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FUTURIST

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Thank you very much. It's a pleasure and an honour to be here with you this morning. Rather unique this morning, two Stans on the speaker's platform. When I met him back stage, he informed me that he was Stan, not Stanley, because his mother used to call him Stanley, and I said, oh my God, that's exactly my story too, that's why we're both Stan. So, it's quite a coincidence.

I want to take you on a journey this morning, give you a perspective from a high altitude of the past, the present, and especially the near future. What it's going to be like from my point of view and why.

I'm going to begin with a very simple notion that everything that has a beginning has an ending, and build everything on that simple axiom. Everything that has a beginning, has an ending, and therefore it has a life cycle attached to it in between, and it's important to understand where we are in that life cycle.

Life cycles, whether you're talking about a plant

or a planet, an individual, a family, a culture, a civilization, local state, federal governments, a product of business and industry and economy, they all have beginnings, and they all have endings, and therefore they all have life cycles attached to them. And if you look at what life cycles look like, they divide roughly into four quarters and they look like a snake going up a staircase.

So you begin the first quarter with a gestation period. From an economic perspective it's rather flat. There's a tremendous investment in resources with little return and then you hit the take -- the first takeoff, okay, and you get enormous accelerating rapid growth. This continues and continues through into the third quarter as you mature and then you get the second inflection point where it begins to age and decline and flatten. So you have gestation, growth, maturity, and age of decline and a flattening.

Now when you think about the life cycle of economies, we've been through a series of them. The first ones were hunting and gathering economies. They lasted for hundreds of thousands of years, the pace of change was quite slow. And lest you think that they aren't around any more, when life cycles -- when they get superceded by the next life cycle, it doesn't mean

that the previous one disappears, it means that it fades and it declines, goes into decline at the end of its life cycle, but you still see remnants of it, and I'm not just talking about hunting and gathering cultures and societies, the next life cycle after hunting and gathering economies, are agraring economies. Agriculture is the domestication of plants and animals, but aquaculture, by contrast, is still in its gestation period and so aqua -- fishing is still a hunting and gathering activity. Okay. It's still a hunting and gathering activity. Being -- probably migrating from gestation and into growth where you now have some fish bred on fish farms, um, trout, for example, is -- is overwhelmingly bred, but most are not.

Agriculture dominated for about ten thousand years as the dominant economic forum. After agriculture, then we entered into the industrial economy era. The first one to begin was in Britain in the 1760's. The first one to come to an end was in the United States in the early 1950's, and shortly thereafter, Canada and other countries followed. When I say come to an end, what I mean is that the industrial manufacturing sector stopped its growth, had matured, and then began to decline as a percent of the total economy, in terms of

GDP, employment, those kinds of statistics, after the early 1950's industrial manufacturing began to shrink, just like agriculture began to shrink, although it dominated the economy for a long time.

So we have been in this current economy since the early 1950's. For the first twenty years we didn't know that we didn't know that. It was only in the early '70's that we began to know that it was no longer the industrial economy, we didn't know what it was, so we called it the post-industrial economy, the service economy, the information economy, the shopping and gathering economy. You know, we weren't sure what it was, information economy won. What raises the question, how far into the information economy are we? When will it come to an end? And what will supercede it? What will come after it? And remember, unless you're a Hollywood movie star, you tend to bring on the next generation during your middle years, not when you're in your seventies, right? And that's reserved for Hollywood movie stars. Therefore, in all likelihood, the economic foundation, the infrastructure for the next economy has already begun, but it's still in gestation. It hasn't really commercialized and grabbed headlines too much yet.

So I want to talk with you about this very

interesting decade ahead from this economic point of view. Now, before I do, let's get some audience participation involved, and let's find out where you think we are in this current economy and when think it's going to come to an end. Remember I described four quarters, gestation, growth, maturity, and decline. Where do you -- which quarter of this information economy do you think we are in? Let's get a quick show of hands. Okay. How may of you believe that we are in the first quarter of the information era? Okay. Looks to be about fifteen percent of the room. How many of you think we are in the second or growth quarter? I estimate about fifty-five, sixty percent of the room. Third quarter? Looks to be about fifteen, maybe eighteen percent of the room. And how many of you think were in the fourth quarter? I see one -- one hand up. Okay. That's -- that's an interesting dispersion. I -- I'll vote -- I'll tell you my vote now and I'll tell you my reasoning for it.

I believe that we are about halfway through the third quarter of this economy. Okay. I believe the -- the economy began in the early '50's. I believe it will come to an end somewhere in the late 2020's. That the first half of the economy, the -- but -- the infrastructure for this first half of the economy was

based on the computer fundamentally as a crunching tool, and what it crunched for the first four decades were two things, numbers and words, and it was a free-standing box. With the takeoff of the Internet in the early '90's, I believe that we shifted into the second half of the information era, and the focus shifted from a focus on crunching to a focus on connecting, connecting the boxes up together.

The crunching power used to be a strategic decision, you know, how -- how powerful was your computer, now our computers pretty much have whatever power we need. It's no longer a strategic decision, it's become a commodity business and we are focused now on connectivity and more strategic decisions from investment point of views with regard to the infrastructure have to do with bandwidth, not with how many miffs, millions of instructions per second you've got on your computer.

That's one of the reasons I think we are more than halfway through. Another one to skip ahead, and I'll -- I'll just do it for a moment and then come back, is that economies don't die because they run out of steam or oil or computing power or the like. They -- they fade from dominance because they are crowded out by another technology that goes through its life cycle and

pushes it -- pushes the prior one out of the way in terms of importance. To anticipate that future, I'll just say a word now and then I'll come back to it toward the end, about the next infrastructure, the next economy, and what it means. It begin -- if you want to say that the apple falls on Newton's head and then about six decades later you get the steam engine, and then the steam engine gives you -- leads to the railroad, and then the railroad leads to industrial enterprise on a national basis. In the same sense, you get the progression from the combustion engine to the automobile, which is the consumerized version of the railroad. And with the automobile then you get the growth of suburbs and all sorts of shifts that occur downstream as a result of that. And the same thing happens in the information era, and you had the transistor and replacing the vacuum tube. You had mainframes in the beginning of the information economy, you got chips, microprocessors and the PC, which is again the consumerized version of the mainframe, the equivalent of what the automobile was to the railroads. So you get these kinds of shifts. Newton to the steam engine was about six decades. Einstein to the ENIAC, the first mainframe type of computer was about five decades. In 1953 Crick and Watson discovered the

structure of DNA and the double helix, and if you want a marker event, that's probably it for what the next infrastructure will present to you. And five -- almost five decades later in the year 2000, you get the announcement of the completing of the reading of the human genome with lots of surprises and lots of portent in terms of what it will mean, and so for my money, those are the marker events ending the gestation period of the next economy and what we will see over the next few decades is the commercialization of -- of that discovery.

Another way of looking at what I talked about is that the front quarter, that first quarter or gestation period in a life cycle, begins when scientists have new understandings about how the universe operates. You can replace the word science with words like art or religion, as well they're all interpretations about the universe. But the one that matters from an economic point of view is science, and science then needs a bridge where you take the understanding and put it to practical use and that's called technology.

So first quarters are dominated by science and by the time they end is the beginning of the technology driven second quarter of the life cycle. That's when, for those of you who are old enough in the room, that's

when you get early adapters of computer use, but most sectors of the economy say, why would I possibly want or need a computer? Okay. That's technology driven. Why would a hotel, or a fishery, or an automobile company need and use computers? You'd ask the same question now, why would a hotel, or a bank, or a construction firm possibly want to employ and use biotechnology? It will, but we don't quite get how yet. I'll say a -- a bit more to, as I progress, to anticipate the answer to that.

So now let me introduce to you yet another layer of complication, and that is what we've been going through of late. In the last year or so, the last year and a half, although things differ between your country and mine, they don't differ that much, particularly from this perspective. We've had a recession, we've had the dot-com bubble burst, we've had 911, we've had, at least in my country, a lot of corporate scandals, we have had panic in the financial markets, we have had a stalled recovery, we have the fear of deflation. There's been a lot going on that has captured our attention.

Now it's wonderful to come here and -- and see such beautiful weather. I remember giving a speech not too long ago and being in a hotel room early in the

morning and watch a hurricane that gathered steam in the Caribbean and was coming up the east coast, and watching the weather map. And here's the coastline, which, oh, isn't quite, but almost like this S-curve, and there is the hurricane, this whirling pinwheel. And I thought, this is a perfect metaphor for the difference between the life cycle of the economy, which I was about to speak about, and the business cycle which I just described in terms of what's been happening with the recession and the dot-com bubble bursting, etcetera.

I want to distinguish for you between the life cycle and the business cycle. In the -- the business -- the life cycle is long-term deep structural progression. The business cycle is much more short term, even if it lasts a decade to do one -- to do one revolution. You have what's going on now, we are trapped in the business cycle and so for those of you -- and I stopped in Seattle on the way up here in the United States, the State of Washington has the highest unemployment rate in -- in the United States. Boeing is laying off thirty thousand people. And you don't have to be from the States, here in Canada too, you hear about concerns with regard to layoffs and this is all about the business cycle, it is not about the life

cycle. Okay? So it is about what's going on this way as this whirling economy also goes through its long-term life cycle and it's overlaying two processes at the same time.

I want to focus for you largely on the life cycle more than on the business cycle, but I'll say a word about why. You go around, as I do, and talk with businesses and you ask them, well, what is the grabbing, electrifying, dominant new idea that's driving the business world, and you don't get answers. The only phrases that I hear are, "back to basics", "fundamentals", "one step at a time". If you're a football fan, there's no Hail Mary passes, it's just three yards at a time. You know. And if the focus, indeed, is back to basics, I'd like say a few words about what those basics are and where -- where they are taking us and a bit about the various sectors involved.

The main point that I want to get across to you with regard to life cycles, remember science during the gestation period, technology during the growth period, then the focus shifts as the technology matures, the focus shifts to how you manage and run the enterprise, and then only in the last quarter, by the way, only in the last quarter of economies do you get the major models for how to manage and organize. If you look at

the previous era, the industrial economy, from the 1760's to the 1950's and you ask what were the major models for how to manage and organize, they all cluster in the last fifty years. The railroads were the first industry to develop the concept of general management. Ford's assembly line was major in terms of how to manage and organize the core function at the time, the production function. The major model for how to manage a corporation was developed by General Motors in centralized planning and financial control, decentralized operations around the division structure, that was in the 1920's -- 1920's. 1760's to 1950's we were sixteen decades out of nineteen, finished with the economy before the dominant model for how to manage and organize a corporation was articulated. And then probably the last candidate would be the General Electric strategic business unit concept. That was in the early 1950's, so it was a stroke before midnight on the twenty-four hour clock of the economy.

So science, technology, business organization. The message that I want to get across to you is, that every time the infrastructure shifts, how we conduct our activities shift. Whether they are in the public or the private domain is a very secondary of natorciary (PHONETIC) (sic) issue from the -- from this high

altitude perspective. I don't mean to demean it, it's crucially important, but it depends on what lens you're looking at. Every time the infrastructure shifts, how we conduct our business activities shift. The infrastructure shifted from industrial to information and it's shifting yet again. It's shifted, if you refine the lens and look closer within that -- within the information era, the first half is dominated by the crunching of free-standing computers as products in boxes, or the second half is more dominated by the connectivity of the Internet and a communications focus, and then you get the next phase itself.

Now, let's factor you in as individuals so that you get a sense of where you fit into this. Think of your own personal life cycle. And when you think of -- if -- if -- let's -- let's simplify it and the average lifespan of an individual today, between seventy-five and eighty years let's say, so to simplify it to eighty years, twenty year quarters, or seventy-five years, you graduate at eighteen, you know, so that your gestation period from this perspective is not nine months in the womb, it's nine months plus eighteen years where your parents invest an awful lot of resources, time, energy, emotions, money and love and attention, with very little return, and then you would take off and you

would go out on your own, right? And the rapid growth period from that point of view from age eighteen through your mid-thirties where you establish both your economic viability, as well as establishing a family, and begin to bring on the next life cycle. See the overlap, okay? And then maturity from forty to sixty, or from the, you know, thirty-six to, add another eighteen years onto that, and then the age and decline. And remember, the fourth quarter doesn't just stop, it does this, right? Okay. Now, 1953 in the United States let's -- that's for economies, let's take a look at individuals. The baby boom generation by demographic definition is from 1946 to 1964. The mid-point being, therefore, 1955, the middle of the baby boom generation.

Now let's get a show of hands, how many of you were born before 1955? Wow. I guess I'm not as alone as I thought. Okay. Quite a significant number of you. Let's get the contrary, how many of you were born after 1955? Okay. It looks to be about a fifty-five, forty-five split. How many of you were born -- let's get a -- a number, the second half of the baby boom generation between fifty-five and sixty-four, how many of you were born between fifty-five and sixty-four? And how many of you were born after sixty-four? Only

about -- less than -- five percent of the audience. Okay. Let me overlay that map, the demographics of the audience and the individual life cycle, onto the map of the life cycle of the economy. Before we went on, we were talking, Stan and I, and our sponsors were talking about the commonality of the information systems that you have that there were -- what was the number, two hundred and two? Two hundred and two different computer systems in the Canadian government, or in the provincial government, right? Two hundred and two different platforms of different systems in -- that could not communicate with each and they're not inter-operable, okay. So that if you had one map of Cariboo and another map of forests, you couldn't lay one on top of the other. Or if you had hardwood and softwood, you couldn't even lay those maps on top of one another. And the attempt to get them down to five, that inter-operability -- well, what I want to do is lay the map of us as people and individuals on -- and the map of the economies and the life cycle, to see where we are. The -- the simple point is this, the older you are, for example, if you are close to sixty or a little over sixty as I am, you -- you remember the industrial era when you were a kid. You lived -- and you're living the early part of your life still in the industrial

period, and then you go through the information era, and if you live a long and healthy life, you will live to see your grandchildren begin to absorb that next economy, for the moment let's call it, let's say the bio-economy. So you are a unique generation in the history of mankind, and most of us are. Why? Because most of us will -- this -- this economy, this information economy, if -- if I am correct, is about a seventy-five or eighty year economy. It's a unique generation that maps the life cycle of one generation. That generation is unique in the history of mankind because it -- it bridges three different kinds of economies, industrial, information and bio-economy. And then the more out of sync you are, the more you are dominant within one or the other of these economies. Most of you will spend -- going forward now, the younger you are, the more you will witness the development of yet a different economy. Most of you will spend most of your productive careers, the forty or so years that you're in the workforce, in the information economy. But during the next decade, what we will increasingly begin to see is the overlap of information technologies and biological technologies in terms of their impact.

Now let me just say a few quick words about what

this means to some of the sectors of the economy. Okay? I talked a little bit about you as individuals. Now let's take a look at the economy. I'll just say a few words about some of the larger sectors in the economy. The largest sector of your economy and the economy of the States is healthcare. Now remember, the basic premise is every time the economic -- every time the foundation of the economy, the infrastructure based on its technology, dominant technology, every time it shifts, how you conduct those activities shifts. So let's take a look at the healthcare system.

Healthcare is really a misnomer, it's really sick care. There's an irony that doctors take a sacred oath to keep us healthy, but they don't see us until we get sick. And basically that relies on the customer to self-report, I'm no longer well, I need to see a doctor. Healthcare is -- or to put a positive spin on it, medical care, is basically remedial. It is basically curing what ails you. It focuses on sickness, disease, rather than on health. We are going through a transition period that's probably two to three decades in length. We're in the midst of it now. In the States we call it managed care. I think you use that term here also. It is a transitional focus, it is not going to be the -- the final fundamental focus.

That is going to be affected by these long-term shifts in terms of the biological technologies, because with the focus on the genome, what you are going to get, and it's taking a long time, but ultimately what we will get and emerge with is, true healthcare, a focus on preventative care rather than on remedial care.

The old -- if you look at it from a business model point of view, the business model in the industrially dominated model of medical or sick care, you had centralized control, thousand-bed hospitals, you know, parallel to the mainframe. You know, the big central -- centralized facilities, top down, hierarchical. Horizontal care, the way you made money was fill the hospital beds. Okay. In the -- this transition period around managed care, you've got vertical care. You know, get them up and out of the hospital beds as fast as possible. That's how you make the money. So instead of filling the hospitals, you want to empty them. It's an interesting flip. And instead of the focus being on the value chain being upstream with the providers, who are the doctors and the hospitals, it -- it moves downstream one notch to the payers, the insurance companies and the governments, and a focus on efficiency.

Let me say one thing about efficiency. It's the

first time I've mentioned it in the speech this morning. Let's go back to the life cycle for a moment. The snake going up the stairs. There are two inflection points, there's that take off from gestation to growth, and then there's that second inflection point from maturity to aging and decline, okay. Now what efficiency is about, focus on efficiency and productivity, is about propping up the declining curve as long and as well as you can. That's the efficiency focus. What that first inflection point is about, is about growth and innovation, okay. So if -- if you go into a business, a sector, an entire economy, if you pay attention to what the talk is about, you have a sense of -- of where we are in an economy, but, important caveat, remember the weather report, you also have that whirling storm system, you see. And when you're in the uptake of the business cycle you can talk about growth and innovation. When you're in the down take, you could talk about efficiency and productivity. So it's important to understand where we are. Particularly for those of you who feel that we're still in the growth or second quarter, which is a slight majority of you in the room. It's anomalous, it's contradictory, that you feel we're in the growth quarter, but we're focusing on economy and productivity

rather than on growth and innovation. Okay. So we're focusing on efficiency and productivity because of the business cycle, not because of the life cycle in this regard. Okay.

Now one more word about healthcare, a few more words about it. You -- you get a shift as well from central control, look at the infrastructure, from the mainframe to the PC, from the free-standing box to the connected, distributed net worth. Here's the essence -- here's the essence of the technology of the information economy. That's the essence of it. From the center to the peripheries, pushing things out from a centrally controlled to a network model, distributed, computing and the like, okay. Same thing happens with our management and -- and models and our organizational models. So you go from the centralized focus, the large hospital out to neighbourhood clinics. Okay? The more connected you are, the more distributed you are, the more you get over the hump of -- of the last mile, which is the wire across -- from the -- from the street into the home. The more we shift to wireless communication systems, anytime, anyplace, the more you push it out to the periphery, okay, the more you push the operations of the system out to the periphery , the decision-making moves from the center to the periphery.

This is exactly what is happening and so what you can predict and see occurring is that healthcare will migrate increasingly into the home. Okay. Thank you very much. It will migrate increasingly into home and that's only the pin-ultimate place that healthcare will migrate because ultimately, and when I say ultimately, what I mean is not until the bio-economy is well into its growth quarter, if not mature into its third or mature quarter, then it will ultimately move -- it will move into the ultimate place, where will healthcare ultimately migrate, it will migrate into our bodies. Okay. And again, in the same way that I pointed to aquaculture, at the far end you can look at it from the near end and see how to anticipate it, more and more things are moving into our bodies. So, for example, the first pacemakers were in 1973, okay. Clunky affairs. Now pacemakers are virtual, this is only -- all -- almost oxymoronic, they're -- they're commodities. Can you imagine a pacemaker being a commodity? And -- and yet if you think from '73 to what's been happening to pacemakers, they got smaller and smaller and smaller, they're implanted into our bodies, and imagine somebody with a pacemakers saying, I don't feel right, something's wrong with this, calling up the doctor and trying to get an appointment,

right. And as bad as it is in the States, as I'm told, the waiting lists here are even worse, which has to do with investment issues, not the model of the system. So what does the patient want? The patient wants anytime kind of response, so what that little business developed, was hold the telephone up to the pacemaker and be able to read the output in real time. And if you can read it in real time, then you can send a signal back in real time and zap the patient from a distance and that's the kind of thing that is moving that product improvement, that product upgrade is moving from gestation, from R and D, into actual production and implantation now. So that's the kind of thing that you begin to see shifting. Okay.

Let me say a word about another important sector of the economy. Again, based on the simple notion that every time the foundation of the economy shifts, so too does how we carry out all our economic activities, so let me focus on education, another critical piece of your economy and mine. Here, again, we have a very simple notion that every time you get a shift in the foundation of the economy, you get a shift in who bears the mantle of responsibility for the our educational systems.

When we were an agrarian country, Canada and the

United States, the basic educating institutions were the church and the family. Okay. As we shifted to be -- and more and more of our economy depended upon industrial base and foundation, and we shifted to these more centralized models, we shifted from church and family to government, from church to state, and government emerged as the major educating institution in both of our societies. That is fundamentally the way it is today.

Let me tell you where I see us today is where we don't know that we don't know that it's already shifted, okay. And what do I mean by that? Well, to use the metaphor of bandwidth, in the agrarian era, the bandwidth for education was say seven to fourteen years of age. When you got to the industrial age in our countries, the bandwidth shifted to -- from seven to fourteen to kindergarten through university, and it grew, okay. What's happening to the bandwidth, it's growing all the more and you already hear phrases like, "lifelong learning", "cradle to grave", "K through 80", that "human resources are our most important resource", "they're our most sustainable renewable resource", "intellectual property", "human capital", "knowledge based management", all these phrases focusing on that. Now isn't that interesting. If you're thinking K

through 80 and lifelong learning, government dominates during the first, during the front end of the individual life cycle. Okay. And that's not going to change. But if you got lifelong learning as the dominant shift in -- in terms of education, people are going to be educated where they spend the most time, which tends to be in their employment and in the workplace.

Now what that -- now, you folks are from the public sector and Canada has a much, you know, greater emphasis on public sector, so it may stay more government controlled. In the United States it is going to shift much more from the public to the private sector. And the private sector increasingly will begin emerging in the States as a dominant educating institution, not because it's going to take over school systems, it's not. The -- in the United States, the educational slice of the economy is about six hundred and sixty-five billion dollars, second only to healthcare, with defence running a very distant third in place in terms of the economy. And of that six hundred and sixty-five billion, about a third of that is in the for profit private sector. It's not -- and -- and most of it is not, and that's without counting an awful lot. It doesn't even take into account the kind

of learning that goes on. For example, in this -- in -- in this hotel room at this moment, this is, you know, part of the education sector of your -- of your economy. And it's through a public-private alliance, is that a fair way to put it, all right, and represents really the future of educational systems. Education, and remember, again, you don't have to go to a central place with the Internet, that's migrating out. In my -- in my country, well, in -- in yours as well, when the educational system was government dominated, which it still is through -- K through university, telephones and televisions were not permitted in -- in the classroom, okay. Now PCs and Internet are making their way into the classroom, but they're lagging behind relative to making their way into the offices. That's a fundamental disconnect. That is a legacy of the -- of an old way of looking at things, because even in the public sector, you understand the importance of the PC and the Internet, but it has infiltrated more into other work environments than it has into the classroom environment.

Okay. Well, we would go on with -- with each of these for a long time, but let me just show you a kind of way that it will shift, a few illogics. I'll just give you two quick ones. I'm more familiar with the

higher education. I used to be a professor in a -- in a previous lifetime. I'll give you two examples. Say a school admits four out of every ten people who apply, okay. And they improve their quality and they get really good, okay. So they can -- so now they only admit two out of every ten. So they can turn away more people. This is built on a logic of the number of seats in the classroom that we have available, the number of beds in the dormitories, it's -- it's based on a limited growth model, okay. That's the rational perspective. And a second simple example in this regard is, you look at most four year colleges, in your country as well as mine -- in your country, you know, the vast -- overwhelming majority of your population is located within a hundred miles of the border, in -- in about seven major cities. And most of your -- most of your students in colleges and universities live within a hundred miles of those schools, okay. And even if -- even if they change what city they're living in, they're probably going to move to another urban center. The point is this, if you look at the school as a business or -- or as an enterprise, even it's publicly owned enterprise, it was a mind set that -- that says, you're our customer for four years and then we kiss you good-bye, and the only time we want to hear from you is

for an alumni check or something like that. Now, that's irrational. It violates one of the basic laws of the private sector, which is much better to hold onto a customer than to have to find a replacement for that customer, you know. A growth model, an innovative growth model -- remember the bandwidth is now lifelong learning. Why not take an orientation that says, once we admit you, our orientation is you're a customer for life. Okay. We have you for four years during which we're going to make you part of our family like your parents made you part of their family. We want you part of our family for life and we will do everything in our power, the growth innovative part of -- of our strategic posture will be to develop this lifelong learning marketplace for you and with you.

Okay, well, again, I can't dwell on that for too long. I did say that I wanted to -- to take questions at -- at the end, so I notice I've got a countdown clock. We're down to about fifteen minutes, so let me take the remaining five before I turn open to questions to talk a little bit about that next economy and, you know, what it's going to look like.

As I say, it began with Crick and Watson and then the first quarter gets completed with the genome completion. During that period, the degree to which

you look at it from an economics point of view, the business model, it -- it -- the technology model was focused on recombinant DNA. The business model for the businesses in -- in recombinant DNA was basically the model of Big Pharma, big pharmaceutical firms, which is you take a lot of money and you get a lot of big vats, and you -- you pour the stuff in and you mix it around and you don't understand the molecular structure, and it's hit or miss and it takes an enormity of time and money and government regulations before you finally bring something to market. We still have a legacy of a lot of that. It's fifteen years to bring an average drug to market at a cost of a quarter billion dollars per drug on average.

The next wave that has already begun is genomics and prodeomics (PHONETIC) which is the -- the quick falling on the heels of it. I'll lump the two together, you can make them separate if you want. Genomics only lasted a couple of years if you do that though. That -- that is the over -- the overlap of -- of information technology and biotechnology really operating because you're focusing very much on decoding information, the information of -- of the DNA structure. And there it's a very, very different kind of a focus. I'll give you one quick story as an

example. My son-in-law used to work for Big Pharma, now works for Biotech Start-up, colon -- involving colon cancer testing. Colon cancer is basic -- is I think it's the second biggest killer in the United States in terms of cancer, it's beatable. People don't have to die from colon cancer. The -- the problem is that the test is expensive and uncomfortable. Okay. Colonoscopy. Now what this Biotech Start-up does, is it takes a stool sample which you go to -- you go to your drug store and you get an over the counter kit, dis-intermediating the medical establishment, okay. Again, I'm going fast, but that's not a small point, okay. You -- you, at home, again migrating the healthcare, preventative healthcare into the home, at home you take a stool sample, you send it into a lab and in -- in a couple of days for a couple of dollars, you can get back an early reading and it's based on your DNA. They can examine the DNA to see if you are pre-cancerous or cancerous. Okay. And they'll pretty soon within -- I would guess within another five, ten years, or he would guess within another five or ten years, they'll be able to take scrapings off your -- the inside of your cheek in order to do the same DNA testing. So this gives you a quick feel for what's involved. Drugs will be coming onto market faster,

cheaper, dis-intermediating the upstream end of the doctors and the hospitals, more -- and, you know, you used to if -- am I pregnant, do I have diabetes, do I have HIV, all of these you used to have to go to the medical providers for, increasingly they're over the counter home and private health administered activities. That is going to continue.

One more word, when you -- the science that gave us the technologies for the industrial and information eras was the sign -- predominantly the signs of physics, okay. So you went from physics to industrial technologies to information technologies. You -- the science has shifted to biology for the next wave, not exclusively, but predominantly, and biology operates very differently than physics. Biology, by the way, is the only science without a predictive model, okay. Physics is based on laws. This is the way the universe operates. It was handed down either by God and the tablets, by the Prime Minister, by the CEO, it's a top down model that involves strategic planning, you know, from the God, you know, God or God given laws, you know, on down. Biology doesn't operate that way. Unless you're a creationist, biology operates from the bottom up, okay. In other words, you didn't have an ecosystem and then species occurred, and then organisms

occurred, and at the end you got DNA. It worked the other way around, from simple to complex, from the bottom up. Okay. You didn't have an economy and then get industries, and then get businesses, and then get products, you got products and they -- and they grew into more complicated businesses and sectors and -- and entire economies, and ultimately a global economy, okay.

That's very important and just to quickly give you a -- and I've got to stop. Just quickly give you a feel for what that means. For example, in the future, economic value will increasing be created at the molecular level, okay. And if you look at it from a management and organization perspective, it's all emerging from the bottom up, not imposed from the top down. That -- that's going to get mixed in with political philosophies and ideologies about democratic versus commanding control models and the like. All that will play out over decades, okay.

Well, here's the tell them what you told them six second wrap up of -- of the talk. I wanted to give you a big, broad perspective of where we are because we're so caught up in the business cycle and what's going on, that we lose a perspective on the larger picture of things, and what's happening. It's a -- from that

point of view, it's a pretty darn exciting time. It can get derailed by terrorism. It can get derailed by a decade of -- of recession and deflation, which I hope does not happen. I'm more optimistic than not. I continually surprise myself by seeing the glass as half full rather than half empty, and I've tried to give you a perspective for it. I know the marketplace thinks I'm a futurist, my focus is I'm not being a peripheral futurist where I can see far into the future, but it's a little askewed, you know. So I hope -- I have given you my -- my perspective on the future and I hope that it has been helpful. Thanks very much.

(END OF PRESENTATION)

I hereby certify the foregoing to be a true and accurate transcript transcribed from audio taped proceedings herein, transcribed to the best of my skills and ability.

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Patti Spooner