

LARRY ELLISON

ORAL HISTORY

COMPUTERWORLD HONORS PROGRAM INTERNATIONAL ARCHIVES

Transcript of a Video History Interview with
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DSM: The theme of this year's program, and the overriding theme of the series of oral histories we've been conducting has revolved around the notion of a journey of ideas since the beginning of information technology. So before we begin there's a question we try to ask all the folks who have agreed to contribute to the oral history collection. And that is: What do your thoughts about information technology have in common with the evolution of information technology through the ages? I would like to begin our interview with having you talk about the great library at Alexandria and Oracle as you see it.

LE: Of course. We've named our project the Alexandria Project; it is the digital rebirth of the great library at Alexandria that was destroyed a long time ago. The goal of the Alexandrian Greeks was simply to collect all of the books, all of the histories, all of the great literature, all of the plays, all of the mathematical and scientific treatises of the age and store them all in that one building; to take the sum total of mankind's knowledge and make it available in one place. And they came very, very close to achieving that.

In fact, at one point, they had about a half a million volumes. After the library was destroyed in the 5th century, 500 years later, the largest library had less than 1,000 volumes. It took a long time before we could claim a library of equal endowment. The New York Public Library is larger than the Alexandria Library, but, even today, there are very, very few libraries that have anything like the collection at Alexandria nearly 2,000 years ago.

DSM: In the long term, will the media server function as a warehouse of the world's cultural collections?

LE: Well, I think we have the same ambition as the Alexandrian Greeks. And, of course, the world is much wealthier today in terms of knowledge in science and mathematics and literature. We've been around a lot longer. So the library is much more extensive. But it's not only a textual library, it's an audio library, with wonderful music; it's a video library, with documentaries as well as the latest hit motion picture. All of it, everything; all forms of media will be stored in the digital library. And this time you won't have to travel to Alexandria to get it.

Not only will we warehouse the information, but we'll also distribute the information democratically across the world, to whomever has requisite communicational law and whomever is in sight of a satellite. So this information, again, will be collected, stored and made generally available. And it's not a far-out dream. It is not media hype. It is real. It is certain to happen.

In fact, when the information highway finally arrives--or, I would say, 10 or 20 years after it arrived--people will have a hard time remembering what life was like before its arrival. Most certainly it will change everything.

DSM: It really is an exciting time. Well, I would like to take you back to the beginning of your time, and get some sense of how you got to where you are today. Tell me a little bit about your background, your experience growing up.

LE: I was raised on the South Side of Chicago. I remember *Look* Magazine called it the oldest and worst black ghetto in the United States. But we certainly outlived *Look* Magazine. It was a lower middle-class neighborhood. It was a Jewish ghetto. It was surrounded by a black ghetto and a Puerto Rican and Latino ghetto. But it wasn't anything like the ghettos today. I mean, the ghettos of today and the lower middle-class neighborhoods of today are dominated by guns and drugs. I didn't even know I lived in a "bad" neighborhood. I was unaware of it. No one told me. And I didn't discover it until I left.

DSM: You're about 48, 49?

LE: I'm 49. I was born in 1944.

DSM: Just at the end of the war.

LE: Right.

DSM: So all the things that were happening in Europe were just becoming known at that time. And it was the beginning of the fifties. How do you compare then and now?

LE: Well, actually, I guess we all look nostalgically back at our childhood--and I don't want to get into a political speech here, but--I mean, I'm thrilled that the Congress finally decided to outlaw assault rifles. What a modern and interesting idea. I'm shocked. It passed by two whole votes in our Congress.

Well, when I was growing up, we really didn't have assault rifles being carried to school by kids. I mean, if the kids carried weapons, they carried knives. They didn't carry guns. Now, you know, 15-year-old girls carry pistols and automatic weapons in their purses to school every day. It is ridiculous.

Again, the ghettos . . . I should not even call them ghettos. They were lower middle-class neighborhoods and not nearly so violent as they are today. They were not drug infested. The family was largely intact, or at least in a whole lot better shape than it is today.

So, again, when I say I was raised in this lower middle-class neighborhood and people try to associate that with what you think of as, you know, the troubled neighborhoods of the late 1980's and early 1990's, it was a very, very different situation. The gap between rich and poor was not nearly so great as it is today. And certainly the opportunity gap was very different than it is today.

DSM: How about the sense of the possible? I have a son who's 19 now, a member of Generation X. And while I don't think he exhibits the despair of Generation X, he does worry that his friends think there is no opportunity out there. I mean, did you have a sense, growing up, that you could be anything and do anything? What was it like?

LE: I think we did. I think it was a very optimistic time. It really wasn't until later in my life, when I was in college and during the Vietnam War, that a general cynicism began to creep into our culture and become part of daily life. But, no, I think at that point the American dream was very much alive and central in the minds of most of the children growing up, at least in my neighborhood. And my neighborhood was a place where you would expect people to feel foreclosed from opportunity. In fact, that just wasn't the case.

DSM: Now, you were very interested in mathematics and the sciences. Did this begin in childhood or later on?

LE: Well, I think it was--well, I don't know. I think I was interested in math and science because I was good at it. And people tend to like what they're good at and not like very much what they're not good at.

DSM: You grew up in Chicago, went to school in Chicago, studied mathematics, and then headed west. The rumor has it you were a self-taught programmer. Is that right?

LE: Well, yeah. It's interesting. I'm giving the commencement speech at Carnegie-Mellon University next Sunday. I'm the first non-CMU graduate to be invited to give the commencement address at CMU. And in my opening remarks, I confess that I went to a rival institution--I went to the University of Chicago--but I also confess that I did not in fact graduate, but I don't feel too bad about it, because neither did Carnegie nor Mellon. So a college degree is certainly useful, and I would recommend that everyone get one or more of those. But, you know, I left school without a degree, came to California. I never took a computer science class in my life. I got a job working as a programmer; I was largely self-taught. I just picked up a book and started programming.

DSM: In a minute I want to talk about 1977 and that crazy relational database idea. But before that, I would like to have you talk a little bit about Japanese culture and its influence on you.

LE: One of the first jobs I had in California was working at Amdahl. And Gene Amdahl, who was also not a trained computer scientist but an ex-physicist, took pity on me and decided to invite me to Amdahl in the early days. And Amdahl is 45 percent owned by Fujitsu of Japan. So I took a business trip to Japan and while there visited the City of Kyoto. And I was stunned; it was one of only two times I was stunned. The first time was when I first saw Yosemite Valley. I simply didn't know such a thing could exist. The same thing with Kyoto.

But Kyoto was very different. It wasn't on the messianic scale of Yosemite Valley and other creations of God. It was interesting, because it was the same natural--if I can use the word "design"--but on a much smaller scale, on a much more human and intimate scale. There were these wonderful gardens that were designed to promote intimacy between the viewer in the garden and the garden itself. And they had done--and of course, Japan is one of the centers of Zen Buddhism, and what Zen tries to do . . . in fact, what the entire Japanese culture seems to do--is intelligently pursue tranquility.

And--I'm going to rattle on here--the way they do that is to recognize the fact that we've only been civilized, if you want to use that term, for 7,000 years; but human beings have been around for about 4 million years. And the bulk of those 4 million years we have spent in the forest. And we really have become adapted to living in the forest and its nature, much more adapted than living among concrete buildings and highways and glass and steel and all of this stuff and its attendant noise. So when you spend time in a forest, and especially in these wonderful, small reproductions of forests--these Japanese Zen gardens--it is a wonderfully reassuring and tranquil experience.

And I just fell in love with Japan--the landscape architecture, the minimalist nature of the homes, the fact that their music, which seems strange to us because, again, even the music is meant to replicate the sounds of nature, so it sounds like wind going through bamboo or water travelling across stones; it's very different than Western music. In fact, Japan is like going to another planet. I was very disappointed when I first went to Europe. I mean, Europe, it was just like, oh, it's just the buildings were a little bit older. It looked like us. They had the same--essentially the same values, the same ambitions. Japan was--well, I might as well have been on Mars. It was a wonderful experience, and I learned so much from the insights of that culture, insights unavailable, for the most part, to us in the West.

DSM: Larry can you tie in these influences to other aspects of your life? How did your experience of Japanese culture tie in to your vision of Oracle and to where you are right now?

LE: That's an interesting question. Japanese culture is very interesting, and it has influenced me--and let me tell you--a great deal. The Japanese are at once the most aggressive culture on Earth and the most polite. There is this incredible arrogance combined with unbelievable humility; a magnificent balance. And I think, in building our company, we tried to, as much as possible, replicate that culture: to be very aggressive on the one hand and humble on the other. If you can balance those values I think you are increasing your opportunities to compete and succeed, both as individuals and as a group.

The other remarkable thing about the East versus the West is their focus on the *group* as opposed to our focus on the *individual*. And I think this works sometimes to our advantage--in the arts, for example--and sometimes to our disadvantage, as on large engineering projects and organizational activities; basically anytime a person has to give up his or her ego for the benefit of the group.

And if you look at our social and legal and political systems, we always tilt in favor of the individual and against the group. We're always terribly concerned about the welfare of the individual; we make the statement that we'd much rather see a thousand guilty people go free than one innocent person in jail. But, the fact is, if a thousand guilty people go free, *many* innocent people will suffer as a result. We are perpetually focused on the state not damaging nor ever infringing upon the rights of the individual, often to the detriment of the group. These are such fundamental beliefs in our society, and are diametrically opposed to those in Japanese society. This affects the way organizations work.

Someone suggested to me once that, well, perhaps the United States will learn from Japan and Japan will learn from the United States; and maybe eventually the two societies will converge. And my response was, I can *guarantee* you the Japanese will learn from the United States. But we don't like to learn from others. The whole Western notion is we want to see *our* ideas bear fruit. This has certain advantages, of course; but it is a double-edged sword. We want to see our ideas in print. We want to see our ideas memorialized in products, in art and music and all of this. I always hear artists saying, "I don't want to do that; it's been done before." Well, the Japanese say, "I want to do *exactly* what has been done before, but just a little bit better. They're completely different points of view.

And, again, this permeates their culture and it permeates our culture. As much as possible, Oracle is a Western company. We are not populated exclusively by Americans by any means; more than half of our employees are outside the United States. But if you look at our California headquarters, you know, it is clearly a company that is dominated by Americans. We try not to lose sight of the fact that the things we are trying to do *cannot* be done by individuals. The projects are so ambitious that they can only be undertaken by groups. And we have to work at, again, coming up with a good result for the group, rather than perhaps the best results for every single individual.

DSM: I would like to have you talk for a moment about your vision of the global information revolution and global integration.

LE: It's very interesting that Ted Turner was [the winner of the SAIC Award] last year and that you have been kind enough to honor me this year. The last 30 years can be described as the age of television. And television is a very interesting medium. It's a *broadcast* medium. In other words, a handful of people in New York City--maybe, in Ted Turner's case, Atlanta--decide what happened in the world today, and then tell us about it.

And if they didn't decide it happened in the world and it's not on television, then it didn't happen. I was speaking at the Museum of Radio and Television to a bunch of news anchors recently. Boy, I was wondering "what in the world am I doing here? I cannot believe I am sitting here and making a speech in front of people who do this for a living."

But, anyway, I was asked, you know, what happens when people can watch whatever they want to watch? What if someone wants to watch nothing but Roseanne from morning till night--reruns of Roseanne all day? And it's the most popular show on television. Now I can watch nothing but Roseanne. And won't this information on demand cause a great deal of damage? And my response was, the broadcast days are over. I mean, choice, individual choice, will change a lot of things. Now, in the news area--and what I actually brought up was I have been following the war in Rwanda now for several years. I'm involved in conservation activities, deeply involved in conservation activities in Rwanda. I'm on the board of the Digit Foundation, which is designed to preserve the habitat for the mountain gorilla.

And because of the war, there are a million refugees in Rwanda for a long time, you know, and we are trying to do something to help the refugees that are in encampment. But this never made the news. There was no war in Rwanda. It wasn't covered. They covered in great depth what was going on in South Africa, in great depth what was going on in Somalia, but Rwanda *simply didn't exist*. And as the great Bishop Barkley asked--the philosophical question--if a tree falls in the forest and no one sees it, did the tree really fall? Well, I would say the 1990s version of that is: If it wasn't on television, did it really happen? And the answer is no.

The American people decided we were going into Somalia. Well, actually, that's not exactly right. The *news anchors and news editors* decided to broadcast the famine in Somalia and the tragedy in Somalia, which encouraged many Americans to urge the U.S. Government to go in there and address that awful situation--first with humanitarian aids and then, finally, with military support to guarantee that the humanitarian aid got in there. And that was because of broadcast TV. We are there, I believe, because of broadcast TV. There was no similar response in Rwanda, which is a much more serious problem: 100,000 people had been killed before this latest round, where I think a quarter of a million people have been butchered. A hundred thousand people had been killed a few years ago. And it simply did not get any coverage.

With news on demand, people will have access to the information they want, and to any depth they want it. Some people will watch Roseanne, you know, from morning to night. Others will be able to watch the news shows they find interesting and important. It's going to be a lot more like print media than it is like broadcast media today. There will be choice. And we will not have the same, if you will, "collective consciousness" created by TV. There will be a lot of individual interests pursued. And we will be a more diverse society as a result.

In November of 1976, a paper--a landmark paper now--was published by IBM Research, called "The System R Project." And SQL, a complete language for accessing a relational database, was published also by IBM Research. And we were reading that paper and were stunned--again, I hate to keep using those words--but every once in a while, there are, you know, epiphanies. And we said, "Wow, for the first time, someone has ascribed a mathematically consistent and complete way of managing and retrieving information." Never before had this been done.

Ted Codd had written that paper almost 10 years before, in 1969-1970. This was where he first described relational theory. And IBM Research, over the next 10 years, had been developing prototypes. And the first prototype relational database was this project called the System R. And the language for accessing the data was called SQL, pronounced sequel. And this paper came out describing the 10 years of research and how much they had accomplished. In November of '76, I saw the paper, and thought that, on the basis of this research, we could build a commercial system. And, in fact, if we were clever, we could take IBM's research, build the commercial system, and beat IBM to the marketplace with this technology. Because we thought we could move faster than they could.

Now, at the time, conventional wisdom was that relational databases would never be commercially viable, because they were simply too slow. You could never build them--make them fast enough to manage large amounts of data, to handle large amounts of users accessing the data. They were functionally rich and very easy to use, but the down side was that they simply were much too slow. And because of this conventional wisdom, no one was really trying to build a commercial version of this. It was very interesting that the universities were building prototypes. U.C. Berkeley was building INGRES. So universities were interested and research labs were interested, but no companies, including IBM, had committed to take this technology and commercialize it.

So we thought that conventional wisdom was in error, flawed, wrong. We thought that relational databases could be made commercially viable. You could build them and implement them, write the programs so they could deliver. They could support large databases, lots of users, and perform well. And because conventional wisdom was in error, this gave us tremendous advantage: we were the only ones trying to do it.

So we started the company. And the goal of the company was to build and deliver the first commercial relational database. And there were four of us. We invested \$2,000 of our own money in Oracle. And there was no outside funding. In fact, in those days, when you would try to get money for a software company, and Silicon Valley and its famous venture capitalists notwithstanding, they wouldn't even meet with you. They invested in hardware companies. But software at the time was this vague notion. There was nothing tangible; nothing you could touch. And, in fact, they would just leave you waiting in the waiting room for 45 minutes, until you finally got the idea they were not going to see you. And then the receptionist would search your briefcase to make sure you were not stealing copies of Business Week from the coffee table. We were persona non grata in the venture capital community.

So we could not raise money. No software companies could raise money at the time. That's why we had to take \$2,000 of our own hard-earned money and start the company. Now, the good news is software is not a capital-intensive business. You can do it with on a shoestring. And all the great software companies have started pretty much that way. Not all of them, but certainly that's how Microsoft started. But I think we had less; we had nothing. We had no outside investment whatsoever.

So we had to support ourselves before we got our product out--and it took us 2 years to get the first version of Oracle out. And the first version of Oracle was sold and installed in November of 1979. I was personally on the road for 5 weeks, because I actually did the installation and taught the training course myself.

DSM: Who was the first customer?

LE: The first customer was Wright-Patterson Air Force Base, the Advanced Technology Division of Wright-Patterson Air Force Base. Who but the Federal Government would buy database technology from four guys in California? You know, who would be that courageous or that--maybe you can even think of another word--to do something like that? It took us about 2 years to build the product. In the meantime, we were doing consulting work to support ourselves. In fact, we built the IBM-Tandem interface for Tandem. We took a variety of different projects with Amdahl and Tandem and Memorex and people in the Valley. So we did consulting work to fund our product development work.

We were profitable from the days we opened our doors. We never, ever lost money. In fact, the only time we lost money was one quarter. One quarter, unfortunately, I think, in fiscal year 1990, we lost money. But from the day we started the company, over the 17 years, we have had only one lost quarter. And, boy, even that was one too many.

It took us 2 years to write the code. I remember shocking our bankers. You normally think of bankers--you know, someone talks about their banker like their dentist. This guy was basically the branch manager of a little tiny branch in Santa Clara, California. This was not Wall Street. He was very concerned, because we told him we were going to get out of the consulting business. We had built up a savings account. That's all we had was a checking account and a savings account. We had built up a savings account of a couple of hundred thousand dollars doing our consulting. And we figured that we could stop doing consulting now, because this \$200,000 would last us until we got our product out the door. And we timed it, as it turned out, very, very close. But he was very concerned about us, that we were going to stop the consulting, what appeared to be a very--and was--a very profitable consulting business, to devote all of our energy to just finishing up our product.

DSM: And now that early vision of being in the consulting business has reemerged.

LE: Right. (Laughter) We decided that the technologies were becoming so complex that the process of transferring the technology from the supplier, the creator of the technology, to the user of the technology has got to be something better than, "Here is our CD-ROM, use it, I dare you." So we have packaged our software with optional services, again, to help our clients use the software. Yes, and now we have -- originally there were four Oracle consultants who started the company, and now we have, my God, you know, 4,000, who continue to work at the company.

DSM: Going back to Japanese culture, one of the quintessential elements of the Japanese approach to competition has been the aggressive pursuit of market share. Was your aggressive pursuit of market share early on something you learned, or was it just the natural outcome of heads-up business?

LE: No. I think it was absolutely our primary goal. I was always influenced by Japanese business people. In fact, it was a very famous story that I've gotten in a lot of trouble for, and I'm very hesitant to mention here, but I will, because at least it's on video and it's harder to take things on video out of context. But I was in Japan and I was talking to a Japanese business executive. And he told me that the problem with America is that we just have no stomach for competition. And I was defending America. I was defending my country and my culture. I said, "What do you mean? America, at the turn of the century was the leading edge--I mean, we were the *laboratory*, you know, for free market economics. The industrial revolution reached its zenith in the Eastern States of North America. What do you mean?" And he says to me, "Don't tell me about things that happened almost 100 years ago. Let's talk about today. You listen to your business executives and they say things like, Well, we have great respect for our competition; the market is very large; there is room for all of us to compete." "In Japan, you know, that would be sacrilege," he said. "In Japan, we believe our competitors are stealing the rice out of the mouths of our children. In Japan, we think anything less than 100 percent market share is not enough. In Japan, we believe it is--and this is a quote that supposedly came from Genghis Khan, but I have heard it attributed La Rochefoucauld and other people--it is not sufficient that I succeed; everyone else must fail. We believe that this is not sufficient. We must destroy our competition.

And I remember I came back with that story and told it to people at Oracle. And I remember telling a *New York Times* reporter this story. And the *New York Times* reporter had a huge picture of me, took the whole thing out of context. It said, Larry Ellison, quote, "It's not sufficient that I succeed; everyone else must fail." With a huge picture. Then I started getting hate mail. (Laughter) I mean, this story stuck with me for a long time. But getting back to the Japanese: where this came from is this pursuit, this relentless pursuit of market share--that market share is everything. Microsoft is a very market share driven company. In the long run, you will live or die. Jack Welch over at General Electric: "If you're not one or two in the market, you don't make money. The market leaders make the money." You know, you have to have share. You have to have substantial market share in order to be profitable in most businesses. The Japanese recognize this very, very clearly. And not just the Japanese. The great business leaders in the United States are the same, whether it is the old guard--and Jack Welch forgive me for calling you the old guard--or the young guard like Bill Gates. And we certainly believe that that is absolutely correct, that we have to pursue market share. Today we have more share than all of our competitors combined. And our primary goal is to improve our share, our market share.

DSM: I would like to talk now about what I call, for lack of a better term the massive new parallel path to media servers.

LE: Right.

DSM: And that is sort of a natural transition from sales there. The story I have heard is that in about 1987, it was an aggressive sales person dragging the boss into a sales call that introduced you to Steve Cully at M-cubed, and kicked this off.

LE: Steve Cully, right. Right.

DSM: So talk about that, if you would.

LE: Well, actually, our policy is to be promiscuous. Our software runs on everyone's hardware. And in pursuit of promiscuity, we had a sales force that went out and tried to sign up a variety of different hardware manufacturers and encourage them to pay us to move our software to their computer. And so he came here with his proposal. And it turns out Steve Cully really didn't have any money and really couldn't pay us. And I was asked to approve a proposal, you know, a bid to Steve Cully that for X number of dollars, we would put Oracle into the M-cubed machine. And the M-cubed -- and I looked at the specifications for the M-cubed machine, the high-level specs of the machine. And I said, I don't believe this machine even exists. It was the most bizarre computer I have ever read about in my life.

Then I said, "This is sheer nonsense." Clearly, something is very wrong here. Let me call someone over at M-cubed and ask a few questions. I can prove this machine is just someone's fantasy and we can just tear up the contract and move on. Then I talked to Steve Cully, and I asked what I thought were very, very difficult questions, and I got incredibly clear responses. I asked what I thought were five, you know, crushing questions of Steve. I got these incredibly clear and cogent responses. And I said, "Oh, well, I'll call you back in a couple of hours. Let me think about all of this." Because, basically, what you are telling me is everyone is building computers the wrong way and you are building computers the right way, or at least you found a fundamentally different way of building machines and building machines that would be, at once, very inexpensive and enormously powerful. I want to think about this.

So I decided this was not a fantasy at all. It was an incredibly clever idea someone had. You know, Steve was at Cal Tech, and the idea was developed at Cal Tech. And I started to read about, you know, massively parallel computers, which were relatively new. And, again, conventional wisdom were these were interesting machines for doing a certain class, a very narrow class of calculation-intensive scientific applications, but they had, you know, no application whatsoever for commercial use. That was conventional wisdom.

And whenever you can find flaws in conventional wisdom is when you get real competitive advantages. Whenever you're just doing the same thing everyone else is doing, the best you can hope for is parity, you know, or small advantages, to do it 10 percent better or 20 percent better or even 30 percent better, but not a thousand times better.

And these massively parallel computers were very interesting, because they used the same low-cost parts you find in PC's. And those parts are low cost because they're made huge volume. It's the same memory chips in PC's. It's the same disk drives in PC's. The same low-cost microprocessor technology, CMOS technology, to build the processor -- all these cheap components. But now there was a way to gang them all together, to network them all together. Not as you normally think of PC's networked, with a big piece of wire, but all these chips plugged into a PC board, 64 processors per board, 64 computers per board, and then a thousand processors per 19-inch rack. You know, so something about the size of a big stereo system would have the power of a thousand PC's and cost less than a thousand PC's.

Now, the question was, can you take this technology and move database software there? That was the big issue. Could you do that? If you could, you could improve database performance by a factor of 10, a factor of 100, and reduce the cost of managing data by the same factor of 10 or even a factor of 100. So this was a worthy objective if you could actually do it, if it was technically possible. And the big question was, could we do it? So we studied the problem for a while, and we decided yes, we can do this. We actually can do this. And, once again, it turned out to be a lot harder than we thought, but we did in fact do it. In fact, today we are the only company whose software runs on conventional computers and these exotic--hitherto exotic--massively parallel machines. And we're really bringing these exotic, massively parallel machines into the mainstream to manage large amounts of data.

And these large amounts of data could be just vast amounts of text or vast amounts of traditional corporate information, structured transactional information, or new media--audio, CD-quality, high fidelity audio, or high resolution video streams. We can do that on massively parallel computers. So we took the massively parallel machine and we used it to deliver the first version of the Oracle media server, a database system that manages not only conventional information--small amounts of basically simple, structured information, like accounting records and personnel records and inventory records, and operate transactions on those--but also huge amounts of text and their related images. And of course, the most exciting component, the real-time stream information, audio and video--all in one unified, digital library in the Oracle media server, running on a massively parallel computer.

DSM: How big a risk did you think you were taking when, in 1988, you made the decision that your software was going to be compatible with massively parallel computers?

LE: There is really nothing riskier than not taking risks. I often say that when you think you have this really great idea and everyone else thinks you're nuts, there's one or two possibilities. You have a really great idea; the other possibility is you're nuts. So, you know, we were told we were told we were nuts when we tried to build a commercial version of a relational database. We were told we were nuts when we tried to move our software to massively parallel computers. Fortunately, we have not tried too many things that are radical; you don't need too many things that are radical to get ahead. You know, painting your hair green is also--I'm not sure what--I guess it aids you in certain ways. I mean, perhaps it will make you more popular in high school. But just being different is not enough. You've got to find a case where a new technology emerges and people don't recognize that this technology has changed what's possible.

And then you can address customer problems and engineering problems, which were hitherto intractable. And that's what massively parallel machines did. That's what relational database technology did. And you need about one of those every 5 years. You have to take these big risks on a regular, though not too frequent, basis.

DSM: So we expect the next giant product in 1998?

LE: Yeah. (Laughter) But we think the relational database and the massively parallel computer is going to go a long, long way. And, without it, we think probably video on demand and the Alexandria Project would be impossible.

Oracle Version 7 runs on massively parallel machines, like the N-cubed. But also others-- Thinking Machines' new CM-5, and we are going to move to ICL's Goldrush. We'll run on all the different massively parallel machines. Massively parallel machines have suddenly become popular now in part because of our software. Again, they are moving out of the scientific realm, into the commercial world. But our software runs now on over 100 different computers, and I think about five different massively parallel computers.

DSM: Now, ideas and questions drive visions. Another story I have heard is a story about a British Telecom request regarding software that would run a video server, for video on demand. Tell me that story.

LE: Sure. Actually, we had signed a contract with U.S. West, where we were the supplier of enabling technology for U.S. West's Information Highway Initiative. And in that contract, we signed up to deliver video on demand in about 5 years. And, to tell you the truth, we did not know if we could do it at all. We really had not spent much time thinking about it, but 5 years is a long time and we saw technology moving a lot in 5 years and, who knows, maybe we could even keep our commitment. We had some ideas, but we really had not come up with a solution. But we thought we could solve it generally in 5 years. We felt that was safe.

And that was what U.S. West expected; they thought it was unreasonable to try to get it very much sooner. They did not think this was our area of expertise anyway. Then British Telecom had the reverse set of priorities. They wanted video on demand immediately, and were willing to wait for some of the other services that our software offered. A guy just a few offices down from mine received the British Telecom request for proposal, and I was walking by his office and he said, "I've got the BT request for proposal and they're asking for video on demand almost immediately; they need it in about 6 months." I said, "video on demand -- I'm not sure I even understand the problem -- can you please give me a copy of the RFP." And I went off and thought about it.

And it was very, very clear that the reason this is such a difficult problem is that you have to move a tremendous amount of information; every movie is 1.5 megabits *every second*. And then there are lots of movies. You multiple that by a factor of 100 or 1,000; you have lots of movies being played and stopped and started and individually controlled. So the problem was moving information through a computer at much higher rates than any computer could handle at the time.

That is, any computer but a massively parallel computer. It turns out, all the work we had done in understanding massively parallel technology and working with massively parallel technology could be re-purposed to handle the video-on-demand problem, which suddenly became trivial. Because a massively parallel machine's ability to move information was 10 hundred times greater than conventional machines, that the problem was not much of a problem. And we generally don't admit this.

I then called in one of our senior programmers--not a manager, one of our senior programmers, actually a fairly young mathematician from Harvard, Bill Bailey. I called him into my office and I suggested that we could use the N-cubed massively parallel machine to do video on demand. And I hope Bill remembers this. He told me I was nuts. And, obviously, people here just are not afraid of me enough.

And I said, "Well, just hear me out a half an hour." In a half an hour he said, "There's no question we can do this. In fact, I can do this. And I think I can do this pretty fast." And Bill Bailey and Mark Porter and a couple of other people got our video server working within months of the idea. Now, again, we were standing on the shoulders of all the work that was done by others in the MPP group, the massively parallel group. But we were able to get our video server working almost overnight--I mean, overnight is an exaggeration; even the overnight successes take a long time. We had to build this foundation of 5 years worth of massively parallel computers. But we were able to demonstrate within months--and I will never forget, they called me up on a Saturday night, they called me up at home at 12:30 am. And I was actually on a date. I had a date. And there was just kind of screaming into the phone, "It's working, it's working!" And we both, you know, went into the lab and, sure enough, we had video streams, rock videos, coming out of this computer in our laboratories. And it's a pretty big computer. Well, it is not that big a computer. But here's the lab with all these stereo speakers and screens. It was not the normal Oracle computer lab. And these rock videos blasting all over the place. It was pretty exciting.

But a very small team of people had done this work. Now, I have the utmost respect for Microsoft, but I always hear Bill Gates saying he is spending \$100 million a year on doing this. Again, software has never been a capital-intensive undertaking. If it was a capital-intensive undertaking, you know, I suppose we would have a tremendous number of huge software firms in Saudi Arabia; they certainly have a lot of cash. Again, in a very short period of time, a very small number of people did remarkable things by combining the right technologies and finding the right solution to the problems.

British Telecom opened the first on-ramp to the information highway. Again, the last thing I want to do is slam Microsoft, because I have the utmost respect for them--but it was interesting that CNN identified that Microsoft's information highway demos were precisely that. They were fake. You know, they were not real demos. They were movies of what it might look like. And then Bill said, "Everyone's stuff is fake at this stage." And someone in the audience stood up and said, "Well, then you should come to Leeds, where it is up and running. You can go to some people's houses and this stuff actually works and it is turned on."

So there is an N-cube video server delivering across regular telephone wire, twisted pair, not fiber, not coax, but across twisted pair, movies to the homes of people in the United Kingdom. It is interesting that the UK and British Telecom beat Bell Atlantic now. The first North American project turns on, I believe, in mid-July; Bell Atlantic, in the area of Alexandria, Virginia. What a perfect spot to turn on the first digital library in North America.

DSM: It is perfect for many reasons. Tell us about this Bell Atlantic Star Gazer project. What's it going to be like?

LE: Well, Star Gazer are the applications that we are building on behalf of Bell Atlantic. We are the contractor for the Bell Atlantic project. We are the systems integrator. We are the programmer of the applications they specify. Those are the Star Gazer applications. We are the supplier of the media networking software, you know, the software that transfers the data out of the digital library and onto the network and to the set top. We supply the set top software, the networking software, the media server software. We integrate the hardware with the network and we write the applications. So we are the prime and primary contractor, working with Bell Atlantic to implement Star Gazer.

The Star Gazer project has many components. The one everyone talks about is the movie finder or the movies-on-demand. People sometimes say video-on-demand, and that is really a technology, the ability to get pieces of video out, any kind. And it can be educational video or news video or movies. But the specific application, movies-on-demand, is the first application we will have up and running for them. So we will have, on the digital library, a bunch of movies. And you will have the ability to search the movie library by star, by director, by year, by type of movie or play, you know, watch anything you want to watch any time you want to watch it. And you will have complete control over that movie. You will be able to pause it when you want to, fast forward it when you want to, restart it when you want to, just as if you had a VCR.

And what gets more interesting is every time a new show or television broadcast show is broadcast, that broadcast is recorded on your behalf and stored in a digital library. So if you get home at 9:07pm and you want to watch the evening news with Dan Rather, you can watch the evening news with Dan Rather. And that creates an interesting problem for CNN Headlines News. Suddenly everything, all the information that is broadcast has been recorded in the library. All the movies are recorded in the library. If you buy a Sony Handicam, perhaps you will not have a manual that comes with the handicam. Instead, you will get a little tutorial on how to use your projector on interactive TV. You will be able to look that up.

To do shopping, to do comparison shopping, you will be able to get infomercials on demand. So if you want to hear what Jeep has to say about the Cherokee and Land Rover has to say about their product and the others, you will be able to do the comparison shopping directly from the manufacturer. And you will even be able to, if you like, place an order. We will be able to handle at least 150,000 simultaneous video streams out of an N-cubed in February of next year. And then the costs will drop again. It will drop to a couple of hundred dollars per video stream. And at this point, the cost of video-on-demand will drop below the cost of a decent VCR.

So this technology, which people said was just too expensive, suddenly becomes achievable by most people. You know, most Western nations can afford this. Certainly the emerging countries in Asia can also afford this technology. So I think we will see this technology proliferate to the same degree as telephony. Probably not so much as broadcast TV. I mean, it is very interesting, broadcast TV is in 97-98 percent of American homes. Telephony, a phone is in about 93 percent of the American homes. So television is more pervasive. Broadcast is more pervasive than two-way communications, because it delivers better value in the eyes of a great many Americans.

DSM: Larry, when you look back, was there any one "spark" which set off this chain of innovation in your life, when you look back to the New York or Chicago days? Was there a flash, a moment of profound inspiration?

LE: I wish that were true. I wish that were true. No. It was just a series of--there were major, major decision points where either we were lucky or smart--you know Curtis LeMay's great line, "You can't tell the difference between lucky pilots and less smart pilots." You know, you don't know how to do it, and you don't have to. And we made a couple of very good choices.

When I started Oracle, what I wanted to do was to create an environment where I would enjoy working. That was my primary goal. Sure, I wanted to make a living. I certainly never expected to become rich, certainly not this rich. I mean, rich does not even describe this. This is surreal. And it has nothing to do with money. I mean, you buy clothes with money, and cars. But I really wanted to work with people I enjoyed working with, who I admired and liked. We used to have a rule at Oracle to never hire anybody you wouldn't enjoy having lunch with three times a week. Actually, we are getting back to some of our original ideals these days.

Because what we wanted to do was create an environment where not only were the people talented--and I think that is very important, so I can rely on your competence and your industry to do your part of the job, so we can work together as a team, so I can trust you. You will do what you say you are going to do--but also I like you personally. So when you succeed, that will not annoy the hell out of me. In fact, because I have so much affection for you, when you succeed, I will say, "You know, isn't that great. Look what Bob did. Isn't that fabulous." I'll get as much joy--or almost as much joy--out of your achievements as my own. This is a much healthier climate than unthinned intramural competition. That was the early goal. And I think, as we got larger, we lost sight of a lot of that. And if you look at now, as we are kind of in our adulthood, I mean, we had a little bit of a rough time in our adolescence, you know, when we went through the billion-dollar mark in sales, and we will be around 2 billion this year. And as we came out of that adolescence, we forgot or lost track of our original ideals and objectives, which is wanting to create an environment where we all enjoyed working, an environment of mutual respect and mutual affection. And this sounds a little bit cliché, but it is essential in our business. The size of the engineering project we take on cannot be managed by one person. Therefore, you have to have groups of people working, all together, and working well over long periods of time. If there is intramural competition, that is death.

DSM: Where did this idealism, this sense of teamwork come from? Were there key people that you admired or ideas or role models?

LE: Just exactly the opposite. I worked in a couple of start-ups in Silicon Valley. And I was the vice president of R&D of a couple of companies in Silicon Valley, and I saw this constant strife amongst the different managers. I mean, they were constantly one-upping one another and in competition with one another, as if our company was large enough to accommodate intramural competition, compared to the rest of the world.

I mean, there are all these people outside to compete with, what are we doing competing internally? But I guess it is human nature. I mean, sibling rivalry exists, so it is not surprising that this exists inside of companies, and we compete more, you know. And, again, I think the Japanese have dealt with this magnificently. This is long before I had much knowledge of Japan. But this just did not make a lot of sense to me.

So after working for two star-crossed Silicon Valley companies--you know, ill-fated, whatever you want to call them--and a couple of CEO's who I did not think were as capable as they should have been--after all, they both ran their companies out of business--I thought, well, I don't need leadership to do that. I can run a company out of business all by myself. So I thought, next time, if the company was going to go down, I was going to be out front. So we wanted to start a small business, wanted to start our own company. And we were looking around for ideas, this landmark. The first idea was to start a company, again, to create this environment where we would enjoy what we did and who we did it with. And this paper was serendipitous, because it turned out to be the blueprint, our product blueprint, and allowed us to take our organizational ideas and combine them with a product idea, and we were off and running.

DSM: What role did the context of the times in which all of this took place play? Do you believe innovative thinking is similar pretty much in any situation? Was it just the intersection of the right time and the right place?

LE: That is an interesting question. I don't know how I can answer that question as far as I'm concerned. I think I always would have gone out and started my own business. But it might have been in construction. I know, as a kid, I wanted to be an architect. That's before I read *The Fountainhead*. I mean it is hard to find a profession that pays worse than architecture. Even school teachers make more money than architects--except folks like Richard Meyer. It is such a wonderful profession. I mean, the act of creation is one of the most profound act we can have as living beings. And I think men are disadvantaged; we cannot have children. So our creation has to be our art or our engineering.

I am not sure I always wanted to have my own company; I always wanted to work in a company where I would be able to build things. And in fact, as a child, once again, I lost track of myself, where I really wanted to be an architect as a kid. And then, for some reason, I got the impression that I was a scientist. And I think it was seeing yourself and seeing the world as it should be, rather than as it really is. So I started seeing myself as a scientist. Because, after all, science, the pursuit of knowledge, was nobler, somehow, than being a mere engineer, than building things.

But whether it is bridges or trestles or skyscrapers of 50 years ago or the information highway and computers of the 1980's and 1990's, you know, studying theoretical physics or theoretical mathematics--the pure pursuit of knowledge. That is what I thought I should be doing. And I tried to do that. And I really had no enthusiasm for it and no enthusiasm for school, even though I tried. I thought this is what I should be.

If I had only realized that I was an engineer and a builder by nature. Because if I needed information to build something, I was relentless. I could not stop thinking about a problem that had to be solved in order to build something. I was obsessive. I certainly was never obsessive in the pursuit of knowledge, just knowledge. I liked solving problems and I loved building things. So I was a lousy student, but a good builder.

DSM: You have been portrayed as the quintessential Attila the Hun capitalist on the one hand; on the other hand, and more recently, exactly the opposite: an absolute idealist, a visionary of a multimedia future. What I would like to have you talk about is about ideas, great ideas, the challenge of innovation, the act of creation that you talk about, mixed with the necessities of business. I mean, you talk about ideas that were so compelling, that just had to be done, and yet there is the nitty-gritty business side of doing that. Has that been a source of frustration or part of the challenge?

LE: Quite the contrary. I think making a profit enforces the discipline that allows you to be idealistic. And I would much rather see the schools in the hands of private enterprise than in the hands of the government, which does not have to make a profit, does not have to show results, and can just raise taxes. In fact, we have an Oracle Education Foundation, where we give money to schools and we give computers to schools. Yet we probably will develop our educational software for a profit, because we think it will cost us less money and we will get better software and we will be able to deliver it for less.

And the pursuit of profit forces you to do things efficiently and competitively. If you take that away, you lose that discipline, you lose that market-imposed discipline, and you get sometimes just horrific results, like our wonderful public school system. And look what has happened to it. On the other hand sometimes you get wonderful things. You get public television, which is fabulous. So, again, I do not want to paint this with too broad a brush. Not a simple question.

DSM: But a very good answer. What do you think is going to be the most striking innovation in information technology in, say, the next quarter century?

LE: It will be in the area of education. I think that technology has a chance to really solve our public school system's biggest problem, which is the fact that kids just get very little individual attention. But you can put an electronic, digital teaching system in every kid's desk and you can drill the most disadvantaged student in the basics that they did not get in the home--the basics of mathematics and language. And then, with that foundation, they can continue their education. With the absence of those basics, it will just frustrate them as they try to learn more advanced and more complicated subjects. As big a deal as that is, I think a bigger deal--and it is going to sound very strange--is home shopping. (Laughter) How can I possibly say that? I can just see that taken out of context: "Larry Ellison thinks that home shopping is far more important than education." (Laughter)

But, you know, those are always funny to read afterwards. Well, maybe not so funny. But what happens when a village in China can manufacture wonderful silk shirts and sell them directly to consumers in New York City, in northern Virginia, in London, Paris, you know, for \$50 or \$40? And you get this wonderful, interesting video. I don't know if you saw the movie *Judo*. It is a fabulous film. I guess the Chinese filmmaker, whose name escapes me, has won a variety of awards at every film festival around the world. And *Judo*, without going into the detail of the story, but the cinematography is just absolutely fabulous. It takes place in an old wooden, silk factory, where there are these huge bolts of white silk hanging from these weathered, wooden rods in this wooden building with this dirt floor. So all this monochromatic palette. And it drops into this vat-- all you can see is this dark vat -- and they pull this white bolt of silk out, and it's crimson or purple or intense yellows--visually incredible.

You combine this kind of visual feast with an explanation of the silkworms munching on mulberry leaves, and then in their cocoon, and the machines unravelling the cocoon, and how their silk gets woven, and the characteristics, the wonderful tensile strength of silk, you know. And it is an extraordinary material, in how it is carefully crafted and dyed into these wonderful shirts. So you get a great black shirt or a great gray shirt or white. And you start selling these for less than you can buy a cotton shirt in Macy's. What happens to the world economy? What happens to that village in China? What happens to the villages in Central Africa, who can take their creations and vend them in electronic bazaars all over the world? We have truly a global market. We talk about global markets; we do not now have a global market.

And people, creative, industrious people, will be able to get their products to market anywhere. And we should have a world that is vastly more wealthy because of commerce and because of diversity of culture and exchange of information. And it should truly be a golden age. And it is back to: It is the economy. You know, Clinton saying: It is the economy, stupid. I mean, the alternative answer to your question would be about information technology and health care and information technology education--and I would like to take a second and talk about that in a moment. But I think those are really not as important as information technology and commerce. Because improved commerce would create vast wealth which would allow us to be a much more humane society. It is much easier to be altruistic when you have means.

Wealth in China will beget a political revolution eventually. The rise of middle classes have always been the worst nightmare for totalitarian leaders. And disasters in the economy have created the worst possible politics, whether it is Germany in the thirties or any number of other examples we can cite historically. So I think that is going to be just an incredible change on a global scale.

I think *then* you go into what I said earlier about education. And suddenly, everyone can take a physics course; the most gifted students can learn at an accelerated rate, because of personal digital tutors sitting on their desk and broadband connections, high-speed connections to all of the information in the world in all of its different forms.

And, finally, there is the small issue of health care. And here, on the small issue of health care, as a baby boomer, you know . . . we must look like the Sword of Damocles suspended over the necks of the next generation, because they are going to have to care for us. And we have increasing expectations as to the quality of health care we are going to get in our senior years. And there are so many of us and relatively so few of them that it is all going to be enormously expensive. This enormously rich nation just is not rich enough to support us in the manner we would like to be supported in our dotage. I probably should not use that term.

So what is the alternative to health care? I do not like the term "health care." It is really an issue of care versus cures. Suddenly, again, technology rises to the rescue. The culmination of information technology, mapping the human genome, databases of human genomes and biotechnology will allow us to address diseases that have proved intractable to science for most of this century. Whether it is cancer or Alzheimer's or multiple sclerosis, for the first time we have a real chance of not care, but cures, for these diseases.

And our technology, both the information technology, combined with biotechnology, really will yield nothing short of miracles. And cures are infinitely more humane than care and economically much more efficient. And I think that is going to be one of the great outcomes of this next 10 years. I would say this wonderful health care and this wonderful education, again, will--to disperse it throughout the world and make it available to everybody, to give everyone access--which, really, the Clinton's health care plan is about; it is not about health care at all; it is about access to health care--you need wealth. And the more wealth, the better. And the stronger the economy is, the more we can address the needs not only of the disadvantaged in our country, but, you know--I mean, the poor in our country are envied by the poor, by the middle-class even, of other countries.

And I don't mean to make light of their plight at all. But poverty exists outside the United States. And it would be nice if the wealth became so great on this planet we could address the poverty. You know, poverty not just north of the Rio Grande and south of the 49th, but around the world. And I think it will be possible. And, again, I think this technology will help create that wealth. And I think that is, again, the single most important thing.

DSM: It almost seems like the problem solving we are hearing about and the way business in information technology is being done is very holistic--integrating very different disciplines to make it work. That's what it sounds like I have here.

LE: Yes. Again, I completely agree with that. Our two greatest sciences of this decade and probably in the last decade--information technology and biotechnology--are really now conspiring together to create miracles. And again, if life is a miracle, then I think that we can legitimately call these miracles. Because these are preservers of life. And I believe life is the only miracle.

DSM: The last question before I ask you if there is anything you would like to talk about off the record: Is there any advice that you have for those following in your footsteps?

LE: Oh, that's interesting, because I'm going to talk to. . . I've thought about this, and I'm not sure exactly the precision of your question, but I think, for the first time, people who have decided to go into the sciences and mathematics and engineering, again, have a chance to contribute more to society's changes and society's improvements than the people who decided to go into leadership positions, let's say, in politics. And, for better or for worse, most of the people we have in Congress are trained as attorneys. And I'm just not going to render a value judgment on that. (Laughter)

But suddenly scientists and engineers are going to find themselves in the midst of the social revolution that can make the world vastly better. So I am envious. I am envious of the kids that are graduating from school right now, because they are right at the beginning of this revolution. And they will see these dramatic changes as we go to a true global market, as kids all over the world get individual attention in education, and we cure these horrible diseases of aging, which make our golden years not golden at all. Maybe I will refer to them as our lead years. And, again, I would just encourage that the brightest minds in our country and other countries to get involved in the act of creation, the act of creation of products, the act of the creation of art, in buildings, in ideas. So, again, as I say, sons and daughters who are going into architecture and engineering have my enduring respect and envy.

DSM: Well, is there anything else you would like to talk about on the record or, alternately, anything that you would like to talk about off the record? Maybe you could talk a bit about heroes.

LE: You know, in Rome if they did not like somebody, they threw them to the lions in the coliseum. Today we have the media. The media feels it's their job to make sure they destroy anyone who gets larger than life. We have become egalitarian to the point that we do not like heroes. We have lost interest in heroes. Too many people go through life wanting to make certain that no one is better than they are, and look to the media to make sure anyone who is getting too big for their britches is torn down to size. So no one is taller than William Penn in Philadelphia, no one gets too big.

As a kid, I had tons of heroes. And it was great. Whether they were athletic heroes, like Sandy Koufax and Mickey Mantle or they were military heroes like Doug MacArthur, or they were the man who did nothing less than save Western civilization, Winston Spencer Churchill, who stood alone. And I retain these heroes to this day. And if you look at Churchill when he was alone and ridiculed by his own party, who stood alone, who, again, ignored conventional wisdom and had the courage and inspiration. And, again, I go back to the way you do something great; of course, Churchill's greatness was nothing less than saving Western civilization. And I think I can make a case that he did just that. He stood alone. George Bernard Shaw said everyone knew when England got into really serious trouble, they would go on bended knee and beg Winston Churchill to take over. Which is exactly what they did. Just in time. He did not succumb to conventional wisdom; he maintained his beliefs throughout his life, regardless of the fashion of the time. And the courage it took to be such an individual, to stand alone, and the great benefit all of us received because of his intellectual integrity and courage. That is so--at least for me--that is so inspirational.

Doug MacArthur, when he left the Philippines in a P.T. boat and made it down to Australia to take over the Army, the defense, trying to slow down the Japanese in World War II. . . and he had retired; he was in his mid-sixties. He was recalled by Roosevelt in a desperate situation, not unlike Churchill, who was recalled by his country in a desperate situation. And he all these young men around him, all his young staff officers around him, questioning his judgment, his tactics and strategies in fighting the Japanese. And MacArthur had almost no casualties. It was very interesting. You can look at MacArthur, and MacArthur lost less people in the entire war against Japan than Mark Clark lost during his invasion of Italy. So he was very economical with his troops. And his brilliance was so great. And it is not widely recognized, his brilliance was so great. Not only did he utterly demoralize the Japanese by bypassing their strong points, he saved American lives and Japanese lives as a result.

And, again, his staff kept criticizing his strategy, at least for the first five or six battles. Then they finally just said, "Okay, General, what do you want us to do? Just tell us." And, again, these inspirational heroes made me believe that anything is possible--that great things are possible.

DSM: What are the upcoming great causes?

LE: Every generation has to find its own cause. I know that in the sixties we embraced, amongst other things, civil rights. The great upcoming causes? I hate to be repetitious, but right now we are so concerned about spreading democratic institutions throughout the world. And, again, I go back to, "It's the economy, stupid." If you can improve the wealth in China, if you can increase the wealth in China--and what is going on in southern China right now is nothing less than a revolution, with much greater impact than the Cultural Revolution. And it will forever change that country. And China is so large; people do not realize the Chinese economy, I think, is \$2.4 trillion and the Japanese economy is \$2.6 million. China is about to become the second largest economy in the world. And it is growing in double digits, I think. It is just an absolutely incredible rate. They certainly have not had a political democratic revolution in China yet. But it is certain to happen. And the economic revolution that precedes it will do more to end human suffering than democratic revolution that succeeds it ever will.

And, again, it is not very popular to think that commerce is more important than politics, but it is. It is not very popular to think that Ford Motor Company did more to help humanity than the Ford Foundation ever did, but it did.

And I really think what is going to change the world will be this great global economy, this great commercial revolution, the spread of technology all over the planet, this incredible increase of wealth that will just allow education for everybody, health care for everybody, better communications for everybody, you know, more comfortable lives, more interesting and diverse lives for everybody.