

INTERVIEW WITH RAY KURZWEIL

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Tobias Hülswitt

Tobias Hülswitt: Mr. Kurzweil, during my research the number of my questions increased exponentially. I have around 7000 of them now. If we make 100 of them per day, it would take us 70 days. Could you take 70 days off to work with me? – Since you're going to live as long as you want to, you have all the time of the world ...

Ray Kurzweil: No problem, should be only a small fraction of the remaining time.

ON PATTERNS

I'd like to pay you a compliment to see whether you will like it: You are an interesting pattern.

Thank you! I think we are patterns, much more than material stuff. The stuff that makes me up is in large parts completely different from what it was just a few days ago, but if you go back six or 12 months, it's a completely different set of particles. If there's a river and you ask: Is the river still there? – Yes, the river is still there. – But is it the same river that it was a year ago? – Yes, it's the same river. – How is it the same river though? The water is completely different, it changes every few seconds. But the pattern of the water remains the same. Of course it changes slowly, but there's a continuity of pattern with gradual change, while the stuff that makes up the river is completely different within minutes. The particles flow through us as well, but we are also a pattern and we also evolve gradually. It's very similar to the pattern that water makes in a stream if it goes around some rocks. The pattern has a complicated shape and it stays the same for hours or months or years, but the water changes in a few seconds.

Some people might feel offended and say: I'm not just some pattern.

I would question the word 'just'. To me patterns are the fundamental reality. They are what's real about the world. They are what persists. Take the sun. It's completely different stuff, the particles are all in different positions than they were a year ago, but there's a pattern of information. We do live in a universe that's capable of having patterns, and of course that's an amazing thing, because if some of the parameters in the standard model of physics were slightly off by one factor in a billion, the universe would not have been capable of representing information in patterns. There'd be no atoms and no molecules and no suns and no German newspapers. And it's a whole interesting questions to why is it that the universe is capable of representing information. Now we do live in a universe that can represent information at different levels, in atomic structures, in biochemical structures. Since carbon can combine with other molecules in four different directions, it's capable of representing information. Then, after a billion years, DNA evolved, and DNA is actually like a little software program, it represents bits of information. DNA kept evolving, so that organisms eventually developed brains, and brains can hold information in them. And our personality, our memories, our skills, those are all information files, there's a mind file in your brain.

Are those patterns really there or are they something that we see into nature?

Well, fundamentally we are a pattern, and we are a very evolved pattern that's capable of looking back at ourselves and trying to figure out what those patterns are. We have self-awareness, we can actually not only think about things, we can think about our own thinking. And through science and technology we now actually have the means of understanding these patterns, and we are reverse engineering our biology and our brains, and we are understanding how they work and eventually we will redesign them to be more capable. That's the whole basis of my thinking. So the fundamental reality is that we are patterns, much more than material, because the particles that make us up are constantly changing. There's a western and an eastern philosophical perspective behind all this. From the western perspective the fundamental reality is stuff, particles, like electrons, and all the forces and particles that make up reality. Those underwent evolution, they became more and more complicated, and finally evolved creatures that are so complex like us, who are capable of being conscious and self-aware, so consciousness evolved because of the evolution of these patterns of information. From the eastern perspective the fundamental reality is consciousness, and consciousness is able to perceive patterns. But the fundamental reality is the consciousness being aware of the patterns. They both end up in similar places. And in fact quantum mechanics, which is the latest theory of physics, actually combines these two viewpoints. Because from the perspective of quantum mechanics particles don't decide where they are until a conscious observer looks at them. If you have electrons at some place in the universe and nobody's looking at them, they have no definite position. But when a conscious observer examines reality, they rule out ambiguity and decide where there are. It actually reminds me of virtual reality. If you are playing a video game, you have this impression of a virtual universe that's all over the place, and the screen is looking at one part of it. There are presumably things happening off-screen, but you just have this one viewpoint, which is one part of it. While you are looking at it, you' think the rest of it is still there. But in fact, the computer is not actually creating the part of the universe that you are not looking at. Those parts that aren't being looked at don't exist anywhere, they are not created even in the computer. When you get around to looking at a part of it, the computer bothers to render it on the screen. The universe seems to act similarly. The parts that we don't look at, the universe hasn't actually rendered them! The electrons haven't decided where they are.

ON STORYTELLING AND ARTS

*'And so I have achieved a work which neither the wrath of Jove,
nor fire, nor steel, nor gnawing time will be able to undo.
Let come when it will that day which has power over
my frame only, and end my uncertain span of years;
yet in my better part shall I rise to the vault of the heavens
perennial, and my name will be safe from oblivion.
Wherever Roman might blankets subject lands,
I shall be recited by the people; in the memory of all ages to come,
if there be any truth in poets' prophecies, I shall live.'*

This is the end of Ovid's 'Metamorphoses'. What do you think of that?

It has to do with a transcendence over the apparent temporariness of human life. Up until recently we didn't really have any means of having a strategy to reverse the apparent inevitability of decline and death. Death is hard to imagine, because our own awareness of ourselves, our own consciousness doesn't seem temporary, it seems permanent. Yet we observe the fact that people don't live forever. So we came up with various theories, why even though it appears that people only live a temporary amount of time they're really eternal: reincarnation, or living forever then in heaven, or any other formulations. And that's a reasonable attempt to deal with the tragedy of death when you have no alternative. We do have an alternative now. And even though we don't have it in our hands at this moment, or the knowledge we need to extend life indefinitely, we do have the knowledge to extend life to the point of time where we will have the knowledge. That's why the subtitle of my health book is 'Live long enough to live forever'. Cause we can apply what I call Bridge One, which is applying today's knowledge, so even baby boomers like myself can still be biologically young and in a good shape ten or fifteen years from now where we can have Bridge Two which is being able to reprogram our biology through biotechnology. That will bring us to Bridge Three, when nanotechnology and nanobots inside the body will enable us to live indefinitely. For someone of your age it's not as urgent a problem, because ten or fifteen years from now you will still be reasonably young.

So I could have some more drinks?
(Laughs) Drinks are not bad for you.

I heard you drink one glass of red wine per week?

No, a few, two or three.

It's a relief to hear that.

So we have more practical means to transcend our biology through the acceleration of our technology, and that does obviously address an age old desire. But our religions emerged in pre-scientific times, and I think we do have to update them. Imagining some benefits that spring from death was really the best we could do before we had a practical program to achieve that.

The reason why I started to be fascinated with your work was that in my understanding the fear of death, or the melancholy, or rage, that springs from the insight into the fact of being doomed to die, is the strongest motor behind storytelling.

Right.

The literature critic and theorist Harold Bloom for example says in his famous book 'The Anxiety of Influence' about modern poets: '... this misery [of being trapped in a body and in dripping-out time], this poverty is the starting point of their art...' – The same misery is not only the drive, but also the oldest and most constant subject of narration. It is at the same time the driving force behind and the subject of the oldest written epic we have, the Sumerian Gilgamesh-epic, which is not only a blueprint of all literature written ever since, but it also gives a very precise image of how human civilization, culture and psychology, including religious beliefs, are organized around the unsolvable problem of death. Was this misery, which poetry and narration in the broadest sense, including religion and science, derive from, the starting point of your work too?

The fear of death does animate a lot of our stories, and I think it's a driving force in human psychology. And people will argue philosophically how death is really a good thing, and it's liberating, and it would not be a good idea to extend human life indefinitely, and it's really a very broad denial of what is in actuality an overwhelmingly terrifying idea. The idea of dying, not to mention the suffering that goes along with the process of dying. It's overwhelmingly tragic. So we rationalize it and say: Oh, that's actually a good thing. And we get very attached to these rationalizations, because they allow us to go forward in facing this oncoming tragedy. I didn't start with the idea of overcoming death and any of the other similarities of my ideas to religious prophecy. I didn't start from that endpoint. There are two different derivations of my ideas.

In terms of information technology I started as a practical inventor. I wanted to time my own projects, since most inventors fail not because they can't get their inventions registered, but because their timing is wrong. So I became a student of technology trends, and I saw that the information content of technology is very predictable. Even though specific projects are not predictable, you can predict the overall power of computation and the power of communication technology. And this has taken a life of its own. I have a group of ten people, we gather data in many different fields, and we build mathematical models, and they've been very predictive. I use this primarily to time my own technology projects. We have introduced a pocket size reading machine for the blind by using this technique: In 2002 I saw that the underlying technology will become feasible in 2006, so we started the project 2002 so it would be finished 2006. However, a side effect of that effort is that with these models we can predict not only one or five years ahead, but we can predict 10 years, 20 years, 30 years ahead and see what the world would be like. And because of the explosive nature of exponential growth and the fact that these information technologies are exponential, I came up with these conclusions, that the world will be remarkably different in 20, 30 years from now. And I've spent now decades getting my mental arms around these forecasts and what they actually mean for human life and the human civilization. When people first hear about it and they never thought about it, it just seems overwhelming and very different, and it does to me too, but I had time to think about the implications, and that forms the basis of my books. And it does come up with very transcendent changes to human civilization. But I did not start there by thinking: There are going to be big changes in the future, let me figure out how I can rationalize why that will happen. I really came out of a scientific investigation of where technology is headed. And it really is quite inexorable: The price performance of computation has been a smooth double exponential through a hundred and ten years, through the two World Wars, through the Cold War, through the Great Depression in the United States and Europe, and non of these things had any impact, it just kept growing smoothly. And I have my own theories why this is the case. So that's one derivation.

The other, in terms of health: when I was around 35, 25 years ago, I developed type two diabetes. The conventional approach made it worse, so I said, okay, I'll punch this as an engineer and a scientist. I gathered a lot of information and I came up with my own approach. I wrote a best selling health book about it. I cured my own diabetes through supplements and life style changes and I've had no indication of diabetes ever since. So that gave me the idea – a kind of a meta-idea –, that you really can, and I

can, overcome health challenges with the right set of ideas. The ideas are out there, and if I can put the right set of ideas together to overcome something like diabetes, we can do that with any disease. Then I had another health challenge which is called middle age, just the acceleration of aging that normally occurs when people are in their forties and fifties. I think I've dealt with that pretty well. There are biological aging tests where, when I was 40, I came out 38. I'm going to be 60 in a few weeks and I now come out at 40. You can argue whether these tests are accurate or not, I feel they're pretty accurate, I think it reflects the way I feel and my mental and physical energy. And also I measure things like hormone levels and nutrient levels, I measure 50, 60 different blood levels, and things like memory and reaction time and tactile senses activity, and I come out at 40. So I've only aged two years in 20 years. And that's Bridge One, and the point of Bridge One, as I said before, is not to live indefinitely, but just to keep me in good shape for another 10 or 15 years. So if in 15 years, when I'll be 75 chronologically, I want to be 38 biologically then. In 15 years, through Bridge One, we will have Bridge Two, which is a very powerful means of reprogramming our biochemistry. And that will bring us to Bridge Three, nanobots operating in the blood stream and in our cells.

So these are the two different derivations of my thinking. They used to be two different areas. My original overcoming diabetes was not an information technology, I did it through supplements and life style, it was just a health interest. And then I had this career in information technology. It now merged, because now, and this is just since we collected the genome, which is only a few years ago, our health, biology, medicine is now becoming an information technology, it's really a new set of computer processes. And it's subject to the Law of Accelerating Returns and to exponential growth. Through the combination of the Law of Accelerating Returns, which has to do with the exponential growth of information technology, with the fact that health, biology, aging, disease, is now being understood as information processes, we have the practical means to see the end of death and a way to get to a tipping point which I think we are only 15 years away from, where we will be adding more than a year every year to our remaining live expectancy. So the sense of time rapidly running out will stop running in the end.

You come from an artistic family, your father was a pianist, and your books are full of quotes of fine literature. I always thought that the melancholy of mortality in art and the solace that art can bring makes the beauty of art. What beauty will art have if death should become history?

Art is the cutting edge of human knowledge. Poetry is a very intense

human language that provides deep inside into the human condition. It's not just the solace from death. The idea that death gives meaning to life is wrong, it's a rationalization. Life gives meaning to life and the things we can do with it, like creating art. Human knowledge is not a fixed phenomenon, we will never get to a point where we would have done all the art that could be done. The more knowledge we create, the more knowledge we can create, and knowledge is ever expanding, and that's true of the arts, too. Look at music today: It's very diverse, it's hundreds of different genres of music, and science is very diverse, too. Human knowledge in all these different areas is expanding. We have expanded our intelligence already by having all of human knowledge at our fingertips, since you can access all of human knowledge with a few keystrokes. And we will actually expand our brains by directly merging with our technology. We will become more capable of creating and appreciating human knowledge, and knowledge includes arts, literature and music.

But is knowledge itself beautiful?

Yes, I mean, knowledge is ... that's one of the characteristics of knowledge. Knowledge is not just information. Knowledge is information that has value. And human emotions, like beauty, love, and things like jealousy, humor – these are all things done by the human brain. They are the most complicated things we do, they are the cutting edge of human intelligence, and that's ultimately what we're going to expand, we are going to understand how that works, and we'll be able to increase it, so we can create more beautiful music, more powerful poetry, more powerful art.

If we had read 5000 novels and would read our 5001 novel and we knew we could read another indefinite number of novels because we live indefinitely, would we still enjoy it?

Well yes, because we are going to have more powerful forms of art. We have interactive virtual worlds today, which are beautiful, we created astonishing virtual environments, and they're interactive, so that's actually a new art form. Try to explain it to somebody 200 years ago, they wouldn't know what you're talking about. But it combines art and language and music, and so we are going to come up with new art forms we can't even describe today, that will take advantage of our expanded minds.

If you rewrite first your biochemistry and subsequently your complete body, you – or anybody who does it – could be described as a new kind of writer, in the way the philosopher Richard Rorty described people like Marcel Proust: as a person whose obsession it is to take the text that is his own

life, but that has been written by others in the beginning, and to rewrite it as he himself wants it to be. Rorty argued that this is the act in which Proust created himself, and he calls people like him – borrowing the term from Bloom – 'strong poets'. Harold Bloom himself says, quoting Nietzsche: 'the man of action, the true poet, "is also without knowledge: he forgets most things in order to do one, he is unjust to what is behind him, and only recognizes one law – the law of that which is to be." What do you forget in order to rewrite yourself and to gain immortality?

That's the nature of intelligence: selective destruction of information. There's so much information that streams into our brains, if we tried to keep track of all of it we would not accomplish anything. Just the routine process of being able to see involves reducing that massive amount of information to a few key queues, and then we go through our information in our brains to find just the right information that is meaningful. And art is doing that. Picasso didn't put a million different strokes up on a canvas, he may have put just a few strokes and captured just what the viewer really needs to see. A poem is very selective in the images and the words it's using, but if it's really great art it's expressing just what you need to know to get some new inside. So intelligence is a process of selective destruction of information and we do need to forget most of what is in our brains and in our environment at least temporarily to come up with some new insight.

Harold Bloom says that every poet has his precursor and a certain range of possibilities to deal with that precursor – and to free himself of the precursor in order to create himself. One of these possibilities is 'completion'. This completion, Bloom says, is common with American poets (while the British tend rather to politely revision.) Besides certain poets, the precursor is always also the complete history of poetry itself. Now, you say that the technological evolution will transcend and complete the biological evolution. Is evolution itself your precursor in Bloom's sense of the word? A script that you want to get rid of by completing it?

I don't know whether the word completion is right, because evolution is never complete or finished. The creation of human knowledge, which includes technology, but also the arts, is an evolutionary process, and it's build on the evolutionary process that created the human species. Today our heritage is both our biological capability, because we are born with biological brains and have certain abilities, as well as the whole human knowledge, which means all the arts and all the traditions that exist. They shape our thinking, and our brains wouldn't be capable of doing anything if they weren't influenced by all the knowledge they are constantly exposed

to. We're going to be able to go back and redesign our biology to be more capable. But that's again not a fixed aim, it's not something that we can ever complete. At one point in time our history, and our traditions, and the knowledge that exists at that time, and the designs that we got to recreate ourselves will be the past that we build on. We will ultimately replace our biology as we know it today, but a lot of it will be based on our biological paradigms, building things in a biological way, but with more durable materials, we can already see how to do that.

*In your book *The Singularity is Near* you say that the aim of evolution is to fill up the universe with an intelligence that will bring the universe to an awakening to its own consciousness. I am practicing ZEN meditation since more than ten years now, and my experience is that freedom is something that happens when I just sit down and I don't fulfill any task, I don't fulfill any inherited duty, I don't take part in evolution. From the moment I sit down, I don't do anything. I don't even think. If the aim of evolution is to wake up the universe, why should we take part in fulfilling it, why obey this duty?*

First of all I take issue that you don't do anything when you sit and meditate. I meditate also, I do Transcendental Meditation. In my meditation – and I think that's true for many forms of meditation – you're not directing your brain, you're not trying to go through some mental discipline. But that doesn't mean your brain isn't doing anything. In fact you can watch your brain, it's like clouds in the sky, thoughts come, pleasant thoughts come, but you're going to be patient and say, okay, some pleasant thought, but this cloud will go away, and it does. And that consent swirling process, even if you don't discipline it – you just let it free –, it is nevertheless doing creative work. I actually have a whole mental discipline where I do this at night. I cite myself a problem, but then I let my mind go free, and I dream. In your dreams a lot of restrictions on your thinking, a lot of taboos are relaxed, and I think creative new thoughts, and I come back to this in the morning when I have my rational faculties again – there's a dream state between waking and dreaming –, and I will access these dream thoughts again, and now I have my rational faculties and I can come up with new insights. You can tap this undisciplined freeing of your mind to actually be creative. But even if you're not trying to do it in an organized way, still as you go through the day you're bombarded with new ideas, new thoughts, and people say things to you, and you haven't really processed it all, you're just letting your mind free and your mind will absorb that knowledge, will think about what it means to you personally. So that's all going on, it's part of creative thinking.

But still, why should I take part in making the universe wake up?

Because that's what is going to happen. The exponential growth of information technology is very powerful: by the end of this century we will be able to infuse (modern?) energy at a level of ten to the fiftieth calculations per second per kilogram, which is a trillion trillion times more powerful than the thinking in the human brain, and we will be able to infuse that with the software of human intelligence, since we will have reverse engineered human intelligence. And we will have saturated the ability of (modern?) energy in our vicinity here on earth and neighboring celestial bodies, to do that kind of thinking, basically expanding our biological thinking with this tremendous power of non-biological thinking. And at that point we will need to spread out to the rest of the universe, and it's a whole issue whether we are limited to the speed of light or whether we can find wormholes to the other parts of the universe and get to spread out this thinking more quickly. If we can find wormholes to the other parts of the universe, it will only take another century for the whole universe to wake up and to be reorganized into super-intelligent processes. If we can't go faster than the speed of light, then it would take a lot longer. But eventually a human machine civilization in its not biological form is going to spread through the universe, and at that point the universe will wake up. I think there is a lot of intelligence we have in our own human brains, that we can tap with things like meditation. If you look out throughout the universe, you got all this swirling matter in stars, and planets, but it's not an intelligent process, it is all swirling around through dumb mechanical forces like gravity. Cosmologists argue, whether in 20 billion years will the world be going to another Big Crunch or another Big Bang or will it just expand forever and all the stars will die and it'll be a cold, dead universe. Implicit in those discussions is that intelligence has nothing to do with it, intelligence is irrelevant, it's just this little bit of froth on the fringes, and basically whether the universe dies in fire or in ice is a matter of these dumb, mindless, celestial mechanical forces. My view is that within a fairly short period of time the whole universe is going to get infused with intelligence, and we are going to make an intelligent decision and apply universe wide engineering, so that the destiny of the universe is going to be an intelligent decision we make and not up to these mindless forces.

As a child you were a passionate science fiction reader. Reading your books, I had the impression that you bring science fiction and reality closer together than it has ever been. How did you do that?

I was a passionate reader of those Tom Swift Jr. books, they all have the

same paradigm: Tom Swift would get into trouble with his friends, and very often the destiny of the human race is at risk as well, and he would go to his basement and come up with an invention that would save the day. The moral of the story was that you can come up with an idea to solve every problem. The ideas are there and you can find and apply them. As I got into technology, I became excited about the potential of finding those ideas and overcoming problems, whether it's my own diabetes or the inability of the blind to read, by applying the power of technology. In my view it's only technology that has the scale to solve problems like energy, environment, disease, death – technology really has the scale to do these things. It is a form of magic in a way, but it's not magical thinking, it's just the inherent power of technology.

So technology will solve problems that ethics could not solve?

The problems that we struggle with right now we will readily be able to overcome with these emerging technologies like nanotechnology. The energy problem for instance: we have ten thousand times more sunlight than we need to meet hundred percent of our energy needs, and we will do that with nano-engineered solar panels and fuel cells over the next twenty years. Sometimes these new technologies can introduce new problems. A very good example is biotechnology. We can reprogram biology, and I believe we will overcome cancer and heart disease and other major diseases in the next 15 years by reprogramming our biology away from disease. But the same tools can be applied by bio-terrorists, to create something very dangerous, like a bioengineered biological virus, that could be more damaging than an atomic bomb.

Or the military creates it.

So there is potential to apply these technologies to being destructive. That's where ethics comes in. It's not automatic that the benefit will outweigh the damage. We have to apply these things in the right way. Ethics can get very detailed. For example there are ethical standards for people that work in biotechnology to keep them safe, it's called the ASILOMAR guidelines. It's a set of very detailed guidelines and rules to not accidentally create, for example, new deadly viruses. That has worked very well. It doesn't address the problem of someone who purposely doesn't follow the guidelines because they want to be destructive, like a bioterrorist who wants to kill millions of people. For that we need a rapid response, to develop defensive technologies. But it's also an ethical decision to apply resources to develop that kind of defenses. And to apply these technologies to overcome poverty and disease and to address diseases in

the Third World, not only diseases in the developed world – these are all ethical issues. So ethics is very important, and given the increasing power of these technologies it's increasingly important. On the one hand ethics alone can't solve the mentioned problems, on the other hand we need the scale of power of the technologies applied in the right way.

ON RELIGION

If you'd ask anybody, listen, what would you say this is: it predicts the advent of something unimaginable – the Singularity –, quite frightening, overwhelming too, but it gives, at the same time, hope by promising an eternal life if you stick to certain life style – and also moral – rules or recommendations (which you put down in yours and Terry Grossman's book 'Fantastic Voyage'), – the one you ask would probably say, that's a religion, a stabilizing system of fear and hope of deliverance. Are you the finder of a new religion?

As I said, religion is a pre-scientific concept. All our major religions emerged in pre-scientific times. I think they tell us something about humanity because they tell us what is important to us: we wanted to overcome death and disease and suffering, we wanted to find some meaning from all of this suffering that existed in the world. So it gives us some insight as to what the goals of humanity were, but we didn't really have the means in terms of scientific knowledge to actually accomplish very much in terms of overcoming suffering. I didn't start with a set of religious precepts or ideas about the way life should be. My ideas do stem from the scientific background. They do end up in a similar place as some religions in terms of the idea of transcending death and overcoming suffering and becoming greater than we are by transcending our limitations, but it's not a religion in the sense that it's based on faith. It's really based on a scientific examination of technology trends and inquiries to why technology evolves in certain ways and how technology is a continuation of the evolutionary processes that created technology in the first place, and what that will mean for us. And perhaps there was an intuition in early religion that there eventually would be some means of actually realizing the fantastic ideas in religion of transcending mortal limitations. There was really no idea how to do that, but they had the idea that there must be some way to do it. So they came up with the idea without the apparent scientific foundation, because there was no science. So my thinking is perhaps a merger of religious goals, of transcendence and relief from suffering and death, but it's based on a real, practical and scientifically grounded vision of how to accomplish that.

The best thing the Singularity – if it takes place – may bring seems to be a widespread experience of our interconnectedness with each other, with everything, since we will be able to share knowledge and even personal experience by firewire or wireless connections. Maybe we won't have to ask 'How are you?' anymore, but just take a quick bluetooth-look into each

other's condition. But it would be possible to feel that interconnectedness today. I'd dare to assume the Dalai Lama feels it already today. If we don't experience it now, why should we experience it then?

Certain concepts that we take for advantage with our computers routinely seem strange when applied to human beings. We have the idea of a unique identity, and we are embodied in a physical form, and our brains are caged in the skull, they don't physically overlap with other brains, so there's a uniqueness to each individual. Computers are very different. You can take a million computers and make them into one computer, and that can be that one million cpu processor that's basically one computer, and it can then become a million computers again. So computers can merge their identity and all their software very easily and then segregate it again. The identity of a computer is based on its software, and if that notebook dies you can just copy the software from a back-up to another computer and the computer is alive again, even though the hardware crashed. We have this idea that when the hardware crashes, which is what death is, it's a crash of the hardware, that the software has to die with it. But we don't have that expectation when we talk about computers. So, as we in fact become more non-biological and more computerlike by merging with our computers, the computer part of our intelligence ultimately will a billion times more powerful than the biological portion, and therefore we will be basically non-biological, and we will have the same attributes as our computers today. We will be able to merge our intelligence just the way they do today. We can really become one and then become separate again, or we can have it both ways, just the way computers do today. When you say the Dalai Lama experiences this interconnectedness of people – you know, we do have these means, the means of experiencing others, to have the experiences of someone else through empathy. We've actually found the brain structures that do that, neural neurons and spindle cells that allow us to put ourselves in someone else's shoes and actually feel someone else's emotion to some extent. We do share knowledge through language, so we can share ideas and we can empathize with other people's experiences. There's an ability of a whole group of people to have sort of one mind, and there are ways of harnessing the wisdom of the crowds, and the crowd can have, through the electorate, one viewpoint, that's made of millions of viewpoints. The crowd can have kind of a personality, kind of one mind. So we do have some ability already to merge our thinking, to create thinking entities that accomplice many different people, and we have communication tools like the Internet that allow us to communicate around the world and create communities which didn't exist decades ago, and I think it's actually a very deeply democratizing technology. So someone like

the Dalai Lama may have a better developed ability to empathize, but still he's a human being and has limited ability to put himself in other people's shoes, and he can't really mind read.

ON POWER

Will the possibility to connect directly to other people's mind really create a better world, or will it be a terrifying tool of power?

It's both. You can easily come up with examples of both today with the Internet. The internet can spread hate, it can spread misunderstanding, but it's also deeply democratizing. I wrote in my first book that the Soviet Union was doomed because of the emerging decentralization of electronic communication, and I think that's what happened. My idea is that the democratizing forces, democratizing effects of this distributed communication outweighs the negative effect of spreading hatred and misunderstanding, I think overall it's a democratizing and liberating technology. When we can really more deeply penetrate someone else's mind by merging our thinking with theirs in much more intimate ways, through non-biological intelligence, it will overall be a positive thing in terms of increasing empathy and increasing understanding.

The Inc. magazine called you the 'rightful heir to Thomas Edison'. But I'd rather relate you to Benjamin Franklin. He was an inventor, an entrepreneur, a writer, and he gave health advises in his books, too. Could you feel any affinity towards him?

Yes. He was very interesting and had real ideas about health, but he lived at the wrong time. It was just no matter how capable he was, there wasn't the technology available to greatly expand human life spans. But he did talk about that some day we will be capable to vastly expand human life spans. He was very inventive as a scientist and inventor and entrepreneur.

Franklin's colleague in politics, John Adams, remarked when he learned about Franklin's death, that the Doctor had fallen a victim to his own theory, having caught the cold which finally choked him by sitting at an open window – Franklin always slept with an open window, as John Adams knew, because they had to share a room once on Staten Island where they negotiated with the British, shortly before the Declaration of Independence. Many people, at least in Europe, are suspicious of nutritional supplements, fearing they could be Franklin's open window to them. But you are taking 250 supplement pills a day.

I got down to around 200 by being more efficient. We're actually developing some technologies called 'protected supplements', because with a lot of supplements, only a fraction of them survives the digestive tract. The purpose is not to put it in your digestive tract, the purpose is to get it in your blood stream and ultimately in your cells. And I do some

intravenous supplements, things that don't go through the digestive tract at all – but still, the most effective means we have is through the digestive tract. We're developing some actual technologies called 'nano cages', which actually surround the supplements with a little temporary nano cage. After it's gone through the digestive tract and gets into the blood stream, the nano cage falls away, so all of the supplements can get through the digestive tract. So instead of taking six green tea supplement pills you could take one and get more effect. My company Ray & Terry's in cooperation with some other people are working on these kinds of technologies. So eventually I can get it down on maybe 80 or 100 pills with actually more effectiveness. But I'm not just randomly taking these supplements based on some superstition or just personal hunch that it's good. My program is actually very conservative, it may seem aggressive and in some ways I am, but it's actually very conservative. We have 2000 scientific citations in our, [Terry Grossman's and my] book 'Fantastic Voyage', and there's a lot of scientific evidence behind everything I do and recommend. If something is a little controversial, or a lot controversial like human growth hormone, which has some benefits but also some negative effects, I don't take that and I don't recommend it. And there are some other things where we don't have enough knowledge, so I don't experiment with them. And I'm not flying without an instrument panel. I don't just say, well, there's a lot of evidence for this and I just take it. I'm measuring my own body in lots of different ways, I take 50 or 60 different blood tests every few months, and lots of other kinds of tests, to see how I'm doing. I've been doing this for 20 years now, and I'm doing very well, by every indication of aging and things like cholesterol levels, which 25 years ago was 2.80, and now it's 1.30, and I could list a lot of other things. I really have ideal levels of lots of things, hormone levels of someone who is in his thirties, or 40, and I'm 60. And I feel good, and I sleep well, and I'm still pretty productive. My program is based on my own testing of myself, and also on a lot of scientific evidence, cause there's thousands of studies on these things. I don't know why Franklin slept with an open window, it was probably some superstition. I sleep with a closed window, but I do actually test the air in my house, to make sure there's no indoor pollution, and I have air filters.

When do you take all those pills?

All through the day.

I appreciate you wrote in 'The Singularity is Near': "A charismatic leader is part of the old model. That's something we want to get away from." At the

same time you're involved with power by being member of the Army Science Advisory Board, and you spoke before the congress. Could you imagine to get in the political lead yourself one day, like Franklin did?

So far that seems like a very insufficient way to me to use the skills I happen to have, because it's very time consuming to get involved in politics. I do talk to political leaders and advise them in issues where I can be of help, but trying to be a political leader oneself is kind of a full time job and I got other things I want to do. But I do get involved with public policy. What I advise the army on is developing a rapid response system for biological viruses, because the Army in the United States is responsible for protecting the nation from bio-terrorism. And part of bio-terrorism protection is protecting against known things, like small pox and anthrax, but the really big threat is if some bio-terrorist would take a benign virus, like a flu or cold virus and change it to be much more deadly and more communicably and create a real super killer virus. We actually have the means of protecting ourselves, at least the ideas. RNA interference for example can turn off a biological virus. We can sequence a virus now within a day or two, and we could develop our rapid response system within a week. If there's some new virus that a terrorist put out, we can sequence it, create a medication and get it manufactured in a matter of days. So I am working with the Army on that. Because I think that's a real existential threat that we need to get up for.

Why is America the place that will embrace radical life extension earlier than Europe?

That's a good question. There is also a lot more opposition in Europe to GMO, Genetically Modified Organisms, than it is in the United States. Maybe Europe has more attachment to its history, which can make it more fearful of change. The United States has a frontier mentality. It had the geographic frontier with the manifest destiny in terms of the nineteenth century history, when we expanded the United States geographically, and there's been a certain kind of spirit of pushing past frontiers, going into space, and venture capital was invented in the United States ... – The world is largely following this lead, the idea of entrepreneurship and venture capital is not just an American phenomenon anymore, but it started here. There's an American spirit of pushing past frontiers, beyond past limitations. Our limited life span is a big limitation. It's really quite tragic. I mean, just when people get things right and finally figure out how to contribute to art or science or how to have good relationships, they die. We could really benefit from the wisdom of people. And this idea that there are limited resources and that there would be too many people that are going

to use up all the energy and the water is nonsense. These new technologies, they are going to provide vastly expanded physical resources. Just from the sunlight alone we have ten thousand times more energy than we need, than we use today. There are plenty of resources, once we can apply things like nanotechnology to use them in a sufficient manner. – So, there is an anti-technology movement that is strong in Europe, and I think there's maybe a more deeply rooted connection to these ancient rationalizations that death is a good thing because it gives meaning to life.

You mean because the Americans left behind the whole Old World it's easier for them to leave old concepts behind, too?

Yes, and the United States is all the world's people, you know, there are Europeans in America, but there's also Africans in America, and Chinese – we have all the world's people, so there isn't an over-attachment to just one culture. There's kind of a New World's culture. And there's a New World's culture emerging all over the world, because the Internet connects the whole world, but in the United States we've had all the world's people to begin with.

My biggest concern is that in a world designed and computed by strongest artificial intelligence there'll be no room for the beautifully unnecessary things, things that have no purpose and don't serve anything. How about these things in the future world?

When we really recreate human intelligence, we're going to recreate all of its imperfection and all of its many diverse ways of thinking that aren't necessarily useful at first blush. How did Yeats write poetry? He didn't create it through a strictly logical process. Or a couple of kids in the Bronx, who were just fooling around and just showing some new kind of cool street dance steps created Hip Hop, which is now a huge musical movement. So these intellectual cultural artistic movements stem from surprising places and stem from people doing things that aren't clearly instructive or serving any obvious purpose. But that is how human intelligence works. To say that it's not going to happen implies that what we're creating in artificial intelligence is a kind of intelligence that's very mechanistic for which everything has to be purposeful, but that's an old idea of thinking of machines as being mechanical and logical and not really able to do emotional things that may seem strange at first. No, we are going to capture the richness of human intelligence which includes a lot of surprising things that lead to something grand that may seem unimportant at first.

MISCELLANEOUS

The current Pope said, quoting the philosopher Gabriel Marcel: "To say to a human being 'I love you' means: I refuse to accept your death, I protest against death." Will love still exist if we don't die anymore?

Death to me is a great robber of love, and to lose a loved one is an overwhelming thing, it's just a pain that's greater than I think any pain we can imagine. And it's a loss of love. We don't love someone because he or she is dead or because she is going to die. Love is really the cutting edge of life. It's the best means we have of merging with another person. If two people love each other, they really do become like one person, they can read each other's minds and they can finish each other's thoughts. We will be able to do that a lot more, we will be able to actually get into each other's minds. That kind of deep merger of people will be even more feasible. But death is not something that contributes to love, it's something that robs us of love.

Do people mistake you if they see you as an advocate of the Singularity? Do they blame the messenger?

It obviously brings up controversial issues that speak to deep aspects of people's personal philosophy. And certainly the influence of ancient traditions, like religious ideas about death, are very deeply rooted. I mean, we are thinking these ideas for thousands of years, and they help people to cope with the tragedy of death. So people are very attached to these ideas and they don't give them up easily. It's not like: Don't worry about it, you can give up this idea because we have this other idea. People don't make that leap from one cliff to another so easily. And people are very attached to ideas. They don't easily adopt an idea like the idea of changing biology – they are attached to biology. The reality is, we are not going to take the step from today's world to the world of 2045 in one great leap. 'Come with me and let's take this leap off the mountain and we will land on the other mountain of the Singularity!' It doesn't work like that. We're actually going to get from here to there through tens of thousands, hundreds of thousands of little steps, advances in many different fields. It's happening every day, things that are pretty amazing, like the internet or virtual reality, things we already take for granted now, but which certainly seemed amazing not so long ago. You take a thing out of your pocket and put in a few finger strokes and you can access all of human knowledge – we take that for granted, though that didn't exist just a few years ago! Almost nobody used search engines ten years ago, not even that much five years ago, but now we take it for granted. So the world is going to change a lot,

and it's getting faster and faster. We are going to get used to these things very quickly, because we're really going to enhance our human desires to communicate, to expand, to create and to share knowledge, and we are going to get there through many thousands of little steps.

Maybe death is an interesting experience. Do you sometimes think you could miss something if you don't die?

(Seven seconds of silence.) Well, it's very hard to know what that experience is like. We know some people ...

I have a friend who says it's going to be a gorgeous experience and he doesn't want to miss it.

(Laughs) And then, what happens? As far as we know, the people who started that process, who had been declared clinically dead and then came back, they don't have transcendent tales to tell. If there are beautiful processes, we can go through those processes without dying. We'd have to discover what those are. I think that's just part of this rationalization that death is a good thing, to try to avoid the reality that it's actually a very tragic thing.

In my opinion, the Aristotelian way of storytelling, i.e. storytelling that's based on Aristotle's Poetics, which was brought to perfection in Hollywood, is a metaphysical system. First because the storyline functions as the literal metaphysics above the characters and the action, since everything in the narration has to obey the storyline. Secondly because the storyline represents the superior order, in which everything, even the death of the character, makes sense, since it supports the dramaturgy. Thirdly because Aristotelian storytelling contains the assumption that there is a true self, an inner core, to the story – if you take away all the scenes, there is still the inner strong idea, the true self of the story, it's just not embodied anymore, it became an animus, a specter or ghost. People are stories too. People who are told stories in the Aristotelian way tend to believe they have a true self. The same goes for nations. The true inner self is another metaphysical concept. Many problems arise from these concepts. (For example a general life panic.) – Now if you look at youtube as a narration, that's different. There's no true inner self, if you take away all the 'scenes' or narrative units, there's nothing left. Everything can be replaced. Is that the narrative of the future?

If you look at phenomena like youtube or blogs, they are tapping into a wisdom of crowds, which is not directed as an Aristotelian concept of a story. It is self-organizing instead, but it ends up having a lot of wisdom. So

any one blog might be just series of flames, but the whole blogosphere is very powerful in uncovering the truth of a situation. And Google doesn't have its library to decide what link is going to come up when you search an elephant – it's a self-organizing system that is based on the decisions of millions of people. It's really tapping into the wisdom of crowds. So these new technologies are actually allowing us to create a supermind from all of our minds, which can outperform the most brilliant mind. There's not that much difference between different people, but if you can actually tap thousands of millions of people it leads to insights that would be impossibly any other way. There are limitations to storytelling, I mean, Hollywood for example, there's a certain Hollywood paradigm, like love wins in the end, and certain rules, and you can pick out the story that will come out in the end based on those overriding concepts. Real life tends to be messier than that. But people have some idea of the narrative of their own lives, they tend to overlook some of the real complexity of their lives based on the narrative that they tell themselves. And I think we can come to deeper insights by looking at the messy reality of the world. There is a content that goes beyond just the videos on youtube and the content of blogs, it's interacting with each other and it's self-organizing, and it does come to some deep insights.