

Intelligent design and biological complexity.

Gene 2006 Emile Zuckerkandl (condensed version)

Abstract

Before any intelligence can appear ... there first has to be something intelligible ... "creation" must already have taken place. The general and permanent spectacle of nature's spontaneous tinkering with ... informational macromolecules ... suggests an absence from evolution of design and intelligence. The complexity of biological systems can increase spontaneously.

The intellectual virus named "intelligent design" is a problem.

The "creationists" ... have decided ... to present themselves as scholars in defence of a legitimate alternative scientific theory, intelligent design.

They foster on society a mistaken concept of what is science and what is not. Without this distinction ... we resume in a deeper sense a life of intellectual cave-men.

Creationists ... share the belief in an almighty person ... who intervenes repeatedly, not only in the particular experiences of individuals, but also in the world of observable phenomena ... the beginnings of the universe, the beginnings of biological systems, and the beginnings of humanity.

Believers in Intelligent Design make room for its interventions at further points of biological evolution.

Even when it is accepted, not only that the world and the beings in it evolved, instead of being created, but also that evolution was propelled exclusively by its inherent mechanisms – even then, many will still postulate that a supreme intelligence had to be at the origin of it all.

Plainly, the "solution" of a higher intelligence presiding over the world, in whatever way it presides, introduces greater riddles than it solves.

Being urged to keep an open mind, about whether there has or has not been biological evolution, is a comical invitation. It is equivalent to being urged to keep an open mind about whether the earth is flat or round.

Intelligent design is a consideration extraneous to science, that cannot affect science in the slightest. The effects of the results of science on religion, are in some ways considerable, if slow in making their way. The effects of religion on the results of science are nil, and can only be nil.

Two related misapprehensions ... that biological evolution is a theory ... and that biological evolution is merely or primarily "Darwinism" start the whole discussion on the wrong foot.

"Evolution as a theory", reduces science to incertitude, and, evolution as an "ism", reduces it in practice to an unscientific belief.

Use of the word "Theory" seems to be in keeping with the "theory of relativity", since the theory of relativity indeed, seems to continue to be on the look-out for further confirmation.

For many decades, now – and this is worth pondering -- *no biologist in his right mind has been out to confirm the existence of biological evolution*, given the overwhelming amount of evidence, and of kinds of evidence, in its favor. Biological evolution as a process is now too certain for being considered a theory.

Few historical facts are based on more evidence, from more distinct sources, than evolution is, which, in addition – as an extra-bonus, one might say – is supported by contemporary experimentation and the observation of contemporary processes.

As to "Darwinism", what started out as someone's theory, has meanwhile been transformed into an established *field* of science or *discipline*. It is time routinely to refer to the field, rather than to its originators.

The basis of an established scientific field is not questionable: ... A field would have collapsed long since, were it not based on extant phenomena.

Internal contradictions of intelligent design

How could any intelligence be readymade?

No intelligence can be formed unconditionally, without having dealt with *something*. Because intelligence is relational in character, it cannot be present unless there is something to be understood.

An intelligence, that has been developed by nothing, because there was nothing, and whose fully-fledged, mature state, has been engineered by nothing, because nothing else existed, can only be nothing, truth be told.

An intelligence, without a “creation” that predates it, is in fact an impossible entity. Evolution and (in biological systems) development are so pervasive a condition for *existing* – for anything existing -- that one may bet that this condition extends to the presence of intelligence.

How could such an impossible non-developed intelligence be endowed with infinite power? ... The only remaining logical position would seem to be, that the power of this intelligence, could be exercised only by a sort of extra-natural *person*. ... If this implication is to be avoided, because it would entail an affirmation of God, the only remaining theoretical solution to the problem, is to hold that no power at all was exercised by the higher intelligence.

The claim of the proponents of intelligent design, that they are not talking about a God, is a false claim.

Unintelligent “creation” cannot be envisaged by people of faith, because it would not be divine, and the notion of “creation” would apparently have no meaning at all, except as nature acting.

This applies whether the higher intelligence is supposed to have guided creation over all its phases, or only to have set it in motion from first principles.

A direct implication of intelligent design, is that it could only have been carried out by a God.

A standard response ... when hard-pressed, they proclaim that it is all a mystery. Existence already *was* a mystery, before people of faith further deepened it, and solving a mystery with a mystery is no solution.

Religious talk is designed to give us the impression that we are going to be spectacularly enlightened, but then, at the critical moment, when questions about coherence of thought are raised, the conversation is shut down. The talking that preceded, was thus illegitimate. The right to mysteries, is a right to silence, not a right to incoherent talk.

The fact that *we do not understand* the basic problem of being, is no excuse for giving an answer that is false. I think contemporary biology supports the claim that intelligent design is a false answer.

Biological complexity and the Higher Intelligence

What would be the general distinctive character, of something designed by an intelligence, when contrasted with the products of nature? Would it be increased complexity? No, it would on the contrary be increased simplicity!

It is simplicity that is, much of the time, a hallmark of actual intelligent design. Nature *is* extremely complex, and that's the very reason we can guess it was not deliberately made.

We may be well inspired to retreat, from the ancestral habit, to invent a God every time we don't understand something.

We have progressed along the path of understanding nature exclusively, thanks to the relative simplicities in relationships, that science uncovers.

The biological world can be apprehended only through the complete set of its levels, from the informational macromolecules up.

Phenomena at the higher levels are not deducible, from phenomena at the lower levels, and vice versa.

Informational macromolecules have key properties that put them, at the entrance gate leading into living systems – a gate outside of which there likely is, and can be, no other access to life.

Informational macromolecules form from an extensive linear alignment, of a limited number of distinct building blocks. Genes and their regulatory factors function within cells as guides of molecular interactions.

Intermolecular self-organization is a quite general phenomenon and does not require the presence of macromolecules.

Macromolecules are transported directionally within cells, by various types of “molecular motors” and along fibrils of aligned structural proteins.

There is intimate interplay between distantly directed, and locally directed, higher-order molecular interactions, which are both the result of relationships and forces, built into the materials – the result of a self-generating system.

Here nature should apologize to Intelligent Designers for being so complicated.

The presence of regulatory factors, interacting with genes, which are controlled by the genes while controlling the genes, represent one of the fundamental conditions for the functioning of the genes.

DNA on the one hand, and non-DNA informational macromolecules on the other, form a duality in which *neither side has in fact causal priority*, a circumstance that has not been acknowledged forcefully and generally enough.

The information contained in these sequences is, in general, much more meager and less unique than information expressed in the factors themselves, and in the complexes that they form.

Of course the information for the structure of these factors and factor complexes, is indeed contained in some other sectors of the DNA, but that other DNA inscribed information does not suffice, either for setting up any even infinitesimal rudiment of a biological system.

In the absence of interacting factors, there is no usable information in DNA. Hence there is nothing in DNA that would deserve to be designated as biological information. DNA requires factors, in order to specify information, and factors require DNA in order to be specified. This *circularity* of macromolecular interactions during development is fundamental for all that is living – it may well be a general condition for life anywhere in the universe.

Nothing in every day life evokes the nature of life.

Many are unperceptive enough to feel that nature is limited to the perceptually familiar and that the unfamiliar must therefore bear the stamp of the supernatural.

Genetic information as carried by informational macromolecules is made out by certain proponents of intelligent design (Johnson, 2001) to be in a way a portent of divinity, because of this information's "irreducibility". "The information encoded in DNA is fundamentally distinct from the chemical medium in which the information is recorded"

It is this alignment of building blocks that carries "information". Changes in the sequence of the building blocks happen, chemically, by a manifestly unintelligent process. The information in such arrangements is no more a substance, let alone a divine substance, than are correlations.

Genetic information is used in living systems for forming a copying machine thus making complex structures reproducible.

The history of the universe clearly teaches us that complexity increases progressively. After initial complexifying processes as the universe began to expand, islands of greater

complexity formed and life eventually appeared in at least one of these islands, in the solar system; nebular address: a certain spot of the Milky Way.

Very probably, life in fact appeared in a great, great, great many more than one location in the universe, and at various periods of the universe's history.

The higher Intelligence postulated by the Intelligent Designers thus would be *the only complex entity in existence that would not have been formed progressively*. In this capacity, as suggested, it would represent an anomaly – something like a pathology of the state of being, an absurdity.

A thing or a being that is not the result of an evolution may be a contradiction in terms.

Evolution, here, is taken in the sense of the progressive building of more complex structures from less complex ones. The claim may be made that evolution is a necessary condition for being, so that non-evolved beings are intrinsically impossible. It may be a truth too fundamental for having as yet been discovered.

“God is not possible because, possessing all his infinite degree, He was not able to evolve.”

If complexity is a problem for naturalistic explanations, *the higher Intelligence itself is first to have to face this problem*.

Design does not solve any problem posed by complexity; it only transposes the origins of complexity from the observable to an unobservable world and makes these origins inaccessible to inquiry.

There are many aspects of complexity to consider: the number of different genes; the number of different gene transcripts; the number of regulatory factors per gene; the distribution over the genes of these numbers of regulatory factors; the number of genes controlled by any one regulatory factor; the distribution of such numbers of genes controlled per regulatory factor; the number of distinct *cis*-acting regulatory elements per gene and per functional category of genes; the number of members in different families of genes and in different functional classes of genes; the total number of distinct gene interactions that, at any organismal time and site, occur in living forms as a whole; the quotient of this number, divided by the total number of genes; the number of developmental genes, subject to the mode of gene control related to the sectorial control of the Hox genes; the number of terminal differentiation genes, subject to gene control in the manner of the sectorially regulated ovalbumine genes; traits of the structure of gene interaction programs, such as the density and topology of gene interactions; the number and distribution over these programs of gene circuit cells – interaction modules of distinct character among small groups of genes; the number of forward steps of regulatory interactions per developmentally

deployed subprogram of gene interactions; the molecular foundations and supramolecular organization of chromosomal behavior; and at higher levels of biological integration, the number of cell types represented by the number of semi-autonomous gene interaction programs that get instated and distributed over the organism in the course of development and are carried out by distinct and stable cell clones; further yet, in an even more abbreviated listing, the number of morphological characters, the number of physiological systems, and many different aspects of these.

Cumulative complexity is the greater as the hierarchy of complexity levels becomes more differentiated.

When progressively higher levels of biological integration are considered, the numbers of distinct components, and the numbers of their interactions *decrease*.

For example, there are fewer gene interaction “programs”, than there are gene interactions; fewer cell types, than gene interaction programs; and fewer physiological systems than cell types.

Complexity at the level of the individual is equal to just 1 and is the same for all organisms.

We can see right away how complex the question of organismic complexity is. Total biological complexity of course goes even much further, with population and ecological complexities coming into the picture, as well as the complexity of societies of particular organisms.

Biological processes cannot be put together from scratch – they cannot arise but by a process of evolution, whether natural or artificially produced. Any biologist should by now be able to perceive that it is absurd to postulate an Intelligence that would be able instantaneously to come up with and properly combine the ingredients of a living organism without making use of time as an essential dimension.

No power can put the components of a living system together in the proper relationship without a recourse to time.

Kronos is a God who cannot be denied by any other God.

It is inherently and absolutely unavoidable in order for life to be able to be present that *successive* events occur.

Time and change as unavoidable conditions of existence would have had to impose themselves upon that “higher intelligence”.

Life in particular could under no conditions be created instantaneously – biology makes this abundantly clear, life can only result from a *history* -- no God can be almighty.

"Irreducible complexity"

“Intelligent designers” arbitrarily set some vague limits to the degree of complexity that nature is capable of reaching by herself.

The resulting world is thus supposed to represent a remarkably muddy mix of the natural and the supernatural.

"Irreducible complexity" has been altogether discredited. One of the irreducibly complex organs is supposed to be the eye.

Molecular analyses uncovered master control genes shared by vastly different organisms. The same set of these regulatory genes presides over the development of eyes along very different lines of animal descent. The action in the descendant organisms of at least roughly conserved regulatory genes, often results in quite different formations, such as the composite eye of an insect and the camera eye of a vertebrate. Evolutionary *divergence* among very different eyes is reduced and all partly traced to the same or very similar genes, and an extraordinary unity in the principles of eye formation pervades the animal kingdom.

The evolutionary *convergence* among similar eyes such as those of the octopus and those of mammals, two groups that both have camera eyes, that evolved independently is reduced. The genes of an octopus and a mammal, had been thought to have evolved from independent origins. In fact, in organisms like Octopus and mammals, many highly similar genes are at work. Genes, or at least the domains that compose them, are mostly extremely old objects, and also extremely old, no doubt, are a number of their interactions.

Today we realize that the independent evolution of similar very complex organs can seem unexplainable, only as long as we remain ignorant of the unitary nature of molecular and supramolecular processes, that are responsible for development -- ignorant of the frequent, long-term conservation in evolution not only of particular genes, but of particular gene interactions.

Gene duplication is a very widespread source of somewhat differing editions of a gene. Ancient modules of gene interaction can indeed be re-used in countless re-editions, in distantly related organisms, and the same organism during widely different phases of its development.

Regulatory convergence in gene circuits, and the particular sets of regulatory connections among genes, that the circuits represent, is “easy” for evolution to produce. This is primarily thanks to regulatory DNA sequences, geared to the binding of particular regulatory factors, being short. Thus they can frequently be locally generated by mutation, or by retrotransposition processes and other events.

Here, convergence can be considered as merely the mark of regulatory optimization shared by very different organisms.

With convergence on one level being plausible (optimization of regulatory patterns), and implausible appearances of convergence on another level being erroneous (the independent origins of large sets of genes giving the same phenotypic results), no room is left for any aura of finalism or supernatural intent.

The re-use of gene interaction modules is offered by the evolution of leaves in plants. Relatively simple macromolecular interactions among products of regulatory genes (or their duplicates) had established many hundreds of millions of years ago some function different from leaf formation – possibly shoot branching.

There is evidence that a macromolecular interaction system set up at that time was subsequently reused for the function of generating leaves. Leaves appeared at different periods of evolution in widely divergent, originally leafless forms of plants

No need for any intelligence, the process of *parallel evolution*, (namely, of independent evolutionary processes of the same kind) appears to have been founded on pre-established gene interactions, that had to be modified only rather modestly, to lead to similar novel developments.

There was hardly any need for evolving new genes, except probably in the sense of somewhat modified duplicates of old genes.

For the minority of “intelligent designers” who have any true interest in biology it is important to realize that much of the evolution of biological forms is primarily attributable, not to new types of genes, carrying out new kinds of physicochemically defined functions, (such as for example those of hemoglobin to bind oxygen reversibly), but to *regulatory changes* in the genes, and to new relations among regulatory genes like the timing and location of manufactured products.

Morphological evolution can occur either very slowly or relatively quickly.

According to intelligent design, the “Cambrian explosion” of new forms of organisms – the sudden appearance of new body plans among animals of the Cambrian era -- was too rapid to have taken place by natural means.

The Cambrian explosion was apparently limited to particular groups of phyla, and it may well, not have been as limited in time as commonly believed. The striking extent of precambrian animal evolution is now becoming apparent.

The era designated as that of the Cambrian explosion may well have been a period of relatively rapid evolution. The “intelligent designers” theme song is that the unaided powers of nature were exceeded here in that too many “novel proteins” had to be invented over too short a time.

Comparatively little structural novelty in proteins is required to make markedly different organisms.

The Cambrian explosion, to the extent to which it took place, probably was not based on the sudden appearance of an important proportion of radically new proteins, rather on a rapid variation and differentiation among regulatory networks.

Such changes can be generated simply by mutation or, by the insertion of binding motifs-carrying retrotransposons. In principle, rapid diversification events in developing organisms, can result from changes in the pattern of gene regulation.

One may infer that the Cambrian fauna apparently displayed simultaneously the right degree of *complexity* of interaction among early developmental genes and the right degree of *simplicity* in the overall hierarchical order of developmental gene interactions in order for rapid evolution in body plans to occur – quite *naturally*.

Functional novelty can also originate with a novel protein structure rather than with some regulatory reorganization; or both features can be united via some major structural innovation in a regulatory protein.

We are in most instances still not dealing with the making of new proteins from scratch. We observe modifications in the linear sequence of the components of old proteins, or the building of new proteins, largely from parts of old proteins. These protein domains are structurally compact, and might often have originated in a very distant evolutionary past as independent functional units, that were later combined to form larger more complex proteins.

Using old parts for creating new composites. domain combination, is part of an organism's endless game of tinkering with preexisting functional components.

Nature does its serious business as though it were constantly at play.

Behe claims that the evolution of the bacterial flagellum is impossible without special divine intervention.

Processes envisaged at present to have participated in the evolution of flagella are horizontal gene transfer (the transfer of genes from one organism, primarily microorganism, to another), different combinations of protein domains within proteins, and foreign symbionts fully adopted by cells and integrated.

The deepest split in eukaryote evolution is characterized, by the use of different myosin molecular motors. A multiplicity of cellular motors have been generated during eukaryote evolution. Gene duplicates of the molecular ancestor of the protein dynein, which participates in molecular motors, have diverged into dynein descendants endowed with different flagellum-associated functions, suggesting pathways of origination of these functions.

Nevertheless, flagella can have quite different protein compositions, organization, and modes of formation. Such a multiplicity in itself fails to suggest that setting up a complex molecular motor requires a miracle.

To To imagine that each component of a molecular motor had to be guided by a little angel in order to conquer its place under the sun is medieval in concept, and not in any respectable sense.

No evidence whatsoever is emerging that any of the processes involved in the evolution of cilia and flagella are unique.

The presence of a large number of relatively recent gene duplicates, in part provides the observed resources, of functional redundancy, and the potential for alternative versions of related complex functional subsystems. This provides the basis for the evolution of variable molecular machines, of similarly high complexity.

To make a bacterial flagellum, well over 200 – perhaps up to 600 -- proteins seem to be required. “In the absence of almost any of the proteins” says Behe (though he is far from having data on the more than 200) “...no functioning flagellum is built.”

In a simpler ancestral flagellum, the interacting proteins, though probably often homologous to those in contemporary flagella, would inevitably have differed from the contemporary ones in their amino acid sequences and in the range of their functions.

The sequence divergence of flagellar proteins has been extensive during evolution. The ancestral proteins would nevertheless have contributed to a functional system endowed with some of the properties of the later flagella.

This sort of relationship between past and present, in one version or another, would be envisaged by any scientist who does not suffer from an intellectually dangerous condition, the divine jumping disease; namely, the irresistible urge, upon the slightest provocation, to jump into God.

In due course variant flagellar systems will continue to be analyzed, and at least some of the probable stepwise evolutionary phases of flagella will be established. Today such phases – though well thought out and already sophisticated -- are only hypothetical.

Promoters of Intelligent Design will then scramble to identify other complex functional systems whose genesis will not yet have been adequately determined.

The flagellum is deemed too complex by advocates of intelligent design, for their own intelligence ever to have a chance to understand it, in terms of the mechanisms of its developmental and evolutionary formation, and of the evolutionary and functional histories of its component parts.

The protagonists of intelligent design appear to believe that they would remain incapable of such understanding, even after a large amount of further necessary research has been performed. The greater their perceived need is, to appeal to a higher intelligence, as having necessarily to intervene in the genesis and functioning of the living world, the less intelligence they seem to claim for themselves.

They obviously have a low opinion of both the resources of nature and of those of their own minds. It is conceivable that some of them have a point in this second respect, but as to nature, they surely underestimate it.

Molecular biology makes “intelligent design” look foolish

Francisco Ayala (2004) has written: “...The ‘design’ of organisms is not ‘intelligent’, but rather quite incompatible with the design that we would expect of an intelligent designer.”

God brought *evil-doing* into the world when he devised animals that feed on other animals. The horrific pain that living beings inflict upon other living beings is part of a world created by a “good” God? Good God!

Observations made at the level of the informational macromolecules and their interactions do not suggest that living systems have been built up thanks to the insights and decisions of a master engineer.

Why would God tinker? Doesn't He know in advance the biological pathways that work? Isn't a tinkering God one who loudly says “I am not”? And why would He say so if He existed?

The nature, potentialities, and limitations of biologically successful results are provided by the properties inherent in the previous state of the evolving system and by the developmental phases and spatial sites targeted by the macromolecular changes. Evolution is thus constrained by preceding evolution, but unexpected evolutionary opportunities can arise.

The use of parasites for manufacturing higher organisms was either the idea of an engineering genius, unafraid of offending political correctness or, much more probably, it was an episode of tinkering with any and all available components of a system.

There is such lavish tinkering with DNA sequence motifs that bind transcription factors, that one might incur mental fatigue from the mere consideration of it.

All reported changes are much better explained by the paltry “lower” powers of matter than by “higher” powers. Promoters of intelligent design do not realize how high these “lower” powers really are; staggeringly high, in terms of their creativity and the originality and wealth of forms, that they produce. By contrast, in regard to the world of phenomena, the reputed highest powers bestow upon us tons of further mystery, but not an ounce of solid understanding.

Both tinkering, and the conforming of events to natural laws, and built in trends, are blind processes. That the processes along this pathway were indeed blind, was not as clear as it is now, until the informational macromolecules, and their interactions, became known through the study of molecular biology, molecular evolution, and the molecular biology and evolution of development.

Before the unfolding of these disciplines it was, in my opinion, erroneous, but less patently so, to hold on to some form of the old concept of finalism as the driving force behind biological systems.

Biology has not yet told us some of the essentials about how this astounding adaptive and coadaptive evolution works. Predictably, the mutation-selection mantra will some day be recognized to have been correct but incomplete.

Whenever a scientific answer is not yet in, religiously minded metaphysicians rush to fill the void. Science without fail has chased them in the end, yet they do not learn their lesson. People of “faith” invariably plant their flag, on territory toward which science is marching, but that it has not yet reached.

In the end, metaphysics just as invariably, has to pack its bags – beginning with the interpretation of the rainbow’s origin.

The process is mostly one of progressive reduction of an all encompassing territory that religions had confiscated in bulk, no doubt at the dawn of human time, with each of the thousands of different religions, claiming for itself, absolute and eternal truth – a claim whose implication for the truth of any particular faith, is a prime target of Freudian repression in contemporary believers. In the course of its advances, science does uncover new territory that religions can then undertake to invade.

There are, in science, the areas of incertitude. Examples of a crass uncertainty are the unification of quantum theory with the laws ruling the macroscopic world; the integration of gravity, along with the other fundamental forces; and the macromolecular conditions, under which a nascent, very primitive potentially “living” system can receive the go ahead, for presiding over further phases of biological evolution.

It cannot be excluded that a measure of incertitude will be permanent in some important areas of science, but such areas would be definable only at some point in a rather distant future because the development of science requires time.

An inconclusiveness of science’s objective analytical approaches, to some fundamental aspects of the universe humanity, in the end, would condemn humanity to return to fantasizing, which was of course what she did first, and what she still is largely doing today.

The only alternative, agnosticism, is unbearable to most. Consistently choosing against agnosticism, humanity dug herself into “faiths” like a blind leech into flesh and won’t let go. Feeding like leeches, on irrational beliefs, and holding on to these beliefs at all intellectual and other costs – and at the cost of a momentous and continuous carnage -- is a deep-seated human proclivity.

Biology will be the most unlikely entry point for a new metaphysics. Biology is located in the least metaphysics prone middle of times and in the best mastered of the dimensions. Under these conditions, among all evolutions, biological evolution may well be among the best knowable.

That judgment most definitely includes the question about the origins of life.

One of the ingredients needed for turning a nonliving into a living system will be time.

As life originated, the critical innovations had to be molecular, because only molecular and lower than molecular systems existed;

Molecular copying was a first within the evolutionary process as it took place on earth, probably after it had occurred in a great many other locations in the universe.

The ability to be copied must have been shared by multiple relatively stable macromolecular *sequence* variants that exercised a range of different effects.

The molecules, again, were and are the informational macromolecules ... with the capacity to form reproducible folded structures in space ... and to produce offspring.

The macromolecules and their effects had to be adequately durable in order to form a system that could be built up and reproduced before falling apart.

After countless trials, a system was found whose descendents were able to lead to the formation of organisms.

There are no rational grounds for proclaiming, that the first informational macromolecules, could not grow out of preexisting molecules, as any state of matter, grows out of a preceding state.

During the evolutionary development of a molecular sequence-copying machine, its lower specificity would have ensured its higher probability.

The task today is experimentally, to establish circular mechanisms, whereby the approximate copy making of a spontaneously arisen simple informational molecule, produces a catalyst of this copy making.

Before precise molecular pathways have been established, probability calculations regarding living systems are meaningless, and thereafter they are changed from meaningless to superfluous, since a satisfactory probability of certain reactions will have been established by their very occurrence.

A molecular pathway to spontaneous increases in complexity

If simpler organisms can “make” it in an ecological niche, why would other organisms need to be more complex in order to survive in the same niche? Why would any organism tend to be more complex than bacteria, which, by their numbers and their persistence, may be considered the epitome of biological success?

Perhaps some elementary molecular process is capable, as it were, of chaperoning spontaneous processes of complexity increases.

No supreme intelligence would be needed for bringing about such a sequence of events.

The rate of duplication of individual genes is said to be of the same order as the rate of mutation per nucleotide site of the DNA. New genes per genome per generation are in the hundreds.

An intelligence requisitioned to place itself at the source of such processes would play the role of the fly that by harassing the horses comes to believe that it is driving the carriage.

According to many people, increases in the complexity of organisms, especially when the origin of humans is involved, if not directly carried out by a supreme intelligence, must, at the very least, express the intent of such an intelligence.

Yet, we can see by examining part of the process from close up, and even by merely considering, a still hypothetical mechanism that, given the laws of nature, no intent of a superintelligence needs to be postulated to explain evolutionary increases in complexity.

Sophisticated “strategies” in living systems

None of this is to deny that there are analogies between the workings of intelligence and the workings of nature. These analogies are sharpened when one considers interactions at higher levels where complex events are played out as whole little dramas.

Nature gives us the permanent spectacle of biological arms races.

One argument that the advocates of intelligent design advance in such cases, is that individual steps of a developmental interaction system, cannot always have evolved singly, and that their simultaneous generation requires intelligent guidance.

In fact, it has been possible to show – as Darwin himself already did -- that the components of a complex process, can have arisen successively, even when at first it does not seem plausible that they can.

At times -- though, because of the versatile multifunctionality of proteins, surely not as often as tends at first to be assumed -- two or more structural features, probably do need to evolve simultaneously, or in very rapid succession, for a higher-order structure and its function to be realized.

The arguments presented by proponents of intelligent design are invariably amiss.

There is a universe its laws happen to be astoundingly compatible with life's occasional – and probably frequent -- appearance and with the corresponding states of especially high complexity of matter. (In this context, “occasional” and “frequent” are synonymous.)

Yet, the claim that the facts of biology suggest intelligent design continues to be further eroded as our understanding of molecular biology, molecular evolution, and the molecular bases of development increases.

If there is a design and the design is intelligent, the intelligence in question must have resolved to act through methods that are brainless, as closer scrutiny reveals. One can stare open mouthed at the overwhelming potential of universal “dumbness”.

Faiths, very frequently, seem indeed to have the inherent propensity of setting and steadying the directions of human hatred. On the other hand, faiths produce marvels of empathy, capacity to console suffering individuals and to make death more palatable.

In sorting out the curses and blessings of faith, "intelligent design" plays the role of offensive little swarms of insects, that more and more fill the air, and must be taken care, of by spraying biological knowledge, before they multiply explosively, and threaten civilized life – or its possibility.

The Great Designer has failed to design humans that, en masse, would do better than produce civilised life in tainted varieties.

Closing perspectives

We witness in nature the greatness of the potential of its underlying regularities. Why it is so great is unknown. Claims voiced by so many, that they have been privy during recent

millenia, to the beginnings of an answer, to the question, namely a “revealed” answer, testifies to Homo sapiens’ gigantic gullibility.

Chance may designate the incidence of individual processes whose necessity has simply not been determined or may not be determinable without disturbing the spontaneous events themselves; alternatively, chance may imply that no necessity underlies a particular observed event.

Scientists often emphasize the role of chance in evolution. Chance offers the *opportunity* for developments to occur, whose basic mechanisms, are not defined by chance.

Just as, on earth, certain forms of organisms have repeatedly evolved independently (e.g. placental and marsupial “wolves”, “bears”, and “rats”), it seems highly probable that species endowed with an intelligence similar to that of humans evolved elsewhere in the universe, even though, one may presume, hardly in our galactic neighborhood and hardly in the exact image of humans.

Though evolutionary pathways must be greatly variable on different planets, an innate trend in living systems toward increases in complexity, may be constantly present. The belief in a general (if each time highly localized) trend in the universe, toward the appearance of intelligence, as a late result of evolution, may well turn out some day to be clearly supported by biological science.

The most remarkable aspect of the history of the world is not intelligent design, but the dumb design of intelligence – namely, of intelligence arising from the nonintelligent.

Theists may assert that, in the end, only an intelligence can produce an intelligence, and that, therefore, the laws of nature that lead to the evolution of intelligent organisms, must have been devised by an intelligence.

The premise of this inference, is contradicted by nature, since nature is in the process of showing us, in detail, how intelligence – the intelligence, notably, of humans and other mammals - can be produced in the absence of intelligence.

The human mind just cannot stand the absence of answers to its biggest questions, and so invents answers anyway.

All we know is that experiential worlds arise, (no doubt at different galactic times and places) long after the universe’s origin, and appear to be linked to the evolution in biological entities, of central nervous systems. We also know our biological systems to have originated, long before any experiential worlds, and that necessarily it had to be so.

I never pretended to solve the mysteries of being; it only presents some evidence that a particular solution, to these mysteries, intelligent design, is false – and unenlightening to boot.

One should be able to expect, from any intelligent design of nature, that humans should be endowed with a good dose of what is called the critical mind.

Yet, humans, this higher Intelligence's alleged pet creatures, in regard to their participation in the critical mind, appear in general to be a basket case.

One of the available foundations of ethics is science itself. Nearly all great values are circumscribed within this framework, save the values of the realm of feeling, such as empathy; the respect of all that is alive; the love of all that is beautiful.