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rator's note: This text has been edited to remove the embolalia [embolalia (m-bo-la'li-ya) n. the use of virtually meaningless filler words, phrases, or stammerings in speech utterings while arranging one's thoughts] and minimally clean-up grammatical syntax to enhance readability.

After Darwin

Dr. Elisabet Sahtouris talks to Big Picture about reuniting spirituality with science in order to form a new world view

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Part One:

Humanity in crisis, sustainability, learning from living systems

You may wonder what an evolution biologist is doing on a "World Commission for Global Consciousness and Spirituality " and that certainly is an interesting question. Because I wouldn't have guessed myself that I would be doing this kind of work. But trained as a western scientist I came to feel that the world view I was taught was too narrow, like a suit one had outgrown, and was searching for the broader context for what a Western science would be. I've been working on that now for quite a few decades and have come to the view that consciousness is not a late emergent product of a material evolution but the exact opposite, the source of all material evolution. So I've come to believe that spirituality and science were separated only for historic reasons and that it's time now to reunite them in a single world view that can encompass the best of our spiritual traditions and the best of our scientific traditions.

When you do that as a biologist, as I am, you come to the view of a living universe rather than this strange concept among human cultures that western science came to, that we're in a non-living universe; a mechanical, celestial mechanics if you like, that's running down by entropy and in which, by some miracle, life emerged from non-life, consciousness from non-consciousness, intelligence from non-intelligence. Those have been the stickiest problems for western science. While many western scientists have convinced themselves that there really are explanations for chemistry coming out of non-life and producing life, I did not find that satisfying.

We have a new definition of life in biology in the last few decades called *autopoiesis* which means that a living entity is one that continually creates itself. This is very unlike a machine which is created from the outside by an inventor, given its rules of operation, and usually in a hierarchic arrangement and has to be reinvented to have generations of technology rather than being able to reinvent itself in an evolutionary trajectory. So when I looked at that definition of autopoiesis I said "What's the simplest entity I can think of that continually

creates itself?" What I came to was a whirlpool in water. It holds a form through a constant intake of new water and lets out what it no longer needs. Very like a human body: we eat food, drink water and breathe in air. We continually renew all our molecules, cells and organs and we hold a recognizable form through that process, letting go of what we no longer need.

So I began to see a continuity between the vortex form in proto-galactic clouds all over our cosmos, the galaxy that we ourselves live in; the self creation of Earth over time, which was initially a stardust ball of heavier elements, and then cooling on the outside, magma inside, began to turn itself inside out, magma coming through to the surface then crustal plates forming and melting again into the magma as they move and shift. If you could see a picture of Earth in a few hours, as it's been from the beginning, you'd have no doubt that this is a living entity constantly changing and recreating itself, and evolving evermore complexities. Three-quarters of its life was devoted just to microbial life and then the big multi-celled creatures came in. The Earth itself is like a giant cell. Even Redwoods have just a thin skin of what we call biological life on its surface. The rest of it isn't alive by our definition. And yet we think of the whole tree as alive. So the planet with its thin skin of biological activity also seems to be a self-creating kind of cell.

Looking at its evolution over time I came to ask the questions of who are we humans in this context? Where do we come from? Where are we headed? What's going on for us now? The obvious thing about humanity today is that we're in huge crisis, that we've created enormous crises in economics, in politics, in spirituality, in just about every area of human life. Besides destroying our eco-systems in the process of developing our technologies. So we're asking ourselves now where do we go from here? How do we solve this? We've got global warming. We've got pollution, we're sharing it all over the globe. Our political boundaries don't keep it away from each other. We have to develop *global family*. We have to engage in this process of globalization. That is our evolutionary trajectory now.

How do we globalize? How do we shift [a] non-sustainable way of life to a sustainable way of life? If we know something is unsustainable it means it can't last and we have to reinvent it. Our job now is to see if we can acquire a world view in which we start with cosmic consciousness (because no human has ever had an experience outside of consciousness) and then recognize that our direct experience is always *now* and that reality has to be the sum total of human experience. How do we build a scientific model of that? You see we can't build an objective model of the world out there. We can only build a model of our experience. And our experience at present is how to get out of crisis.

Looking at living systems[1] over time, I came to understand that they all go through a cycle that's very like our psychological maturation cycles. We start with a unity, we're undifferentiated, we come into the world new. And then individuation happens. We have many experiences. We branch out in many directions. And humanity, as it diversified and had more and more people, created more and more conflict. Exactly as the early Earth differentiated into bacteria and then they developed different lifestyles and they became competitive. They invented technologies in order to carry out their hostilities. They created enormous problems including global hunger and global pollution. And had to solve those eventually by negotiating differences, moving on around the cycle, and working out cooperative schemes that ultimately lead the ancient bacteria that ruled for the first half of

Earth's life to form a new kind of cell as a community of different lifestyle bacteria working together. That's the nucleated cell that we're made of, that all these trees are made of, all the beings in the waters are made of. Everything see around us are made of this wonderful big cooperative cell.[2]

Now humanity is going through the biggest event since the time that bacteria formed the nucleated cell because we're now trying to form the body of humanity around the globe. Seeing that other species matured out of a youthful competitive phase into a mature cooperative phase means everything to us now. The Darwinian story only goes to the adolescent part where there's hostile competition. You take all you can get. You fight your enemy. You try to out-do him or try to bump him off and that's what makes you survive.

But that's not what sustainability is all about. Sustainability happens when species learn to feed each other instead of fight each other. You get mature ecosystems such as rainforests and prairies where you have far more cooperation than you have hostile competition. You can still have friendly competition, but that's very different. So I see humanity doing exactly this right now. We of the western culture who divorced ourselves from nature saying "We're separate. That's nature out there. Let's see how we can exploit it to our purposes." Interestingly, we're the species who invented the concept of *entropy* and we're the one who creates it, who deteriorates eco-systems while the other species are building them up. So we have a great deal to learn from nature and by recognizing that our conscious experience *is* of other beings, *is* of teachers in nature that we can learn from and gain hope from. If bacteria could do it without benefit of brain, can't we [do it] as humans with big brains?

Part Two:

Crisis of economics, WTO, GM foods, interconnectedness, butterfly metaphor and body economics

In addition to this maturation cycle I see in evolution, it's also very important to recognize the embedded-ness of living systems within each other. Our bodies are made up of cells within organs, within organ systems, within a whole body and we can see that every level within this *holarchy* (these are *holons* within a holarchy -- terminology from Arthur Koestler[3]), we can see that the self-interest of every level can be expressed and that what happens is *that* pushes negotiations towards a cooperative overall system. So self-interest is good as long as its contained by the self-interest of a community. You see, that makes us always be aware of other levels. If we can learn this as humans to say when we're making a decision: Is this good for me, my family, for my ecosystem, for my nation for my world? And then if it's good at some levels and at least harmless at others, like the Hippocratic oath "Do No Harm" then go ahead and try it. You're a creative human being.[4]

In evolution we see that every time the Earth has had a huge crisis like an extinction then afterwards we have had an explosion of new life. Not slow accidental Darwinian lineages. But an explosion of all kinds of new life like the Cambrian explosion where suddenly multi-celled creatures appear in the evolutionary record. Many different types at once. Or after the last extinction with the dinosaurs, when extinct we see a flowering of all the different kinds of mammals afterwards. Not one giving rise to the other but many chains of

them emerging at once. Human creativity now is our big crisis. And we are causing the latest big extinction. We're extinguishing creatures faster than that meteor that caused the extinction of the dinosaurs. This is a big crisis, a huge crisis that we've created. And we have to let all the different cultures express their self-interest and their understanding of the situation.

What we have now in the world (because our biggest problem is economics) is a World Trade Organization (WTO) that's trying to dictate to other countries how they should behave economically. [5] What they can produce and what they can export. What we have to recognize is that we need *glocalisation* rather than globalization. Local and global flourishing at once. So if the WTO functions at the expense of the local economies, it's just like a body trying to run at the expense of its cells. That awareness has to come about that the negotiations of the cycle can happen simultaneously among levels of a body or a world economy.

We also have some practices in our world economy today that don't work very well like Genetically Modified (GM) foods.[6] DNA is a worldwide information system and genes, which are pieces of DNA, are tradable among all creatures. My genes and the genes of a plant are interchangeable. I breathe in new genes all the time in viruses all the time -- in bacteria, in plasmids, in prions -- all kinds of them are flowing through my body all the time. And it appears that we have an intelligent genome. We know now there are what biologists call *repair genes*. When there's accidental damage to the genome it is immediately repaired. Otherwise these errors would build up and you wouldn't be able to function for a whole lifetime. We now know there are *editor genes* when DNA is copied that make sure it's copied correctly. There are *repair genes* fixing any damage done so again we have to give up the Darwinian notion that evolution occurs through accidents and trust that the genome is intelligent. We see it's intelligent.

We have a hundred trillion cells in our bodies and each one of them has thirty thousand recycling centres renewing our proteins. They're so hi-tech that they can take in a protein, disassemble it, build a new protein (perhaps an entirely different kind) and issue the new protein. That's as if we could stick trees into a chipper machine and get a live tree out the other side. Very hi-tech! We're not nearly as hi-tech yet, as our own internal microworld.

We have a great deal to learn from nature. Take economics. If we ran our bodies' economy the way our economy is run it might look something like this. We could call the heart-lung system the "northern industrial organs". You give them ownership of the bones in which you mine the raw material blood cells that arise in the marrow. Sweep them up here to the northern industrial organs. Purify the blood as actually happens. Add oxygen and then the heart distribution centre announces "The body price for blood today is so much. Who will buy?" And you ship the blood to the organs that can afford it and not all can. This is the situation we have economically in the world today. You can see that a living system can't function that way.

Getting back to GM foods. DNA has been traded from ancient times in the bacterial world among species. But it's an intelligent trading system and it knows what to take in, what not to take in, what to release. When we started to implant genes in other genomes, first of all we harnessed bacteria and viruses that were capable of carrying DNA into cells to do the work

for us and we plant the genes in that way. Then the next time we looked at what was happening in those plants that were modified that way, we saw that gene was gone, it had disappeared. So it took many years to figure out how to get genes to stay in place when we put them in there. Unfortunately, our genetic "engineers" think that you can stick a new screw in place in the machine and change it that way. But it's not a mechanical system.[7] Genomes are intelligent systems and can detect the gene that doesn't belong and get rid of it. So they were throwing the genes out.

What we do now, essentially, is to shoot them in under pressure with a kind of crazy glue attached and force the genomes to accept these genes. The good research is showing that the whole organism reacts in the same way flesh hardens and gets red around a splinter. The entire organism can be disrupted by this because it's passed to all its cells. We find that for rats, fed on genetically modified foods versus natural ones, their organs begin to shrink and go leathery. But research scientists who discover these few things we know about it tend to get fired because the research is usually funded by the big corporations that are doing the work.[8]

So we're in trouble with genetically modified food. In Mexico the wild stocks of corn are now polluted. Even though the company scientists said the pollen wouldn't carry the modified genes that far, but it did.[9] In Canada we have farmers sued for having genetically modified crops in their fields when they did not steal or plant them. They blew in on the wind.[10] In the United States we can no longer guarantee organic soy or corn because the stocks are so polluted. So the genie's out of the bottle, and we can't stop it. Europe is being much more sensible in rejecting these foods because the research on their effects on people over time are absolutely inadequate. We do know that some of the GM foods are interfering with people's medications. It's certainly enough to warrant a ceasefire on this until we know far more about it and until we understand life better and possibly can make good use of such technologies, learning from the natural world that's been trading genes for so long.

The really exciting thing about being alive today is that we're all here for a great transformation. It's clear that we're unsustainable. We have to change things and we're figuring out how.[11] And in a sense the old system is getting more entrenched, more violent, more powerful. It's trying to keep itself alive while we know that we need a new system.[12]

The best metaphor I've found about this situation comes from the biological world again. It's the metamorphosis of a caterpillar into a butterfly. If you see the old system as a caterpillar crunching it's way through the eco-system, eating up to three hundred times its weight in a single day, bloating itself until it just can't function anymore, and then going to sleep with its skin hardening into a chrysalis. What happens in its body is that little imaginal disks (as they're called by biologists) begin to appear in the body of the caterpillar and its immune system attacks them. But they keep coming up stronger and they start to link with each other. As they connect, as they link with each other, they mature into fully-fledged cells and more and more of them aggregate until the immune system of the caterpillar just can't function any more. At that point the body of the caterpillar melts into a nutritive soup that can feed the butterfly.

I love this metaphor because it shows us why, first of all, we who want to change the world are co-existing with the old system for a while and why there's no point in attacking the old

system because you know the caterpillar is unsustainable so it's going to die. What we have to focus on is "can we build a viable butterfly?" A butterfly that really can fly because that's not guaranteed.

We can put our energy into building all the alternative ways of doing things that we know we want for a loving world. The kind of world we talk about in this Commission. How do we wake people up to understand that we're spiritual beings having human experiences? We can learn from nature how to go about this process of evolution that's called for today. We can build alternatives to the old models of education, of law, of healthcare. All of this we're doing. We know we can function as a global family because we've got communication systems that are global. Even if wars are going on we see that we can send faxes and make phone calls and be on the internet. The internet, by the way, functions like a real self-organizing living system.[13] You have to tolerate a lot of chaos in that situation to see the good things emerging, to see us connecting more and more and that's happening.

So I have tremendous hope for all of us humans together, using our creative technology, our computers, in order to link each other -- linking our minds, our concepts, our visions. Above all we need a very powerful vision to hold that butterfly image for us. To know where we want to go. Because the old system is very clear about what it wants. And we really do create our realities out of our beliefs. [14] If we don't believe in a positive world in which all humans are liberated to express their creativity, we cannot build it. We must hold the vision very clearly and then go about doing whatever each of us loves doing most, knowing that the others will do the other parts. None us has to do the whole thing. Together we can really make it happen.[15]

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Footnotes

1. See the fifteen properties of Living Systems discussed in *The Principles of Living Systems*, from *The Biology of Globalization*, by Elisabet Sahtouris, 1998.
2. For more on this see Chapters 6, A Great Leap & 7, Evidence of Evolution from *Earthdance: Living Systems in Evolution*, by Elisabet Sahtouris, 1999.
3. Arthur Koestler (1905-1983) was a novelist, political activist, and social philosopher. For more on the explication of his word holarchy, see "Holarchies," by Flemming Funch, 2/4/95,
4. For more on the WTO see the list of assembled articles in the Ending Corporate Governance section of ratical.org.
5. For more on holarchy see Lessons of Nature from "The Biology of Globalization," by Elisabet Sahtouris, 1998, and the section describing holons and holarchy in "Living Systems, the Internet and the Human Future," by Elisabet Sahtouris, 2000.

6. See for example, "Genetic Engineering Biotechnology - Challenges and Opportunities," by Mae-Wan Ho, Academy of Sciences, Kuala Lumpur, 5/28/99, "Genetically Modified (GM) crops are neither needed nor beneficial," by Mae-Wan Ho, *Sovereign Magazine*, "Changing the Nature of Nature - An Interview with Martin Teitel," *Multinational Monitor*, January 2000, "GM Food Hazards and the Science War," by Mae-Wan Ho, 12/1/99, "GREED OR NEED? Genetically modified crops," Panos Media Briefing No 30A, February 1999, "What many farmers have found about genetic engineering," National Family Farm Coalition, and "Genetically Altering the World's Food," *Rachel's Environment & Health News* #639, 2/25/99.
7. See for example, "Unraveling the DNA Myth - The Spurious Foundation of Genetic Engineering," by Barry Commoner, *Harpers*, February 2002, "What Our Human Genome Tells Us," by Elisabet Sahtouris, *WorldWatch Magazine*, May 2001, and "The Biology of Free Will," by Mae-Wan Ho, *Journal of Consciousness Studies* 3, 231-244, 1996.
8. See for instance, "Why I Cannot Remain Silent," Dr. Arpad Pusztai, *GM-FREE*, Aug 1999, and "Dr Arpad Pusztai Talks on Food for the 21st Century," prepared by Angela Ryan, 5/7/99.
9. See Transgenic Maize in Mexico: Two Updates, by Doreen Stabinsky, *GeneWatch*, Vol.15 No.4, July 2002.
10. See "Monsanto vs. Schmeiser, The Classic David vs Goliath Struggle."
11. See "Skills for the Age of Sustainability: An Unprecedented Time of Opportunity," by Elisabet Sahtouris, *The Bridge*, May 2002.
12. 11 September 2001 is one striking example of this. Contrived and manipulated as the so-called war on terrorism is, stemming from the unprecedented sequence of events and governmental non-responses during that day, this situation serves many purposes including diverting people's attention and energy away from the core work humanity faces in this unique time of our species' maturation. The Crimes Against Humanity section on [ratical.org](http://www.ratical.org) is devoted to highlighting some of the contradictions and factuallities of this historic special operation. Start with the Summary of Useful Research & References on the 11 September 2001 World Trade Center and Pentagon Bombings, compiled by David T. Ratcliffe, 9/11/03. The work to eliminate corporate rights is blazing some of the requisite trails to manifest this different system. See *Model Amici Curiae* Brief to Eliminate Corporate Rights, by Richard L. Grossman, Thomas Alan Linzey, & Daniel E. Brannen, 9/23/03, "Shifting into a Different Gear: Empowering Communities, Protecting the Environment, and Building Democracy by Asserting Local Control Over Factory Farm and Sludge Corporations in Pennsylvania," by Thomas Linzey & Richard Grossman, 2/15/04, and "Sins of the Fathers: How Corporations Use the Constitution and Environmental Law to Plunder Communities and Nature, speech by Thomas Alan Linzey at the University of Pittsburgh School of Law, 3/4/04.
13. See "Living Systems, the Internet and the Human Future," by Elisabet Sahtouris, talk presented 13 May 2000 at Planetnetwork, Global Ecology and Information Technology.
14. See "Vistas - Evolving Our Beliefs to Evolve Our Lives," by Elisabet Sahtouris, work in progress - preview of the book.
15. See "Discovering the Living Universe - Scientific Spirituality for a Global Family, by Elisabet Sahtouris, 2003.