

**Interview with Peter Atkins conducted by Jim Spadaccini at The Future of Science Conference in Venice, Italy
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Q: Let's talk about your book *Galileo's Finger*. Can you tell me about the title and what it represents?

PETER ATKINS: Yes. I mean, if you go into the Museum of the History of Science in Florence, and you go into one of their rooms, what you find is a pot, and sticking in the pot is Galileo's finger. Actually, it's that finger, but I pretend it's this finger (*Peter waves his finger*.) And I use it as a representation of a change of direction, when scientists in the old days used to sit around thinking about what the world should be like. And then Galileo and the experimentalists came along, and they went out to discover what it is actually like through experiment. So it's a change of direction, really, and modern science really stems from the time that experiments became the principal mode of exploration of the world. But I also use it as an admonition. So be cautious about the future of science. So it's a change of direction and an admonition.

Q: You've written that "natural selection is essentially unpredictable because it is the outcome of sometimes competing tendencies and adaptations that at first sight might be advantageous remain unachievable. Can you explain?"

ATKINS: Yeah. Well, natural selection is totally blind. It's totally opportunistic. All it does is to press on open doors and to see where, where they lead. It doesn't know that if it presses on this door and goes through it might become trapped. It just... it just presses on doors and goes wherever they lead. And in some cases, those... the doors that it opens are fruitful. In... you know, for example, in our case, the doorway that opened that... into the primates became us, and we think that that's good. It could have been that, you know, another door would have led somewhere else, and the consequences of that would have been even better. But we... we're rather satisfied with the doors that led to us. So it's totally blind and it's totally opportunistic, and it thinks only for the present. And in some cases, it's... well, in all cases, in some sense, it's highly successful.

Q: But natural selection is imperfect, right? You talked about the appendix as an example.

ATKINS: Yes, I mean, if you... so an example of being trapped. Sometimes you

just can't lose an organ, which is a nuisance, because it's too much trouble to reverse the process, and you might open yourself up to dangers by trying to... by eliminating that organ. So you live with it, and you learn to live with it. Modern medicine helps us to cope with the mistakes of evolution.

Q: In your book *Galileo's Finger*, I was surprised to find a list of arguments against creationism. If creationism isn't science why bother addressing it at all?

ATKINS: Well, that's... I mean, so it's a real... it's a political question, really. At the moment, there is, certainly in the United States, a move towards belief in creationism, disguised as it is, as intelligent design, and so on, which, in my view, really undermines society and undermines the progress that we have made since the Renaissance and since the Enlightenment, and is totally irrational, and it shows... it diminishes the power of human thought. And I think that children who come through high schools and then go on to universities ought to be shown how to be rational, how to think about the nature of the world, and so on, and not to be deflected by religious... religiously motivated forces into blind allies.

Creationism and intelligent design have absolutely no explanatory power. They are easy modes of explanation... they... that... you know, on the shape of the structure of the eye, that it was designed, or God did it, things like that, leaves you completely misunderstanding the nature of ourselves. Whereas if you try to explain how the eye might have evolved by nature, discovering that light sensitivity was an important survival instrument, and then nature in its very economical way, bringing together the proteins that help to enhance vision by forming a lens, and so on, sharpening vision, I think that's a wonderful way of understanding our own nature. It's much more deeply satisfying even though it's much more harder work to understand how we have emerged than simply to lie back and say God did it.

Q: Beyond the intellectual aspects, are there more tangible dangers in having a large segment of the population that doesn't accept evolution?

ATKINS: People no longer understand their own nature, and I think it's very important for humans because we are so powerful, because of our control over the world, over... our control of the rest of the biosphere, really, to understand our own nature. It makes us much more sensitive to it. I think we need to understand our place in the cosmos, and our place is quite extraordinary. We can understand things. We can reflect upon the consequences of our actions. We can respect even a small pox virus in a sense, because we can understand how it has actually discovered a niche. And I think understanding where we are in the cosmos increases our respect for it. If we were simply made, we wouldn't have any respect for the rest of it. And I think it's very important to realize how

we have emerged, and how we fit into things.

Q: What do we do about it?

It's very difficult, going back to your earlier question about whether we should simply ignore creationists or whether we should fight them is, I find, a terribly difficult question. I think in some sense, if we stay calm and show people the beauty of the world in terms of our understanding of it, or some... you know, there are many religious people... we know this is religiously motivated, we know that, however heavily it's disguised. But there are many religious people who respect evolution, natural selection is God's way of building his world, and his... letting his image of the world emerge. I think that's nonsense, but it is... you don't need to be a creationist in order to be... to believe in God.

Q: In your book you point out that “Darwin and his contemporaries...knew nothing about the nature of heredity.” Can you explain how the emergence of genetics helped strengthen and support the theory of evolution?

ATKINS: Darwin's recognition of evolution and his explanation... I mean, there are two levels: There is the fact of evolution and the theory of its mechanism, and the theory of its mechanism is natural selection. And it's very important to distinguish the factual basis and the theoretical mechanism. But both the recognition of evolution and the... Darwin's realization of natural selection as its mechanism were made on observations at a macroscopic level, in the sense that you picked a bone and you looked at it, you captured a finch on the Galapagos and looked at the shape of its beak, and things like that.

What we've done, really, since 1953, with the introduction of molecular biology and the understanding of DNA, is to find a whole parallel world of evolution at a molecular level, at a level that you do not notice unless you explore it, in laboratories and at a very atomic level. And these two parallel streams have been found never to be in conflict, and that is very important evidence for the validity of our ideas. So we have two completely independent ways of looking at the emergence of the biosphere, and they are not in conflict.

More than that, whenever you have different streams of explanation, you find that each... if they are correct, then each reinforces the other. So it's like two rivers that merge and augment the current. They don't diminish the current.

Q: We're at a conference for the future of science and the theme is evolution. What do you see as the future of evolution and genetics?

ATKINS: Well, genetics, that's an easier one to answer. In genetics, we will be like God. We will be able to design future organisms. In a sense, that is what we

are doing already with genetic engineering, and it gives us an extraordinary responsibility to do it cautiously, carefully, and sometimes not to do it at all.

In terms of evolution, well, it could be that the evolution of the human species has come to an end, that we have such powerful medical control over disease and abnormality and so on, and the societies have a conscience about abnormality, which, you know, in the wild there is no conscience, or that we retard the pressures of evolution and accommodate the disabled.

Q: At the end of your chapter on DNA in *Galileo's Finger*, you mention that we shouldn't "waste our aspirations in petty squabbles that stem from the difference of a few letters in our genes." Obviously, you see understanding genetics as a potentially unifying force, can you elaborate on this?

ATKINS: Well, I think science is the one... probably the only, and I hesitate when I say that because there are other contenders, perhaps, for what I'm going to say, but perhaps the only transnational, trans-cultural human activity with no political flavor. I hesitated when the word 'music' popped into my brain, but music can be political and have political influences, and so on. You know, the *Star Spangled Banner* doesn't go down terribly well in Iran at the moment. So the... whereas, you know, the Second Law goes down in Iran just as well as it goes down in Canada, or wherever.

So I think that the community of scientists is an extraordinary community transcending national conflicts, and I think is a power for peace in the world. And I do a variety of things build upon that perception to help bring misunderstanding people into a state of understanding.