

## In conversation with Steven Pinker



**Steven Pinker's *The Language Instinct* provided the first and most comprehensive account of a major area of human psychology as an adaptation designed by natural selection. He then took on the rest of the brain in his book *How the Mind Works*. *the evolutionist* caught up with him to ask him about the grey matter we all call home, the eternal problems of consciousness, and those things that shall ever remain beyond our understanding.**

***the evolutionist:*** *How the Mind Works* is an enormous achievement. Can you say which particular issues you were addressing and why you thought it important to address them?

**Steven Pinker:** The main goal was to present a cohesive picture of the different faculties of the mind - to discuss topics that we understand reasonably well, such as stereoscopic vision, and topics that have not been studied as much, such as romantic love, all within a single framework. It was based on three key ideas. The first was computation. The fundamental activity of the brain is information processing -- that is what makes intelligence and organized behaviour possible. The second idea was evolution. The particular kinds of computation the human brain performs were shaped by natural selection and other evolutionary processes, and therefore evolution offers the ultimate explanation for why we have the kind of thoughts we do. And the third idea was specialisation. There is not one single principle that explains all of our emotions or learning mechanisms; the mind is composed of different parts, each engineered to be good at solving particular kinds of problems, the problems faced by our evolutionary ancestors.

***the evolutionist:*** And what has been the reaction to the book?

**Pinker:** There's been every reaction you can imagine. There have been kind, even effusive reviews in some places, and scathing attacks in others. The attacks have been from religious people, and also from people who wouldn't call themselves religious but who still subscribe to some of the core tenets of Western religion. These people are disturbed about the mechanistic approach of the book which seems to leave no room for the soul and which therefore undermines choice and moral responsibility. In fact they are attacking the last 100 years of research into the human brain, which sees the brain as an organ that works by physical principles just like the other organs in the body. I think that by making this idea so blatant -- by claiming that our emotions and higher callings such as religion, as well as our grubby low-level physical systems like stereo vision and motor control, are products of a machine -- I put that discovery of 20th-century science in neon lights and therefore drew a lot of attention.

***the evolutionist:*** Is that what you were expecting?

**Pinker:** No, that came as a surprise. Like virtually all neuroscientists, cognitive scientists, and biologists, I assumed that no one doubted that the mind is a product of the brain. Like many neuroscientists I privately snickered at Francis Crick for writing a book called the *Astonishing Hypothesis*, in which the astonishing hypothesis was that the mind is a product of the brain. But Crick was right and we all were wrong: It is an astonishing hypothesis; we were just so jaded by working under the hypothesis that we have forgotten how astonishing it is.

That also explained other anomalies in my perception of intellectual life before I wrote the book. The American writer Tom Wolfe has been giving a speech based on the work of EO Wilson, which described him as the leading figure in neuroscience. From our point of view that is a misnomer because he's an entomologist; he doesn't study the brain directly. But at Wolfe's distance, the term neuroscience refers to the general approach that sees the mind as a product of the brain. Wolfe expressed alarm that the trend of science is to eliminate the traditional notion of the soul and replace it with the activity of an organ. At the time I thought that was an eccentric take on the contribution of Wilson and neuroscientists. But it was news to Wolfe and most people, and like it or not, that foundational assumption of my book seemed to stick in people's throats.

I also got negative reactions from some people in the faculties of arts, especially "cultural studies" and "critical theory," who attacked the notion that there is such a thing as the mind that can be studied separately from the surrounding culture. They treat the mind as a temporary repository for the autonomous ideas that congregate in a culture, and believe that the proper study of the mind is the study of words and images that float around in a society. Again, that was not so much a critique of the novel content of the book but a critique of the entire idea that there should be a field called psychology, which is dedicated to the idea that the mind of an individual is a cohesive entity that can be studied in its own right.

And there were attacks by the Marxists biologists, such as Steven Rose, who saw the book as representing the kind of sociobiology that they detested in the 1970s.

**the evolutionist:** What about feminists?

**Pinker:** I had braced myself for a feminist attack. I anticipated it in writing the book and I had several paragraphs on the apparent contradiction between feminism and biological approaches to sexuality. I argued that in fact there was not contradiction. To my surprise that seems to have been successful. The book has not received any attacks from feminists that I know of.

**the evolutionist:** Do any of the criticisms worry you?

**Pinker:** Among the ideological attacks there are also some substantive criticisms based on particular claims that were not as well supported by data as they could have been. Those were reasonable criticisms, for example, of work that I cited on human habitat preferences and environmental

aesthetics. The idea is that our tastes for certain landscapes come from our being creatures that were adapted to the savannah and cognitive creatures who feel most content when an environment has geometric frames of reference that allow it to be easily explored and remembered. I think it's a plausible idea, and there's some direct empirical support for it, but there could be more. Similarly with some of the work on infanticide as an adaptation to poor prospects for infant survival: I believe it's true, but I take to heart the criticism that there are not as many data as there should be.

There were also a number of recurring misunderstandings of particular points that some reviewers insisted on having, even though I made every effort to leave nothing to the imagination. One example is the shaping of personality. I said that the most important influence parents have on their children is at the moment of conception. People interpreted that as coming from the discovery that identical twins reared apart are quite similar, which is indeed an interesting finding. But the finding that motivated that claim is that twins or siblings reared apart are no less similar than twins or siblings reared together. It's a separate and logically independent finding: it's not just that you're similar if you're reared apart, but you're no more similar if you're reared together. That is a second finding that many highly intelligent people just cannot grasp - Steven Jones in the *New York Review of Books* being an example.

**the evolutionist:** In many ways the book is arguing against the view that our thoughts are socially constructed by how we were socialized as children. Can you say what this view is and why you think it's wrong?

**Pinker:** Yes, it argues against the view that parents mold or shape their children, that the early years in the home form personality for the rest of one's life: "as the twig is bent so grows the branch." This is unlikely from an evolutionary point of view because the interests of children and the interests of parents only partly overlap. Robert Trivers pointed out 25 years ago that a direct consequence of Mendelian genetics is parent-offspring conflict: a child shares 50% of its genes with each parent and shares 50% of its genes with its siblings, but shares 100% of its genes with itself. Therefore one would expect that parents would, all things being equal, have an interest in treating all of their children equally. But each child values its own interests twice as much as those of his siblings, and this sets up an area of conflict. So you should not expect children to allow themselves to be molded by their parents -- to follow the norms and examples their parents set for them.

And, indeed, one of the deepest discoveries in psychology and behavioral genetics in this century is that there are few if any long-term effects of "shared environment," that is, the environment that siblings have in common when they grow up in a kin family. It's amazing that few people know about this finding, and few people understand it even when it's spelled out. It runs so counter to our deeply ingrained folk-theory of child-rearing that it's very difficult for people to accept that it's even a logical possibility as opposed to being self-evidently false.

It's not that children are unaffected by their parents or environment. It's just that they are information-

processors and strategists who tailor their own best responses to the environment they find themselves in; they are not pounded or indoctrinated into shape.

**Pinker:** The assumption that children are permanently moulded by their upbringing is shared among theories that differ in almost every other way. Psychoanalysis, behaviourism, Marxism, and secular humanistic liberalism all believe to varying degrees that the way we treat children in the first few years is decisive. It's also thought to have political and moral implications, namely that the details of child-rearing will shape the next generation and therefore deserve special attention. This is in large part a good thing. The child-rearing revolution of the 20th century, where we switched from Oliver Twist/Jane Eyre-style tyrannical treatment of children to one in which children are indulged has certainly led to an improvement in human welfare. But it has also led to misplaced priorities and expectations. Parents are routinely blamed for any difference or deviation in the way their children turn out: if the child is schizophrenic it's because the mother conveyed mixed messages; if the child has a language impairment it's because the mother didn't provide enough "motherese" and so on. Not only does it stigmatise mothers but it diverts attention away from the real causes of differences among children.

**the evolutionist:** I've always thought the standard social science model presents a surprisingly pessimistic view of human nature -- that people are entirely malleable and at the mercy of the rest of society -- compared to the evolutionary psychology view in which people are born high-spec, specialised problem-solvers just waiting to spring into action.

**Pinker:** It's pessimistic in the sense that it's fatalistic, even though it's touted as the alternative to the fatalistic view that everything's determined by our genes. It's fatalistic because it says that the first few years of life set the course for the person's entire existence, which I think is false. I personally find the alternative comforting: the first few years don't put you on trolley tracks that you travel the rest of your life. The child-moulding theory has also led, ironically, to a perverse view of child rearing. Judith Rich Harris is coming out with a book called *The Nurture Assumption* which argues that parents don't influence the long-term fates of their children; peers do. The reaction she often gets is, "So are you saying it doesn't matter how I treat my child?" She points out that this is like someone learning that you can't change the personality of your spouse and asking, "So are you saying that it doesn't matter how you treat my spouse?" People seem to think that the only reason to be nice to children is that it will mold their character as adults in the future -- as opposed to the common-sense idea that you should be nice to people because it makes life better for them in the present. Child rearing has become a technological matter of which practices grow the best children, as opposed to a human relationship in which the happiness of the child (during childhood) is determined by how the child is treated. She has a wonderful quote: "We may not control our children's tomorrows, but we surely control their todays, and we have the capacity to make them very, very miserable."



**the evolutionist:** The main thrust of your book is to bring together evolution and computation. With enough computing power and enough knowledge of our evolved psychologies, can you envisage being able to run a human psychology application on some future computer?

**Pinker:** A robot? A HAL? A Terminator? A C3PO?

**the evolutionist:** Well, yes. Or Microsoft Psyche version 1.

**Pinker:** There's a big difference between "in principle" and "in practice." The question is similar to: Would an increased knowledge of physiology and molecular biology enable us to grow an android in a biotech factory? In principle there's no reason why we couldn't, given enough time and resources. It will all depend on a lot of mundane stumbling blocks or opportunities that pop up as you go. Some things just may not be practical. There may be some aspects of the psyche that require having a body. We may have to wait for some genius to be born to give us the key insights about how a particular mental faculty is organised, and those geniuses may turn up once a century and you may need eight of them to know how to do it. It may require more parallel computing than we can fabricate on silicon. The parallelism of the brain, where each neuron can synapse with up to 10,000 others, is easy to grow molecule by molecule in a foetus, but may be difficult to fabricate out of little wires and silicon traces, and that might stop us in our tracks. And there may be other roadblocks that we can't even imagine.

**the evolutionist:** But in principle?

**Pinker:** In principle, it would be possible. I think a bigger question is: If we could build MS Psyche 3.1, would it be conscious? Would there be some sentient entity that was actually feeling something?

**the evolutionist:** In *HTMW* you break up consciousness into access to information, and sentience. Can you elaborate on this distinction?

**Pinker:** There is an ordinary scientific problem of consciousness, namely, why is information processing in the brain organized into two streams, one of which we can talk about and reflect on and that plays an active role in our moment-by-moment deliberations, and another stream to which we have no access. The first category includes ordering from a menu, planning the rest of your day, or looking on your bookshelf for a particular book. The second category includes the sequence of muscle contractions that allow you to pick up a glass, and the rules of syntax that order the words you speak. Understanding the distinction between them is an ordinary topic in cognitive science and neuroscience, and there's no reason why we can't solve it in the way other problems in perception and cognition have been solved. I suspect that implications of evolutionary theory, such as Trivers' theory of self-deception, will shed light on why some of the emotionally tinged contents of our thought may not be conscious in this sense. In other areas the reasons why we are conscious of some kinds of information and not of others may have to do with the need to avoid combinatorial explosions, or the fact that the brain is a finite machine that obeys the laws of thermodynamics and can't use infinite

energy, and therefore has to prioritise certain kinds of computations. That might provide the ultimate or evolutionary explanation of consciousness, in this sense of the word.

We can also expect to arrive at a computational characterisation of consciousness. Perhaps it corresponds to a finite data workspace -- what psychologists sometimes call working memory. Or perhaps it can be characterised in terms of levels of representation in processing hierarchies, as Ray Jackendoff has argued. For example, what vision researchers call the "2 1/2 D sketch," or "visible surface representation," seems to correspond to our conscious visual experience -- conscious visual experience does not correspond to the activity of rods and cones at the lower levels, nor to abstract ideas about the kinds of objects that are in front of us, at the higher levels.

The other sense of consciousness is what one might call a philosophical sense of consciousness, what David Chalmers calls the 'hard problem' of consciousness (the former he calls, somewhat tongue-in-cheek, the 'easy problem'). The hard problem is why we're conscious in the sense of having some subjective, private experience of perceptual and emotional and cognitive states. Why does red look red as opposed to just being distinguishable from green in the information processing of the brain?

***the evolutionist:*** Or why flame feels painfully hot, instead of just prompting an automatic reflex to pull your hand away.

**Pinker:** Exactly. And that ties into ethical problems, such as whether a lobster feels pain when its boiled alive as opposed to merely thrashing for a few seconds. If we built a life-like robot, would dismantling it be murder? Some philosophers of science dismiss such questions as pseudo-problems because they're quintessentially unverifiable -- by definition they refer to the private and the unmeasurable. Others try to domesticate the problem by making it equivalent to the easy problem of consciousness, information access (the sense we discussed earlier). Still other philosophers admit that it's a real problem, but suspect that it's one that we'll never understand. The categories of cognition that our brains give us don't accommodate the notion of sentience, so we'll be as eternally puzzled by the notion as we are by four-dimensional space, or as puzzled as a rat would be trying to solve a maze that was baited in the prime-numbered arms. I'm actually sympathetic to that position, as long as consciousness in the sense of the 'hard problem', or 'sentience' or 'qualia' is distinguished from the more mundane problem of information-access, which I predict will be solved.

***the evolutionist:*** Do you think that sentience is a unitary thing?

**Pinker:** Definitely not. It comprises certain bodily states: hunger, thirst, pressure, and so on. It certainly comprises the emotions. Emotions almost by definition are conscious. It comprises some cognitive states, not just a sense of mental effort but awareness of meanings of sentences or ideas, notions, plans, concepts. All of these aspects of consciousness rest on a substructure of information processing that is not consciously accessible; the products of that lower-level processing bubble up into this higher or conscious level. What we can experience as consciousness is a diverse subset of the

information processing activity of the brain.

**the evolutionist:** So although it's possible to come up with adaptive explanations for these different aspects, even when you've done this there remains the problem of why we feel these things happening at all...

**Pinker:** Since we can imagine a robot that, behaviour-for-behaviour and state-for-state, is identical to a human, but in which there's "no one home" -- no one actually feeling the pain or seeing the red -- there can't be an adaptive explanation of sentience, because we've defined it as something that can have no external consequences.

**the evolutionist:** So it's not just a case of the adaptive explanation of sentience forever eluding us, but rather that there cannot be one?

**Pinker:** That's right. Something that has no consequences can have no adaptive consequences. We can imagine a robot or a zombie or an android that has no consciousness, but otherwise interacts with the environment in the same way a sentient human does. Incidentally, people like Daniel Dennett insist that the whole concept of sentience is a horrible blunder. They say that if some hypothetical entity has no consequences, we're deluding ourselves to think that the entity exists at all. The thought experiment of a robot that's behaviourally identical to a human but without internal subjective experience is a delusion. Empirically, should we meet such a robot, Dennett argues, we would conclude that it did have subjective experience -- just as the thought of dismantling *Star Trek's* Commander Data is horrifying to the audience because they cannot escape the conviction that there is a sentient being inside. If we were to deconstruct the notion of sentience we would see that it boils down to having the particular behaviours and information processing patterns that constitute intelligence and organized behaviour. In that view, there is nothing left after you have laid out the consequences of consciousness.

**the evolutionist:** How does this relate to the work on folk psychology and theory of mind, which shows that people attribute consciousness to other people, and sometimes to pets and sometimes to cars with cute faces? Could we be mistaken in applying it to ourselves?

**Pinker:** Yes, it could be. People like Dennett say that our theory of mind is the source of the misconception that there is some ineffable essence or dimension of being that is somehow packed inside the brain. If so, this would be a habit of ours coming from our innate theory of mind rather than an objective characteristic of the mind.



**the evolutionist:** Consciousness, free will and some aspects of morality are things that, in the last chapter of your book, you say are likely to remain mysteries rather than the kind of problems that are conceivably solvable.

**Pinker:** I would say that each one of them would have some core that remains a mystery, though there are also parts of each of those problems that are "easy problems" in Chalmers' sense. There is a psychology of morality, and ultimately an evolutionary biology of morality and of the will, as there is of consciousness. But when those problems are solved there will still be some residue that we do not feel we understand. In the case of the will, the easy problems are: what structures of the brain initiate voluntary behaviour or trains of thought, what computational characterisation can we give them (perhaps some executive subroutine or winner-take-all competition), and in an evolutionary sense, why is the brain organised in this way as opposed to alternative ways. The hard problem is: How can we reconcile this understanding with our equally strong conviction that voluntary behaviour is not caused at all but chosen, and therefore something that we can hold people responsible for?

**the evolutionist:** Isn't that precisely the reason *why* we attribute free will to people, so that we can hold them responsible for their actions?

**Pinker:** Yes, I think that's right. The hard problem is explaining why the attribution is so compelling, almost indispensable. We don't think of neural causation when we are doing moral reasoning; we take free will seriously. We don't think of will as a convenient fiction, or as an artefact of our social cognition module. We proceed on the assumption that behaviour really is uncaused, not just that our brain is wired up such that we like to think of behaviour as uncaused. Again the existence of free will has been questioned by philosophers, who say that we should just dispense with the notion of uncaused behaviour in our moral reasoning, and treat responsibility in strictly utilitarian terms, namely as part of the only system that will allow us to influence behaviour for the common good. Those aspects of behaviour that are susceptible to reward and punishment, to guilt and pride, to entreaties and persuasion, are those that we label free will, and it's simply a matter of effective tactics that we concentrate our moral persuasion on those aspects of behaviour that are sensitive to it. So that would be a way of dispensing with free will.

**the evolutionist:** And what do you think of that view?

**Pinker:** I think it's ultimately unsatisfying because it gives you a radically utilitarian ethics that conflicts with some of our moral intuitions.

**the evolutionist:** It doesn't mean it's incorrect view, just because it contravenes some of our other evolved moral prejudices.

**Pinker:** That is true. If one thinks of morality like colour vision, an evolved quirk of the brain as opposed to something that has external existence, the hard problem of free will would vanish. If one thinks that there are things that are inherently right or wrong, independent of the fact that our mind treats them as right or wrong, then the hard problem of free will comes back.

**the evolutionist:** And you would think that there are things that are absolutely right or wrong?



**Pinker:** I think so, although not being a moral philosopher I don't know how far I could convincingly push that. But it strikes me that to get a system of moral reasoning to work you require notions of right and wrong that are external to human sentiments. In the same way, in mathematics, even though there is an evolved faculty of mathematical cognition, there's still a sense in which mathematical truths are true independent of the way the brain is put together. One plus one equals two is true regardless of whether any creatures have evolved to grasp that. The theory of moral realism would be equivalent to the theory of mathematical realism, namely that the brain contains evolved faculties of mathematics and moral reasoning, but that doesn't make mathematical truths -- or moral truths -- figments of human cognition. It's conceivable that those truths exist in some Platonic sense, that under some circumstances brains can evolve to grasp.

**the evolutionist:** You talk a lot about a hypothetical alien anthropologist landing on Earth -- What would he make of what you've said? Presumably he used the same maths and engineering to build his spaceship, but he might, if he came from some strange termite race, have a very different morality, and be surprised that an evolutionary psychologist, of all people, was arguing for some absolutely morality.

**Pinker:** Possibly. On the other hand it might be that the best ethical theory really does embrace termites, Martians, and humans, but is couched in terms of "well-being" or "interests," which happen to differ among termites, Martians, and humans, and which therefore draw out different specialized implications of that single moral system. And perhaps the differing interests in turn can ultimately be explained in terms of the genetic interests of the agents in question.

**the evolutionist:** There are other things in your last chapter that you don't think are adaptations. Could you say why?

**Pinker:** Music, art, most narrative, religion. It's often been suggested that music, art, and religion adaptations because they bring the community together or they enhance happiness or allow us to experience the sublime or see the world in new ways. I don't accept those explanations because they are close to being circular. They assume that music has the ability to bring a social group together, or that religion does. That aspect of human psychology -- the tendency of people to enjoy music, or to be brought together by religion -- is as much of a puzzle as the question of why we have music and religion and art to begin with. If there is a beneficial effect, it's as much of a puzzle why it has that beneficial effect, as why it exists. Why a series of noises in harmonic relations should cause people to feel that they're more in touch with their fellows is part of the same mystery as why a single individual puts on a record for his own amusement. The direct physical effect of noises in harmonic do not include "bonding within the group," so we cannot invoke such an effect as an explanation of why music evolved.

With genuine adaptations, the ability in question causes some effect that we can antecedently argue enhances fitness. An adaptation is a mechanism that brings about effects that would have increased the number of genes building that mechanism in the environment in which it evolved. Stereo vision has the

effect that you have accurate information about where the edge of the cliff is. Language allows you to share information. Sexual desire increases the probability that one's genes will make it into the next generation, and so on. But the direct effect of music is sheer, pointless pleasure.

Instead of being adaptations, most of the arts may arise because we have acquired technologies to excite our pleasure circuitry. The pleasure circuitry has an adaptive explanation. The intelligence that manipulates the world to bring about certain effects has an adaptive explanation. But you put them together and you get a species that in a biologist's sense, misapplies its intelligence to infiltrate motivational circuitry and short-circuit it. We have figured out how to amuse or titillate ourselves with artificial stimuli that don't themselves enhance fitness.

***the evolutionist:*** What do you think of psychologist Geoffrey Miller's theory that the vast difference between the sexes in terms of cultural production, and the peak for males being at an age when you might expect most male-male competition for status and mates is good grounds for believing that cultural production is an adaptation in the sense that it is a courtship display?

***Pinker:*** The data that I saw don't really show that as much as Geoffrey would like. For a lot of art forms, the peaks are in the 30s and 40s rather than in the late teens and 20s. I think there is something to what he says but that he pushes it too far. Anything a person can do can be used as a courtship display -- athletic ability, beautiful language, beautiful works of art, wit, intelligence, and so on. So it is true that one use of our mental faculties is to impress the opposite sex. But art, music and language and intelligence don't follow the pattern of sexual selection particularly well. A 70 year old woman playing Mozart on the piano for her own pleasure is not of the appropriate age or sex or circumstance for an explanation in terms of sexual selection.

***the evolutionist:*** But then she wouldn't be very representative of people playing the piano?

***Pinker:*** She certainly wouldn't be unrepresentative of people who enjoy listening to music. Likewise for art, music, narrative and so on. You don't find it appreciated only by females of reproductive age, or produced by males of reproductive age. It seems to give pleasure too broadly and symmetrically between the sexes to meet the criteria of a sexually selected trait. One can easily argue that fighting to enhance reputation and status is a sexually selected trait, because it is strongly concentrated in the early reproductive years and highly sexually asymmetric. Language, art, music, intelligence and so on, seem to be appreciated too uniformly across the sexes and lifespan to be sexually-selected traits in and of themselves. I don't deny that, as with every feature of the body and mind, these features can be used for courtship, but I don't think courtship is a reason for its existence.

***the evolutionist:*** If you're happy to claim that appreciation of the arts is a by-product of other faculties, could the fact that it's widespread be a by product of this sexually selected trait?

***Pinker:*** Only in part. I distinguish between a component of the arts that's purely aesthetic and a

component that's tied to status, and I think a lot of virtuosity -- the avant garde, the cutting edge, inaccessible art, sheer sumptuousness -- may be in the service of the pursuit of status. And of course the pursuit of status is in part a kind of courtship -- although probably not exclusively for courtship, because people pursue status to help out their family and to have networks of allies to preserve their physical well-being in the presence of enemies. Of course, ultimately everything is in the service of gene-level reproduction if you're an evolutionist. But when we talk about what particular traits are engineered for, there are intervening links between reproductive success and the operation of those traits. The component of the arts that is primarily status-seeking is more closely tied to Miller's hypothesis, but it still may be a link or two removed from courtship per se.



**the evolutionist:** So after working out how the mind works, how do you top that?

**Pinker:** My next book will be on regular and irregular verbs, which is my day job. The book will be called *Words and Rules: The Ingredients of Language*, and it will try to explain language as an interaction between memorised words and combinatorial rules. It uses as a test case the contrast between regular verbs such as walk-walked, where the past tense is generated by a combinatorial operation of gluing a suffix onto a stem, and irregular verbs such as bring brought, where the past tense is idiosyncratic and retrieved from memory.

**the evolutionist:** Lastly, I have to ask you, has *The Language Instinct* been translated into any other languages, as it must be the hardest book to translate ever?

**Pinker:** Absolutely. To my surprise it's been translated into six languages and there are another six on the way. It's been translated into German, Japanese, Spanish, Dutch, Italian, Korean, and Chinese, and there are Greek and Portuguese and Hungarian translations on the way.

**the evolutionist:** Thank you.

**the evolutionist**



(The interview was conducted over the telephone, June 2, 1998.)