Why Can't Evolutionary Biologists Quit Believing in Intelligent Design?

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NOT LONG AGO an intelligent design advocate responded to one of my occasional swipes at ID theory. Thinking I had misinterpreted the theory, he said it was wrong to imagine the Designer working only in the remote past. "ID is open as to when the Designer implements Design."

My response was along these lines:

> For me, the issue isn't whether a designer acted millions of years ago or a millionth of a second ago. Rather, it's that the picture being offered is one of a designer working from outside upon a mechanical artifact. But organisms are not machine-like. Their activity is not an outcome of parts assembled by a designing engineer. They are not contrivances periodically requiring service by an outside agent for the sake of evolutionary progress. No, their very *life* consists of the activity through which they grow and transform their own physical means of acting.

Given today's charged environment, you might wonder why I did not accuse my correspondent of being a "science-denier." There is good reason. The label is a dastardly one, poisoning the spirit of evidence-based conversation, which is so crucial to science. It strongly suggests an inquisitorial demand for creedal belief rather than understanding. It almost inspires sympathy for intelligent design theory — and *does* inspire it for a number of the theory's proponents, who can be fully as qualified as their authoritarian persecutors, and sometimes far more critically alert.

Some of those who labor to guarantee the purity of evolutionary orthodoxy habitually refer to intelligent design theorists as "IDiots" — and their argumentation naturally tends toward the same exalted level of discourse. To the shame of science, relatively few biologists have yet been willing to call out such behavior. It has mostly been outsiders who have urged greater scientific integrity. For example, the widely respected New York University philosopher, Thomas Nagel, has labeled the biological community's treatment of intelligent design proponents "manifestly unfair"[1] — this at the risk of his own reputation.

History teaches us that the kind of knee-jerk nastiness and vitriol leveled at ID theorists is not uncommon among competing sects trying to differentiate themselves from each other on fine points of sectarian doctrine — nuances that can assume gigantic importance in the minds of the disputants. You have to fight hardest with those who try to occupy your own ground.

That mainstream biologists are quarreling with ID theorists over common ground may seem a strange idea. But look again at the quoted paragraph above. As we will see more clearly in what follows, it applies without reservation to conventional evolutionary theory as well as ID. Few biologists are reticent about their conviction that organisms are machine-like and have been "tinkered" with throughout evolutionary history by a designer capable of producing intelligent results — all without any *intelligent* aid from organisms themselves.

The designer they have in mind, of course, is natural selection, which has famously been likened to a blind watchmaker and is almost universally referred to as an agent capable of intelligent activity. Selection *shapes* the bodies and behaviors of organisms, *builds* specific features, *targets* or *acts* on particular genomic regions, *favors* or *disfavors* (or *punishes*) various traits or behavioral strategies, *operates* in this way or that, *maintains* DNA sequences, *promotes* adaptation of populations to local environments, *polices* mutations, and, in general, *causes* an endless variety of effects.

Not many biologists, whether ID proponents or otherwise, seem particularly interested in confronting the reality of intelligent agency where we observe it directly — in living beings — as opposed to taking the organism merely as evidence for the *real* guiding intelligence of their preferred Designer. This indifference toward organisms follows rather naturally when you have conceived them as machines, which always require an external designer. But we will take the alternative path, turning toward the organism's inherent *life*. And because the molecular level is where mechanistic explanation was supposed to triumph finally and completely over life, we will start there.

Intelligence, caught in the act

RNA splicing is one of countless activities in our cells that put the problem of intelligence on display. The standard story is that DNA gives rise to RNA, and RNA is in turn "translated" into protein. This story is now almost *nothing but* complication, and one of the complications is known as "RNA splicing." That is, our cells routinely cut RNAs into pieces, with some of the pieces discarded — possibly to be put to other uses — and the remaining ones stitched back together, often in different ways at different times.

In other words, the organism effectively modifies and repurposes its genetic content "on the fly." The cutting and stitching must not only be attuned to the context, but also be executed with a precision that would put any brain surgeon to shame.

Through careful variations in this process, different protein molecules can be synthesized from a single RNA derived from a single locus of DNA. This is one reason why it is thought that the 21,000 or so genes in human DNA may give rise to as many as a million different proteins. To say that the function of a protein-coding DNA locus is context-dependent is to say, among other things, that the organism as a whole oversees splicing with great subtlety, so that the derived protein can vary slightly or otherwise from one cell or context to another. And the differences can be more than a little consequential. "Even relatively modest changes in alternative splicing can have dramatic consequences, including altered cellular responses, cell death, and uncontrolled [cell] proliferation that can lead to disease."[2]

In organisms possessing nucleated cells ("eukaryotes"), the central player in this drama is known as the "spliceosome," which is less a fixed thing or structure than a complex performance. The performers include, among other contributors, over three hundred proteins. Working together — in coordinated groupings that must reconfigure themselves along the way — the elements of the spliceosome "select" two of the various possible endpoints of the RNA segment to be removed. They then ligate, or join, the portions of the RNA on either side of this segment, following which the segment itself is released. It is rather as if you were to take a string and bring one point together with a second point a few inches away. By joining those two points together, you would be able to release and discard the intervening portion, which now forms a loop.

This entire, extremely elaborate biochemical process may be performed several times along the full length of the RNA. Misjudging either terminus of a removed segment — shifting the point of severance by a single "letter," or nucleotide base (RNAs may contain thousands of them)— could well render the spliced product useless for producing protein, if not downright harmful or fatal.

To complicate matters further, "rather than being the one-way pathway typically drawn in textbooks, almost every step in the spliceosome cycle is readily reversible." In fact, the spliceosome "can even convert spliced products ... back into unspliced [RNA]!"[3]

The intricacies of splicing, and the multiple, interwoven levels of "decision-making" (which extend far beyond "Should we now move this process forward or backward?"), are far too many to enumerate here. For example, some of the spliceosomal proteins are subject to "post-translational modification" — the addition or removal of (mostly small) chemical groups that can critically shape how the proteins function within the larger context. These modifications, too, are dynamic and reversible, which is to say that they must be properly applied or removed in light of current needs.

And, again, some proteins of the spliceosome are themselves spliced — a fact that illustrates the causal ambiguity (X is one of the causes of Y, and Y is one of the causes of X) deeply engrained in all organic activity.

Finally, whereas proteins were once viewed as rigidly formed "molecular machines" (for which there was never any justification), biologists now speak of "disordered" regions in many proteins — meaning, a little confusingly, only that their structure is not strictly fixed. This allows for a lively and wisely employed flexibility:

> To achieve the right balance between precision and malleability, the spliceosome contains scores of individual parts, many of which are structurally disordered. Working in a highly orchestrated manner, these parts perform incredible feats of molecular gymnastics with each round of splicing.[4]

Ignoring the organism's wisdom is not an option

I would ask any biologist: Think back on the preceding description and concretely picture the activity of the several hundred participant molecules. "Watch" them as they are synthesized and somehow modified in the needed manner. Watch as they converge upon one of perhaps hundreds of currently available splicing targets, each requiring its own unique "surgery." And then watch as they cooperate in a tortuous, drawn-out, contextually regulated operation requiring remarkable teamwork from beginning to end. Remember also that the "surgery" required for the different RNAs — or for the same RNAs under different circumstances —

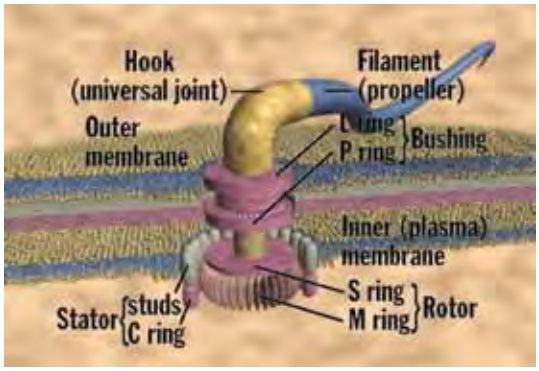
can be very different. So the dynamically varying collection of spliceosomal molecules must continually honor distinctions both subtle and profound.

And after taking all this in, tell me whether, based on what you know of the physical and chemical laws and regularities of the universe, you can even begin to imagine those laws and regularities being adequate, solely in their own terms and in ever-varying contexts, to direct these molecules every considered step of the way. In imagining this, it is also worth bearing in mind that these molecules, as they diffuse through the thickly populated plasm of the nucleus to carry out their tasks of the moment, encounter numerous opportunities for other legitimate (and illegitimate) business.

Certainly all the activity is "lawfully correct." But can you picture just how that sort of correctness could ever underwrite the proper unfolding of the many-themed, extended, and end-directed molecular *story*, with all its requirements for *getting from here to there* — for, that is, complex, end-directed coordination and right "choices" in light of the organism's current needs?

I find myself perplexed again and again by the fact that, with all the contemporary progress in molecular biology, the difficulty of this question has yet to erupt with volcanic force in all the molecular-based disciplines of the life sciences. Surely the picture we have gained brings current ways of speaking and styles of explanation into question.

It is not that physical and chemical investigations reveal any anomalies in their own terms, or that they fail to serve crucial supportive functions for biological science. It's just that physics and chemistry do not tell us about the distinctively *biological* activity. They can only characterize activity with regard to those lawful aspects that continue, uninterrupted and just as lawful, when the organism dies. In terms of *this* characterization, death is not even a recognizable event.



In particular, physical laws and regularities cannot satisfy our need for understanding the organism's *perception of significances* in its environment; its power of appropriate response to stimuli; the molecular "surveillance" processes through which cellular health is maintained and problems corrected; or, in general, the end-directed nature of all activity — from DNA replication, to mating and reproduction, to preying and predator-avoidance.

If the problem presented by the profound intelligence immanent at the molecular level hasn't disrupted our life sciences, then, so far as I can surmise, it is because scientists at their workbenches and theorists in their studies do not concretely picture the *biological* reality they are talking about, as opposed to its physically and chemically lawful aspects. What most intelligent design advocates and conventional evolutionists do imagine is well-designed machines. They simply assume that the machine's successful operation will have been underwritten by the omnipotent Designer, or Blind Watchmaker, at some time in the past. This is despite the fact that the organism's activity is a *present* and unprogrammed creative improvisation and "decision-making" of the sort we see from moment to moment in RNA splicing, as in all other life activity.

The argument for intelligent design

Intelligent design theorists like to point to features of organisms that are "too complex" for accepted evolutionary processes to explain. One of their chief exhibits is the flagellum, a whip-like appendage of various bacteria and other single-celled organisms. It is used for propulsion when swimming, and also performs sensory functions. It is indeed an impressively complex structure, which can vary between different types of organism. The illustration at left, below, shows a group of green algae (*Chlamydomonas*) cells with flagella, at 10,000X magnification. At right is a schematic (and highly "mechanized") representation of a bacterial flagellum — the kind of illustration much beloved by both ID proponents and mainstream, machine-minded biologists.

In their rather nicely written textbook, *The Design of Life*,[5] mathematician and philosopher William Dembski, and molecular biologist Jonathan Wells — both writing as Senior Fellows at the flagship intelligent design organization, the Discovery Institute in Seattle — discuss the bacterial flagellum at some length. It is worth looking at an extended passage in which they enumerate the "hurdles evolution must overcome" in order to bring about structures of such "irreducible complexity":

1. *Availability*. Are the parts needed to evolve an irreducibly complex biochemical system such as the bacterial flagellum even available?
2. *Synchronization*. Are these parts available at the right time so that they can be incorporated when needed into the evolving structure?
3. *Localization*. Even with parts that are available at the right time for inclusion in an evolving system, can the parts break free of the systems in which they are currently integrated (without harming those systems) and be made available at the "construction site" of the evolving system?
4. *Interfering Cross-Reactions*. Given that the right parts can be brought together at the right time in the right place, how can the wrong parts that would otherwise gum up the works be excluded from the "construction site" of the evolving system?
5. *Interface Compatibility*. Are the parts that are being recruited for inclusion in an evolving system mutually compatible in the sense of meshing or interfacing tightly so that, once suitably positioned, the parts work together to form a functioning system?
6. *Order of Assembly*. Even with all and only the right parts reaching the right place at the right time, and even with full interface compatibility, will they be assembled in the right order to form a functioning system?
7. *Configuration*. Even with all the right parts slated to be assembled in the right order, will they be arranged in the right way to form a functioning system?

Keep in mind that the authors' concern is the evolutionary *origin* of the flagellum. They want to know: "Is the Darwinian mechanism adequate for coordinating all the biochemical events needed to clear these seven hurdles and thereby evolve the bacterial flagellum?" And they believe a positive answer would "attribute creative powers to the Darwinian mechanism that are implausible in the extreme" (pp. 184-6).

I fully agree. Dembski and Wells have pinpointed a critical problem for any evolutionary theory grounded in a machine-like understanding of organisms. Unfortunately, that includes intelligent design theory as it has been widely presented to the public.

What if the organism's intelligence is the real thing?

The problem lies in an indisputable fact: all the intelligence we could ask for is clearly already there in the living bacterium, which proves quite handy at growing its own flagellum. In doing so it must overcome a developmental version of all the hurdles listed above. It has to bring all the right resources together, in compatible form and at the right place and right time, assimilating them to the growing structure in the correct order, all while avoiding both unwanted cross-reactions and harm to other processes dependent on the same resources.

We are looking here at a sustained, almost unimaginably complex choreography in the face of all sorts of unpredictable variation and contingency. At the lowest level the narrative is a trillion-stepped performance that, in the history of all bacteria, could never have been carried out twice with exactly the same sequence of molecular interactions.

We are looking, in other words, at a present, effectively striving intelligence — a *forming activity*. If we don't really understand it — well, there are many things we do not currently understand, especially if we have preferred not even to acknowledge them. But we still observe what we observe.

Unlike most biologists, ID theorists do not resist the very idea of intelligence. I assume they will have no great difficulty acknowledging the creative, adaptive, improvising, presently active intelligence evident in the individual organism — an intelligence capable of surmounting in a living way the developmental version of the hurdles listed by Dembski and Wells. But, then, what are the grounds for claiming that this intelligence is inadequate for the kind of adaptive change we call "evolution"? What, exactly, is the missing ingredient?

I am not suggesting that we now understand how evolution occurs. I believe we are still almost wholly ignorant. But I do not see what intelligent capacities we can reasonably imagine are required beyond those that now so thoroughly challenge our understanding in the lives of all our fellow creatures.

Here's a way to think about it. Organisms are not collections of things, or parts. Every organism is an *activity* — the particular sort of activity through which its own, ever-changing parts continually come into existence and pass away. The organism is not a mere product, but is a living way of being. It gives rise to its own material basis. It is this living activity alone of which we can meaningfully say, "It has the capacity for evolution." *Living things are by their very nature powers of origination.*

This is what my colleague, Craig Holdrege, had in mind in titling a recent monograph, "Do Frogs Come from Tadpoles?"[6] The answer, in a critical sense, is "no." A tadpole is a prerequisite for the adult frog, but no one can look at a tadpole — or the egg preceding it — and see any physical/chemical necessity for the subsequent, dramatic, and detailed story of metamorphosis and transformation that yields the adult. At every stage a creative activity is bringing something into play that is not already wholly prepared for or determined in a purely physical and chemical sense — which is the same truth I was pointing to with my abbreviated depiction of RNA splicing.

This is also the truth that philosopher Ronald Brady was getting at when he wrote, "We cannot detect, in [organic] phenomena, the distinction between 'that which is to be vitalized' and 'that which vitalizes.'"[7] The material organism is itself a direct, unmediated manifestation of the power we refer to as "life." It makes no sense to detach this living impulse from its coming-to-material-appearance in the organism, then project that impulse upon an outside designer performing occasional tune-ups on supposedly independently existing physical "mechanisms." We never see such a separation, just as we never see mechanisms. The physical structures of the organism "precipitate" out of its intelligent *doings*, and they never become wholly fixed — they never achieve independence from those doings — until the moment of death.

According to a statement on the Discovery Institute website, "The theory of intelligent design holds that certain features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection."[8] But *there are no undirected life processes*, and the conventional attempt to conceive organisms and their evolution in such terms, being confused, should simply be rejected. Whenever we look at organisms, we find ourselves staring at active intelligence.[9] Surely this ought to affect how one argues about evolution.

When ID theorists do truly reject the conventional view with its scientifically extraneous materialist metaphysics — when they recognize that every organism is through and through a play of its own wisely directed activity — then the main foil for the ID argument will be gone. It will no longer make much sense to elaborate arguments aimed at proving that such-and-such a conventionally conceived process cannot, in the end, achieve this or that evolutionary result except through an appeal to a designer's intelligence. For the fact is that the conventional conceptions fail at the very outset. They fail by refusing to acknowledge the intrinsic intelligence without which not even the most basic biological activity is conceivable.

The task I would recommend for the intelligent design theorist, in other words, is not to confront science with an outside Power that must periodically intervene in order to make up for the world's "deadness." Rather, it is to transform this science from within, by overcoming the bias that refuses to acknowledge intelligent activity where we actually see it.

An irrepressible recognition of agency, misplaced

Intelligent design theorists at least recognize the fact of intelligence in general. But because most of them have accepted the image of the engineered machine-organism, they have shifted the living locus of this intelligence to an external Designer. As for conventional biologists, they would like to deny the very idea of intelligence, at least as a living power rather than as a lifeless design imprinted upon machine-like organisms. And so they shift the source of this intelligence as far as possible to less obvious, less sentient, and less threatening places, where it doesn't belong.

One of those sources, noticed by a few observers over the past century, consists of sovereign molecules such as the gene that, according to geneticist Sean Carroll, "sculpts the form of [a fly's] hindwing."[10] Commenting on the way the germplasm of his day was being pictured (it was then on its way to becoming the genetic material of our day), marine biologist E. S. Russell wrote in 1930 that "Aristotle would have recognized in this almost mystical conception something strangely like his 'soul'!"[11]

Three decades later the eminent cell biologist, Paul Weiss, referred to "current hopes — or illusions — that it might be possible to pinpoint in the cell a master compound 'responsible' for 'life' — an obvious reversion in modern guise to animistic biology, which let animated particles under whatever name impart the property of organization to inanimate matter."[12]

In our own time, philosopher of biology David Scott Robert observes how, with the demise of vitalism, the "*animistic* (and otherwise problematic) idea of a genetic programme" took its place.[13] Likewise, in an article entitled "Biologists Behaving Badly," developmental systems theorist Susan Oyama seems perplexed by the creative and almost mystic role assigned to immaterial information and programs by some of the most influential biologists and philosophers of biology. Many of them, she notes, "wish to convince their readers of the absolute sufficiency of materialism, the absurdity of anything else." But then, "If you find the formulations of past vitalists (and present theists) so devoid of reason, why would you adopt so much of their conceptual and lexical infrastructure?"[14]

All this testifies to the fact that the organism's native intelligence — even, or especially, when observed at the molecular level — is so obvious that no one manages to describe living activities as if it were absent. The problem is that biologists have attributed this intelligence to specific molecules via terms such as "control," "regulate," "information," and "program."

This sleight of hand has been rather easy to pull off because the supposedly controlling molecules are indeed *caught up in* an undeniably intelligent performance. The deception lies in the fact that molecules as such are not intelligent agents in the required sense. They cannot direct the *storyline* of activities such as RNA splicing. The relevant agent — the organizing center of the life performance — is the

organism as a sentient, cognizing, living whole. This whole cannot be described as the causal result of its parts, since the parts come and go — and even gain existence in the first place — only through the coordinating powers of a whole that cannot be identified with any particular collection of material substances.

A "higher" designing power

But controlling molecules are not the only vessels for the biologist's misplaced agency. The idea of information, along with that of the genetic program, coheres wonderfully well with the notion of natural selection as a kind of higher, orchestrating power hovering above the collective life of organisms and directing their evolutionary advance. This power is often projected upon a programmatic logic, abstracted away from organisms themselves. In philosopher Daniel Dennett's succinct formulation, "evolution will occur whenever and wherever three conditions are met: replication, variation (mutation), and differential fitness (competition)."[15]

Dennett refers to this as a mindless recipe, or *algorithm* — one that could be derived even without reference to organisms, while nevertheless offering "guaranteed results" in biology.[16] The algorithm, according to Dennett, is "Darwin's dangerous idea" and, its wholly abstract, materially indifferent character notwithstanding, it is the key to making sense of everything from the simplest irritable cell to human meaning, cognition, culture, and morality.

But the fact is that logical abstractions such as program instructions and algorithms do not *do* anything. The only doers in the picture are the organisms that Dennett considers scarcely relevant to the evolutionary algorithm. So if we think the logical structure of natural selection tells us much of interest about what actually happens in the history of life, it can only be because we think we already know everything living beings are up to. We know how they will, with no surprises, collectively "execute" the algorithm.

Of couse, the prevailing assumption is that they are not up to much of anything at all. They are straws in the wind, driven this way or that by the environment and subject to random, "cosmic-ray-induced" mutations, which they mindlessly pass on to their offspring.

Yet the story of evolutionary studies has been one of continual surprises. Many of these reflect the fact that *nothing* in the organism is any more random or undirected, any less a kind of purposeful striving, than those activities of RNA splicing we looked at earlier. For example, organisms possess unthinkably complex and directive capacities for managing exactly what form mutations take and how those mutations get assimilated into genomes. As evolutionary biologist Arlin Stoltzfus has remarked, "Heritable variations generally aren't chemical accidents, but programmed responses catalyzed by enzymes acting in complex pathways, sometimes induced by genomic damage or cellular stress ... The more one learns about mutation, the less one thinks of it as a series of accidents."[17]

To say that "natural selection did it" is just as much a refusal to investigate the actual life of organisms as to say "God did it." At the same time, biologists do carry out all sorts of empirical studies that illuminate what organisms actually do. These are where understanding arises, and it is a real question whether the obligatory casting of the findings in terms of natural selection has ever added much at all to that understanding.

Beyond "science-denial" and the machine-organism

I am convinced that, for the population at large, much of what evolutionists call "science denial" is not fundamentally a refusal to "believe in evolution." It's just that many people recognize what is overwhelmingly obvious — namely, that the activity of living beings is meaningful and purposeful. When they are told that life results from a series of lifeless and meaningless evolutionary events, they simply can't believe it.

Intelligent design offers these people an alternative. And one thing that makes the alternative attractive is the fact that the leading exponents of the theory have not abdicated their critical faculties. Mainstream biologists, on the other hand, especially those who question the dominant forms of theory, must proceed in fear of crossing an ill-defined (and potentially career-ending) line and sounding "ID-friendly" — a constraint perhaps more severe than that imposed by the church upon Galileo.

Yet criticism, along with some fresh, creative thinking, is certainly needed. How little we know about the most basic evolutionary questions is not often acknowledged. The blank spots include the fundamental problem of macroevolution (how does it occur?) and, specifically, the origin of body plans. There is also the difficulty of knowing when, today, we are ever actually looking at *evolution*, as opposed to the many forms of plasticity, including genetic plasticity, that seem to be features of a healthy species regardless of any evolutionary trajectory it may be on. Actually, there may be no clear distinction between these two things, since evolution can hardly be anything *but* the continuing, plastic, adaptive activity of communities of organisms within their changing and challenging environments.

So, then, what is my advice to the adversaries in the "evolution wars"? Just this — first to ID theorists, based on my

(admittedly limited) understanding of the religious convictions common to most of them:

"Consider what you mean by the 'breath of life', or by the 'creative Word' through whom material stuff is said to come into being as living speech. Do these images from your own traditions not provide a far more reasonable foundation for your thinking about the evolution of living things than the woefully inapt model of the human engineer merely manipulating already existent stuff?

"In other words, are not the meaning and purpose you seek to understand manifested *in the world* rather than somehow impinging upon the world from a place apart? You could perform a tremendous service, helping to reshape contemporary biology, by drawing forceful attention to this meaning. You imagine that a Designing Power, in ways more or less unknowable by us, has acted *upon* the bacterium, making its flagellum possible. Why not shift your attention to the power of life we can observe, here and now, acting *in* the bacterium, making its flagellum possible?

"This in no way conflicts with any convictions you may hold regarding a transcendent creative power sustaining the universe. It is merely to say that what we observe on earth is a power of life immanent in the organisms around us. Presumably you believe not only in the transcendence, but also in the immanence of the creative power. Surely whatever we know about this power can only derive from that which is immanent and therefore accessible to us."

And my advice to conventional evolutionists: "When you confront those who cannot accept your metaphysical appeal to the 'meaninglessness' of reality, do not stoop to insults that demean your profession. Better to leave your critics alone. Better still would be to learn from their criticisms how to make your own case more convincingly.

"And if, quite apart from intelligent design theories, you are inclined to dismiss references to intelligence, consciousness, and purposeful activity as 'unscientific' or 'vitalistic' or 'mystical', perhaps it would be worth checking in with your respected colleagues in the various disciplines of cognitive science. Many of them today are arguing vigorously, vibrantly, and without much constraint over matters of consciousness, meaning, and purpose — all topics that might seem to reside at the heart of biology. Why can't evolutionary biologists be given the freedom to consider these aspects of life, not as things to be explained away, but rather as key elements of their understanding? Would there not be a hint of what you call 'science denial' in any effort to declare the exercise of such freedom out-of-bounds for respectable investigators?"

NOTES

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