothetico-deductive method for gleaning events in a person's life and generating insights regarding their connection to his current state of mind and functioning.

So, is psychoanalysis a science, pseudo-science, or sui generis?

Psychoanalysis is a field of study, not a theory. It is replete with neologisms and formalism but, like Quantum Mechanics, it has many incompatible interpretations. It is, therefore, equivocal and self-contained (recursive). Psychoanalysis dictates which of its hypotheses are testable and what constitutes its own falsification. In other words, it is a meta-theory: a theory about generating theories in psychology.

Moreover, psychoanalysis the theory is often confused with psychoanalysis the therapy. Conclusively proving that the therapy works does not establish the veridicality, the historicity, or even the usefulness of the conceptual edifice of the theory. Furthermore, therapeutic techniques evolve far more quickly and substantially than the theories that ostensibly yield them. They are self-modifying "moving targets" - not rigid and replicable procedures and rituals.

Another obstacle in trying to establish the scientific value of psychoanalysis is its ambiguity. It is unclear, for instance, what in psychoanalysis qualify as causes - and what as their effects.

Consider the critical construct of the unconscious. Is it the reason for - does it cause - our behavior, conscious thoughts, and emotions? Does it provide them with a "ratio" (explanation)? Or are they mere symptoms of inexorable underlying processes? Even these basic questions receive no "dynamic" or "physical" treatment in classic (Freudian) psychoanalytic theory. So much for its pretensions to be a scientific endeavor.

Psychoanalysis is circumstantial and supported by epistemic accounts, starting with the master himself. It

appeals to one's common sense and previous experience. Its statements are of these forms: "given X, Y, and Z reported by the patient - doesn't it stand to (everyday) reason that A caused X?" or "We know that B causes M, that M is very similar to X, and that B is very similar to A. Isn't it reasonable to assume that A causes X?".

In therapy, the patient later confirms these insights by feeling that they are "right" and "correct", that they are epiphanous and revelatory, that they possess retrodictive and predictive powers, and by reporting his reactions to the therapist-interpreter. This acclamation seals the narrative's probative value as a basic (not to say primitive) form of explanation which provides a time frame, a coincident pattern, and sets of teleological aims, ideas and values.

Juan Rivera is right that Freud's claims about infantile life cannot be proven, not even with a Gedankenexperimental movie camera, as Robert Vaelder suggested. It is equally true that the theory's etiological claims are epidemiologically untestable, as Grunbaum repeatedly says. But these failures miss the point and aim of psychoanalysis: to provide an organizing and comprehensive, non-tendentious, and persuasive narrative of human psychological development.

Should such a narrative be testable and falsifiable or else discarded (as the Logical Positivists insist)?

Depends if we wish to treat it as science or as an art form. This is the circularity of the arguments against psychoanalysis. If Freud's work is considered to be the modern equivalent of myth, religion, or literature - it need not be tested to be considered "true" in the deepest sense

of the word. After all, how much of the science of the 19th century has survived to this day anyhow?

Return

THE AUTHOR

Shmuel (Sam) Vaknin

Born in 1961 in Qiryat-Yam, Israel.

Served in the Israeli Defence Force (1979-1982) in training and education units.

Education

1970-1978: Completed nine semesters in the Technion – Israel Institute of Technology, Haifa.

1982-3: Ph.D. in Philosophy (dissertation: "Time Asymmetry Revisited") – Pacific Western University, **California**, USA.

1982-5: Graduate of numerous courses in Finance Theory and International Trading in the UK and USA.

Certified E-Commerce Concepts Analyst by Brainbench.

Certified in Psychological Counselling Techniques by Brainbench.

Certified Financial Analyst by Brainbench.

Full proficiency in Hebrew and in English.

Business Experience

1980 to 1983

Founder and co-owner of a chain of computerised information kiosks in Tel-Aviv, Israel.

1982 to 1985

Senior positions with the Nessim D. Gaon Group of Companies in Geneva, Paris and New-York (NOGA and APROFIM SA):

– Chief Analyst of Edible Commodities in the Group's Headquarters in Switzerland
– Manager of the Research and Analysis Division
– Manager of the Data Processing Division
– Project Manager of the Nigerian Computerised Census
– Vice President in charge of RND and Advanced Technologies
– Vice President in charge of Sovereign Debt Financing

1985 to 1986

Represented Canadian Venture Capital Funds in Israel.

1986 to 1987

General Manager of IPE Ltd. in London. The firm financed international multi-lateral countertrade and leasing transactions.

1988 to 1990

Co-founder and Director of "Mikbats-Tesuah", a portfolio management firm based in Tel-Aviv.
Activities included large-scale portfolio management, underwriting, forex trading and general financial advisory services.

1990 to Present

Freelance consultant to many of Israel's Blue-Chip firms, mainly on issues related to the capital markets in Israel, Canada, the UK and the USA.

Consultant to foreign RND ventures and to Governments on macro-economic matters.

Freelance journalist in various media in the United States.

1990 to 1995

President of the Israel chapter of the Professors World Peace Academy (PWPA) and (briefly) Israel representative of the "Washington Times".

1993 to 1994

Co-owner and Director of many business enterprises:

– The Omega and Energy Air-Conditioning Concern
– AVP Financial Consultants
– Handiman Legal Services
Total annual turnover of the group: 10 million USD.

Co-owner, Director and Finance Manager of COSTI Ltd. – Israel's largest computerised information vendor and developer. Raised funds through a series of private placements locally in the USA, Canada and London.

1993 to 1996

Publisher and Editor of a Capital Markets Newsletter distributed by subscription only to dozens of subscribers countrywide.

In a legal precedent in 1995 – studied in business schools and law faculties across Israel – was tried for his role in an attempted takeover of Israel's Agriculture Bank.

Was interned in the State School of Prison Wardens.

Managed the Central School Library, wrote, published and lectured on various occasions.

Managed the Internet and International News Department of an Israeli mass media group, "Ha-Tikshoret and Namer".

Assistant in the Law Faculty in Tel-Aviv University (to Prof. S.G. Shoham).

1996 to 1999

Financial consultant to leading businesses in Macedonia, Russia and the Czech Republic.

Economic commentator in "Nova Makedonija", "Dnevnik", "Makedonija Denes", "Izvestia", "Argumenti i Fakti", "The Middle East Times", "The New Presence",

"Central Europe Review", and other periodicals, and in the economic programs on various channels of Macedonian Television.

Chief Lecturer in courses in Macedonia organised by the Agency of Privatization, by the Stock Exchange, and by the Ministry of Trade.

1999 to 2002

Economic Advisor to the Government of the Republic of Macedonia and to the Ministry of Finance.

2001 to 2003

Senior Business Correspondent for United Press International (UPI).

2007 -

Associate Editor, Global Politician

Founding Analyst, The Analyst Network

Contributing Writer, The American Chronicle Media Group

Expert, Self-growth.com

2007-2008

Columnist and analyst in "Nova Makedonija", "Fokus", and "Kapital" (Macedonian papers and newsweeklies).

2008-

Member of the Steering Committee for the Advancement of Healthcare in the Republic of Macedonia

Advisor to the Minister of Health of Macedonia

Seminars and lectures on economic issues in various forums in Macedonia.

Web and Journalistic Activities

Author of extensive Web sites in:

– Psychology ("Malignant Self Love") - An Open Directory Cool Site for 8 years.

– Philosophy ("Philosophical Musings"),

– Economics and Geopolitics ("World in Conflict and Transition").

Owner of the Narcissistic Abuse Study Lists and the Abusive Relationships Newsletter (more than 6,000 members).

Owner of the Economies in Conflict and Transition Study List , the Toxic Relationships Study List, and the Links and Factoid Study List.

Editor of mental health disorders and Central and Eastern Europe categories in various Web directories (Open Directory, Search Europe, Mentalhelp.net).

Editor of the Personality Disorders, Narcissistic Personality Disorder, the Verbal and Emotional Abuse,

and the Spousal (Domestic) Abuse and Violence topics on Suite 101 and Bellaonline.

Columnist and commentator in "The New Presence", United Press International (UPI), InternetContent, eBookWeb, PopMatters, Global Politician, The Analyst Network, Conservative Voice, The American Chronicle Media Group, eBookNet.org, and "Central Europe Review".

Publications and Awards

"Managing Investment Portfolios in States of Uncertainty", Limon Publishers, Tel-Aviv, 1988

"The Gambling Industry", Limon Publishers, Tel-Aviv, 1990

"Requesting My Loved One – Short Stories", Yedioth Aharonot, Tel-Aviv, 1997

"The Suffering of Being Kafka" (electronic book of Hebrew and English Short Fiction), Prague, 1998-2004

"The Macedonian Economy at a Crossroads – On the Way to a Healthier Economy" (dialogues with Nikola Gruevski), Skopje, 1998

"The Exporters' Pocketbook", Ministry of Trade, Republic of Macedonia, Skopje, 1999

"Malignant Self Love – Narcissism Revisited", Narcissus Publications, Prague, 1999-2007 (Read excerpts - click here)

The Narcissism, Psychopathy, and Abuse in Relationships Series
(E-books regarding relationships with abusive narcissists and psychopaths), Prague, 1999-2010

Personality Disorders Revisited (e-book about personality disorders), Prague, 2007

"After the Rain – How the West Lost the East", Narcissus Publications in association with Central Europe Review/CEENMI, Prague and Skopje, 2000

Winner of numerous awards, among them Israel's Council of Culture and Art Prize for Maiden Prose (1997), The Rotary Club Award for Social Studies (1976), and the Bilateral Relations Studies Award of the American Embassy in Israel (1978).

Hundreds of professional articles in all fields of finance and economics, and numerous articles dealing with geopolitical and political economic issues published in both print and Web periodicals in many countries.

Many appearances in the electronic media on subjects in philosophy and the sciences, and concerning economic matters.

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