

## ***Talk #17    What We Don't Know***

Education is a progressive discovery of our own ignorance.

– Will Durant

- Thea:** You've spent the last few weeks telling me how much we've learned. Why not finish up with an evening on what we don't know yet? Tell me about the questions that are still open.
- Guy:** That would be fitting. I think the measure of a theory or paradigm is less the answers it gives than the new questions it teaches us to ask.. The paradigm we've been discussing is rich in this respect. It expands the scope of our ignorance enormously.
- Thea:** You know, that's typical. It's that love of good questions – more than anything, probably – that alienates the philosopher, the artist and the scientist from the rest of humanity. And vice versa. Most people don't care for interesting questions. What they want are simple answers that will spare them the need to think and to take responsibility for difficult choices.
- Guy:** I've never understood why that is so. Why is thinking so painful for most people? After sex, it's just about my favorite pastime.
- Thea:** After sex, you roll over and fall asleep, like every other man I've known. Due to the way your brains are wired, no doubt. When you're awake, you talk more than most and, I admit, you have interesting things to say. Seriously, it's not thinking that's painful so much as uncertainty. Your own notion of suggestive guidance explains it. What you overlook is that most people don't have time to think – least of all, for thoughts that might disturb their living arrangements. Most people are working too hard juggling their commitments and trying to get through the day. They don't have the leisure for intellectual sports. And they will pay a good living to anyone who relieves their uncertainties, and reassures them that their lives are meaningful. Not just to priests, but to shrinks like me. Clients aren't happy when we insist they do their own thinking. Much of my work is coping tactfully with that fact.
- Guy:** I suppose you're right. Most people don't see, and don't want to see that science is most fundamentally a method of inquiry and an ethic of intellectual honesty. Its real power lies not in the answers it gives, but in the ones it teaches us to ask: "How does this work?" instead of "Why are the gods against or for us?"
- In the past, we had myths to block uncomfortable questions, but today these are coming unstuck, and peeling off. The great questions are open again, and within the purview of scientific inquiry.
- Thea:** It's those renewed and sharpened questions I'd like to hear about now. You've suggested many answers in these talks. Where do we stand now? What great questions are still open?

**Guy:** The first one would be, “Where to begin?” There’s so much that we still don’t know.

**Thea:** Why not start with the ecoDarwinian paradigm itself – the intellectual taproot of this whole world-view, this whole approach? What features of your paradigm are still uncertain?

**Guy:** Well, then the first question must be “What is the paradigm’s scope? Just how far can the concept of self-organization take us, and what are its limitations?”

**Thea:** You’ve been talking as if this style of thinking could explain everything.

**Guy:** You know the saying, “When your tool is a hammer, the whole world looks like a nail.” The concept of self-organization is not our only intellectual tool, but it’s by far the most promising we have now. Of course, people are trying it everywhere, to see what it can do. One big thing we don’t yet know is what it can’t do.

**Thea:** What limits can you imagine? What basic problems can you foresee for your ED paradigm?

### *eD paradigm and general systems theory*

**Guy:** To begin with, despite a lot of interest and work in the field,<sup>1</sup> we don’t yet have a general theory of self-organization. Until we do, there’s no way of knowing how far the paradigm can be pushed – what it can and cannot cover. At present self-organization remains a concept, an approach to science and scientific explanation. In its light, a number of specific theories have been developed. These, on the whole, have proven highly successful, though much of the work – especially in the social sciences – remains controversial. Various mechanisms of self-organization have been identified. I reviewed some of these with you at the beginning of these talks.<sup>2</sup> But we don’t have a general theory of self-organization and it may be nonsense to ask for one. After all, we’ve never had a general theory of cause-and-effect.

**Thea:** Though that paradigm too has had remarkable successes.

**Guy:** And is still preferred for any purposes. I think it’s important for eD enthusiasts (like myself) to keep that in mind.

**Thea:** Why?

**Guy:** For the same reason that you don’t use a hammer to cut a board, or a saw to drive a nail. We want different tools for different purposes in our

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<sup>1</sup> See, for example the Santa Fe Institute web site at [www.santafe.edu/](http://www.santafe.edu/), and Stuart Kauffman’s site at [www.ucalgary.ca/ibi/kauffman/](http://www.ucalgary.ca/ibi/kauffman/).

<sup>2</sup> See Talk #2.

intellectual toolkit also.

**Thea:** All right. Agreed. Do you see any other key problems for the eD paradigm?

**Guy:** Yes. One in particular. Emergent patterns in eD systems almost always take us by surprise. We can't really analyze these systems. We can only simulate them to some extent. Often with them, we don't even know how to explain what happens after the fact. We see only "blind chance" or some mysterious "destiny," where what we should see is bottom-up, evolutionary patterning – an outcome of necessities and tendencies in the system.

**Thea:** You've said at several points in our talks that self-organizing systems may not be as blind as we tend to think.

**Guy:** If the ecoDarwinian paradigm stands, then we ourselves show how much foresight a self-organizing system can attain. This is another area where we've gained just enough knowledge to see how ignorant we still are. We know about the Baldwin effect, the capability of at least some replicating patterns to select the selection criteria that act upon them. But we don't fully understand the role of contextual effects in eD systems, least of all in that of human society. In fact, there's still some dispute that such effects can be significant. Because Baldwin's idea is attractive, and because of its Lamarckian overtones, biologists were reluctant to accept it. By now, they've mostly done so, but uncertainties remain.

**Thea:** Then where does our science leave off today? Where do the speculations begin?

### *inanimate Nature*

**Guy:** Well, to begin at the beginning, the role of self-organization in fundamental physics is a matter for speculation. There is no generally agreed answer to Leibniz' great question, "Why is there something rather than nothing?"<sup>3</sup> Nor to the further, related question, "Where did the laws of physics come from?"

**Thea:** Since you assume they were not edicts of God. Surely, from a physicist's perspective, fundamental law just *is*. To ask where the laws came from is to imagine something more fundamental.

**Guy:** Not necessarily. The view most widely held today is that the laws of physics follow from tautological symmetries of Nature, and that the observed structure of the universe, including values of its fundamental constants, resulted from a random breaking of those symmetries. It may be that Leibniz asked the wrong question: One result from quantum

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<sup>3</sup> See <http://plato.stanford.edu/entries/nothingness/> and Jum Holt's amusing article at <http://dbanach.com/holt.htm..>

physics is that primordial Nothingness is unstable and tends to collapse into Somethingness. In that case, it would be Nothing, not Something, that would call for explanation, except that there would be no one around to do the explaining.<sup>4</sup>

We don't really know yet. Maybe what we take to be physical law resulted from those mathematical tautologies of symmetry. Or maybe they evolved (as Lee Smolin has argued) through a kind of cosmic natural selection (which is itself a tautology: ripples of the random that last longer than those that last not so long!).<sup>5</sup> Perhaps the collapse of symmetry into structure should be considered a principle of self-organization – the most fundamental of all. One interpretation of our ecoDarwinian paradigm is that anything that can happen probably will happen, given sufficient time. Since we know that intelligent life can happen – as it has here – we may conjecture that it has probably happened elsewhere, perhaps again and again. It may be that whole universes have to happen, simply because they can.

**Thea:** “Can happen.” “Probably will happen.” Then according to your paradigm Einstein was completely wrong: God (your Supreme Context) really does play dice with the universe – rolling them to decide if there will be life! Perhaps to decide if there will be a universe at all!

**Guy:** Dice is certainly a better metaphor than chess for the cosmic game. But the bottom line is, we don't yet understand the relationship – the respective roles – of chance and necessity in Nature.<sup>6</sup>

**Thea:** What relationship do you see – or would you expect?

**Guy:** When we think of chance, we think of things that happen for no reason – or no discernible reason: events that have no explanation. When we think of necessity, we have in mind events that seemingly had to happen as they did: events so fully determined that they could not have happened otherwise. On the surface this distinction looks clear enough, yet when you look deeper it breaks down: Chance and necessity now seem to be aspects of one another.

Think first about the statistical predictability that keeps banks, casinos and insurance companies in business. Bankers don't know when exactly their clients will deposit or withdraw their money; casinos don't know which card will come up, or how the dice will roll; insurance

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<sup>4</sup> That there can be no privileged points of space and time; and that the universe must look the same to all observers, in any direction, using any system of coordinates. See Victor Stenger's slide presentation at: [www.colorado.edu/philosophy/vstenger/Nothing/Lawhigh.ppt](http://www.colorado.edu/philosophy/vstenger/Nothing/Lawhigh.ppt), and his article at [www.csicop.org/sb/2006-06/reality-check.html](http://www.csicop.org/sb/2006-06/reality-check.html).

<sup>5</sup> Notably Lee Smolin. See his book, *The Life of the Cosmos*.

<sup>6</sup> See *Chance and Necessity*, Jacques Monod, (1970).

companies don't know when a policy-holder will die, or when his house will burn down. But such businesses manage to turn a reliable profit all the same with the help of carefully plotted probability distributions and the "law of averages."

Natural selection, in all the versions we've been discussing, relies on a similar blending of chance and necessity. Inheriting advantageous traits from parents does not guarantee that an organism will live long and leave many offspring. It merely (by definition) increases the likelihood that it will. Yet here we are, on a planet teeming with weird life forms, with ourselves among the weirdest.

**Thea:** I begin to see what you mean. But these situations are fairly well understood. Is there more to the relationship between necessity and chance?

**Guy:** Much more. The development of any fertilized egg into a viable organism is a demonstration of their subtle interplay as we discussed early on in connection with teleonomy – the lobster trap effect. The arrival of lobsters at the trap follows a random distribution, as does the arrival of sperm cells at an ovum, or the arrival of neuro-transmitter molecules at a synapse. Nonetheless, in these and many other cases, the over-all direction of the process is essentially determined. This one principle is at the root of life itself – the key reason why life is possible.

In quantum mechanics we discover another subtle interplay between chance and physical causality that appears to make the physical universe possible. In this case, the relationship is so subtle that it is still not fully understood. But it is clear enough that Einstein was mistaken in this respect. Contingency and chance, along with logical necessity, are in the scheme of things.

**Thea:** The examples you've given are all cases of necessity arising from chance. Can chance arise from necessity?

**Guy:** Just as easily. When you roll a dice or flip a coin, no one doubts that it is a fully determined mechanical system, but so unstable that its outcome is entirely unpredictable. Another example is the local weather, which can rarely be predicted more than a few days in advance, and not reliably at that.

Still another example, of chance and necessity working inseparably, is human history itself. I remember using the example of the First World War,<sup>7</sup> but any other event would serve equally well. In one sense that war was inevitable – had to happen – given the mutual suspicion, the arms races and the irreversible mobilization plans of the European powers. But there is another sense in which the war happened almost by accident, because an assassination plot succeeded instead of failing as it nearly did.

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<sup>7</sup> See Talk #6.

*biology and the biosphere*

**Thea:** All right. Let's change the subject. This bit about chance and necessity gives me the creeps. What's the situation in the life sciences? What are the open questions there? Biological evolution itself is still contentious for most people.

**Guy:** That is unfortunate and dangerous. Many areas of public policy – global ecological management, food production and health care, for example – all turn on correct understanding and sensible interpretation of current biological science. And regardless of how the ecoDarwinian paradigm turns out in general, its role in biology now needs to be appreciated by every educated person. Without the concepts of evolution and ecology, the science of life is an uncatalogued collection of meaningless facts.<sup>8</sup>

That being said, this whole branch of science seems to be in a kind of adolescence now, if no longer in its childhood. Considered as a physiochemical system, we are just beginning to understand what life is, and how living beings function. The deepest questions, perhaps, concern the relation of life to inanimate Nature. Is life merely a kind of infection that some planets catch? Or (at the other extreme) should it be seen as a tendency of universes to become sentient and conscious of themselves?

In present-day biology, ontogenesis is probably the central problem – the development of an individual organism from a fertilized egg. How precisely do suggestions from the genes, from the local environments of individual cells, and from the global environment of the whole foetus – in its egg or its mother's womb – result (most of the time) in a viable representative of the species?

**Thea:** Chance and necessity again! So much of what we think of as chance – pure happenstance – is not truly random at all, but reflects patterns of influence that we have not followed, and could not possibly follow, in complete detail. While so much of what we think of as necessity is merely high probability.

**Guy:** Right. And these patterns of reciprocal influence produce the wonderful *physical* effect called life. Some features of the world – like planetary motion – are mechanical. Everything that happens appears to do so by necessity. Other features seem to happen by chance, so that the only regularities we can find in them are statistical ones. But in between, there is this realm of living creatures where the random and the mechanical work dialectically, building interesting patterns and tearing them down in order to build new ones. The most wonderful part of it is that the researchers who study these processes are just such systems themselves. The teleonomic life-cycle has evolved to a level that can observe itself in action.

**Thea:** Ah . . . That brings us to the shaping of brains and minds now, doesn't it? In spite of all you've explained, I think that is still a mystery. I doubt we

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<sup>8</sup> As Theodosius Dobzhansky explained. See <http://people.delphiforums.com/lordorman/light.htm>.

can ever really know how a given person became who she is. I doubt any therapist will ever know in advance why one client turns her life around while another just goes round and round in the same grooves for a lifetime.

### *brains and minds*

**Guy:** You may well be right that minds will remain unpredictable in this way. In a general sense, we are beginning to understand how learning works, yet the details of that process, and its limits, and the relation of those limits to the neural architecture of a given individual or a given species, are still way beyond us. Even the mind of a dog, or a laboratory rat or a goldfish remains beyond our comprehension.

**Thea:** You insist on speaking as if these creatures had minds. I still think we should keep that word for creatures with language, with a sense of past and future . . . for creatures like ourselves, in other words. I still can't see that fish have minds, in any worthwhile sense.

**Guy:** As I've said before,<sup>9</sup> all you've got here is a semantic argument about the scope of a four-letter word. Every form of life must have some kind of "mind." You can use scare quotes if you like, but the point remains: To survive, feed itself, and reproduce, a creature must evaluate and respond to suggestions, selecting appropriate behavior from its repertoire. However primitive, that is already a mental process – agreed that it is different in degree and complexity from what we do, to the point of appearing different in kind. But even the most sophisticated brains are in the business of parsing, evaluating and constructing responses to suggestions as these reverberate in a neural network. Human consciousness itself, unique and wonderful as it is, is only just such an effect. But I will grant, if you insist, that this is not yet fully proven. Likely as it is by now, you can count it as one of the things we still don't know for sure.

**Thea:** I do insist. And so will most people. But if you will concede some room for doubt that your notion of suggestion processing exhausts the concept of mind, then I need not harp on the point, and I can concede, in turn, that what has been learned so far is impressive. I can ask: What big questions remain about your suggesters – about suggestion processors as such?

**Guy:** More than enough to keep us busy for awhile. To begin with, there's the problem of complexity that we talked about earlier. We need some way to analyze or just describe the workings of a suggester ecology, a suggester network. We don't have the tools as yet. Also, a general theory and taxonomy of suggesters is needed. We know, just by looking at the forms that life takes and has taken here on Earth, that these systems are capable of staggering variety and versatility. We need some way to classify their

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<sup>9</sup> See Talk #5.

possibilities.

**Thea:** Yes, I can see how that would be quite a job. What else?

**Guy:** We need to re-think and work out in detail the relation between cognition and emotion. We are used to thinking of emotion as something that gets in the way of, or distracts from a dispassionate appreciation of “the facts.” At best, this is a half-truth. From the biologist’s perspective it is completely wrong. Affect and emotion lie at the core of our perceptions, and are inextricably mixed with them. Affect tells us what things and situations mean to us, suggesting that we care about and orient ourselves toward them in some appropriate way – with interest, fear, disgust, or whatever. Without pleasure/pain and the affect system, nothing would motivate us, one way or the other.

Neural learning and the brain’s representation of the various kinds of information – a motor skill, a new face, a meaningful experience, or even a telephone number – is another line of research. We now know that learning is not an all-purpose capability as originally thought, but is domain-specific. We have different mechanisms for different types of learning, and can learn some things very quickly and easily, while other things are very difficult. We know that there are special developmental windows for certain types of learning. We know – as the key to what is called “instinct” – that brains of different species somehow come pre-wired to learn what their young will need to learn. We humans are no exception.

**Thea:** When you say that we still know little about how the brain represents information, what exactly do you mean? I thought you said quite a lot about that in our talks.

**Guy:** I tried to summarize what we now know. It seems clear that the brain stores information by setting up firing patterns amongst neurons, which excite or inhibit other neurons to which they are connected. Learning seems to occur through the strengthening or weakening of these synaptic connections, or by creating new ones. These strengthening and weakening effects occur as suggestions from the creature’s environment (as this impacts its sense organs) to the neurons and glial cells of its brain. When some event or association re-invokes a certain firing pattern in its working memory, the corresponding information is recalled. This much is generally accepted by now.

But we still lack tools to trace and document the neural correlate of a given mental pattern, in a human brain – or any vertebrate brain, for that matter. We don’t yet know exactly how experience suggests the neural changes of learning. Details about a brain’s representation of spatial location and navigation and its usage for muscular coordination are only now being worked out. The neural correlates of abstract thought, metaphor, symbolic representation and reasoning, still elude us almost completely.



**Thea:** So at the end, your argument fizzles a bit, doesn't it? You can't really finish the story you've been telling. We don't really know what makes human brains distinctively human. At least, not yet.

**Guy:** There is much we still don't know about the architecture of human brains. We know where language is coordinated, but not exactly how. We're just beginning to understand what all those glial cells are doing. Much about their interaction with the neurons and with each other is still unknown. But if you think how far we have come, then . . . no, I don't think my story fizzles. I think it's coming together. I think it marks the beginning of a new phase for human intellect and even spirit, as we learn to perceive, accept and make the most of what we truly are.

**Thea:** Here I remain unconvinced. When I ask what is special about human beings you reply with a list of primate traits – social living, curiosity, intelligence, tool use, language, prolonged childhood and education – that came together as a new specialty and ecological niche. You explain how we evolved right out of Nature into the wholly novel domain of culture and society, but as an account of the human condition, your story is neither comforting, nor inspiring. And it requires a good education and a huge investment of leisure time to even begin to understand it. For those reasons, I still doubt that your eD paradigm will greatly appeal to most people, or greatly influence the human self-understanding that prevails in our human cultures. Though the new technologies that stem from that paradigm and its sciences will certainly change our lives.

### *humankind*

**Guy:** The future of these ideas is one of the biggest things we still don't know. You're surely right that the eD story lacks mass appeal. But there are two things you should remember: First, its uptake is no more optional than modernity itself was. Traditional cultures can resist them, but only at the price of making themselves poor, weak and fundamentally ridiculous, however much of a nuisance they become. In the United States right now, there is a conflict between the forces of greed and tradition over stem-cell research and other bio-technologies. Either greed will win, or the technologies and their profits will move elsewhere – probably to India or China or Japan, where there are no such scruples.

A second point is that most of the story I've been telling you is less than 30 years old, even amongst the small group of scientists and thinkers who have been piecing it together. It is just now becoming public knowledge. The theory of evolution is about 150 years old. Modern science, and the glimmerings of a scientific understanding of Nature only got off the ground about 500 years ago. Civilization itself has to this point, about 5000 of written history behind it. Considering that primates of genus homo were already walking around on the plains of Africa more than two million years ago,<sup>10</sup> the story I've been telling is like a headline in the newspaper: It's just too soon to say what it means,

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<sup>10</sup> See [www.onelife.com/evolve/manev.html](http://www.onelife.com/evolve/manev.html).

or where it's going. Present-day sensibilities, interests and concentrations of power mean little on the time-scale of history, and nothing at all on the time-scale of evolution. Perhaps the central conclusion of my story is that human evolution is an incomplete experiment whose long term consequences are still unknown. We ourselves are the "missing link" between anthropoid apes and the true human beings: the biological specialists in tool-use, stigmergy, symbolization, culture and social cooperation who (if we manage to survive) are still to appear.

**Thea:** So one key question might be the current direction and long-term prospects for human evolution?

**Guy:** That might be a question for an anthropology of the future, when we understand ourselves and the implications of a human lifestyle much better than at present. Right now, social science faces the more immediate task of working out what we are and how we got here. There's still a long way to go – maybe an impossible way – before those questions are properly answered.

**Thea:** It's not for science to tell human beings what they are or should be. Those are more questions of values than of science.

**Guy:** True. Science cannot define what human beings are or should be. Evolution itself will do that. And in that process, there is space for self-understanding and self-creation that science cannot and should not usurp. But the science is not irrelevant. With all that is known today, the way we understand ourselves must now be informed either by a serious science of humankind, or by willful ignorance.

**Thea:** That "science of humankind" is much on your mind, obviously. At several points in our talks, you've stressed the need and possibility of such a discipline. What would its central questions be?

**Guy:** I think Gregory Bateson framed the agenda for such a science when he spoke of "an ecology of mind." If the ecoDarwinian paradigm prevails as he expected, then the task will be to understand societies and their members as suggestion ecologies along the lines that we've discussed.

This won't be simple. Even apart from the daunting complexity of social systems, we must accept that some cherished concepts break down when we begin to think in ecological terms. We lose a clear distinction between cause and effect; because the loops of suggestive influence are circular. We lose a sharp distinction between friend and foe because ecological dependencies are usually politicious in character: blends of symbiotic collaboration with competition or outright conflict. We blur the distinctions between form and process, structure and system, because the patterns we'll have to deal with are mostly temporal ones. I would guess there are many other conceptual issues that we can't foresee. Philosophers who come to grips with the eD paradigm will have plenty to do.

Finally, it's not clear that the society that pays academic salaries

really wants or is ready for a science of itself. A serious science of culture must question its society's core myths, and will be subversive merely by existing, merely by demonstrating that those myths can be questioned. All this said, I think the ecological science of mind that Bateson dreamed of may be feasible to some extent, though I have no idea how far it will get. Of course, there's no way to know except to try for it and see.

**Thea:** It would be a science of humankind far beyond anything we have at present. Clearly, there's no danger we'll run out of things to think about, any time soon.

### *philosophy*

**Guy:** No danger at all. Rather, science is just beginning to tackle the fundamental questions all children ask – the questions that have attracted myth and speculation for thousands of years. And there is one large area that we haven't mentioned yet.

**Thea:** Namely?

**Guy:** There is no name for it at present. I think of it as personal philosophy. Its questions have traditionally been matters for art, philosophy and religion, but what I have in mind would be none of these. Unlike classical philosophy, it would embrace some version of constructivism and turn its back on the fantasy of a God's-eye, universal truth – especially ethical truth. Unlike religion as we know it, it would reject revelation and belief in the supernatural. Unlike art which seeks primarily to stimulate the imagination with original suggestions, it would seek as the philosophers did to evaluate the suggestions on offer, and to live by a reasoned selection of the one's most worth following.

What I have in mind would be a quest for personal truths – of the kind that psychotherapy at its best can offer, understood to be on one's own responsibility, with no more than incidental help from selected gurus. As an intellectual discipline, it would treat all suggestions as matters for reflection, personal choice, commitment – subject to dialogue and debate, but accepting that public truths concerning them must be structures of argument, rather than flat universal doctrines. Accordingly, it would teach people to avoid promoting their beliefs into dogma. And it would learn what it could from science while freeing itself from the central limitation of science – the insistence on testing all concepts and hypotheses in replicable experiments.

**Thea:** I'm surprised you acknowledge that as a limitation.

**Guy:** You shouldn't be. Though I respect what science has accomplished and is accomplishing, it seems clear that private experience is not replicable, and that the human animal needs suggestive guidance that authentic science can't offer. Whether the mass of humanity can find such guidance without lapsing into superstition and bigotry can be the last question of these talks.