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[00:00:18] MODERATOR:

Ladies and gentlemen, welcome. I'd like to introduce

(unintelligible)

Professor Holmes Rolston. Sadly for the last time for this particular series, this is the final lecture of the Gifford Lectures series for 1997.

But it's the lecture in which the overall title for the series comes the title specifically of this lecture. 'Genes, Genesis and God'. Professor Holmes Rolston.

[00:00:47] PROF. HOLMES ROLSTON:

Thank you. May I remind you again that the set of the ten lectures are available, this one plus the others tomorrow morning at the David Hume Tower, the Faculty of Arts.

And these lectures exist at about twice this length in a book manuscript that will be published by Cambridge University Press, though I'm not certain exactly when, but presumably in about a year or so, if you can remember these things that long. They might be publicly available in print.

I would like to thank the Gifford Lecture Committee. It's been a rewarding experience for me to be here. Yesterday afternoon, I walked out to Lord Gifford's grave.

I know where that is and I bet some of you don't.

(audience laughing)

In Calton Cemetery. And was thinking he lies moldering in his grave, but the request and his inspiration certainly carries on. The quest goes on and I'm humbled and privileged to be a part of that sequence.

I think it's probably true that never has the will of one man assembled as many scholars over more than a century now in great Scottish universities, and certainly it is sobering to be asked to stand in that tradition. But let me also say that you yourselves, I think, since these lectures were intended for a broader audience, I appreciate the numbers of you who've come again and again. I see many familiar faces by now in my audience.

And I think you too are part of what he intended, an audience and an event of this kind. So we sort of have a share in continuing that long tradition. Well, can one move through the genes and their genesis to a glimpse of God?

Essentially, my argument is going to be that we have no reason to deny that the startling genesis on earth is sacred, nor to deny that humans, funded by their evolved perceptual and cognitive equipment, can ever detect that sacred presence. So I wanna return to the global claims of religion, maybe transcendent claims, but at least the global claims of religion that detect the kind of divine power in, with, and under the genesis that we know on Earth.

The question is, does biology leave space for such claims or even invite such claims as complementary explanations? Against the reductionist, religious persons have to be, we might say, compositionists. They have to move up, not down, to get the interpretive levels needed to frame and complete the lower levels. Another way of looking at it, it's a characteristic of narrative, I think, that events have to be understood in the light of the ends to which they lead, and not just in the light of the origins from which they flow.

Now, genes record only a small portion of the history of the universe. They certainly do not record the pre-life cosmological story, and they do not record the genetic cultural story. And yet on Earth, the vitality in the earth epic of natural history is intimately linked with the genes.

There are no such genes on the moon, nor Jupiter, nor Mars. It is in the genes, the genes remember and they research and re-compound discoveries, storied achievements.

And the values achieved have continued over several billion years, rising to spectacular levels of attainment and power. You might say the cosmic universals on Earth give place to the particulars of Earth and natural history. And the question is whether the particulars of Earth and natural history contain any hint of a larger more universal powers in which they are embedded. Let's think first about how the possible becomes actual over evolutionary time, passing, if you like, from bioscience to the fertility question in a metaphysical form.

The generation of the actual out of the possible and the generation of possibilities, and perhaps even a generator of possibilities. The possibility route, so to speak, is not just a logical one or an empirical one or a physical one.

The possibility route is a historical one. And what kind of possibility spaces are needed to get from the primeval beginnings to where we have now arrived in Earth history? At a kind of opposite extreme from those emphasizing the contingency, there are a number of imminent biologists, and they do tend to be molecular rather than evolutionary biologists, or paleontologists who find that this storied natural history on Earth is inevitable, at least an outline, and therefore predictable.

Christian de Duve, a Nobel laureate in biology, says, 'Life was bound to arise under the prevailing conditions and it will arise similarly wherever and whenever the same conditions obtained. There's hardly any room for lucky accidents in the gradual multi-step process by which life originated.' Now, De Duve knows there are elements of contingency, but he calls this a constrained contingency, so that the general trends in the development of life, cellular organisms for example, multi-cellular organisms, solar energized organisms, increasingly diverse and complex organisms, are all he thinks inevitable. 'Life and mind,' he continues, 'Emerge not as the results of freakish accidents, but as natural manifestations of matter written into the fabric of the universe.'

I view this universe as made in such a way as to generate life and mind, bound to give birth to thinking beings.' Another biologist puts it this way, George Wald, still alive but active a generation back, 'This universe breeds life inevitably.' He sees life as a kind of accident waiting to happen, sort

of like sodium and chlorine are pre-set to form salt. Only more startlingly so because of the rich implications for life and the openness and information transfer in the historical life process.

So there's dice throwing, but for George Wald, the dice are loaded. Another Nobel laureate, Melvin Calvin, a Biochemist, thinking of the origin of life, puts it this way, that 'The predecessors of DNA and RNA appear and are conserved not by accident, but because of the peculiar chemistries of the various bases and amino acids.

There's a kind of selectivity intrinsic in the structures. The evolution of life is a logical consequence of natural chemistries.' Manfred Eigen, with his irreversible thermodynamics, concludes, 'The evolution of life must be considered an inevitable process, despite its indeterminate course.' Still more recently, Stuart Kauffman in his study of the origins of order says, 'I believe that the origin of life was not an enormously improbable event, but law-like and governed by new principles of self-organization in a complex webs of catalysts.' Now, these kinds of accounts suggest that the possibilities are always there. Now, they realize that there are elements of contingency, but these are like the contingencies in a kaleidoscope.

The patterns differ. But essentially, the kind of mechanism that spins out these beautiful patterns is fixed into the kaleidoscope. But all these possibilities are seen only retrospectively.

If we could imagine, as is impossible in a thought experiment, if we could imagine that some scientist had under observation the elementary particles forming after the first three minutes. There's not much in them that suggests anything specific about the coding of life that would take place 15 billion years later on Earth. And even after Earth forms and the lifeless planet is irradiated by solar energy, as are the other planets as well. The events in physics and chemistry are considerably law-like and predictable, at least statistically, even if in geology and meteorology, the system is rather complex, maybe at times even chaotic.

But the patterns of erosion, and the patterns of geological movement, the shifting of the tectonic plates, in that respect, the possibilities always seem to be there. At the microscopic level, submicroscopic levels, quantum physics depicts a kind of open system and nested sets of possibilities.

But at first, and through most of the history of the universe, all the atoms and molecules take non-living tracts. It's only later, it's only on Earth so far as we yet know, that some of these atoms and molecules begin to take living tracts, called forth as an interaction.

If there's some kind of inside order to matter that makes it pro-life, it'll have to be in the whole system and not just in the particles. Now I'm familiar with the anthropic principle, which I think is important and contains its insight. But despite the anthropic principle, this pro-life order is not manifest in the vastest parts of universe.

They are lifeless. Life, as we know it, is an earthbound probability, though if life appears elsewhere I will welcome it, but it will still be rare in the universe.

You see, it's only in biology that there open up entirely unprecedented levels of achievement and power. And these possibilities are not clearly sort of inside the atoms and molecules.

Apart from their systemic location, the atoms and molecules would not even be collected into the thin hot soup except for the earth world in which this is possible. And this or that sequence of DNA can't code for anything, unless there's an environment in which to cope with a niche to fill. Physics and chemistry, I'm saying, unaided, do not get us all that near to life and mind.

There isn't all that much in the physics and chemistry of atoms and molecules prior to their biological assembling that suggests they have these inside tendencies to order themselves up to life. Even if we get as far as the building blocks of life, the amino acids, let's say, there's not all that much in an amino acid that suggests it will be inevitably built up into proteins, or that the proteins will arrange themselves to code for the various structures and metabolisms of life. Now all these things may come naturally, but they come as quite a surprise. Recent microbiology has been revealing their enormous complexity.

We do not know if life does appear on other planets. It will be built of the same atoms but whether it must select these same biochemistries.

There are amino acids we think, on meteorites, and there's some prebiotic molecules that are guessed to be present in interstellar dust clouds. So we might say that the potential for life is omnipresent in matter.

Is it then some kind of law, or inevitability that life appears? Laws are important in natural systems, whether extraterrestrial or terrestrial. The mixture of order and contingency is significant.

But in historical nature on this planet, there's a kind of creativity by which more comes out of less. Science doesn't handle historical explanations very competently, especially when there are emergent novelties. Science prefers law-like explanations in which there are no surprises.

One predicts and the prediction comes true, or if such precision is impossible, science prefers statistical predictions. One predicts and probably the prediction comes true.

Biology, meanwhile, though prediction is sometimes possible, is full of unpredictable surprises, like calcium endoskeletons in vertebrates after millennia of diatomaceous silica and chitinous arthropod exoskeletons. A main turning point in the history of life is when two once-independent organisms fuse into the cell and its mitochondria, which became the powerhouses for life.

Another critical symbiosis brought free-living chloroplasts into the plant cell, again producing the energy vital for all life. Nothing in the atomic molecular structures enables one to predict this kind of symbiosis, nor does anything in irreversible thermodynamics or chaos theory.

See, there isn't any induction which expects the future to be like the past by which one can expect even probably trilobites later from prokaryotes earlier, or dinosaur still later by extrapolating along a regression line or some sort of progression line that one can draw from prokaryotes to trilobites. An acorn, we understand, secretly contains an oak, but there are no humans invisibly or secretly contained inside a primitive eukaryote, to unfold in a law-like or programmatic way. We can say, in retrospect, that the vertebrates began with the notochords of primitive chordates.

We can say, retrospectively, that eyes began with this or that light-sensitive pigment, perhaps. But still there is this kind of epic story. Now, can we insist that the probabilities must always have been there, or at least the possibilities?

You might claim that what actually managed to happen must always have been either probably probable or improbably possible all the way. But if you push that to extreme as one must do, if you claim that all the possibilities are always there, latent in the dust, latent in the quarks, that becomes pretty much an act of speculative faith. Not in present actualities, since one knows that these events took place, but in the past probabilities always being omnipresent.

That's certainly not some kind of induction or deduction or most plausible case. The speculation about the possibilities always being there is easy once one doesn't have to specify any of the details. But this perennial and vast library of possibilities is mostly imaginary.

For in fact, there isn't much in the rocks that suggests the possibility of Homo sapiens, much less, the American Civil War or the World Wide Web, or the conference in Japan on global warming. And to say that these possibilities are always there is simply as Alfred North Whitehead once put it, 'To have possibilities floating in from nowhere,' against which he warned us. Unbounded possibilities that one posits ad hoc to whatever one finds has in fact taken place.

Possibilities of any kind and in any amount desired in one's metaphysical enthusiasm can hardly be said to be a scientific hypothesis. I think it's equally credible and more plausible and no less scientific to claim that possibility spaces open up en route. Now, someone might say, 'Well, you weren't listening when we said that matter is self-organizing.' Matter is, autopoietic.

There are enormous possibilities there from the start. And nothing much in the historical drama ought to take us that much by surprise. Here is Tom Cech.

Tom Cech is our only Colorado Nobel Prize winner, a Biologist, for his work on RNA as a catalyst. If, he says, 'intrinsic to these small organic molecules is their propensity to self-assemble, leading to a series of events that cause life forms to originate, that is perhaps the highest form of creation that one could imagine.

At least from the perspective of a biologist, I have given an account of how possibilities did in times past, become actual. When this happened, life originated with impressive creativity, and it does not seem to me that possibilities floated in from nowhere.

They were already present, intrinsic to the chemical molecules.' The creatures have, over time, the possibility of speciating and re-speciating. But it's not that clear to me that the creatures, in their self-actualizing, have or generate all by themselves, all these other forms into which, they are transformed. One can say, if one likes, that a dinosaur is lurking in the possibility space of a microbe, that microbes self-transform themselves into dinosaurs, which self-transform themselves into primates, but that's not really a claim based on anything we know about the biology or ontology of microbes. Perhaps a theologian can say from the perspective of such truth as the psalmist did once say, 'My frame was not hidden from thee when I was being made in secret, intricately wrought in the depths of the earth, thy eyes beheld my unformed substance.' But we humans do not have such a God's eye view.

We know that somehow the possibilities got there and got actualized, but it's quite as much an act of faith to see dinosaurs in the possibility spaces of quarks as it is to see dinosaurs in the possibility space of God. We might say that, looking at a pool of amino acids and seeing dinosaurs or homo sapiens, is something like looking at a pile of alphabetical letters and seeing 'Hamlet.' But 'Hamlet' is not in fact, lurking around a pile of A to Zs. Such a play is not within their possibility space, not until Shakespeare comes around.

And Shakespeare, plus a pile of letters, 'Hamlet' does lurk. By shaking a tray of printer's type, one can get a few short words which are destroyed as soon as they're composed. But if sentences begin to appear, an analog of the long symbolically coded DNA molecules in the polypeptide chains, and if they form a poem or a short story, an analog of the organism, one can be quite sure there's some formative or irreversible constraints on the sorting and shaking that are catching the upstrokes and directionally organizing them. Here is the way that Sir Karl Popper put it, 'In our real changing world, the possibilities and thus the propensities change all the time.

This view of propensities allows us to see in a new light the processes that constitute our world, the world process. The world is no longer a causal machine, it can now be seen as a world of propensities, as an unfolding process of realizing possibilities and of unfolding new possibilities.

New possibilities are created. Possibilities that previously simply did not exist. Especially in the evolution of biochemistry, it's widely appreciated that every new compound creates new possibilities for further new compounds to synthesize, possibilities which previously did not exist. The possibility space is growing.

Our world of propensities is inherently creative.' Now, at this point then, with the genesis of possibilities comes the creation of information. The story becomes memorable, able to employ a memory only with genes or comparable molecules.

The story becomes cumulative and transmissible. If the DNA in your body were uncoiled and strung out in a thin thread, that thread would reach to the sun and back over half a dozen times.

It conveys some idea of the astronomical amounts of information soaked in the body. In the Newtonian view, there were two metaphysical fundamentals, matter and energy.

Einstein, in some sense, put the matter-energy together. There's conservation of matter and energy.

But the novelty in the biological sciences is that this matter and energy is found in diverse information states. The biologists still claim two metaphysical fundamentals, matter-energy and information. Norbert Wiener, a founding cybernetician says, 'Information is information, not matter or energy.' Manfred Eigen says, 'This is the key word that represents the phenomenon of complexity, information.

Our task is to find an algorithm, a natural law that leads to the origin of information. Life is a dynamic state of matter organized by information.' George Williams whom you have met earlier in this series of lectures a number of times, puts it this way, 'Evolutionary biologists have failed to realize that they work with two, more or less incommensurable domains, that of information and that of matter. Matter and information are two separate domains of existence would have to be discussed separately in their own term. The gene is a package of information and not an object.

Maintaining this distinction between the medium and the message is absolutely indispensable to clarity of thought about evolution.' John Maynard Smith, as I've said before, I think the best of you British biologists, says, 'Heredity is about the transmission not of matter or energy but of information. The concept of information is central both to genetics and to evolution theory.' Richard Dawkins, whom I have dealt with earlier, notices, I think, in his most recent book that there has been, as he says on earth, a remarkable 'information explosion,' analogous to an astronomical supernova.

The essential thing about a biological molecule contrasted with a merely physicochemical molecule is that it contains this vital information used for coping in the macroscopic world. All such information did not always exist, but came into place as the locus of creativity. John Maynard Smith again, now working with the Szathmari, says he's looking for the major transitions in evolution, and he wants to know how and why this complexity has increased in the course of evolution. 'Our thesis is that the increase has depended on a small number of major transitions in the way in which genetic information is transmitted between generations.' Here are some of the critical turning points, he thinks, 'The origin of the genetic code itself, the origin of eukaryotes from prokaryotes, meiotic sex, multicellular life, animal societies, and language, especially human language, making culture possible.' But when he looks over the resources of biology with which to interpret this, there is no reason, he concludes, 'to regard the unique transitions as the inevitable result of some general law.' Now this, you see, is contrary to what De Duve and Eigen and Calvin and Kauffman and Tom Cech found.

So what makes the critical difference in evolutionary history is the increase in information possibility space that it's not something inlaid into the molecules themselves or inlaid into the laws of biology.

The philosophical and metaphysical and theological challenge, which is left over after the current scientific accounts, is a query, what to make of the origin of these information channels? In the course of evolutionary history, one would be surprised to find matter and energy spontaneously created. But here is information floating in from nowhere.

For the lack of better explanations, one can say, well, nature is self-organizing, though there's no self present, nature is spontaneously organizing. It is an autopoietic process.

But that may just be a name, like soporific tendencies, used to label the mysterious genesis of more out of less. It may be a seemingly scientific name that's really sort of a mystic chant over a miraculously fertile universe.

See, what is inadequately recognized in the self-organizing account is that new information is needed in enormous amounts. Something is going on over the heads, so to speak, of any and all of the local individual organisms. There is a ground of information or an ambience of information.

Otherwise known perhaps as God. Another way of interpreting this genesis of information arises from looking at its result, the generation and the transmission and the deepening of lives with their diverse and complex values.

Scientists and philosophers have been much exercised about the generation of values, about how an ought comes out of an 'is.' But it seems pretty much fact of the matter that over evolutionary history, values have been generated. Survival value figures large in evolutionary theory.

Organisms defend or value their self-actualizing. Scientists have sometimes tried to portray nature as a valueless place.

And that could seem so in the emptiness of outer space, or maybe the frozen waste of Antarctica, or the sands of the Sahara. But where there's life, value is always at stake. Once humans might have thought that biological nature was valueless with value lighting up when humans take an interest in things, but that kind of anthropocentric view is increasingly incredible in Darwin's century. The same evolutionary science that discovered nature red in tooth and claw, discovered value in teeth and claws.

The vitality flowing in this blood, the world as a sphere of the contest of values generated in this perpetual context. Evaluating Earth, the appropriate category is not, I think, its moral goodness, for there are no moral agents in nature.

The appropriate category is some kind of non-moral goodness, better called its value or its worth or perhaps its riches. One must evaluate the phenomena such as the achievement of diversity and complexity out of simplicity. Any struggle and suffering, I was trying to say in my last lecture, can only be interpreted in the larger context of such creativity. Now, according to a kind of long-dominant paradigm, there's no value without an experiencing valuer, no thoughts without a thinker, percepts without a perceiver, no deeds without a doer, no targets without an aimer.

But in the evolutionary account, Earth is a kind of value-generating system. Essentially, this is what I've been trying to convince you of in the last ten lectures. 'Earth is a value-generating system, value-able, that is, able to generate values that are widely distributed, dispersed, allocated, proliferated, divided, multiplied, recycled, and shared over the face of Earth, pervasively present in living organisms, which includes but is not limited to their embodiment in myriads of experiencing valuers.' Humans are not so much lighting up value in a merely potentially valuable world, they are psychologically joining an ongoing planetary natural history in which there's value wherever there is positive creativity that's present in subjects with their interests and their preferences, but it's present objectively in living organisms, defending their lives. From this point, it seems to me to be

that seem something philosophically naive, even something hazardous in a time of ecological crisis, for humans to continue living as though nature were valueless and everything generated in natural history only to be evaluated relative to its potential to produce benefits for humans.

When Earth's most complex product, Homo sapiens, becomes intelligent enough to reflect over this earthy wonderland, everyone is left stuttering about the mixtures of accident and necessity out of which we have evolved, but nobody has much doubt. Recalling the way one of the astronauts phrased it, that this is a 'small pearl in a thick sea of black mystery.' Ed Wilson, whom again you have heard numerous times in these lectures, can find no divinity in the Earth process, but he can still say, 'The flower in the crannied wall, it is a miracle.' And he's devoted enormous energies to the conservation of this biodiversity. See, here's the fertility question again. The generation of these flowers clinging to life in the crannied wall, generating a religious impulse, as it were, in a thoroughgoing naturalist.

Or another thoroughgoing naturalist Daniel Dennett says, 'The world is sacred.' He holds that conclusion even though Darwin's dangerous idea, the book from which this is taken, Darwin's idea is a universal asset that can dissolve God, but it cannot dissolve his conviction that the world is sacred. See, what I'm trying to say is that the secular, this present epoch studied by science, does not eliminate the level of value rising to the point not only of its respect, but even of its reverence. If there is any holy ground, any land of promise, this promising earth is it.

Beginning of this century, Harald Höffding said, 'The essence of religion consists in the conviction that value will be preserved.' In a way that helps us, I think, to understand Ernst Mayr's remark that 'Most biologists are religious.' See, if one finds a world in which value is given and which persists over time, one has a religious assignment. Frederick Ferre, American philosopher, says, 'One's religion is one's way of valuing most intensively and most comprehensively.' I'm trying to say that at the metaphysical level, science neither describes nor evaluates the genesis of value adequately.

Although the descriptions of biological science, those of evolutionary history, present an account that demands evaluating. Religion is about the finding, creating, saving, redeeming of such persisting sacred value in the world. And in this sense, whatever the quarrels between religion and biology, there's nothing ungodly about a world in which values persist in the midst of their perpetual perishing.

That's about as near as earthlings can come to an ultimate concern. That's where on earth the ultimate might be incarnate. The universe existed for 10 or 15 million years without any biological information present, so far as you know, and the divine presence in that epoch would have to be found in the setup. Perhaps that's the fine-tuned universe, or the divine presence will have to be found along the way, in, with, and under the physics, the astrophysics, and the chemistry.

And that divine presence may well continue, must continue, during the biological epoch on Earth. But now, the creativity is more notably present in the generation of this information vital to life. Detecting the transcendent could ask whether God is sort of underlies the earthen setup. God is the ground of the universe, but God is in some sense the good fortune of this planet.

The Genesis writer put it this way, 'Let the earth bring forth living creatures according to their kinds.' Now perhaps if once there was a primitive planetary environment in which the formation of living things had high probability, for such living things to become actual would not require divine interference by a supernatural energy, but rather the recognition of a marvelous endowment of matter with a propensity toward life. That's what the molecular biologists earlier were arguing. And such a natural performance could, I think, congenially be seen at a deeper level as divine creativity.

But one still has to give an account of information appearing 'ex nihilo,' that is, where no such information was present before. One may need a fortunate endowment of matter with life with a

propensity to life, helped along perhaps by the entropic principle in cosmology, and at the same time one may also still need something to superintend the possibilities during evolutionary history.

That are complementary explanations does not always mean that one is superfluous. So one can posit God as a kind of counter-current to entropy, a sort of biogravity that lures life upward. God would then not be so much in anything particular, but be the background, the sort of autopoietic, or self-organized force that energizes all the particulars. The particulars would be the discoveries of the autonomous individuals.

See, then God would be in the lift up, as well as in the setup. The lift up that elevates the creatures along their paths of upward development. God introduces new possibility spaces along the way.

Daniel Dennett, although he finds that the earth is sacred, says, 'After Darwin with his universal acid, one must posit cranes, not skyhooks, for the building up of evolutionary history.' Now that contrasts of metaphor does seem initially persuasive and it appeals to causes more natural than supernatural, more imminent than transcendent. But when we pinpoint this issue, what account are we to give of this remarkable negentropic cybernetic self-organizing that characterizes life's story on Earth?

Then I think metaphor becomes more pejoratively rhetorical than it is analytically penetrating. For there is the repeated discovery of information how to redirect the downhill flow of energy upward for the more advanced forms of life built on and supported by the lower forms.

Cranes and skyhooks down and up a few miles, down a few miles up, or rather local conditions. It doesn't matter much which direction we think of the help as coming from east or west, right or left, below or above, high or deep, eminence or transcendence, skyhooks or cranes. The Hebrew said one needs wind as well as dirt.

The current metaphor is that one needs information as well as matter and energy. Stripped of the rhetoric, Dennett says, 'One is looking for explanations that involve mindless, motiveless mechanistic, not mind-like explanations,' which is the sky-hoop side of the metaphor.

Now interestingly, Dennett says that Darwinian science, extrapolated philosophically, has discovered cranes on cranes on cranes on cranes, it's 'cranes all the way down and building up and up with creative genius.' For there is, he says, 'Simply no denying the breathtaking brilliance of the designs to be found in nature.' This is how, out of next to nothing, the world we know and love created itself.' One might look to the potential deep in matter, cranes all the way down, the kind of bottomless bootstrapping, as if lifting one's self up and up by one's own bootstraps was not remarkable, matter lofting itself up to man. Such cranes piling higher and higher are still pretty super, quite imposing with their endless superimposing of one achievement on another.

But one can just as well look to some destiny toward which matter is animated and inspired, if you like, skyhooks. Even an infinite regress of cranes, or regress ending in nothing at all, or in informationless matter energy, or in a Big Bang, even then one might not find that explanations are over.

The issue is where the information comes from, by which matter and energy become so superimposingly informed across evolutionary history that this brilliant, sacred, miraculous output, as the naturalists have said, can arise from a mindless beginning in chaos. How? Out of next to nothing. The world we know and love created itself.

Cranes or skyhooks latently changed the metaphor, borrowing one from the current chaos theory, 'There are strange attractors.' And this accumulating achievements in diversity and complexity, perhaps even a strange attractor. Returning to the metaphor of the alphabet and Shakespeare, the

question is whether, in the introduction of these possibilities, one needs an author as well as an alphabet.

What is required to get Hamlet out of a stack of letters is a great deal of information input into the letters. Now perhaps the author-alphabet analogy is flawed. Perhaps the alphabet is self-organizing.

But then, one needs to posit a maker of the self-organizing alphabet. And as I've tried to say, the elemental particles are not evidently an alphabet from the beginning.

They are taken over for alphabetic functions. That requires them to begin to be used for the generation, the conservation of information. Now a skeptic will protest that there's no need for an author at all.

One can have law without lawgivers. One can have history without historians. One can have creativity without creators.

One can have information without an informer. One can have stories without storytellers. Yes, but one does need a source adequate to these results, a generator adequate to the genesis.

And not a source only once upon a time at the beginning, but a constant source, a resource all along the way, generating new possibilities, actualizing and conserving the values achieved, informing and inspiring the epic story. God, if you like, is the atmosphere of possibilities, the metaphysical environment in, with and under the natural, as well as also the cultural environment. God could be in the details, though I think the general picture is not one of divine micromanagement, but it's rather one of secular integrity and creaturely self-organizing. The extent to which God enters into the particulars might be difficult to know.

If there has been divine selection, this might not be detectable as any gaps or perforation of the natural order, though it might be detectable in the resulting Genesis. You see, if the roulette wheels at Las Vegas spin at random most of the year, but one day in the year God loads the dice, that could be difficult to detect. Chance is a kind of effective mask for the divine action.

But God could be slipping information into the world, and one might suspect such divine presence if the resulting story in the lotteries of natural history produced the epic adventures that have in fact actually managed to happen. It could be, I think, a mistake to look for God in the particulars of information discovery. God does not intervene as a causal force in the world, not of such kind that science can detect. But still, we always have again and again the introduction of channels for information.

Not a mere cause in the old sense, not a physical chemical sense, but a cause that comes and puts meanings into events. When such construction of valuable biodiversity has gone on over the millennia, the epics suggest mysterious powers that signal the divine presence. The question the biologist will say is of the selective forces, but the answer comes partly at least from seeing the results with ever more emerging from what is earlier less and less. This could be true in culture, I think, perhaps, in our tradition, mine at least, in the inspiration that underlies the Ten Commandments or the Sermon on the Mount.

But it can as well be true in nature. Some inspiration, now to use the theological vocabulary, that first animates matter and energy into life, or launches replication and genetic coding, or eukaryotes, or multicellular life, or sexuality, or that energizes life with mitochondria and chloroplasts or glycolysis, or the Krebs Cycle, or that moves life onto land, or invents animal societies, or acquired learning, or that endows life with mind, and, as we've noticed, inspires culture ethics, religion, and science. I've been trying to argue that life is a kind of gift.

And now if I may be permitted a recollection from my years at New College with Professor Torrance, my mentor present. It was 40 years ago here that I began to learn at depth, the meaning of divine grace, reading then historical theology, reading Calvin and Luther, learning that life is a kind of gift.

If in the 40 years since I have had any inspiration, any information to discover and to report, it will be that nature too is a kind of grace, a kind of gift. In the tradition I once was reared in, contrasted nature and grace more than I subsequently found to my liking. That is to say that with this creation of value, with this information, the possibility spaces, in which life comes in its richness and its complexity, culminating in human life, I wanna say that grace is life regenerated in the midst of its perpetual perishing, generating diversity and complexity, repeatedly struggling through to something higher.' And I do believe to recur now to ancient language that this is a response to the brooding winds of the spirit moving over the face of these earthen waters.' Thank you. I will remain down front to answer questions for the next 15 minutes or so.

Those of you who need to leave may feel free to do so now.

(audience applauding)

[01:06:38] MODERATOR:

The opportunity to ask question has been given,

(unintelligible)

Yes.

[01:06:43] AUDIENCE MEMBER ONE:

Well, first of all, may I thank you for an excellent series of lectures which are thought provoking. And myself, I have been

(unintelligible)

to know so personally. I'm still puzzled by the way you use the word God and religion.

[01:06:58] PROF. HOLMES ROLSTON:

Okay.

[01:06:59] AUDIENCE MEMBER ONE:

Because I like majority of people in Britain

(unintelligible)

because I'm not religious. And it seems to me that you've been discussing what's natural and what's rational and yet religion surely by definition, is a belief in the supernatural and the irrational, and especially life after death and so on. And isn't this because we are the only species that has this capacity for abstract and symbolic thought that enables us to know that we're mortal, we don't like it. And therefore, from stone age man to ourselves in the present day, we use our imagination, our very fertile imagination, to escape from the miseries of life into art, music, literature, but also religion, mysticism, astrology, superstition, you name it.

I'm classifying all of them as the same. And therefore, I would use the word God, I would say he's a life force and we don't know very much about it. And of course, I plead ignorance to the answers.

[01:08:12] PROF. HOLMES ROLSTON:

Yes.

[01:08:13] AUDIENCE MEMBER ONE:

And maybe, maybe not, we will find the answers. I think it's a cop-out to use the word 'God' as an answer.

Instead of saying we must with rational arguments with discoveries, with study even in action, perhaps get nearer. Because your use of the word 'religion' and 'God' isn't what's used in the pulpits and the mosque as the opium of the people.

[01:08:40] MODERATOR:

I think that's an affirmation, which is a question underlying if you don't tackle the question.

[01:08:46] PROF. HOLMES ROLSTON:

Well, the question of supernatural is a difficult one. Let me just say that, nature is pretty super. Cranes on cranes on cranes, if you like. That nature does not strike me, this nature which is pretty super, which has generated all that we've seen, doesn't strike me as being self-explanatory.

And perhaps it does to you, and that might be the difference between us. Now the question about, the aspect of your question that dealt with religion as making us feel good, arts and other things do as well.

I did try to deal with that in a couple of these lectures. That might be so, that religion is a Cinderella story at times, in places, for certain people, certain kinds of religion. Meanwhile, it seems to me that the fact of the matter is, this is a very fertile and prolific planet.

And when religion reflects on a planet, when people reflect on a planet with as much, a planet that's as much of a promised land as this one is, a land flowing with milk and honey, a land flowing with five million species now, five billion species over three and a half billion years. I think you've got a real religious assignment on your hands and you may say and all of us would say, 'We don't have all the answers yet. More answers will come.' When I think when more answers come, the religious assignment of interpreting the genes and their genesis is not likely to go away. Essentially.

Yes, behind you.

[01:11:02] AUDIENCE MEMBER TWO:

You have

(unintelligible)

cranes going back in time, yet do you not find that the metaphysics of reductionism and the metaphysics of chaos and complexity is something mutually exclusive? Because at one point, when you get to the edge of chaos, these linear cranes break down into a completely like skyhook situation.

[01:11:26] PROF. HOLMES ROLSTON:

Now of course the cranes, this is kind of a joke because who was it said? Asked this native about what held up the earth and it was on the back of a serpent and that was on the back of a turtle.

And then asked, 'Well, what holds up the turtle?' And this lady replied, 'Its turtle's all the way down.' Dennett is playing on that when he concedes that its cranes all the way down. That's not my view, of course. There's cranes—

(unintelligible)

[01:12:02] AUDIENCE MEMBER TWO:

Isn't Popper to be a kind of,

(unintelligible)

project more than possibilities and not possibilities and it says yes.

(unintelligible)

morphogenetic attractors as more kind of non-linear model and that suggests

(unintelligible)

going to be. because its a more complex organized system.

[01:12:29] PROF. HOLMES ROLSTON:

Isn't Popper's universe an open universe? It's one full of propensities, if you like, probabilities, but he's an indeterminist, I believe. I don't know about the linear part of it. Lines are dangerous.

The natural world's not all that full of lines. It's more story form or historical form. And histories are not linear, but they do generate plots.

They do generate narratives that are of interest and value and one enjoys being a part of this kind of story. Now it strikes me that nature, this nature which the gentleman before you didn't wanna call very super but I said it's super, is very historically fertile, if you like. And there again, I think that gives us a religious assignment. It's a universe in which value is elaborated and diversified, I think in the genes, as I tried to say, recycled, shared, distributed, multiplied.

And where you have a universe in which value is generated and persist in the midst of its perpetual perishing, that strikes me as being a religious assignment again.

[01:14:14] MODERATOR:

Shall we take rollcall.

[01:14:16] PROF. HOLMES ROLSTON:

Let's do the gentleman in dark blue. Yeah.

[01:14:21] AUDIENCE MEMBER THREE:

You mentioned the earth making value-generating system.

[01:14:24] PROF. HOLMES ROLSTON:

Yeah.

[01:14:25] AUDIENCE MEMBER THREE:

When Richard Dawkins was pressed on a TV program some months back, he finally agreed that Darwinism is not basics for

(unintelligible)

[01:14:37] PROF. HOLMES ROLSTON:

Yes.

[01:14:39] AUDIENCE MEMBER THREE:

Surely the earth value generating system which tends to be around are brutal ones

(unintelligible)

[01:14:50] PROF. HOLMES ROLSTON:

There are, brutal, to use your frame, there are difficult aspects of this. Life is a contest, there is struggle and suffering.

But that's not all that takes place. There is, I tried to say that shadow side seems to me to be part of the creativity and development.

I have not in my own life achieved anything worthwhile without a great deal of struggle and ordeal, and thought and false starts, and so forth. I have come to believe that the very character of creativity is that it inevitably involves struggle, generating and testing kinds of ideas, and with sufficient kinds of development, that means the possibility of being hurt. I'm not able to conceive of the kinds of things that have happened on earth happening in any other way.

I am not able myself any longer to conceive of even God creating the richness that God wishes to create without divine suffering. I think that's essentially what Christianity is all about, with echoes of it in Buddhism and so forth, that life is cruciform, like takes the form of a cross.

The theologians will have to interpret that out of the New Testament, right? I think that life, even in natural history, takes the form of a cross. It is always life redeemed in the midst of its perpetual perishing.

I predict that'll be true anywhere life exists in this or any other universe. That gives me problems as to what happens when I get to heaven, right? Will the same feature happened there?

I haven't got easy an answer to that. In the only world I know and know how to interpret, the element of struggle in life is inseparable from the element of its creativity.

[01:17:37] MODERATOR:

Professor Rolston—

[01:17:38] PROF. HOLMES ROLSTON:

Thank you.

[01:17:39] MODERATOR:

I think we must give our thanks to you, we've ended on a high note of affirmations by you, an affirmation which I'm sure Lord Gifford would be proud and would be delighted to hear coming from one of his Gifford Lectures. Not all amenable positions make such affirmations, I have to point out from time to time. The business on which you have been engaged with

(unintelligible)

reflects very much the character of this university. You are a distinguished theological graduate of the university. The university has great and immense strength in the areas of biological science which we've been discussing. And what you've been concerned to show is that explanations need not be monochrome or unitary or single or exclusive.

And I think you've taken us through to the point where you wish to establish with us that alternative explanations are compatible with each other, indeed even in the next stages complementary to each other. Whether you've gone beyond that established could be correct and whether that is actually a legitimate question is I guess one of the major theological issues of our age. But I have to confess to rather a sympathy for the notion that we do still seem to have lost badly and lectures such as yours give us shocks of light that illuminate areas of landscape within a university such as this, clearly, we should have illuminators.

You've established very clearly that there is as much difficulty and denseness in terms like autopoiesis as there is in the terms such as creation or inspiration. I think to remind parts of the intellectual community of that is in itself a very important task. At the very beginning of these lectures, you told the audience that you were actually subject to a great deal of mail coming from the--

[01:19:36] PROF. HOLMES ROLSTON:

Not a great deal but some.

[01:19:38] MODERATOR:

As an inductively trained mind, you came to work out many of these grand-buff envelopes in fact, containing information about the university also had subtle little hints that you might wish to give large sums of money to the university.

(audience chuckling)

And having that essential accompaniment, many of it, a good bin, you started dropping these pretty quickly into the bin. Fortunately, you did not drop into the bin a letter which in fact was a letter of invitation.

(audience chuckling)

I found I'm getting these different lectures. For that, we are very grateful indeed. We thank you for your lectures. We look forward to their form published by Cambridge University Press. Thank you.

[01:20:20] PROF. HOLMES ROLSTON:

Thank you, sir.

(audience applauding)

END TRANSCRIPTION