

The Origins of Biological Deception: Ambiguous Information and Human Behavior

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*Whereat some one of the loquacious Lot—
I think a Sufi pipkin—waxing hot—
“All this of Pot and Potter—Tell me then,
Who is the Potter, pray, and who the Pot?”*

—Omar Khyyam, *Rubáiyát*, LXXXVII

INTRODUCTION

In a previous article in *Minding Nature*, “From ‘Egosystem’ to ‘Ecosystem,’” we discussed the origins of deception in biology from discrete physical conditions that are rooted within thermodynamics and cellular/molecular interactions.¹ There is, however, another aspect of biological systems that must be explored to understand the origins of the pervasive deceptions in biology that are so much a part of our daily human behavior and relationships. This additional contingency is the problematic nature of the information upon which biology depends.²

All living organisms, including all cells and microbes, receive, communicate, and deploy information.³ However, as opposed to the inanimate realm of water or rocks, the living circumstance imposes some important restrictions on the ability of any organism to receive and assess any communicated information. In biological contexts, all information is inherently noisy and ambiguous.⁴ Any communicated information is

subject to degradation by distance, time delay between delivery and receipt, and distortion by the medium of transmission through which it must travel as a signal of one kind or another. This obligatory limitation is the source of an ingrained dilemma within the living condition. Although life can be properly defined as the ability to actively use information directed toward communication and problem-solving, the reliability of information upon which it depends is always uncertain.⁵ When it comes to the use of biological information, ambiguity rules, and thus it is not surprising that deception is a prominent tool within a biologic system in which reality can never be assessed with precision.

There is also another pertinent aspect of this informational insecurity. As any living organism conducts its life, it is obliged to influence its environment. It necessarily leaves a trace of its impact on that environment through its own use of information.⁶ So all organisms, by their actions, alter their environmental information space, which represents the totality of the sources of information available to themselves or others. Any action or communication by a living thing changes the information value available to others within their contextual environmental space. Therefore, it is an essential reality that each organism is very definitely “of” the environment and not merely “in” it.⁷

However, the obligatory impact on the outward environment that is caused by any organism using information carries another codicil. Every living organism assesses information as a unique observer/participant within its own self-referential terms. So any time an organism passes information along it also communicates an interpretation of that information. Information is now filtered and changed. As a result, like a vast game of “telephone,” the quality of the communicated information sent and received is degraded by this subjective and idiosyncratic evaluation. Unavoidably, any living organism reciprocally communicates and casts informational cues into a shared environmental space. The result is that biological information is unalterably rooted in uncertainty from all sources. Since this is true for all living entities, humans must cope with a constant stream of ambiguous information. Our contention is that this conditional circumstance governs our human choices and social interactions, and so it underpins the origins of human culture.

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THE GRAND CONCEIT

All organisms that can be seen with our eyes (multicellular eukaryotes) are collective organisms representing a vast collaborative partnership of microbial life and innate cells. These collective forms of life are termed hologenomes or holobionts.⁸ This is the case with the human microbiome as well, where the fraction of our total selves that is microbial in origin is currently estimated to be ten times greater than our innate “human” cells. Furthermore, the total amount of the genetic material within that microbial fraction is currently estimated to be at least one hundred times greater than our own eukaryotic cells. This microbial life is not merely appended. It is vital to our metabolism, our immune systems, and our survival.⁹ It has also recently been demonstrated that our microbial fraction significantly influences a range of behaviors and phenotypes that include our moods, appetite, circadian clock, satiety, and body weight. Therefore, our actual cellular makeup is best understood as a vast, interconnected system of collaborative, cooperating, co-dependent, and competitive mixed cellular ecologies. Although we feel ourselves to be a singular entity, we are decidedly not, and this is our greatest illusion.¹⁰ As Richard Schloss has so aptly put it, life on this planet is a “biotic arc of ‘we.’”¹¹

The reason that the illusion of oneness can be sustained is that it is the nature of all the individual cells that form our cellular ecologies, such as our gut or respiratory system, to work together. It is the willing collaboration of each of these cellular/microbial ecologies that permits our body as a completely cellular entity to function as a seamless entirety. The organic glue upon which this is based is a few essential principles of cellular co-existence: cooperation, co-dependency, mutualism, reciprocation, and balancing competition. And importantly, all these mutual arrangements are driven by communication between and among cells.¹² Therefore, it is not accidental that this collective form of life is the exclusive manner by which all visible organisms are formed. The reason is that ambiguous information from the environment is best assessed through collective cellular appraisal.¹³ Biological information is imprecise. This leads to stress, at all levels and scales. The collective form of cellular life that we represent is the best solution. Life is a unique type of information management system.¹⁴

INFORMATION AND OUR CELLULAR SELVES

As ecological collections of cells control our physiology and cognitive capacities, our human perceptions of any stimulus must necessarily be based upon both physiological and cognitive systems through their inter-linked cellular actions. We and all other organisms use both our reason and our physiology to make the best of available information. Yet it seems as if we have an unconscious awareness that our sense of singularity is an illusion and that cellular communities underlie our living circumstance. We readily acknowledge that our rational thoughts are not necessarily reliable and can be misleading. It is not uncommon for our decisions to be guided by something other than our overt mental processes—for example, an instinct, an amorphous presentiment, or a “gut feeling.” Somehow, we know that our physiological mechanisms can intuit informational signals that our cognitive faculties have not quite discerned. As humans, all our faculties are used to assess information and attempt to overcome deceptive signals and background noise.

It is this dualistic approach to all sources of information, through both cognition and physiology, that energizes our exceptional human extension into collective information space. Our human expression of the exploration of that shared information is the visual arts, music, liturgy, and literature. The same impulses also govern economic practice and political interplay. Together, all these interpolate as our complex cultural fabric. In this way, humans use culture and its norms as one method of trying to impose a sense of predictable order to the analysis of complex

sets of information in which meaning can be quite ambiguous. We use both our cognitive capacities and our physiological reactions to best assess our uncertainties. Research indicates that many species other than humans do the same.¹⁵

Up until now, the origin of culture has been assumed to operate within a Darwinian framework of natural selection from which social selection emerges as societal constraints.¹⁶ Instead, we suggest that the origin of the creative impulses that lead to culture and strongly influence human social behavior are grounded within the biological architecture of cellular being. By that obligatory architecture, we are forced to analyze information, the quality of which is always equivocal, in a distributed manner. The human expression of that predicament is to organize ourselves to try to make the best of our individual uncertainties through collective guideposts in our struggle to evade persistent stress. Social behaviors and many of our cultural proclivities are our best means of dealing with the uncertain information that reaches us from an agitating environment.

THE ORIGINS OF DECEPTION

The analysis we have offered is reinforced by the work of quantum physicist David Bohm. Since information is biology's common currency and communication is its means, a root paradox arises. In his book, *Wholeness and the Explicate Order*, Bohm argued that it is our inherent nature to misperceive physical reality.¹⁷ Our experience of our physical surroundings is a subjective one in which our evolved senses offer a range of potential interpretations of information. He discussed this subjective phenomenon in terms of a series of superimposed "implicates" (directions an organism might take) as a range of unexpressed further potentials. Eventually, these must resolve into "explicates" as the actual expression of that prior range of possibilities becomes a particular action, function, or form. However, the crux of the paradox is that any implicate that yields explicate action also creates a new set of superimposed implicates. In such circumstances, any notion of fundamental reality is merely an illusion, and information is as likely to be deceptive as it is to be reliable. This produces a condition of stress, to which we will return below.

The problem further compounds when the intent is to transfer information between generations, as any parent might attest. Therefore, it is not paradoxical that deception is one of life's conditions; deception is the inherent circumstance for all biological organisms. Deceptions, dualities, and cheating are a part of the panoply of uses to which information can be put and affect how it might be interpreted. In *The Folly of Fools*:

The Logic of Deceit and Self-Deception in Human Life, Robert Trivers insists that deception is overwhelming in biology as a primal impulse toward self-deception.¹⁸ In his view, an organism first deceives itself to better deceive others. However, when life is properly regarded within its obligate circumstances as a living entity that must use information, we can push Trivers's perspective one step further. Given the imperfect nature of information, no matter the intent of the user, an inherency of deceit is simply the conditional circumstance of life that depends on information.

BEING HUMAN: STRESS, AMBIGUITY AND RISK-TAKING

All organisms use whatever information they have to the extent to which they are able. Many animals have a well-developed capacity to seek to relieve some stresses at the expense of imposing simultaneous fresh anxieties on others. This is more than mere impulsive behavior, however. Within Bohm's construct of reality, which is composed of both superimposed implicates and realized explicates, a fundamental truth follows. There is no basis in biology in which any form of permanent relief from stress can be expected. Any range of implicates that can be settled into explicate action merely serves as the originating source of a differing set of renewed conflicting implicates with their own stresses. Any problem that is solved and dispatches one set of issues inevitably creates new opportunities or constraints. Either can be stressful. From the perspective of an information system, nothing is ever completely settled.

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Therefore, it can be reasonably argued that this permanent reality underscores the impulse for the restless wandering of many species and which is particularly exemplified by humans. Since—in the terms of information management—one set of solutions simply yields a new set of uncertainties and stresses are met with both rational consideration and physiological set-points, it is natural to expect that there are inevitable biochemical responses to this situation. Indeed, it has been found that behaviors based on uncertain information leading to induced stress are physiologically mediated.

In most primate species, some animals will ultimately leave the group of their birth and seek another habitat. Commonly it is the males, but for some species such as chimpanzees, gorillas, or spider monkeys, it is the females. Most out-migration occurs in adolescence when risk taking increases. Robert Rose and colleagues noted that in most monkey groups, the adolescents leave volitionally, not because they are driven out.¹⁹ The initiating factors are ascribed to the risk-taking predisposition of those who migrate, competition for scarce resources, and social rank. In competitive circumstances, when environmental conditions deteriorate, the high-ranking animals usually stay in place and the aggressive, lower-ranking animals might leave. The migrating few explore new opportunities, incur new risks, and learn about their limits. Although such actions have complex causes, physiology has a dominating influence. When a new social group is formed in rhesus monkeys, the alpha dominant male shows a progressive increase in plasma testosterone.²⁰ The newly subordinate males show a drop in testosterone that can be as much as 80 percent from baseline levels for the lowest ranking member. In rhesus monkeys, optimism, self-interest, restless curiosity, and ambition are the best predictors of emigres' willingness to test the environment, explore their place within it, and deal with the insistent stress of ambiguities. Those that do leave are the subset willing to accept new information and its uncertainties in order to get away from the imposed cultural deceptions that nonetheless brought some limited order to their anxieties. However, these characteristics are specifically related to plasma testosterone levels that are, in part, attendant to status levels in hierarchical social groups. Exploration is a highly correlated response to uncertain status within a social network and its linked physiological consequences. In effect, uncertain information—such as from uncertain status and its anxieties—leads to behaviors that express as physiological changes. These changes can self-reinforce in ways that lead to new actions and differing anxieties. In short, the processing of information leads to a cycle of physiological augmentation that yields consequences well beyond the initiating behaviors.

Since all primates share most physiological pathways, we should expect that it is much the same for humans. Therefore, human cellular physiology not only permits us the opportunity to explore, but impels us to do so. Humans are a restless species with an exceptional capacity to adapt to a range of climates despite our otherwise limited physical gifts. We meet our own particular range of uncertainties in our own species-specific manner through an unusually flexible system of cultural adaptations to stress. Those faculties are used to explore

the outward environment, but also to conduct an inquiry of our own inner terrain. Combined, these constitute our “information space.” Our explorations and inquiries are part of our constant search for an enhanced connection to our truer selves beyond any ambiguities that we confront. Our aggressions and impulsive risk-taking are tools for the exploration of the limited information that we can receive and assess in the furtherance of those deepest aspirations. Therefore, humans confront informational insecurity through cognitive capacity, which is deemed “reason,” and through our physiology, which is regarded as “animal instinct.” Indeed, both serve our predilection to explore our equivocal circumstances. But there is always an invariable and inevitable catch. Every new resolution of uncertainty in one sphere becomes its own new series of potential uncertainties and renewed anxieties in another. This represents our own obligate loop of perpetual recursive causality as an endless series of reciprocating causes and effects. One thing settled always leads to the next reaction. Any settled set of implicates becomes our evanescent “Truth.” But in most cases, we are only momentarily deceived, then disillusioned, and so we must begin again in a reciprocating cycle of recursive causality, which we see in the artistic mode of music. It is our permanent human condition.

BEING HUMAN: THE SEARCH FOR UNAMBIGUOUS TRUTH

Humans are not the only creatures that deal with information in a skeptical frame. But, through our specialized discernment and skills, we have become a special case in its applications. Apart from the unique advancement of the scientific method, humans are separated from other species by our exploration of information space through the supplemental agencies of the visual arts, music, literature, liturgy, and economic and political systems. We shall discuss each of these briefly in turn.

The Search for Truth through Art's Visual Deceptions

Unlike any other animal, humans view works of art with both cognitive associations and visceral feelings. It is common for us to proclaim our physiological reaction to one piece of art versus another. What might be an idealization of beauty or an imparted sense of inner completeness to one can be a source of agitation for another. For some individuals, a particular painting, sculpture, or photograph might enable a fleeting escape towards a new “reality.” For others, art conveys a sub-rosa evidence for logic or some ineffable truth in nature. Whatever the particular reaction, the universality of art across time and all cultures has ancient beginnings. These sensibilities were as true for the early human that created petroglyphs as for any modern

abstract artist. Given this enduring expression of our humanity, it can be argued that this act of artistic creating and recording is one resonating format for addressing the ambiguities of being alive. This self-organizing and self-referential action becomes a connection to our deepest selves and thereby acts at all levels of the human emotional range. It does so by technical sleights-of-hand. For a painting, the viewer must imagine three dimensions when there are only two, and in so doing, the content of the work becomes an integrated artifice. Perhaps art's universal appeal through this contrivance is that we are encouraged to suppose that there is harmony in the Universe if only we could see it. As the magician Marco Tempest put it, "Art is a deception that creates real emotions—a lie that creates a truth. And when you give yourself over to that deception, it becomes magic."

Music and Universal Harmony

There may be no other art form that so explicitly exemplifies our exploration of information space as music. At first, we crave the familiar, the reliable. Soon, that becomes trite. Instead, we insist on new ambiguities with unfamiliar rhythms and cadences. This becomes our delight and then, in turn, even that becomes old, and the next musical form is required. It is an exact example of the phenomenon of recursive causality, in which dissatisfaction with one form of music leads to the next, inevitably resulting in an endless loop. Yet through the reiterating discourse of repeated harmonies, music beguiles us into a belief that there is larger harmony in the Universe despite our anxieties. Harmony in music whispers an unseen order amidst turbulent uncertainties and hints of humming hidden coherences. After all, any piece of music has a discrete beginning and always has an unambiguous end, and it may be that our satisfaction with music is that it is so unlike the uninterrupted stresses of our actual lives.

This does not imply that music does not have its own ambiguities. Through its differing meaning to each listener, music functions at both our rational level and through our emotions. G. F. Miller insisted that music is a universally distributed biological adaptation that must have been "too complex to have arisen except through direct selection for some survival or reproductive benefit."²¹ The Darwinian frame is assumed. Even Darwin himself considered music an explicit example of mate choice shaping a behavioral trait.²² Yet it need not be so. Instead, one can argue that its universality is through its purchase on our instinctive selves as an echo of our eternal disquiet with our own equivocal form: singularities that are not, collaborative enterprises unsensed, and boundless ambivalences. The allure

of music is that it transports us. In some transcendent manner, through music, we are permitted to explore our personal unknowns by imagining new places and fresh outcomes. Even so, the deceptions remain when the music stops. Yet, at least for some, there are joyful, ephemeral feelings of oneness with the outer Universe. Through the jubilation of music and its appealing endorsing structure, we simply feel our existence within a universal harmony in which we have been granted temporary, even if fanciful, resonance.

Sacred Rites, Rituals, and Our Uncertain Place

There is a central belief that Man originated in the Garden of Eden as an ideal world. The bite of the apple was Man's introduction to knowledge. In an instant, he was immediately self-aware. The Bible asserts that it was through that pivotal, self-referential moment that man's anxieties and doubts began. Yet it was not merely that Man became imperfect in that instant, but that the world was revealed to Man as itself imperfect, with entwining joys, sorrows, and impermanence. That complexity is reflected in Ecclesiastes (1:18): "For in much wisdom is much grief, and he that increaseth knowledge increaseth sorrow." It is clear that the power of sacred rituals, observances, and rites rise from a universal desire for an unassailable connection to Oneness in the promise of an eventual release from uncertainty. Each of us is forced to confront our frailties and doubts and the deceptions of others while contending with inconsistent sources of information that are open to wide interpretation. For some, faith and its comforting practices are their answer to these stresses. For believers, it is their search for their vital center through secure knowledge. Yet devout believers or not, we all share in a binding enigma of doubt, vulnerability, and precarious awareness, and we arrive together at only one aspect of enlightenment: much is uncertain.

Literature and Deception: Truth and Untruth

"Well, then, it is settled," is a familiar phrase in literature and movies. Our human bias encourages our belief that a range of choices may be put to rest by choosing one course of action over another. The fallacy of that assumption is always apparent. Every action taken, any explicate enacted in Bohmian terms, becomes a fresh panoply of choice as renewed implicates and potential outcomes. There can be little doubt that through thousands of years of oral history and written literature, this has been a primary means by which we come to terms with those doubts. Stories are one of our powerful means of exploring information space without the actual risk of failure. In novels, plays, or movies, the protagonists wander for us or risk

their lives, egos, and comforts. We are encouraged to follow and imagine ourselves within their unfamiliar circumstances. Clearly, any such journey is a conceit. But, quite willingly, we suspend our ordinary judgments and permit the deception. It may be that we all subliminally discern what Jane Austin observed in *Emma*: “Seldom, very seldom, does complete truth belong to any human disclosure; seldom can it happen that something is not a little disguised or a little mistaken.” We glean satisfaction in the creative, though safe, choice of ambiguity and all its potential variants toward discrete resolution. It serves its important purposes. It is a pleasurable cheat against the actuality of our condition, in which there is never any final resolution in our own lives. It provides a service as a trial exploration of our own doubts, limits, infirmities, and imagined strengths. For a time, we are transported beyond our uncertain existence. Through the deliberate artifice, somehow, we fathom what the physician and novelist Khaled Hosseini rightly remarked: “Writing fiction is the act of weaving a series of lies to arrive at a greater truth.”

We suggest that the origin of the creative impulses that lead to culture and strongly influence human social behavior are grounded within the biological architecture of cellular being.

Deception in Economics and Commerce

There is probably no human engagement (other than politics) that better exemplifies our anchoring roots in the cellular form or our ambiguous circumstances than our economic interrelationships. It is now known that bacteria lead complex social lives and display cognitive behaviors demonstrating memory, learning, and anticipation.²³ Microbes exhibit an extensive array of cooperative behaviors, including group motility, layers of multicellular structures, and the consensual production of extracellular public-goods. These aggregated activities even include the active policing of non-cooperating defector cells. Each of these mechanisms reinforces cooperation. Its level of sophistication is such that it can be modeled in the same manner as trade between merchants.²⁴ At their scale, microbes exhibit behaviors that have been closely likened to the economic principle of Structured Comparative Advantage. Many other organisms do also. It has been observed in plants, insects, fish, and mammals.²⁵ Among microbes, these behavioral comparisons are exact enough that their trading patterns of essential

resources are quite analogous to how countries exchange goods and services in modern economic markets. The similarity is so great that a biotic model of general equilibrium theory (GET) derived from human economics can be used to predict the population dynamics of trading microbial communities.²⁶ Since it is known that microbial deception abounds, there can be no doubt that it is also represented in how trade is conducted through this universal model.²⁷

In *American Mania*, Peter Whybrow notes that a dynamic tension always exists between innate desires and social learning, and it is clearly represented in human behavior.²⁸ In turn, this complex interplay undergirds our social agreements, myths, and every aspect of culture. Whybrow asserts that this operates beyond our instincts for personal self-preservation and, instead, subordinates to “competitive collaboration” with others. A market economy can emerge from this dynamic in which trade flourishes through the give-and-take of social interaction and the internalization of conventions and customs. When examined in this frame, economics becomes an excellent example of basic cellular principles writ into commerce: order as self-organization, communication as an echo of cell–cell communication, protection from unpredictable outcomes as the principle of homeostasis, and self-interest as a manifestation of self-reference. These are together deployed to sustain any cell, but also as a means of forming a common barrier against deception. This actualizes in the multicellular form, such as ourselves, to liberate the common good at our scale. Even so, we are well aware that deceit is ever-present. In human commerce, there is a transparent impulse to diminish ambiguity through contracts, agreements, and formal understandings between participants.

WHOM DO WE SERVE?

Each organism connects with information space and the outward environment through its own means. The individual judgment of any organism is always subjective, and the line between reality and dissimulation is not necessarily stark. Therefore, any attempt at discrimination between truth and fiction requires some general sensibility of where reality lies. Put differently, cheating and deceit require a baseline sensibility from which deception can skew. To be recognizable as deception, some things must be consistently reproducible to the extent that they can be a trusted pattern, even if not any absolute objective reality. Properly considered then, both fidelity to reality and duplicity masking reality are best understood as dual aspects of a shared information space. From this, it is plain that each must be considered useful aspects of our human societal

requirements. If society had nothing to grip as social convention and individuals were absolutely overt in their opinions to everyone whom they met, society would promptly disintegrate. Therefore, biological deception serves abundantly. It is a part of our societal and personal toolkit that enables us to persist and collaborate. Therefore, deception is no unalloyed negative and is partially contributory to our happiness and survival.

Certainly, information has no intrinsic coloration on its own. Deception is simply one variational facet of a complex information space. What is duplicity to one entity can be truth revealed to the next. For example, the cheater at cards need not be duplicitous to all at the table. If one player recognizes the deception and becomes aware of the sham, then the potential arises that the cheater becomes his unintended tool. Therefore, deception is simply another form of context-dependent information. From this, it can be asserted that overt deception is not biology's primary problem. The greater issue is the ambiguity that fostered it. Since information is pervasive, the substantive problem is this: what is noise, and what might be actionable input?

Many physicists have tried to understand this interrelationship. Ilya Prigogine, Michael Polanyi, L.L. Whyte, and others have tried. Prigogine and Isabelle Stenger's assessment of life's irreducible complexity in their book, *Order Out of Chaos*, concludes that biology is too complicated to define.²⁹ However, a consonant biologic order can be identified if the conventional frame of reference is willingly changed. Biology must be analyzed from its unicellular origins³⁰ and then, forward through time, as continuous responses to information governed by cellular processes.³¹ No matter our sensibilities, we emerged from unicellular roots and remain ever anchored within that cellular domain. That is the conditional deception in which we exist and with which we must always cope.

Throughout our human journey, there has always been one consistent existential question: *What is our place?* Clearly, this aspect of our condition has received obsessive attention in philosophy, art, and religion. Yet there is an equally compelling imperative that is less explored. *Whom do we serve?* Through contemporary scientific research, a direct answer is available. We serve our self-referential selves. However, to properly understand what that exactly means requires an understanding that the epicenter of this self-referential frame is not imbued within our personal notion of our singularity, our entirety. On the contrary, it is ever and always invested within the collective cellular whole that we represent. Through this perspective, our living circumstance condenses to cellular information sharing through cell–cell communication to resolve ambiguities at

every scope and scale. Cells at their level certainly serve themselves, but do so within the constraining embrace of a co-dependent mutualism.

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What, then, should we make of ourselves, our narcissism, or our gifts? Is it all egotism, or might there be purpose? For our present moment, there is no exact answer. However, art, music, politics, and commerce are our expressions of our directed search for exact information within our constitutive ambiguity. Each can be seen as both living touchstone and requisite attachment with our distant, but permanently connected, past. And by these means, we are privileged to direct our specialized gifts in a continual search for Truth as best as our condition permits.

Our attraction to art, music, literature, or liturgy therefore serves our condition. Each is an expression of our attempt to explore information space, and through that, to better comprehend the limits of our full range of possibilities. Through this process, our imaginings signal how potentials might fold into eventual actions. Each art form, as a creative endeavor, expands our wonder. It asks this: how might we deal with alternative stresses? Some might call this role playing, but it is a means of pre-sorting ambiguous information to allow for more certitude when those circumstances arise. Many organisms can predict, such as bacteria, amoebae, or plants.³² Anyone who owns a dog knows that a capacity to predict is distributed. Humans do this more. And we not only predict, but pretend to predict, in a further attempt to pre-categorize ambiguity. It has only been roughly two hundred thousand years since modern humans began, so it should not be surprising that humans are not necessarily good at this form of stress alleviation. Perhaps then, given this limited capacity, our human proclivity for psychoactive drugs can be understood. We share an impulse to expand our limited skills in meeting uncertainties and their stresses. It may even be true that this same impulse links us to our creativity. Perhaps this is why Coleridge is said to have used opium while creating his poetic masterwork, "Kubla Khan."³³

When we knowingly accept artifice and permit ourselves to remain within its alluring grasp, it becomes its own form of

self-referential guidance. Through it, we attempt to deduce our place in the Cosmos, to somehow grasp our connections with the outer Universe through the invisible threads of our evolutionary journey. We use art, music, literature, and liturgy in an attempt to understand the disquieting range of ambiguities that underscore our circumstances and that are, simultaneously, our anxieties. Our aim is to try to discern, at little risk, a personal set of potential actions toward the unknown through the creative agency of Art.

How then might we stand in apposition to the primal place of the inherency of deceit?

Bernulf Kanitsheder has speculated that the Cosmos is a universe of multiverses in which the concept of position may have no well-defined meaning.³⁴ In any such array of multiverses, the concept of position collapses without any aligning spatial organization. What is our place if that is so? Instead of frustration or despair, our reaction should be to take instruction from our own cellular being as collaborative ecological architectures. We can look inwards toward those cellular principles under which we thrive. Cooperation, co-dependency, mutualism, reciprocity, and balancing competition must be our means. Our resolutions should always be toward reducing surprise (unpredictable outcomes) as much as possible without taking away our proclivity to continue exploring and taking risks. How might we achieve that difficult balance? We can follow the rules of our own cells through the maintenance of order (negentropic self-organization), abundant communication and information flow (chemiosmosis), a commitment to the protection of the environment (homeostasis), and the continuous reinforcement of life-centered individual identity against subordination by others (self-reference). These are the sustaining principles under which cells have flourished since life began. These are the rules by which we came to be. These should serve as societal guideposts and our guardians against hubris.

CONCLUSION

All living organisms depend on the assessment and deployment of self-referential information that must be received and transmitted through a variety of mediums and contexts, each with its own inherent time delay. Therefore, the fundamental aspect of information within the living condition is its imprecision. In consequence, the origin of biological deception is a direct facet of a biological information space that is inherently ambiguous. As this situates all organisms within the uncertainty of subjective and context-dependent circumstances, the living condition is one of continuous stress.

Evolutionary research has confirmed that all complex organisms emanate from cellular roots. Further, too, all reiterate through a single cell stage for reproduction. Despite outward appearances, every complex organism remains perpetually attached to an inherent cellular narrative as an intimate co-alignment of mixed cellular ecological units. We are cellular beings, and ever remain thus. Our range of unique human behaviors are therefore derivative, whether manifested as impulsive risk taking or artistic expression. All such human endeavors are our means of exploring a catalogue of necessary information within an obligatory circumstance in which the information upon which we must rely is always equivocal.

We are cellular beings, and ever remain thus.

Yet, within this complexity, there is hidden unity. Our illusion of singularity depends on the transitory but inseparable conjoining cohesion of all our linked cellular ecologies. And from this emanates the largest Truth: we and the environment are entwined self-similarities. The environment that matters most is not without, it is embedded within our own natural being. And our only sure Truth is our own impermanent and ambiguous transit through this intimate and reciprocating dimension.

Why then is life full of deceptions? At all points in time and for every organism within the informational system that biology represents, the predominating driver is not just access to information, but an active assessment of its inherently equivocal context and quality. Biology's continuous drama is the struggle to settle a range of unknowns into forms of information that are discretely recognizable as secure. Those actions that sustain us must always travel along that path. It is our simple plight that nothing need be as it seems and, in consequence, our survival is an unceasing battle to overcome inherent untruth.

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NOTES

1. J. S. Torday and W.B. Miller, Jr., "From 'Ecosystem' to 'Ecosystem'," *Minding Nature* 11, no. 1 (Winter 2018): 40-48.
2. J.S. Torday and W.B. Miller, Jr., "The Resolution of Ambiguity as the Basis for Life: A Cellular Bridge between Western Reductionism and Eastern Holism," *Progress in Biophysics and Molecular Biology* (2017): <https://doi.org/10.1016/j.pbiomolbio.2017.07.013>; W.B. Miller, Jr., "Biological Information Systems: Evolution as Cognition-Based Information Management," *Progress in Biophysics and Molecular Biology* (2017): <https://doi.org/10.1016/j.pbiomolbio.2017.11.005>.
3. W.B. Miller, Jr., "Cognition, Information Fields and Hologenomic Entanglement: Evolution in Light and Shadow," *Biology* 5 (2016): 21.
4. *Ibid.*; Torday and Miller, "The Resolution of Ambiguity as the Basis for Life."
5. A. De Loof, "From Darwin's On the Origin of Species by Means of Natural Selection to The Evolution of Life with Communication Activity as Its Very Essence and Driving Force (= Mega-Evolution)," *Functional Genomics* 3 (2015): 153-87; W.B. Miller, Jr., "Cognition, Information Fields and Hologenomic Entanglement.
6. F. Heylighen, "Stigmergy as a Universal Coordination Mechanism: Components, Varieties and Applications," in T. Lewis and L. Marsh, eds., *Human Stigmergy: Theoretical Developments and New Applications* (New York: Springer, 2015).
7. J.S. Torday and W.B. Miller, Jr. "Man Is Integral with Nature," *Minding Nature* 8 (2015): 36-43.
8. W.B. Miller, Jr., *The Microcosm Within: Evolution and Extinction in the Hologenome* (Boca Raton, FL: Universal Publishers, 2013); S.F. Gilbert, "Symbiosis as the Way of Eukaryotic Life: The Dependent Co-origination of the Body," *Journal Bioscience* 39 (2014): 201-9, <https://doi.org/10.1007/s12038-013-9343-6>.
9. W.B. Miller, Jr., "The Eukaryotic Microbiome: Origins and Implications for Fetal and Neonatal Life," *Frontiers Pediatrics* 4 (2016): 96; I. Cho and M. Blaser, "The Human Microbiome: At the Interface of Health and Disease," *Nature Reviews Genetics* 13 (2012): 260-70; A.R. Hoffmann, L.M. Proctor, M.G. Surette, and J.S. Suchodolski, "The Microbiome: The Trillions of Microorganisms that Maintain Health and Cause Disease in Humans and Companion Animals," *Veterinary Pathology* 53 (2016): 10-21.
10. Miller, *The Microcosm Within: Evolution and Extinction in the Hologenome*.
11. J. Schloss, "Our Shared Yearnings for a Greater Good," *Minding Nature* 10, no. 2 (2017): 14-22.
12. J.S. Torday and V.K. Rehan, *Evolutionary Biology, Cell-Cell Communication and Complex Disease* (Hoboken, NJ: Wiley, 2012).
13. Miller, "Cognition, Information Fields and Hologenomic Entanglement"; Miller, "Biological Information Systems"; Torday and Miller, "The Resolution of Ambiguity as the Basis for Life."
14. Miller, "Biological Information Systems."
15. K.N. Laland, and V.M. Janik, "The Animal Cultures Debate," *Trends in Ecology and Evolution* 21, no. 10 (2006): 542-47.
16. R.M. Nesse, "Social Selection and the Origins of Culture," *Evolution, Culture, and the Human Mind* (2010): 137-50.
17. D. Bohm, *Wholeness and the Implicate Order* (New York: Routledge and Kegan, 1980).
18. R. Trivers, *The Folly of Fools: The Logic of Deceit and Self-Deception in Human Life* (New York: Basic Books, 2011).
19. R.M. Rose, I.S. Berstein, and T.P. Gordon, "Consequences of Social Conflict on Plasma Testosterone Levels in Rhesus Monkeys," *Psychosomatic Medicine* 37 (1975): 50-61.
20. *Ibid.*
21. G.F. Miller, "Evolution of Human Music through Sexual Selection," in N.L. Wallin, B. Merker, and S. Brown, eds., *The Origins of Music* (Cambridge, MA: MIT Press, 2000): 22.
22. I. Cross, "Music and Meaning, Ambiguity and Evolution," in D. Miell, R.A.R. MacDonald, and D.J. Hargreaves, eds., *Musical Communication* (Oxford, UK: Oxford University Press, 2005).
23. P. Lyon, "The Cognitive Cell: Bacterial Behavior Reconsidered," *Frontiers Microbiology* 6 (2015): 264.
24. E. Bruger and C. Waters, "Sharing the Sandbox: Evolutionary Mechanisms that Maintain Bacterial Cooperation," *F1000 Research* 4 (2015): 1504, <https://doi.org/10.12688/f1000research.7363.1>.
25. P. Hammerstein and R. Noë, "Biological Trade and Markets," *Philosophical Transactions Royal Society London B* 371, (2016): 20150101.
26. J. Tasoff, M.T. Mee, and H.H. Wang, "An Economic Framework of Microbial Trade," *PLoS One* 10 (2015): e0132907.
27. L. A. Knodler, J. Celli, and B.B. Finlay, "Pathogenic Trickery: Deception of Host Cell Processes," *Nature Reviews Molecular Cell Biology* 2 (2002): 578-88.
28. P.C. Whybrow, *American Mania: When More Is Not Enough* (New York: W.W. Norton, 2005).
29. I. Prigogine and I. Stengers, *Order Out of Chaos: Man's New Dialogue with Nature* (New York: Bantam Books, 1984).
30. Torday and Rehan, *Evolutionary Biology, Cell-Cell Communication and Complex Disease*.
31. J.S. Torday and W.B. Miller, Jr., "Biologic Relativity: Who Is the Observer and What Is Observed?" *Progress in Biophysics and Molecular Biology* 121 (2016): 29-33.
32. T. Saigusa, A. Tero, T. Nakagaki, and Y. Kuramoto, "Amoebae Anticipate Periodic Events," *Physical Review Letters* 100 no.1 (2008): 018101; M. Gagliano, M. Renton, M. Depczynski, and S. Mancuso, "Experience Teaches Plants to Learn Faster and Forget Slower in Environments Where It Matters," *Oecologia* 175, no.1 (2014): 63-72.
33. F.L. Milne, "Coleridge's 'Kubla Khan': A Metaphor for the Creative Process," *South Atlantic Review* 51 (1986): 17-29.
34. B. Kanitscheider, "The Position of Man in the Cosmos," in U. Frey, C. Störmer, and K. Willführ, eds., *Homo Novus—A Human Without Illusions* (Berlin and Heidelberg, Germany: Springer, 2010), pp. 7-18.