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Session 52SM
Living Futurism

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Summary: This session features a discussion of:
- *What is futurism?*
- *How can actuaries benefit from knowledge of the principles and techniques of futurism?*

Mr. E. Tom Hughes: One of the principal objectives of the Futurism Section at this point in our development is to educate actuaries and anyone else who will listen on the benefits of future studies or futurism. It's our belief that by studying the future, actuaries and anyone else will be better prepared to deal with that future. This preparedness can come about in several ways.

By understanding possible futures people will be more aware of how business problems take place in a range of environments. Such awareness will help actuaries assess the validity of the assumptions they make about the future and give them a better appreciation of the relative degree of risks they take when they make various assumptions about that future.

Third, some futures may be more appealing than others. To the extent that you can influence current behavior, you may be able to bring about desired futures or avoid undesirable futures, so we think futurism has lots of appeal to people who deal in the future. Certainly we, as a profession, spend a lot of time thinking about, explicitly or implicitly, what the future holds for our clients, our companies, and ourselves. Like any other discipline, futurism has its own set of tools and

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techniques. This session will take us through an exercise designed to illustrate how futurism can be used to deal with matters of concern to actuaries.

We'll also hear how futures studies have been used to deal with other real-life business problems, and we'll also hear a review of current thinking on possible futures with respect to a large number of different facets of everyday life. Our teaching session will be conducted by Joe Coates of Coates & Jarratt in Washington, DC. Joe's firm is one of the preeminent futures groups in the country, and we're very pleased to have him with us.

Mr. Joseph F. Coates: Why study the future? We'll look at some cases in which different kinds of organizations have used the study of the future, and then take a quick look at some tools and techniques. Then I'll give you a general lecture on things affecting the future with the implications of those trends and developments for the actuarial activities. In the second half, we'll move into an interactive exercise in which you will work together to come to some interesting conclusions.

The first and obvious question that should always be foremost in your mind is, why bother looking at the future? What's the advantage to you or anyone else? There's a widespread belief that futurists are primarily in the business of telling you that by such and such a date, with so and so probability, this or that event will occur. That kind of quantitative projection of particular events is important. It's useful, but by no means is that the reason to study in the future.

Rather, what we've found in our 18 years of business is that there are 3 distinctly different reasons for looking to the future. The first of them has to do with something that's right up your alley. Every one of our clients is an expert and they represent firms that depend upon expert knowledge, so the first thing we're trying to do in exploring the future is make it clear to people that there are developments outside their expertise that will converge on them 3, 5, 10, or perhaps as long as 50 years and present either a challenge or an opportunity.

So, the first objective in exploring the future is to widen your horizon.

The second objective is to show how those future developments have implications for your current planning. If the future doesn't relate to your current planning, it will just be a very expensive form of entertainment. That 3-year future or 50-year future, depending upon your business, can have significant implications for your planning. Depth of field is the second reason for looking at the future.

The third reason is the most important, and, in my judgment, the only reason for looking at the future. Failing organizations all share a common characteristic. The

business that goes belly up, the government project that doesn't work, and the nonprofit organization's activity that's a bust all share the common characteristic that an individual or small group of people at the head of the organization had some assumptions about the future that were unsound.

So, the central purpose in looking to the future is to help you understand what your assumptions are that you're bringing to your enterprise. "Oh, I agree completely with everything you've said." "It's exactly my line of belief." "Absolutely useless!" "Never in my lifetime will that happen." "I've never heard such a foolish thing before." "It's unthinkable that could occur." "Would you mind developing a little more clearly why you reject this idea?" If you respond to that, we gotcha! That is because you can't express those firm rejections without revealing some assumptions that you bring to the future. In many cases, those assumptions will be revealed for the first time. The challenge of a look to the future will evoke from you what has been a latent assumption. With that latent assumption, now visible, we can do something that you haven't experienced before.

Is that assumption obsolete? Does it need to be augmented? Should it be complemented by some other basic beliefs? The future becomes the mechanism for making you aware of what is really driving your corporate, your business, or your association activities. That's what we're trying to help you get at. We're not going to do all of that at this session. We're just going to hit some of that as a sampler. We're going to come in on some points there. We're going to show you by example, and then, in your own exercises, how to do some of that. But that's basically what it's about. What are your assumptions about the future?

When you turn to your own actuarial activities, I think there are a couple of specifics that come out of looking to the future. First, it's essential as your own professional activities expand that you move out of the traditionally relatively confined categories to become a more plenary consultant and functionary with regard to your clients or your employers. As you expand in that function, it's essential to understand the future of your customer or your client.

Second, of course, you want to understand your own future. What are the forces working on your own profession, and how might they influence the kinds of things you do in the scope of your enterprise? Those are the general reasons why it should be important to you, both personally and professionally.

Let's turn to the question of how the future has been used. Let me give you some examples. These are projects that we are already working on or have recently completed. We did a study for a large insurance company on the future of seven professions. What was interesting that our client was not in any way interested in

our looking at the risks that carried a liability. They felt that they knew all about liability. That wasn't their goal. What they were interested in was the future of those seven professions from the point of view of what other kinds of risks those professional businesses would face. We're talking about small businesses—the 3-to perhaps-50 person professional activity. What they were interested in, regarding understanding the future, was what kinds of services they could offer to those professionals, whether those services were gratis, good will, or fee-for-service functions.

When you look across almost all professions, what you find is that the professional is an incompetent business person. So, when you get six incompetents together to put a business in place, what do you have? You have an outrageously incompetent business. One of the key risks associated with professional independent activity is that lack of skill. There are very real risks here to these small businesses; hence, there is an opportunity to do something by way of support. I won't go into the details of what we concluded.

Another example would be the rapid unfolding of information technology. A big organization generally has no problem with keeping up. They have specific functionaries whose job it is to watch information technology and understand what can best feed into the company. What happens when you have four men and two women running a business? They probably are pushed to the wall, working a 60-hour week, so they really lose sight of some of the new information technology developments and they're likely to move innocently into technological obsolescence. That can happen very quickly in the field of information technology, where new things are occurring every quarter, every six months, and every year. So, another risk is technological obsolescence.

A different kind of assignment we had was for a Midwestern manufacturer. We had done work for them before, but they had asked us to look at eight Asian countries as marketing opportunities, as manufacturing sites, or as candidates for regional headquarters. We looked at these Asian countries and produced a three-inch thick report, covering every one of these countries in great detail. What came out of all that as the most important thing we had to tell these people was something we could summarize in a simple phrase: It's not Kansas. It's not the place that you're accustomed to doing business. It's not the place where, as a group of Americans, you can go in, find your targets, sit down and have a solid discussion at a two-day meeting, clinch the deal, and go home. The whole nature of business throughout all of these Asian countries is fundamentally slow because you have to build confidence. There's a lot of relationship marketing, and that's business-to-business. When you go down to the consumer, it's even more confusing because domestic

household decisions are not made the way they're made in the U.S., or in the way you're accustomed to seeing them made.

By not being Kansas, the single biggest issue that we saw for this client coming out of that future market was cultural understanding. We looked at the questions of how to acquire that cultural understanding.

For another client, we had an interesting problem. This client had a business that had no biological components to it at all. However, somebody in the organization, presumably the CEO or the chief operating officer, probably learned from his wife or children or a TV program that there's big stuff going on in genetics. They turned to us and said, "Tell us about the future of genetics and what it means to our business." We thought this was going to be easy money. We'd do a very short report, basically saying nothing. By the time we'd finished looking at what was going on in genetics and seriously began to look at the links, we came to the conclusion that ultimately led that company to establish a division within six months to deal with the questions of genetics and its own business, so you can get quite surprising outcomes when you look at what's going on in the future.

We had another client who said, "We know all about the future. We have all kinds of planning capabilities, and we have all kinds of futures capabilities." As they were celebrating their competence to us, I began to wonder what was going on. Why are they even talking to us?

The client said, "We're weak in the areas of understanding discontinuities. What kinds of things might disrupt the rather solid and firm trends that we're accustomed to dealing with?" We said, "Yes, you ought to be concerned about that." What we eventually did was identify and generate an inventory of possible discontinuities. Some people like to call them wild cards. Keep in mind, a discontinuity need not be something objective. In fact, many of the most important discontinuities are psychological. The client has simply failed to become aware of what might be disruptive, although anyone else who has been looking at the situation for the past five years could see the emerging disruption. The discontinuities can either be objective or psychological. In any case, they could be disruptive to your business. We inventoried about 60 of them. We then agreed with the client that we would do in-depth studies of six of them, basically to show them how to explore those discontinuities and to give them the substantive results of what we looked at. That worked out very well. They were a happy crew. I can't give you the details of it because it was proprietary, but what was very interesting is we saw and they saw one new emerging technology as particularly disruptive to their business. They were right. It was going to be disruptive of their traditional business. But what we saw was that servicing that new technology was going to be a business opportunity.

So, turn to what is now the threat, learn to deal with that threat, and integrate that into the service package that you deliver to your customers. That was a very interesting situation.

From the Floor: How is it that a discontinuity in the new technology comes about? What is a discontinuity? It sounds to me like a cultural shift or an attitudinal change.

Mr. Coates: Well, war could be a discontinuity. An epidemic could be a discontinuity, or an earthquake could be a discontinuity. For example, what would happen if we had an earthquake registering 8.3 on the Richter scale in Silicon Valley that basically crippled our own industry for 6–15 months? The break can be political. What would happen if we were suddenly embargoed? What would happen if we had another Organization of Petroleum Exporting Countries? The discontinuity could be regulatory.

What would happen if there were a regulatory decision forbidding or preventing something? For example, there's a lot of controversy now about health data. We have a whole industry set up dealing with health data. People are marketing it, selling it, and so on. What would happen if we took the same path with health data that we've taken with legal information? If you've ever dealt with a personal attorney anytime in the last couple of years, you'll probably find that they don't hold any of your information. It's all yours. Take it with you. Now what happens if we switch to that same situation in the health sector? That would be a big discontinuity for several different sectors of the society, such as you, the individual holding your health data, those companies that are marketing health data, and those organizations that normally think that they own it and have a handle on it.

From the Floor: Do you mean just any change in the environment?

Mr. Coates: It has to be a sharp enough change that it upsets your basic plans. The psychological part of this is equally important. If you don't have your eyes open, you may not see the emergence of something you could have seen five years ago. Suddenly, it looks like it's upon you in 18 months. The psychological side is extremely important.

Let me switch to the second part of this. That's probably enough on cases. What I want to talk about is how clients use futures information. The uses vary all over the map. One of the most interesting is our client at General Motors.

General Motors is using futures information throughout the organization. What they've done is set up a futures room. They have a room in which information

about the future is plastered around the walls in which there are work tables and work spaces.   Not only does their future team meet there, but that facility is available to other units in the company that want to test the water and get their own feeling about the future. It's not only the place where there is future information, but it's also the place where there's an ambiance for exploring the future. They recently began to expand that kind of display of the future in a much more open way around the company. They're planning to put up internal displays about future developments in the automobile industry and what it may mean to that particular company.

From the Floor: So there's a futures department at General Motors?

Mr. Coates: It isn't called that. There's a small group of about 3 people and a larger group of perhaps 15 that is concerned about the future. That grew out of some previous and earlier activities. In terms of futures departments in corporations, the largest futures group of any company that we know of in the world is at Daimler Benz in Germany. They have somewhere in the neighborhood of 28 or 29 people in their futures unit. It's a very elaborate thing. It has a core group that brings in people from around the international corporation for one-or two-year terms.   The company even brings in some outsiders, such as academics and graduate students, so at any one time, there are 30 people doing futures work.

The largest nonprofit futures group that I know of is in Denmark. There are a couple dozen people. Denmark is a small enough country, so that group is particularly influential across the whole economy in Denmark. They tend to specialize in the nontechnological aspects of the future, and that's fine because that tends to be a neglected area.

Let me give you another example. One of our chemical company clients was involved with us in a continuing multiclient project that we had. We delivered a large amount of material, 4,000 pages, over a 3-year period in the form of 41 reports that were about 100 pages each. We then went on and delivered another 1,500 pages to them, which ended up in this book. They had so much stuff that they decided to do something unusual. They decided to appoint four internal task forces to examine all of that material in great detail and look at the implications for each of those four sectors of its business.

Now it takes a major internal commitment to do that. That, in fact, is still going on. We've interacted with them off and on, helping them with bits and pieces of that process, but I thought that was an extremely interesting way to go. It meant lost business for us, but we'll get them back eventually.

Another example is also one of our chemical company clients. We're linked to three or four separate units in that company. We've done a good bit for them in the future of agricultural chemicals. We're doing work with their corporate planners. We've done work with their market research people, and in each of these cases, the exploration of the future and the implications of the future are quite different. Let me tell you about one of the most innovative things that they're doing.

Their business is primarily business to business. Their customers are primarily other corporations that use their chemical products so they are basically insulated from the consumer market. Their raw materials are going from them to another company on to consumers, so they're confronted with an interesting question of how do you intellectually and conceptually, in terms of information, jump over that other business to understand the consumer? If you understood the consumer better, you presumably would be able to develop better market products. What they've done is set up ad hoc linkages with their own customers, offer them a day in the future, and they bring us in to run that one-day exercise. We get together with our chemical companies and look at the product line and what the future is for that customer's business. Of course, the thought is, there will be some very interesting feedback to the chemical company coming out of that day's activity.

We've done a similar thing with a Parisian bank. As you know, there are a substantial number of private banks in France. In this particular case, we were dealing with a small private bank. It was rather interesting. We met with a banker. We met with the vice president and his daughter. We met with the second vice president and his son, and we met with a fourth guy. He must have been the hanger-on, but he wasn't anybody's son as far as I could tell. We spent a day with them and then four months later they invited us back to do the same thing, nominally, for 150 of their customers. Again, it was an interesting double whammy. We introduced the customers to the future, but we did it as a service, which is a very interesting strategy.

There's quite a different use of the future stuff. We had a high-tech company come to us with a product that they were selling primarily to the defense department. It was at the $800-million-dollar-a-year level, and it had been growing at about $100 million a year for the previous few years. They asked us, "Are there any civil sector applications?" We instantly knew they were lying to us. Can you imagine having $800 million worth of business and not having given any serious thought to a civil market?

They had a reason for lying to us. They didn't want us to ask what they had already found. They didn't want us to know that they were putting us in a contest with their internal planners. We could see right through the sham, but we went down for a

couple of days for the detailed, technical briefing, and we went back and we did our work. A few months later, we reported back to them, and that was extremely gratifying. We were exceedingly well-received. We not only found the two areas of primary applications that they had already found, but we walked on water. By using the same processes that led us to the two that they had already identified, we found a third area that they completely missed. This was an extremely successful project from the point of view of what they wanted. We confirmed their own analysis, and then we unexpectedly opened up a third new sector for them. We occasionally do that kind of checking up on other people.

We did a project a dozen years ago for a consortium of 18 Fortune 100 companies. They formed what was then called the Environmental Scanning Association. They did a number of small projects and then turned to us to do a relatively large project on the future of the workforce. It ended up being a 3 inch thick binder, in which we analyzed 46 trends in detail. We gave them hundreds of forecasts. We did those forecasts in the form of implications. A more congenial name for them was "implications for human resources."

Regarding larger matters of judgment or speculation, that's very valuable for the client to know. For instance, which of this can you say comes out of the demographic data? It's easy to understand that. Here these people are just way off in speculation. We have to look carefully at what they're telling us.

That was a dozen years ago. They engaged us a few months ago to go back to the 12-year forecast and look at what was right, what we got wrong, and why. That was a very interesting exercise. It was overwhelmingly correct, but what was interesting is we missed a couple of things. We overestimated a couple of other things. We got a little bit of distortion in the outcomes. We either over-or underestimated a bit. Let me give you an example.

We forecast that unemployment would be at the 7% level. From about 1985 to the early 1990s, it was about 6.5%. Was that right? Was that wrong? That's a call someone else would have to make. I would like to think that that was pretty much on target, but a reasonable person would say, "No you missed it. You're a half point off."

We were trying to get across that unemployment was going to be more of a problem rather than less of a problem. How do you do that? One of the areas we goofed on is we thought that comparable worth was going to take off in a way that it didn't. Of course, it never got out of the box of being a female issue. Every legitimacy said that it should have been something that jumped out of that box, but somehow or another it didn't.

That brings up a point. There are two formula errors that futurists make. One error is anticipating change will occur faster than it really will. This tends to be associated with people who are in marketing, inside the corporation as inventors and promoters of an idea. Their own optimism tends to override all the other considerations that are going to make development slower, so you have to be very wary about the temporal forecast. You may be absolutely right on the product or service, but you mistakenly think it will come three times faster than it will.

The second error, which in fact is more important, is to underestimate the side effects or secondary effects of some new development. This easily comes about from a corporate point of view because you're always selling on the basis of microeconomic considerations. The microeconomic considerations can often become macroeconomic considerations when the new development is widespread, commonplace, and familiar. You begin to restructure sectors of the society so always keep that in mind when you look at futures work.

Let's discuss the two last examples of uses. We have one client that happens to be a Japanese firm. It is well-established, well-known, and has been in the U.S. for a long time. We've been giving them a series of briefings to their various executives, not exclusively to their Japanese executives, but primarily. The idea is very simple. These people need orientation toward the U.S. situation, which they can't readily get by any other source. There just isn't the kind of stuff available that orients them and their business to the general changes occurring in the U.S. We've had great success; that is, success in the sense that they keep bringing us back to give briefings to these executives who otherwise wouldn't have access to it. They don't have access to American data because there's a language barrier, an organizational barrier, and a barrier of who's going to put it together and who's going to tell them this kind of information. There's no problem with me giving them utterly uncongenial information. There might be a very serious problem with somebody doing that internally. You tend to run into self-censorship with staff reporting. On the other hand, nobody censors us.

Finally, a substantial use of the future is in research and development (R&D) planning. Let me just give you an example of a very successful project. A client came to us and we knew about them. We knew what they did, but they reviewed their business with us, and what their needs were. They were looking for products over the next 20 years that would meet certain criteria. We worked with them rigorously on what those criteria were. What are the anchor points that you think are so stable about your business that you think that they will be around for 30 years? You quickly realize that the kinds of things you would think would be stable in business planning, namely the organization itself and the customer base, are

open variables when you get 30 years out. Thirty years from now, both the company and the customers are likely to be quite different.

What were the firm positions that marked their business? Some were financial and some were not. For example, this company said, "We'll never make a product that intrudes on the human body." That knocks out a large segment of the potential future. They had other notions of that sort that blocked out other areas; they forget about them. What we did was create some 200 concepts. We then ran them by the client, and it was a massacre! They said, "Out! Out! Out! Out! Out! Maybe. Out! Out! Keep that. Maybe. Out! Out! Out! Out! Out! Out! Out!" About 200 concepts shrank to 20 concepts. Now what happened? There were a few things they forgot. But seeing the concepts we put in front of them evoked these kinds of criteria. We're never going to do that. This massacre gets us down to 20 concepts.

We then went back and worked those 20 concepts up into 5–7 page treatments, looking very systematically at the concept. What's the supporting evidence that could be important? What's the technological opportunity? What's the business opportunity? What else do you need to know?

We then went back and met with a group of senior people. We gave them very short briefings (about two minutes) on each of these and asked, "Which of these do you want to spend the rest of your day on?" The 20 dropped to 6. We spent the rest of the day on those six, beating them back and forth. We took another vote at the end of the day. It dropped to two. They said, "Let's go back. We missed a couple of interesting ones there." Bring that one back into play. The two swelled to three.

So we had three left. Now what did that mean? Those three were concepts that they were going to directly introduce into their R&D cycle. That was a successful project. There was no other way they could get the time and money for the investment in three new concepts to introduce into their R&D cycle, so there was a massive massacre of the concept, which is not at all unusual. You often need large numbers of unacceptable ideas before getting to the ones that are interesting and acceptable.

From the Floor: What about the public sector? Does your firm have any dealings with the public sector?

Mr. Coates: We just finished a project about three months ago for the National Weather Service. The National Weather Service has an interesting problem. It's caught between a rock and a hard place. It's only parent agency, the National Oceanic & Atmospheric Administration and the Office of Management & Budget

wants to put the economic squeeze on it. Eighty percent of its budget is hardware. If you put an economic squeeze on it, what are you doing? You're putting all the squeeze on manpower. So they felt a need to look at the future of the weather service, but not from a technological point of view—it was in good shape. They needed to look from the point of view of use. They asked us to do a study, which amounted to the following question: Over the next 15–20 years, who will, could, should, might, or ought to be interested in weather information?

What was the point of that? They wanted to understand their potential constituency and some potential markets for our information, which we are not aware of now. In doing that, somewhat to our surprise, we found that there were three major areas of society that were, in fact, underserved by weather information. The first were all small enterprises and small businesses. Second was rural America. Now that was a real surprise to us because we think of farmers wanting weather information and being well-served. Farmers were poorly served, and the small towns were served even less. The third area was, in some sense, the most interesting and provocative—health. It turns out that there are a couple of dozen diseases that directly respond to weather change. Some of you may have sinusitis. You may be having a sinus headache today because it's going to rain tomorrow. Arthritis and Parkinson's disease are affected by weather. We were looking to see if people, with a day or more warning, could take some prophylactic measures. Now it doesn't work with arthritis. Forget doing anything to reduce the pain. When the pain comes, you take your Tylenol and that's it. But if you look at asthma, there are prophylactic measures available. If you had an asthma-related forecast, you could save a lot of travails for a lot of people by giving them that alert. That was a very interesting study done for the National Weather Service.

We do work for associations too. Let me give you an illustration because this is a nice example of changing a business sector's orientation. We had done a study and it was completed close to two years ago for the Multi-Housing Council. This is the association of upscale apartment houses. The smallest amount of apartments a member runs or owns is 40,000. The largest number of apartments that a member runs or owns is about 333,000, so we're talking about very successful, small businesses; that is, small by the scale of any Fortune 500 company. There is a universal problem for businesses like this. The small business mentality can be enormously successful and still have a small business mentality. The future is here and this is my vision. These are my assumptions.

What was interesting is the assumption that runs through the industry. What's virtually universally accepted is that no one wants to live in an apartment—every apartment dweller is really a homeowner. Imagine selling a product that you believe nobody wants. We pointed out that there were many social changes—

two-income households and long commutes—that put tremendous pressure on time. How many people are going to want to spend their Saturday mowing the grass on their half acre? The move toward time saving made apartment living more attractive. That assumption was there and we dealt with it by showing them that the trends suggested a possible boom time for apartments.

The second thing we were showing was the shifting structure of about 4% of the workforce toward becoming off-site information workers. For example, I could be an employee of Acme, but I don't go to work at Acme. I work off-site at home, on the road, or at a satellite center. For those working at home, it's very, very clear that the three-room apartment has to become four rooms. The four-room apartment has to become five rooms. You can't get by forever having the word processor on the kitchen table or having a little desk in the bedroom. So, there is a fundamental structural change in the nature of apartments.   Of course, that raises the question of the wiring, piping, and other structural issues. We are talking upscale now. What other services would your apartment house have to offer in order to make it an effective workplace for 10% of your occupants or ultimately 20% of your occupants? We began to talk about those kinds of services.

We then addressed the assumption that everyone wants to be a homeowner. One of the great appeals of owing a home is that you build equity. We knew of no principle of economics, no principle of science, or no social principle that said you couldn't be an apartment dweller and build equity. We never thought of that! How would you do that? We said, "Look, every one of your companies has financial analysts, six deep. I'm not going to stick my neck out on how to do this and have you immediately kill the idea because of my ignorance. Take the problem home, ask it on Monday, and if you don't have three or four answers by Wednesday afternoon, fire them!" Well, at the end of the meeting, a woman comes up to me and says, "Let me tell you three ways we can do it." You attack the assumption of the business, this tacit assumption that you don't build equity by being an apartment dweller.

The third assumption that we demystified was how small businesses are primarily American. They don't have an international orientation. However, the U.S. is the world's cultural leader in music, video, television, clothes, and lifestyle. Why can't the apartment people carry the American apartment overseas and advertise it as part of the American lifestyle? You could use the three million American expatriates who are overseas as the entering wedge to satisfy the demand for U.S. living.

In all fairness some of them are operating in Mexico and a number of them in Canada, but they basically don't have an international orientation because the

assumption is, housing is domestic. They don't see it as part of a cultural artifact that can be transported overseas, such as music and television.

That's the way to get at assumptions.

From the Floor: The future can be from tomorrow to as long as you want to forecast it. In terms of the private sector companies you've worked with, have you found that they're willing to really recognize your ideas? In other words, how close to the current time does your future outlook have to be before they'll actually make changes in the way they're doing business?

Mr. Coates: That's a good question. I was hoping that you were going to ask a different question. I'll answer a different question first and then come back to yours. What's the biggest problem you face working with business clients? Denial. Denial is the single most important problem we face. The trends are real but they're not going to affect us. They might affect us, but not my division. They might affect my division, but not my unit. Or they might affect my unit, but not anytime soon. It's like those little Russian dolls. Inside each denial is a more specific denial until you reach the point where it is of no consequence. So, dealing with denial is a big question. Let me just point out that the denial often comes about because what they're denying is bad and disruptive news. What we found is that we can tell our clients anything, but it goes in one ear and out the other if it's just bad news. Unless the bad news can be made to stick, they won't pay attention to it. You must show that there is at least some positive thing they can do in relation to the bad news. If you can show them there's action to take, then you have them hooked on paying serious attention to the bad news you're delivering.
You asked about the time horizon. This question, or maybe the answer, is a little complex. We just finished our 18th year of business. I would say that in the first ten years of that business, we had a great deal of difficulty in getting any clients to hold still for more than a decade. The decade was the remote future. They were really happy in five years and six years, but we always dragged them out to ten years, whether they liked it or not. We'd get the commission to do the work and we'd still report ten years. You have to recognize that the client is not all that smart; otherwise, they wouldn't be asking for our help. And so, you do things that they don't necessarily ask for because it's in their interest.

From the Floor: You mean that?

Mr. Coates: Yes. Sure.

From the Floor: Aren't they smart enough to engage you? How many people are ignorant enough to just ignore the future?

Mr. Coates: In the first ten years of our business, we never had a client that wasn't either in trouble directly, or experiencing it vicariously. We're just like them. They're up to their neck in trouble.

On the other hand, the most difficult people to deal with are the ones who are very successful. Why worry about the future? The other group that we have traditionally had trouble recruiting, even though this is all changing, are the clients that have very strong consumer markets. They mistake their consumer market research for insight into the future. Because they have buckets full of consumer research, they don't feel the need for insight into the future.

But all of that is changing. In the last eight years, time horizons are growing. In the last three years, we've had over 50 clients ready to look out anywhere from 25 to 35 years. In some cases, they're recognizing that there is very real value in looking out that far and that longer term future has implications. If the company is a research-based firm, R&D often is on a decade-long schedule. We had one client who came to us and said, "Don't tell us anything about the next six years. Everything is absolutely frozen. We can't make any changes in the next six years. Talk about after six years have passed." Sometimes you have that structured element.

What's really interesting is seeing the time horizon expanding. We see the expansion of interest in the future in general. There are more and more companies getting involved with it as a result of two things. First, there is a kind of millennial awareness. There's no basis for it, but the reality is that many organizations and individuals are seeing the millennium as a kind of critical point. We'll know whether we're on the road to perdition, or whether we're on the road to success. The other, much more concrete, side is that companies for the last 20 years, have had a great deal of difficulty in understanding the corporate environment in the total business context. What they've been doing for 20 years is looking around for various kinds of insight. They look to the future as one source of insight. There are other sources of insight, so they turn to the future to get a better understanding of what's going on in the corporate environment. So, that has changed.

I would say that a relatively short-term future for most corporate studies would be ten years. We were just talking with the client who wanted us to look out three to seven years. That company never looked out more than a year. For them three to seven years is almost an infinite increase in their horizon. Ten years is a pretty common number now, and looking at 15–20 years is not at all uncommon. We have a multiclient project that some of you know about, in which we're looking out basically 20 years—a perfectly reasonable thing to do these days.

We had some clients who even have a 35–50 year horizon. That tends to be in the area of basic natural resources like mining, forestry, and so on. Consumer products tend to upclose horizon.

Apparently, contradictory things can go on simultaneously. One of our chemical company clients went through a major period of belt-tightening, budget shrinkage, a dismissal of people, a reduction in staff functions, and so on. We felt that in terms of pressure on our work, they wanted shorter term looks at the future. They wanted fewer of them and they wanted to knock down the price. That company went through that transition, during which they recognized that in the several years they were doing this, they really were selling off their future. Now they're right back into what they were doing before the belt- tightening, looking out on a 15 to 20-year time frame, and now putting more money back into that longer term future. Many organizations went through that kind of experience.

The smart people in the organization recognized that you had to keep that line out to the future. The thing that really tended to restrict them was their budget. It wasn't conceptual. The boss says do this and all the staff, all the manufacturing, and all these other functions shrink, but the people who are thinking about the future in the organization had to respond to the budget cuts. They didn't conceptually change their orientation.

Mr. Coates: When it actually came to this period of budget cutting and so on, we felt very strongly. Shorter term projects and a tendency to tighten belts meant smaller amounts of money for a particular study. What has happened since that period during the late 1980s and early 1990s is the recognition that there really is a need for a longer term future. The technologically based companies have come to recognize that they better put that money into the longer term future.

So, we've seen that very clear reversal in terms of the look to the future and research in contrast to five to ten years ago. Whatever the company's short-term focus is, you still have these people who are looking to the future. We have a long list of clients who are doing this. We're also finding that because of new competition, often foreign competition, and because of the move overseas, there are just too many things to do. And too many ways to do it. The look to the future has come into vogue. In the same way that the consumer has too many choices, it's now the case that businesses have too many choices. Those choices can be in what they buy to maintain their business, the acquisition of information technology, or it can be down to too many choices in terms of what should they be manufacturing or what kind of processes they should be using.

One of the characteristics for the last 20 or 25 years has been a swelling number of choices at every sector of the economy. That again, drives people to seek some understanding.

Let's discuss some tools and techniques. Before we do that, let me set the tools and techniques in a somewhat larger context: What are the conditions for success in doing a futures study? I think that's very important to understand. First, the study of the future has to be tailored to the culture and the preconceptions of the organization. What would work very, very well for a DuPont may not work well for a General Mills. What might be perfectly satisfactory for Avon would fall on its face at General Electric, so you have to understand the culture of the organization. That's the great advantage of insiders doing this kind of stuff. They understand the culture. On the other hand, they can often be timid because the culture can often be intimidating.

Second, you have to have support from the top. The minimum that you need is support in the form of forbearance. For example, you might hear, "I'm really not confident this is going to work Charlie, but I'm willing to give it a shot." That's the minimum you need. If you don't have that, forget it. Ideally, you would want the CEO in the executive suite to see this as an essential part of the company's future planning, but if you don't have any of that support, you're just wasting your time.

In some sense, what is most easily neglected is obtaining broad participation throughout the organization. The people who are going to be affected by what you learn ought to be participants in the process of generating what's going to affect them. That has two advantages. If you get them involved in your futures activity while it's going on, you're not only drawing on their knowledge, but you're also preparing them to be recipients of what you come up with. Let me give you an example of something we did a number of years ago. It was one of the earliest things we did in our business. We were working with a metals company. They just finished moving the power from highly centralized to individual business units. That company had an annual program of putting out an economic forecast. That economic forecast had been the gospel. Everybody had to adhere to the forecast throughout all corporate planning. They ran immediately into a conflict. They had given the power at the distributed level, so how could they say you must adhere to this? It just undercuts the distributed power. That's exactly what they were finding. They found different units were operating, not only with different economic assumptions, but often with contradictory economic assumptions as well.

The solution we cooked up for them was very simple. Prepare your annual economic forecasts, but now organize 15 or so workshops of about 15 or 20 people from around the company. Twenty times 15 is a nice number. That's 300 people.

Bring them together, give them your document, and tell them that they're there to help perfect it. Will that document meet the needs of your unit? Are there strengths and weaknesses in it? This is a very legitimate process to go through. When they leave, you make the changes that they recommend. Now you have 300 people out there ready to receive the headquarters' economic forecast.

There are two interesting things about that. It worked and there were almost no changes. Participation is essential. It better not be fake. The three conditions for a successful participation are very simple, elementary, and easily overlooked. First, you have to give information to get information. You have to tell people what you're doing, why you're doing it, how you're doing it, and what you hope to accomplish. Tell them what you would like them to learn from you.

Second, you have to be a credible receptacle. Depending on the history of the corporation, you may or may not be a credible receptacle right off the bat. If you have had three false attempts at participation in the past, you have a steep uphill climb. If this is the first time out, and you have the approval of the CEO, everyone knows that this decision is from the top, and that's the ideal receptacle.

The third thing, which is often neglected, is feedback. Nobody but a fool expects you to act on every bit of advice and every bit of information you get. What they want to know is the process by which their inputs were handled, and what actually came out of that. These are some of the ideas that came out of our series of workshops. These were a couple of particularly valuable things that we learned. That kind of feedback is indispensable. It builds your credibility for the next time you do this kind of thing. Again, those three conditions are: go with information, be a credible receptacle, and provide feedback.

The next condition for success, and this is surprisingly difficult to achieve in a bureaucracy, is that the results have to be clear and useful. There's all this bureaucratic language—the if's, and's, and buts; the caveats; and the cautionaries. By the time you wade through all of that trash, it's hard to say go left or go right, go forward or go backward, or go up or go down. You must be clear about where you should be going.

Another point is that whatever you come up with should be implementable. It's amazing the number of conclusions that you see that are totally unimplementable. They tend to be really good will statements. They tend to be wish list kind of statements that have no particular implementability. You want to always build a constituency for implementation, as you do for the future study. Part of it is the participation, but there are other mechanisms because it links to the last point. Under no circumstance should you ever deliver surprises. You can deliver the most

outrageous, outlandish, negative, disruptive, and upsetting kinds of information, but don't let it surprise anyone.

The way you do that, of course, is be sure to stay in contact with your constituency over many months. You raise a point. You hint at something. You talk a little bit more about it. You give them some clue and some insight. By the time you come down with the shocking surprise, it's not a shocking surprise anymore. It's now something to which we have to give some serious attention. We ought to slough off the XYZ division. We ought to acquire a so and so and such and such. We ought to scrap this 15-year favorite of the CEO because it's a loser and it's not going to go anywhere. You don't want things like this to suddenly appear for the first time in your futures report. You want to hint at all of that. You lay the groundwork, and you give a few ideas. Those are seven of our conditions for success.

There are all kinds of techniques. A futures study draws upon the whole human enterprise for what we deal with. We can use techniques out of economics, out of physics, and out of astronomy. We can use techniques out of chemistry, out of biology, out of diplomacy, and out of political science. All of these arts and sciences can be contributors to a futures study. Within the framework of a futures study, there are a number of techniques that are, if not unique to the look to the future, very common. I want to call attention to those techniques that are more specific to future studies, but, keep in mind, any other tool or technique from any other activity could very well play a part in futures studies. For example, in the apartment house study that we did, we made lots of use of architectural information, mechanical information, and different factors that entered into the physical aspect.

In using futures techniques, in an organizational context, we anticipate you want to do a study that's going to senior management. The most important condition is that whatever techniques you use, they must be transparent. What we mean by transparent is something very simple and straightforward that you can test yourself. To see if it is transparent you must see the technique that is used. Second, you should understand it so well that you could do it. And third, if you had done it, you should have come up with similar results. That's our criterion for transparency. It must be clear. You know you can do it and have confidence that you'd come up with similar results if you used that technique.

If we're dealing with Westinghouse, General Electric, or General Motors, there's no real problem in using computer modeling and getting something very sophisticated mathematically. But if you're working in a corporation in which high-tech tools are just a big unknown, forget it. That has no place in your future study. You want to use techniques management can feel comfortable with.

So, you have to fit that concept of transparency into the corporate culture. By and large, you can't go wrong by taking the simpler techniques. That's what we're going to talk about. What are some of those techniques? You're all experts in expert organizations, so one of the things that you might want to do is call upon experts outside the company or inside the company. The obvious and most simple way to do that is to sit down and interview 25 or 30 of them. That's one way to do it and by no means would you want to ignore that. You might draw together a panel of experts. You might have a workshop in which experts are brought into play. There's a step beyond that, which has become very popular, and that's to go to what's called the Delphi study. This is a way to draw upon expert knowledge, but not exclusively expert knowledge, without drawing them together or bringing them to one place. You might simply want to do that because those experts may not be available to you. They may not be willing to come. They may not have the time. You can't get them all together in one place or they just may not want to do it. If you can deal with them by mail, with a questionnaire, then you can do quite well.

The key to the Delphi study is to always ask questions of judgment in which the answers are quantified. What you're doing is quantifying subjective judgment. Let's say by doing background work, you've found that there are seven variables influencing the future of this subject. You list those seven and ask your experts on a scale of 1–10, with one being not important and ten being extremely important, to evaluate these seven variables as to their importance and level of interest. By the way, if you think of eight, nine, or ten variables evaluate them in the same way. What you're getting is their quantified subjective judgments. You then ask them to add to what you already have if there's anything that they want to add.

An example of a question outside your business sector is, What year will we have our first woman president in the U.S.? You ask the group to put down a date. The answer can be this year all the way out to never. You usually break it up into five- or ten-year intervals, depending on what you're looking at, and check the interval. If you have 25 people on your panel, you can put those numbers together and get an interesting pattern.

You can ask them questions of importance about dates and priorities. You can take anything that you're interested in and convert it into a useful, subjective judgment scoring. Let's say you've run your tests and you have your results back. You're now putting them in some kind of display format. When you lay out the votes of all of your participants, you tend to get a certain pattern with a peak.

The much more interesting information comes from the two outlying groups—the people who say it will happen soon or the people who say it will happen in the

distant future. Go back to these people and ask them, Why do they think this development is going to occur in that time period? Tell them that they seem to see it coming faster than other experts do. Or you go to the others, the late arrivals. They can add new information to your thinking. They can tell you something that the central-thinking people may be unaware of. They can tell you about some new development that has otherwise eluded you. So you want to pay a lot of attention to the outliers.

You go through three cycles. It's expensive and it's slow. Going through three cycles might very well take you four months. You have to mail it out and give time to fill it in, return it, and process the information. The current tendency is to do just one pass.

There are eras that are largely associated with doing these Delphi studies. Two are technical with the Delphi, and one is connected with its use. The technical difficulty with the Delphi is learning to deal with ambiguity. It's amazing how many of these questions are ambiguous. The results that come back from ambiguous questions are useless. The other problem is loading too much baggage.

Who is likely to be the Republican candidate against Al Gore in the next election? That's an interesting question, but it's terribly confining because the built-in assumption is one of the candidates is going to be Gore. You should have a question such as, What is the probability that Gore will be the Democratic candidate? Then include a separate question as to who is likely to be the Republican candidate, and so forth.

Loading your questions with baggage usually reflects your preconceptions and they muddy up the results. What will be the U.S. response when North Korea invades South Korea and China decides to back them? There is too much baggage.

How important will so-and-so be? What do you mean by importance? The importance to me is not importance to you. You must clarify. All of these comfortable, squishy, soft words that you use to get a direction, in fact, muddy up your results.

In terms of the use, this is where the real abuse comes from. You have 25 experts and they're giving you this nice, quantified result. The fundamental mistake is to take this as an output and as an answer. We see this as an input into the rest of your futures work. Whatever these people are telling you, look at it and ask, "In terms of my interest, could that really occur? Is that plausible? What might make it work? What really is operating to make this occur? Do we agree with that? Have

they missed something?" So you should always treat the Delphi as an input, but not as an output of your own deliberations.

There's a variation on that, which we like to practice, and it comes out of the fact that these are fundamentally cookie-cutter categories. There's a limit to what the respondent can tell you. We like to do conversational Delphis in which we would lay out the same questionnaire that we would have sent them in the mail, but we meet them face-to-face or on the telephone. The advantage of the conversational Delphi is you can ask people why they think something is occurring or is likely to occur soon. You can get immediate feedback on the points that are critical.

Furthermore, once you've talked to somebody about this, it's very easy to go back to them later and say, "We were talking to six people after we spoke to you, and we've found that some of them think that x is an important driver of this concern. We didn't talk about that when we interviewed you. What do you think about it?" We always advocate the conversational Delphi, rather than the formal paper Delphi. You can also ask people to do different things. In the conversational Delphi, you can give them a sheet of paper and ask them to mark things on a map. Or you can give them a chart showing some development from 1960 to 1997, and ask them to extrapolate this to 2010. Then you have a nice basis of discussion. You can ask "Why did you shape your curve that way? Why did you see it going this way?" The interaction adds tremendous value.

That's a favorite technique. Another very valuable technique is to take advantage of the fact that corporate people want to succeed. Because of their anticipation of success, you can ask them to do things that a volunteer will not necessarily do. One is to do a moot court or a simulated hearing. Suppose we were in the drug sector, and we were going to go before the Food and Drug Administration about some new drug that we've been promoting. A very interesting way to simulate the future is to simulate a hearing. It can be a courtroom hearing or an administrative hearing. It can be a hearing before a group of citizens or a public meeting. Each takes different roles and acts them out. Because you're all interested in succeeding and you're all concerned about succeeding, each one will make the best possible case for the people whom you're dealing with.

The moot events are very valuable because what they really do is focus you on the kinds of things that you normally want to ignore or downplay. You become the hostile public interest person, the hard-nosed interrogator, or the person representing the regulator. You're going to play that role out as well as you can.

There are interesting variations on this. After the Bhopal, India disaster many American companies went into a simulation of disaster at the organizational level.

One of the problems that was associated with Bhopal was that the company involved didn't handle it well from a public relations point of view. What many large companies did was pull the executive suite together, bring in a professional newsperson, simulate a disaster, and have the newsperson interrogate one by one each of the members of the executive suite, just like it would be done on a news program. Ask a question, shout, demand a response, and so on. The guys in the executive suite may be so inept and incapable of maintaining their cool, that they might determine that they don't want him or her to ever say a word! Another executive might have a real knack for this stuff, so he or she may be the only mouthpiece when a disaster hits. This is a very interesting kind of future simulation.

Another technique that has become extremely popular is scenario building. What is a scenario? A scenario is a picture of some future complex situation in which the complexity is dealt with in an integrated, coherent, and interesting story. *Integrated* and *coherent* are the operative words here. I can take some future situation, and I can give you 12 bullets. The problem you have when looking at the 12 bullets is determining how it all comes together. What does it actually mean? By looking at the 12 bullets you don't really know what that future situation is. You are left with the hard part of integrating across the 12 bullets. The scenario carries you past that conceptual limitation by giving you this integrated, coherent, and interesting picture.

Why do you use scenarios? There are a number of reasons for using them, but the two most common reasons are the following. You want to present some future situation in an interesting way to a group within the organization so that they can then jump off from that picture and say, "What are the policy implications for us? What should we be doing? What should our research objectives be? What kind of acquisition should we be in? What could any aspect of our business be about?" What you're doing is looking to create an image of the future that stimulates more effective policy planning. The second use for scenarios is very much like that in form and structure, but it has a different purpose. Suppose our team has made some assumptions about what the company policy or plan should be. You integrate them into your scenario, and you say if we follow Plan *x*, this will be our future situation. You've already captured the policy decisions, and the scenario is now showing the consequences of those policy decisions. Those are the two main uses. Ninety-five percent of any use you want to make of a scenario is going to fall into one of those two categories.

Let's go back and talk a little bit about how you construct scenarios. A scenario is not spun off the top of your head. A scenario is not something that the genius in your company thought up.

How do we construct scenarios? First, we have our team. The team deliberates over the following questions: What are the variables that are influencing that future circumstance that we're dealing with? In many cases, you're going to have demography as a variable. You may have information technologies as a variable. You may have the state of the economy. You may have public interest activism. You may have regulation. Nonetheless, you lay out this list of variables. In any exercise, if we were working with a group this size, we might very well have anywhere from 25 to 35 variables. As a practical question that's too many, so we want to tidy that up. This 25th variable is really assumed under the 6th variable. This 32nd variable really isn't part of the 17th if you can structure, organize, or fold them together. What we find is that for a complex situation, 12–18 variables is manageable and useful. There's no magic to it. You might end up with 21 or 9. If so, the world's not going to fall apart. Actually 35 or 25 is really pushing it, so you want to tidy them up. The most important point, before you do anything else, is to get absolute agreement that these are the variables that are going to drive that future situation.

Having done that, your next step is to look at the themes that your scenario should have. One theme might be that information technology drives the business. A different of theme for many organizations could be Asian markets are a big boom. Another scenario might be public interest groups requiring something. You know your own businesses. You want to determine what the scenario themes are in this infinite multidimensional space involving 12, 14, or 16 variables. Can we pluck out a few themes that are of such central importance that they're going to tell an interesting story, separately and together? That's totally judgmental. It's a matter of experience and a matter of doing it.

Let's say we settle on somewhere between four and six of these themes. Notice I didn't say three or five. In general, if you settle on an odd number of scenarios, what's the boss going to do? He's going to see the middle one, however you arrange them, as the most likely one. What you want to do is force the discussion by trying to keep the scenarios in some even number. It isn't always necessary, but it's a good secondary strategy.

How many do you choose? Twelve is too many. Eight is probably too many, but four to six is manageable. If you run into a situation in which you simply have to look at more than six scenarios, there are ways to deal with that. You can cascade them. You have maybe two or three macro scenarios, and then variations on the minor scenarios are derivative of the macro scenarios.

Are these really the themes that we want to play with? Are we really on the mark with all of this? Is this what we want to talk about? Is this going to deliver the right

set of stories? Once you've decided on all of that, you should now move to the next step.

The team takes theme one, which is a scenario over the next 15 years. What is the value of the first variable that's compatible with that theme? The value of the variable can be quantitative or qualitative. There's a tendency for corporate people to want to drive out the qualitative. They don't like them, but those are the most crucial ones. Let's say the first variable we're looking at is demography. There might be important demographic changes there. It may be that Mexican immigration is going to be important to theme one. It may be total population size is important. It may be that the black population is important. It may be that the number of children is important. What's the value of the variable most compatible with that first theme?

We also do that for the second, third, and fourth theme. By the time we've gone down our list of variables, we have developed a skeleton for that scenario. We've set a value or a range of values for the variable that is compatible with that theme. We do that for each of the themes. We assign one theme to different members of the team and tell them to come back in two days. We'll meet in three days, or whatever is comfortable. We'll review what they've come up with. When those themes come back, we can go through each one of them in detail. Is it comprehensive? Is it reliable? Is it interesting? These are the criteria that you want to bring to bear. Does it tell the story well? Does it deal with the variables and what we think is important? Have any variables been overlooked that are important?

You'll find that in some scenarios, some variables will drop out. You may have 18 important variables, but they don't count for scenario 1, variable 9, and variable 11, so you forget them. You don't have to have every variable in every scenario. You work that back and forth and say, "Charlie, that was a pretty good job, but listen to what you've heard here. There are some things we need to improve. Let's meet again in two days." You repeat that until the group agrees that each of those scenarios is basically interesting, well-told, comprehensive, and solid.

Then what we do is take the whole bunch and give it to one person who deals with the rough linguistic edges. You generally don't want one scenario to be slangy, another one to be full of big words, and another to be full of small words. You don't want to jar the user by having these kind of gratuitous differences. In some cases, though, you may want a scenario that's highly slangy. In other cases, you might not. In general, you want some kind of uniformity and style in language. If somebody gets that responsibility, that's how you create the scenarios. If it's of the first type that we talked about, then you take your scenarios to the group that's

working with the implications. They then become the jumping off place for implications.

When you've done your implications and determined the actions that are derived from them, you'll probably find that there are some actions that repeat across two or three of the scenarios. That's very important. Of course, those are the kinds of things that are going to give you robustness in your planning. What you ideally would want is plans that are compatible across all of those scenarios so they're robust. No matter what happens or what future tends to develop, you have the flexibility to deal with it. That's the way you do the scenarios.

There are other ways to handle scenarios that are not incompatible with what I've defined. Let me give you the most obvious next step. In terms of what I've described so far, we're really talking about your response to an evolving world. That's a perfectly rational way to do scenarios. All of that stuff out there is changing. We've described six different pictures of the future, and now we've gotten the implications for Acme. It's often valuable to go one step further. Let's go back to our scenarios. We've learned a lot from that. Let's look now at the question of, how would we like Acme to develop? In terms of everything we've learned, what is the future picture of Acme? Let's create an Acme scenario and determine a normative, goal-oriented scenario, a positive scenario for Acme, and again, work up the questions of implications and actions.

Another way to approach the scenarios is to only look at the discontinuities. You know that if you feel very confident about your generic planning, you may only want to look at what the implications of disruptions might be. We don't think that's appropriate for most organizations, but it is for some. A number of different kinds of variations exist. The first two I described are the primary ones.

There is one other point to keep in mind. In every organization, there will be important people who think that scenarios are infantile, juvenile, stupid, silly, and a waste of time, and they don't want anything to do with them. What do you do when that's the executive vice president for this and that? You better have a backup approach. We always back up our scenarios with the same story told in plain vanilla, completely bureaucratic language, so you can have it both ways. You have the person who gets the more interesting, complex, integrated story, and then you have it in more straightforward, bureaucratic language. It's just the way you would write a document in a report.

How do you select the kind of scenario you're going to tell? You could do newspaper articles. For example, you could write a 2010 article and headline each scenario for *The Wall Street Journal*. You could write it as a diary. You could write

it as a memo, or a description of a trip. Any conceivable writing form can be the basis of a scenario.

We've had great success with our book, *2025: Scenarios of U.S. and Global Society Reshaped by Science and Technology*, by John B. Mahaffeo, Andy Hines, and myself. The clients decided that they wanted scenarios for that phase of the work, and when we came to that phase, we decided that we would take one topic and work the scenarios until we got the right kind. We must have submitted six or eight different kinds of scenarios on the one topic to our clients, and they kept bouncing back. They said it was imaginative, creative, and interesting but it wouldn't do. It wouldn't do because the client's internal clientele has not spent two-and-a-half years working with us. They don't have the conceptual background for this. We finally got the message that we had a communications problem. We weren't telling them something that was readily communicable within those large corporations. We then asked ourselves, what is the most common form of communication within the large organization? It is the memorandum. So we decided to write the scenario as a state-of-the-art memorandum dated 2025. It was an instant success. We dropped all of the conceptual barriers as low as they could possibly go so there would not be a problem misunderstanding them. There was no conceptual framework to reorient. It was a state-of-the-art memorandum. It just happened to be dated July 2025. They got right into that. We then wrote the other 16 chapters following that same model. Selecting the style of the scenario is often very important.

Let's look at some other techniques. One of the most interesting techniques for working with a group of people, particularly a group of people who you're only going to contact once or twice in the course of the effort, is what's called the nominal group process. It basically operates as follows. We're all staff Acme, and we're sitting down for the first time with the futures team. You're asked the following question: What do you think are the most important factors shaping the future of Acme's business over the next 15 years? This is a very straightforward futures question. Everybody pencils them in. It doesn't make any difference how long it is—3, 5, 10, or 15 items. Don't wait until everyone is finished. That's the most boring thing in the world for the people who finish early when one-third of the people are still writing because they're going to add to their list as time goes by so you're not wasting people's time. Then we'll do a round robin asking, What was your best first idea? We then go around the room and get everybody's first or best idea, put them up on the chart, number them, and so on. We keep going around the room until there are no more.

If we went around this room with that kind of question, I'd expect to get between 25 and 40 responses. If we double the size of the group, we might get 55

responses. But we're talking about an interesting number. The next step is to have each person in the group pick the six most important items.

When everyone is finished, you say, "Now how many voted group one, two, three, and so on?" When that process is all done, the group can see what it thought were the most important variables. You'll notice that the numbers are going to cluster—those that received more than 12 votes, those that received between 7 and 12 votes, those that got between 2 and 6, and those that got none.

The numbers may vary, but the pattern is always very clear. What you obtain from that group is what it thinks are the most important factors driving the future of Acme. You can go past that if you want. You can just record that if you're going to do this with multiple groups. What's even better is, you then begin to talk about those top items and get more information from people.

From the Floor: So this helps me sort out what people really think is going to happen?

Mr. Coates: It is what they think are the most important factors affecting the future. You're not asking them for outcomes. You're asking them for drivers of the future. Now, if I were doing a study in any one of your companies, I would want to do this as a participatory exercise, with anywhere from 5 to 20 groups of people. I would get a high redundancy, but each group would add one or two items to it. What I'm building is constituency and that first stage of participation.

Once I obtained a nice long list, I would then run the same question with the executive suite. I can assure you what will happen. The order of the executive suite list will be different from the staff list. The things that deal with institutional survival will be items 1, 2, 3, 4, and 5. The things that the staff will pay attention to are likely to be noninstitutional survival questions. That's a very interesting contrast because what it shows to the management—your ultimate constituency for this—is that there's dissonance. Nobody is saying that the top five items on the executives' list are wrong; however, the executives can't ignore what the staff is saying. So, you must alert them to a dissonance between what they're thinking and what the consensus is of the 200, 50, or 30 people you've surveyed inside the company. It better be an interesting number.

The nominal group process is surely one of the most effective ways of quickly getting information out of people and structuring and organizing a solution.

There is another technique called a nine box. We used the nine box to structure a discussion. Structuring the discussion is extremely important because you don't

want a loud mouth to occupy all the space. You don't want the quiet person who's retiring to fail to speak, so you want a mechanism for structuring the discussion. The nine box has nine cells in a square. The horizontal axis might be time. If we were doing a 30-year forecast, we'd probably have the present and then the 30-year number. There's an axis called importance, with low, medium, and high.

What we want you to do is take this one item we were just discussing or this one item that came up high on our list. I would like you to each assign that item to one of these nine boxes. We've numbered our nine boxes from upper left to lower right. Let me simulate a vote. How many voted box one? Two people. How many voted box two? Three people. How many voted box three? No people. Box four? Seven people. How many voted box five? Four people. How many voted box six? One person. Box seven? One person. Box eight? Two people. Box nine? Zero. We can look at that pattern and immediately see which subject is likely to become important in the next few years, and which is of medium to high importance to the company. The numbers jump off the page. You should then begin discussion.

You might ask why something was far out in the future and of medium importance. Structure the discussion in such a way that you're drawing the juice out of everyone's position. The nine box is a very valuable tool. It's a participatory tool. With this nine box, you can go through a dozen concepts in an hour. If you did it in a more free-form way, you might only be able to cover two or three concepts.

There's another technique called a futures wheel. The two kinds of failures in futures work is anticipation of too speedy development, and, second, the failure to look at secondary consequences. This is a very nice secondary consequence tool. Suppose we made the business decision that we're going to manufacture Product x in a tentative way. Let's look at the next 15 years. The assumption is we are making Product x and we describe what the picture would be. We're selling x million units per year, and the price is in a certain range. We give people a little picture of what that variable means.

What you ought to do is determined by what the principle consequences will be. They can be consequences for the company, for the customers, for competitors, or for the society at large. Then you fill in that ring. Now we've all taken our time to do that. Let's look at what some of the consequences might be. You find how one thing affects another. You gradually build a complex picture, linking these outcomes with your arrows. This brings you into the primary effects, and you can often show reinforcement.

We begin to lay that out, and it really is an eye-opener. You can again use this kind of format as a mechanism for initiating discussion. You tell the group to fill in the

first rating. Then you tell the group that six of you at each table should talk about your first rating and exchange what you come up with. Agree on what the three most important things were that came out of your discussion. Then tell the group to fill out the second rating based on those three things. You can structure your discussion in a variety of different ways to take advantage of it.

This is a beautifully transparent mechanism that works as well with seven-year-olds as it does with corporate senior executives. It has been done very extensively. We've had some interesting experience doing it with the Girl Scouts. Everybody understands this.

There are all sorts of things you can do. I always like to start a group off by doing the simplest thing. After they have that experience, then you can show them some variations. I'm a strong advocate of plain vanilla.

The cross impact is very interesting when you're working with a fairly large complex of variables. As you all know, variables are rarely independent. Let's talk about our variables as A, B, C, D, and E, and, in this case, we'll talk about them as their trends. We run each of them in both axes. Let's have a fixed time frame, say of 15 years. If this trend continues to develop, what will be the effect on each trend? We can begin a very simple evaluation. One has no effect on itself, so we can X out all the ??self's??. If trend B continues, what will its effect be? It will promote A, C, and D, and it'll reduce E. As we carry this process through, we can make these judgments either privately (each one of us does it), or we can do it as a group exercise. What we'll come up with as we do this is a big question mark. We just don't know. We might say, "George, you look at this one. Please come back for the next meeting." "Mary, look at that interaction and see what you can find." "Harry, you pay attention to that." We give somebody a little assignment to look into it to see if they can gain any further insight.

That's the cross impact in its most bare bones form. We can now go a step past that. We can ask, "What do we know in a firm, quantitative way about these interactions?" When we can find enough of that, we can move this cross impact into a computer-assisted model of how they interact. For those where we don't know the relationship because it hasn't been discovered, we just pyramid the cros impact. We're now beginning to get into the opaque domain too much where we're seeing less transparency in many of your executives. You may not want to carry that very far.

The third step beyond that is to actually move this into the initial stages of a systems dynamic model. These are the kinds of things that made Jay Forester famous. They underlay some of the major reports on environmental effects.   This can be either a

free-standing activity of its own or the lead into some much more quantitative treatment.

Let me finish up with one that has two variations on it. It's not so much a technique, as it is a method of dealing with the future. In each of your organizations and professional societies, there are a set of issues that you're confronted with. We do not define an issue as a problem for which there is a definitive solution. For example, if I broke my leg, the definitive solution is put it in a splint and wait three months. That's definitive. An issue is different. An issue involves an intrinsic conflict between your interests. It might be between short term and long term. It may be you versus a public interest group. It may be a regulator versus you. It may be a conflict inside the company, but conflict involves something far more provocative than a problem, which has solutions. A conflict doesn't have a solution. What you're looking for at any particular point is a resolution that makes everybody relatively happy, but nobody absolutely happy. You're trying to strike a balance point with regard to the issues on how you move ahead.

Let's assume we've inventoried the issues the company faces. Maybe that list is 75 items long. Maybe 12 or 15 of them are very important. What do we do about that? You can do one or two things. You can do either *a* and then *b* or you can just jump to *b*. In *a* you do a baseline study of that set of issues. We determine what you know about each of those issues. Let's say there are 75 of them. What is the issue? What's the supporting evidence? Who are the actors? What are their concerns? What motivates them? What might be some kind of resolution? What are the consequences of that issue, depending upon what actions are taken? What does this mean to Acme? What kind of actions might Acme take? That's the analysis.

If you do that, you have an interesting baseline for collecting further information about each of those issues. You have the skeleton on which to hang new information. That further collection of new information is what's called an environmental scan. You identify the issues, and you set up a mechanism whereby you scan the published literature, the newspapers, professional journals, newsletters, television programs, government documents, association reports, and any other source of information. If you continually monitor you pull out material that relates to your agenda of 75 issues, 12 issues, 20 issues, or whatever. Then you render some kind of interpretation of that. We recently got an article out of the *Financial Times* that says, "Daimler-Benz is going to sell off its XYZ facility." We just read an article out of *The New York Times* that says that "the public is becoming much more active and concerned about subject *x*." How do we interpret that in terms of our agenda list? That interpretation becomes part of what's fed

back into the system. That scanning is an extremely important process. You can actually begin scanning without the baseline study, but we find that it's good to have one because that gives you an in-depth look. Those are very important techniques.

Before we do the exercises, let's look at the trends that are affecting your sector or the trends that are affecting most of the areas of the Society. Hence, they're going to be important to you. Obviously, people are what most businesses are all about, so let's start with a quick look at demography.

The basic good news for everyone is that the U.S. population is going to grow. It is 268 million today. By 2025 we will add 60–70 million people and hit about 330 million. You can interpolate between that. There is no evidence that another 60 million or 70 million people will intrinsically have any adverse effects on the environment, the society, the structure, or our well-being. That's not to say we won't goof, but there's nothing intrinsic in that growth that's fundamentally bad news. For anyone whose product or process depends ultimately or approximately on sheer numbers of people, this is good news.

When you look at the texture, there are a bunch of variables within that demographic pattern. The most important one or a most important one is the aging of the baby boomers. The older baby boomers are about 51 or 52. The youngest ones are in their early 30s. These are people born between 1946 and 1964. There's no fixed number. They've been the pig through the social python during their whole lives. One of the interesting things we have seen is that they've moved into the period of maximum family formation. It's good-bye to singles bars and hello to Bloomingdales. What we found is that deferred period of marriage has led to a second interesting effect. In recent years, the average age of mothers of first born children is up around 26. That is practically geriatric compared to what it was a generation earlier. A generation ago mothers of first-born kids were in the neighborhood of 19 or 20. They've jumped up roughly five years. What that means is those parents are now more mature. They've probably been working and much of the early youthful turbulence has settled down, so they're probably going to be better parents. They're also going to be parents that offer their children two things that seem at odds—more independence and closer care.

Remember, children have zero economic value in American society. Two generations ago, children were a family asset. They went to work early. They helped on the farm. They worked in the shop. They helped in the factory. Today, children are around for one reason only—they're an extension of our ego. What every family wants is the best possible child or children that they can be. That

means we're ready to heap infinite resources, relative to our own resources, on making that kid successful.

One of the side effects of that is going to be concern for health. Health concerns are going to escalate for boomers and their children.

The baby boom echo kids, the four million children born each year since 1988, who are going to match the baby boom in their numbers, are different from the baby boomers. Baby boomers' moms used to be home with Hershey's chocolate milk and cookies when children arrived home from school. No one is home for the latchkey kids. That has created tremendous guilt on the part of families, particularly for women, who bear a lot of the guilt. It's not enough to drive them out of the workforce, but it is enough to be a fundamental shaping factor in both the workplace and at home. What that amounts to is, we're guilty about our children, so we heap good things on them. "Let's buy them a computer or a horse." That guilt is running through these families.

Of course, it's having an effect on work. The consequences of the two-income household is, for the first time, dragging family-related concerns back into the workplace. From about 1920 to about 1970, the corporate view towards work was, "Here's your money, take it and take care of all of your responsibilities. We want nothing to do with it. We're going to continue to reduce our concerns." With the rise of the two-income households and the single parent households, those family concerns are being revisited.

One of the most important concerns is for elder care. Elder care will break two banks. It will break the corporate bank if you try to handle it the way we've handled health or the way we've handled children. You can take a seven year old, put him or her in something that is fundamentally hypocritical and ineffective, lie about it, and everyone will smile in agreement. You can't hoax a 70- year old. Second, it'll break the private bank, or your own household bank, if you try and deal with elder care out of your own resources. The biggest single thing that corporate America has waffled on is its fundamental policy towards elder care.

One of our clients did a study involving our suggestions. It was a Midwestern company with 50,000 employees. They asked, "Do any of you have an elder care problem?" Five percent did. "Do any of you expect an elder care problem in the next decade?" Forty percent did. What has happened is we've moved to the four generation family. Mom and dad, their children, mom's and dad's parents, and to some extent, mom's and dad's grandparents. That four-generation world is a very real stress on a society that's organized around the nuclear family.

The next big development is the rise to political ascendancy, and in some sense, to political dominance of aging Americans. The older you are, the more likely you are to vote. In the last regular election, (that is, before Perot) 19% of the actual voters were over 65 so what you had in the last regular election was basically one-fifth of the electorate ready to vote the elderly population's agenda, which is fundamentally antifuture. Their agenda was fundamentally give me, give me, give me. Do you know anybody older than 70 who is open, loving, generous, forgiving, caring about the future, and ready to give up their assets? No! Selfishness is the dominant factor among older Americans, and they're will vote selfishly if given half a chance. We've seen it happen. When there is a vote on education, education loses. The biggest voting obstacle to the future success of the American economy are people over 65.

The good side is that Americans are living longer. If you look at the data, you'll see that older Americans are not only more and more abundant, but the most rapidly growing group on a percentage basis are those over 85. When you look more closely, it's old women who are surviving at the expense of old men. Just think of all the widows, but how many widowers do you know? The fact is that women are biologically superior to men. They live longer, healthier, and happier lives, and they die in a far less derelict state than men do. We find very interesting insurance-related problems here. The older women today, those over 70 or 75, have not worked extensively, don't have business experience, and they're just crying out to be ripped off by all kinds of scams, charlatans, and mechanisms for separating them from their money. A major opportunity for financial service organizations is to provide assistance to the groups and teach them how to protect their assets against scams.

The resources of America are accumulating in the geriatric sector. People over the age of 65 are the only group in the last 20 years to grow in both wealth and income.

In the decade of the 1990s, about 25% of the assets of the U.S. will eventually change hands as these geriatrics die off. Nobody knows what the consequences will be of giving $100,000 to one person, $400,000 to another person, $350,000 to another, and $500,000 to you. We have completely neglected the subject. People don't know how to leave or receive money. There are very interesting opportunities in financial services.

Immigration is growing. About one-third of net population growth is now due to immigration. By 2020, all of net population growth will be due to immigration. Those new immigrants are primarily from Latin America and South and East Asia. Places that are culturally more remote from the base population bring us new mechanisms, artifacts, food, clothing, concepts, and social developments, but, by

and large, there is enough difference that it could be significantly disruptive of traditional institutions.

We could talk about the specific groups, but let me skip over that because I want to just make one more point on aging. Obviously, as you age, disabilities come into play. At 65, about 15% of people have some significant disability; it is usually related to mobility or sometimes vision and hearing. You really have to be 85 or older before you have a very large percentage (30%) who have some significant disability. The question of how you deal with that wide spectrum of people is very, very interesting. There is opportunity there, but no one is knocking on that door.

Let me relate one other point to longevity and that's life extension. Life extension is surely occurring, at least in one form.   Our species' life span is 85 years plus or minus a few years. There's some variation in the genetics of it. Every species has a built-in life span. For some insects, it's hours. For some other animals, it's three centuries. For humans, it's 85 years. There's a modal distribution here. Some of us are keyed to die at 45 and others die at 110, but 85 is the mode. These people are dying for a variety of reasons. Could we square off that death curve, eliminate these deaths, or reduce the number? There's no question that we could. Most of these are due to accidents and to bad behavior—smoking, drinking, excess weight, and so on. Unfortunately, squaring off that death curve runs against most of the good things of life. It's not going to immediately occur, but we're definitely have some squaring off.

The second source of life extension relates to whether we can move this set point. It's a very interesting question. We're talking about fundamental genetics of the species. Up until a couple of years ago, I would say "Forget it. There's no hope of doing that." There had been a lot of theories around for years and years about aging. One of the most interesting of them is the theory that has to do with aging as a result of oxidation in the body; that various oxidation processes occur and your tissue basically becomes like a bowl of spaghetti—nice and mobile when it's fresh, but then you put it in the refrigerator and all the starch links together, making everything sticky. Everything becoming sticky inside indicates a move towards death.

Let me give you an illustration of how to do this. I'm going to show you how to assay your biological age, not your chronological one. Take your hand and rest it comfortably flat on the table. With your other hand, grab this loose skin on top of your hand. Lift it up and then let go. If you did this with a newborn, the skin would go back so quickly you literally would not see it move. If you do this with an 85 year old, you can time an egg. That's the result of cross-linking of the collagen

running through your body. That's a rough measure of your biological age, as opposed to your chronological one.

How do we move this set point? The oxidation theory is interesting. For years there has been research on this. A few years ago, some researchers worked with fruit flies. Because they were working with millions of them, there's no statistical problem. They put a gene in for the fruit fly antioxidant, and nothing happened. They put another gene in for a different antioxidant in another group, but nothing happened. They put both genes into the fruit flies, and they lived 30% longer! A major step. If you can do it in fruit flies, you can probably do it in mammals. If you can do it in pigs, you can probably do it in people.

The second and even more interesting development comes out of research done about 40 years ago by a professor. He discovered that all the cells in any species have a finite number of times they will reproduce. There are roughly about eight reproductions, and then they stop. The cell effectively ceases to be able to reproduce. No one had understood what caused this, but there are always cells in the body that do not die. These are most notably, cancer cells. If we understood why the cells die, we might have a clue to preventing cancer or curing it. If you understood why the cells die, you might have a clue about life extension.

It turns out that just in the last couple of years an answer has been found, and it has to do with DNA, the basic genetic material in the cell. As you know, it's a double helix. At the end of the helix, there's a little tail called the telomerese. Every time the cell reproduces, it loses some and when it has finally lost all or most of its tail, the cell cannot reproduce anymore. You immediately see the solution. Can we intervene to keep them from being lost, and effectively give the cells eternal youth? Or, can we cure cancer by figuring out how to make that chop off occur? That's probably the most significant breakthrough in the question of aging in the last five years. In the long haul, there are going to be some forms of life extension.

Let me turn to settlement patterns because this is very important. What's happening is the U.S., which is about 79% metropolitan, is a major shift away from the traditional metropolitan structure. A city like Chicago and a city like Calcutta are exactly isomorphic. They could map right on top of each other. The structure is so universal. The central business district is surrounded by rings of different socioeconomic functions; manufacturing, service, downtown business, government, the rich, the poor, the Irish, the Italians, and so on. The infrastructure in every city radiates from the central business district. Within that metropolitan framework, we have the emergence of the polycentric city. In Washington, D.C. we not only have the central business district, we have Arlington, Alexandria, Reston, a planned community, Columbia, and Tyson's Corner, which is a car dealership that has

grown into a business center. The in, out, in, out, in, out is not only inadequate, but it falsifies the movement of people. The whole structure of the infrastructure will have to be radically altered.

Changing work patterns are adding to that—4%, 4.5%, 5%, pick whatever number you like, of people are now in distributed work. They work for Acme, but they don't go to work at Acme. They're on the road. They're working at home. They're working at satellite centers. So that's changing the in-and-out pattern.

As that work offsite continues to grow, we anticipate it'll hit about 20% around 2005. There's some tip point in there somewhere. I haven't the foggiest idea what the tip point number is, but there will be a tip point in which enough people are not going to work. It's going to change how we dress—good-bye blue suits, brown suits, and dressing for success. It's going to change where you eat, where you recreate, and who you socialize with. It's going to change your day-by-day behavior. It's even going to raise the question of who needs an $18,000 automobile to drive 4,500 miles a year. The big issue now lies in this off-site work, and in the metropolitan areas.

Those are some things that lie ahead. On the globalization scale, I want to mention very casually that there's a lot more to say. It doesn't make sense to talk about "the globe." We choose to talk about three worlds. World one, the advanced nations, contains about one billion people. Over the next generation, it will grow about 30%. That's not dramatic growth, but it is still good, solid growth for prime markets.

World two is the people whose needs and resources are in balance. It is about 3.4 billion today and growing to about 5.1 billion. That's the centerpiece of most American globalizing business.

World three is the people at the bottom of the heap—the Bangladeshs and the Nigerias of the world. There are about 1 billion people, if they're lucky, and they will only grow to 2 billion if they are even luckier. Basically, the present 5.5 billion will grow to about 8.4 billion over the next generation. We'll add 3 billion more people.

Against that background, what we see happening is the emergence of a global division of labor. At the two poles will be products in universal commerce, because they're best of class. That doesn't necessarily imply high-tech. My paradigm for this is the Walkman and its many variations. A Walkman is a Walkman, whether it's on the back of a plow in Nepal or on a coed's ear in Cambridge. It's worldwide

because it's best of class. At the other pole will be those things that are regional or local, and they're going to be things connected with food, clothing, and shelter.

The problem for businesses is to say, "In terms of our global business, we can't occupy a spot in the middle. Are we selling best of class or are we catering to one or more local markets?" We see the middle effectively being vacated. There'll be no place for the mediocre, halfway kind of stuff on the global scene.

There's no reason why a local product has to be prepared locally. The Indians have just moved into the international market with mushrooms. Asian Indians don't eat mushrooms but they're building a mushroom business to cater to Europe and the U.S., so that adds a little twist to that division of labor.

Let's talk a little bit about some social value changes in the U.S. I think these are very important when looking at any business, particularly any service business. The dominant driver of the social value changes is the fact that the U.S. is now overwhelmingly a middle class society. About 70% of us are middle class. The so-called working class is largely middle class, although many of them deny it because of the panache of being different. They are basically either already middle class or aspiring to be, and certainly all the new immigrants are aspiring to be middle class. If you understand that core population, you understand the basic social drivers and what people are aspiring to. Forget that top 1% who are the very wealthy. We know essentially nothing about them. They've managed to resist a half century of research. You could summarize everything we know about the filthy rich in probably two pages. We don't know how they're educated. We don't know how they think. We don't know how their business practices are transmitted. We know essentially nothing about their families, except scandal-mongering. It's a big unknown. Anyway, the bulk of your market is middle class.

The key feature that has come out of this is antiauthority. It's not in opposition to expertise; it is in opposition to arbitrary expertise. "I got my Pd.D. at M.I.T." "I've been at this for 30 years." Let me assure you." That cuts no ice with anybody. They want answers to their questions in their depth of detail and in their lingo. To try to pass off the best of 1950 (these are the 12 most frequently asked questions about Acme), is really to be caught up in obsolescence.

What's pushing this business of getting more and more into detail is the rise of the Internet. Every one of your companies has probably had focus groups looking at its products or services. What would happen if you could have a low-cost, permanent focus group of 10,000 or 20,000 people? That becomes a practicality in terms of the Internet. There is no reason to take 20 people to lunch and milk them dry of what they think about your product or your service, when you can get it wholesale

at a much lower cost per person, even though the cost is much higher in aggregate. In some sense, the information is more reliable.

The next thing is the middle-class desire for quality, service, and reliability. American manufactured quality has surely gone up. Service is the dark spot in American business. Service stinks in the U.S. Try to have your car repaired. Try to get a TV set or your home stereo repaired. That's the service sector at the manufacturing level. But is it any better in the soft services? The answer is no. Why do you use ATMs? Many of you would say, "Well, it saves time." I don't believe that. That's maybe 60% true. You're probably like me. I use the ATM to avoid a hostile, aggressive, ignoramus trapped in a plexiglass cell. Have you ever found a bank teller whom you liked? Why are they such a disaster? Because the banks have tried to robotize the human being. People make poor robots. When you try to robotize a human being in a plexiglass cell, you get a defective robot. The whole quality service sector and most of the service sector is terrible.

My wife hates our insurance representative. He's actually a very nice guy. She has no animosity against him as a person. We've dealt with this guy for 30 years. In a two-income household, do you want to waste a night with some guy selling you something? No. However, there really isn't very much we can do about that. Either turn him away or look at his latest product. The whole business of time becomes the single most important factor in middle-class life. You shouldn't develop a product or a service without looking at what its effects will be on time. If you can save time, you're a winner. If you can eliminate tasks, if you can do two things at once, you're likely to have a winner. If it creates more of a need for time or more demands on time, that's a steep uphill climb. Consideration of time has to be a central dimension in everything you do.

The middle class is pretty smart. They know you don't have to deal with bank tellers. They know you don't have to deal with rude clerks. They expect every commercial encounter to be a positive experience. Is it a positive experience to encounter your company? I'd say the chances are 50/50 it's not. Try it some time. Call your own company on the telephone and ask for something offbeat.

I was out in California, and I wanted to call a company in the Boston area that we were trying to do business with. I got the right area code and the right exchange, but I goofed on one of the last four numbers. I quickly established that the person I was looking for was not at that number. So I said, "This is a long distance call. Could you help me with his number?" I heard the ruffle of pages and a few seconds later, he came back and gave me the number. I said, "This is a long distance call. Could you connect me?" There was a curious two-second delay. Just enough to say, "What's going on? Don't you hear me?" He said, "Well I'm not sure. I'm a

manager and I don't know how the telephone works." What is this guy telling me? "I'm a fool." That's his first message. What's the second message he's shouting at me? "I work for a company that employs fools!" A very interesting message. Try calling your company sometime and see what happens.

Let me look at some other things that lie ahead. The thesis I want to put in front of you is that we're on a ten-year brink of being able to produce all the goods and services of our economy with 70% of the workforce. What do you do about that?

Let me give you some of the numbers. Today, 1.8% of the workforce is inside the farm gate. That's down from 40% in 1920. How did we jump from 40% to 2% since 1920? We did it by replacing human knowledge and human labor with information embodied in machines and devices. That's how we did it. We have the world's most productive agricultural sector.

Today, about 16% of the workforce is in manufacturing. That's down from 25%. They're working like mad to get more and more automation into that sector. It would not be surprising, if by 2005 or so, that 16% dropped to 7%, 8%, or 9%. It would be surprising if it didn't drop substantially.

The third sector is blue-collar nonmanufacturing. That's about 22% of the workforce. We don't see much there because people will still have to make beds, sweep floors, clean buildings, and so on. That 22% might drop to 19-20%. A big block in the workforce, 60%, are information workers. They used to be called white-collar workers.

Look at the propaganda that has been rammed down your throat about those information workers. It says they're all doing cognitive and intellectual work. They are not. Just think of the information workers you know. They're doing humdrum stuff. Most information workers are entering vouchers, travel information, requests, and doing routine data reduction on a computer. That's crying out to be replaced by the next wave of information technology. Now just suppose we eliminated a quarter of those information workers. That's 15% of the workforce. Put the numbers I gave you together, and sometime early in the next century there's a possibility of 20-24% unemployment. That's my weak analysis. I have a strong analysis that puts it up to 32%. The answer to this is very simple. We've had this kind of technological displacement in the past. Look what happened after World War II. We didn't go into recession then. The prosperity, which I think will continue at 2% gross domestic product per year, just led to the creation of new jobs. That's going to continue into the future. That's the critical point. If you look at the formation of new jobs since World War II, they primarily resulted from the monetization of household tasks. When is the last time you saw a scrub board?

When was the last time you washed dishes for six people? When is the last time you ran a flat iron? When is the last time you did any physical labor? You go out and spend $X dollars per month to allow somebody to pull wall weights. Everything in our lives has been monetized. Wives no longer make husbands lunches. He buys it at McDonald's or upscale if he's a salesman. She doesn't even make her own lunch because she's out working too. About 40–50% of all meals are now eaten outside the home. This is a monetization of a household function. What happened to the broom? It was replaced with a vacuum cleaner. Go through all of those things, and ask yourself, what's left to monetize? The last thing I saw was an ad from H&R Block, "Come to us, let us do your taxes." What's more intimate than your taxes? On average, you'll get $400 more than if you do it yourself. What's left? We don't see very much.

Let's look at a couple of other things. We see substantial changes in the workforce. Aside from distributed work, the rise of the contingent workforce is a very interesting phenomenon. Let's say you're working for Acme, but you're not an employee. You're a temporary worker, a contract worker, or in some status other than a direct employee. Now that contract worker situation is a politically dangerous one. The rise of the contract worker or the temporary worker, is because of corporate pressure to save money. You save a little bit of money on salary, but you save large amounts of money on benefits. You have an employee hanging by a string, and at the other end of that string is a totally unreliable employer, who is ready at the drop of a hat, or a fall in the market to open his or her fingers and let you go into the abyss of poverty. That's political dynamite. When enough people have that happen to them, that issue will be rapidly politicized.

Temporary professionals tend to be the happiest of the contingent workers because they generally are paid very well, and they often have a private agenda. "We're going to work for nine months of the year and be able to ski for three months in Colorado." There's often a private agenda behind the professional temporary worker but that has its own problems. We see those kinds of issues growing larger. We see unions becoming much more important as corporate abuses continue. The reason we haven't had unions rise sooner in the corporate world is because there's an interesting scam that has gone on. I'm a middle manager. I come to work in collar and tie. I look just like them. Because I look just like them, they have convinced me I am one of them. But what happens when there's a 40% cut in the middle management staff? What happens when 11,000 people are let go? I slowly began to realize that middle management is not my affiliation; the union is my affiliation.

What has tended to blunt this effect in the middle class about 10 years ago was the massive entry of women into the workforce. Their income acts as a nice cushion

against what would be a very severe blow when the middle manager loses his job. All of that has blunted the middle-class-corporate, middle-manager, middle-aged response. What we see now, as we move into a world in which women are now entering the workforce right out of college, is they don't have a feminist agenda. They think the work place is going to be fair to them. They're looking forward to employment. They come like male workers do, and when they get disappointed, they're going to do the same thing workers have always done. The new unionism is going to be led by women, minorities, white-collar, and service workers. The potbellied industrial union leader is a thing of the past. The future lies in those things connected with information and service.

The most rapidly growing unions today are physicians organized to protect their $110,000 a year when they work for an HMO. The reality of American life is that you're impotent and absolutely powerless unless you're organized. As people see that need to organize, they're going to do it. Look at the UPS strike. The UPS strike was not about working conditions. The UPS strike was not about more income. The UPS strike was about the question of contract workers.

The other thing we see rising in the workplace, it is the single largest growth sector in corporate management, is education and training. The most obvious of them is the cognitive collapse of kindergarten through high school. Every single measure tells us that the collapse began 25–30 years ago. We've basically been in a trough that long. It's now in its second generation, and it has gotten to the point where not only are high school graduates, your lowest entry-level workers, illiterate, but they also can't spell, read, or do numbers. They're also shockingly ignorant of such things as history, civics, and geography.

What's worse is the disease has now moved into colleges. About one-third of state university students now take remedial courses. Furthermore, college has shortened the course requirements for graduation and the time that you're exposed to education. I would judge that the typical college graduate today gets about three-quarters of the exposure that older people got in college, or that anyone got even a generation ago. For that reason alone, more corporate education is needed. With the rise of information technology, the old model of watching the boss and understanding and imitating what he or she does will not suffice in a world of information technology. What's in his or her machine is not the same as what's in your machine. It's an opaque world. You need special training to move up the ladder. The third thing, of course, is preparation for moving up the ladder.

Finally, you have such things as new corporate policies like customer orientation. There are new kinds of business plans that you have to deal with. All of that is increasing the corporate budget. The numbers are not definitive, but as it stands

today, the corporate training budget is within a factor of two of the private education budget. It's somewhere between equal to and half the size of the public education budget. That's exclusive of labor rates for being in the classroom. This is tremendous stuff. It's in big flux. Do we do it in-house or out-of-house? Do we do it on contract or do we do it with our own people? Do we set up a center or do we send them out? Do we have professional associations do it or do we tailor it to our business? Those issues are turbulent right now, but it can only go in one direction—up. Of course, when you start internationalizing businesses, then you get back into what I mentioned earlier, which is this whole area of cultural training, or training to move into another country and do business.

That's the big growth sector. What will accompany that, of course, is going to be a lot more testing. The testing will really be two distinct kinds. There is much more job selection, employee selection, and job-fitting testing. There are things such as the Myers Briggs test. I presume most of you have had a Myers Briggs test. There are also things like the Curtain Adaptation Innovation Test. All of that is going to be framed around optimizing your employee selection and the use of your training dollar. Beyond that job-related training will be a growth of biological testing. Available genetics information is going to lead companies to look for a genetic test as a factor in hiring. We think that's going to be a matter of short-term abuse that will be squelched by law.

As you know, one insurance company has already tried to pass off the existence of a gene for a long-term disease as a preexisting condition. When you realize that each of us carries eight lethal genes, some of which are sublethal, wouldn't insurance companies wish us all out of their community of policyholders? Some things are likely to happen in the short run. Let's say Mary has been selected to head the southern European operation of Acme. The CEO calls her in and says, "Mary, we just got some regrettable news. Our routine insurance examination revealed that on the basis of genetics and considering your age, there's a 55% probability of congestive heart failure in the next 8 years. We don't want to expose you to the shock of the responsibility of that southern European operation. What we would like to do is put you in charge of east nowhere." That kind of stuff is going to happen.

At the employment side, people will routinely ask if they can get away with gene testing. We think all of that is going to pass relatively quickly when the abuse has become clear enough, and it is apparent that these tests are socially disruptive. The outcome will be that no one will be able to ask if you've ever had a genetic testing. No one will be able to require one, and no one will be able to accept genetic information. "I just graduated from Harvard. I got an MBA. I'm fifth in the class, let me also show you my genes." That will be *verboten*! We're going to move through

a period like the early credit card days. Some of you may not recall when the credit card first came along. Ordinary people would have $8000, $10,000, $12,000, or $20,000 bills, and they were responsible for those charges. We had to have thousands of those cases. The industry did absolutely nothing intelligent on its own behalf, until we had legislation that set up $50 limits. Very few people really get stung now. That's where we see the genetics at the workplace going. Testing will be very important in the short run.

Let's discuss retirement patterns. We're continuing to see a drop in the age of retirement and that's irrespective of any social change, movement in unemployment, or anything else. People, by and large, just want to get away from their work. The number of people who dislike their work is clearly the majority. There's a double lesson there. First, they're going to leave early. Second, the real lesson is you could really benefit tremendously by changing the nature of the work that people want to shun so much. The last time I checked the average age of retirement was 61.8. I need to update that. I don't consider that a timely number.

Now with life extension, more economic pressures, and earlier retirement, we're going to find that a lot of those geriatrics are going to go back into the workplace, but less because they need the money. The lower economic end will need the money, but the upper economic end is going to go back into the workplace out of sheer boredom. After all, you've led an interesting, professional life. You've done interesting things. You have a body of knowledge. Are you going to sit around and do your woodworking hobby for 16 hours a day? You might, for three months, but that will be the end of that. Many are going to go back into the workplace on the basis of boredom.

From the Floor: What kind of work is going to be available for them?

Mr. Coates: For the lower echelons, look in your local drugstores. We have a drugstore here and the guy working the cash register must be 80-years-old. They might bag groceries or operate cash registers.

From the Floor: I'm talking about meaningful work.

Mr. Coates: That's meaningful if you want the $150 a week. At the professional level, you see people called back. We have a small list of companies that have goofed when they downsized. They find out almost immediately, within 30 days, that they lost two essential people. These people are the only ones who know about this process. Let's see if we can hire them back. They say, "Sure", I'd be pleased to come back. I only want to work Monday, Wednesday, and half a day Thursday. I have other things to do. My rate will be 225% of what you've been

paying me. Oh, by the way, I don't want to work the three weeks around Christmas, and on our 45th anniversary we're going off for two weeks. Take it or leave it!" You have no choice. You take it. Otherwise you're stuck. A lot of that is going on. It's short-term turbulent stuff. But the lesson is very clear. When you downsize, you have to pay attention to what you're doing.

Let's go back and look at some other changes connected with business, in particular, the changes directly connected with what I'm calling business practices. First, the alliance is probably the most positive business practice development in the last 20 years, aside from the fact that about half of them fail. We'll talk about why they fail. In an alliance, each of the members—two, three, maybe four companies—lacks something to meet the market. For any one of them to get what they're lacking internally—to build it, research it, and acquire it—runs them a set of risks that are unacceptable and likely to run a time interval so the market will pass them by. The alliance supplies you with two things: immediate access to the market and minimization of all the other traditional business risks associated with building the capability. It furthermore carries the advantage of being fault-free if it doesn't work.

To make the alliance work, you need to carefully select your partner. What comes out of that careful selection is a new intimacy between you and the ally. That's the place where most alliances fail. It isn't the old business of "Here's what we need—you go do it. We'll do this and we'll get together." Rather, you get very intimate. Thirteen of our engineers are going to go into your facility and we would like seven of your marketing people to come with us. That kind of intimacy is essential.

Of course, information technology is the great facilitator because you effectively become one entity with regard to that activity. Now what we see, of course, is that these things are only going to succeed because they actually pay off in the bottom line. They bring you more revenue and more business. The failures come about from the failure to select the proper client. Always go for the best in the business.

As a partial example of that, what the Motorola people do when they set up an arrangement is cut down their suppliers by 90%. I'm not sure what the number is, but thousands have gone down to hundreds. They will select somebody that they want to deal with. They'll lay down the business condition and if they go along with it, they'll immediately become intimate with them in the way I've described. To avoid getting stuck with a faltering relationship, they also have a stick that goes with the carrot. There are two other companies as good as yours, and if this doesn't work, we'll say goodbye and we'll move in with one of them.

So that is happening. What we see in the success of the alliance is a major step towards the virtual corporation. With virtuality, the company shrinks from 200,000 workers down to 2,000 and those 2,000 workers in the company have only two responsibilities: financial management and strategic planning. Everything else is taken care of through a network of allies, and the allies have allies and the allies' allies have allies. So you might have a network of 400 or 500 firms producing Acme's product all in this new intimacy.

That kind of thing is a house of cards that could collapse, unless mutuality and full open communication occurs. It's a fundamental shift as you move toward the virtual corporation in business practices. If you want to think about this, the most virtual business sector in the U.S. today, is moviemaking. If you go to the movies, you have probably noticed that in the last ten years, those credits at the end run on endlessly. You might have 60 or more organizations listed. They all come together ad hoc to make this movie. When that movie is completed they all go back to what they were doing. This is the paradigm for virtuality. In this case, you have organizations that are putting $50-60 million on the line and they are hoping to win back $100–400 million. It's a big crapshoot. Sometimes they win and sometimes they lose. They say, "We lost the $50 million this time. We only got $35 million back, but we're ready to go again." Somebody else starts the ball rolling with another virtual enterprise. All of that stuff you see at the beginning of the movies is, in some sense, a charade.

What else is happening in business practices? We have a thesis that 90% of American businesses fail to deliver what the customer wants. We're so accustomed to getting a partial product or a service that we don't even realize that we can't get what we want in the marketplace. We frequently become inept contractors to ourselves. For example, let me give you a household case. We had a leak in the water heater. I called the plumber, who is the same guy who ripped us off three years earlier. He comes in and he looks at it and he confirms my brilliance. He doesn't stop at the leaky water tank. He looks around and expands this leaky tank into a big operation. He gives me an estimate and I decide I need to do the middle-class thing—get a second estimate. I get someone else in and he's 20% higher. So out he goes. Being a good middle-class citizen, I go to look at *Consumer Reports* to research boilers. I visit Montgomery Ward, Sears, and Cheap Harry's. Finally, after two-and-a half days, I'm back to the first guy and he puts it all in place. Then for the next two or three months, I have to make adjustments. I have to find out how hot the water comes. Guess what? Never in my whole life did I have the slightest aspiration to own a hot water heater! What I wanted of course, was hot water. There's no place in America to buy hot water. All I have to do is become this inept contractor to myself. Take that with your business. To what extent do you deliver what the client really wants? I doubt that it exceeds 75%.

What we're witnessing in the business sector, much more clearly in the manufacturing sector than elsewhere, is the move towards buying a functional package. I need 400,000 plastic widgets so I can build a plant. I can get the designer. I can hire people. I can train. I can wait two years for it to be built. I can have a supplier and so on. I don't want to do any of that. I'm going to hire Ajax, and they're going to give me 400,000 widgets, and I don't care how they do it! I'm buying the functionality I want, and that's a growing pattern.

It's much more elusive in your service sector because you think that you're providing services that people want, but that may not be true. I think at best you're supplying a fraction of what they want. They want security, they want financial advice, they want care for their money, they want returns on their money, and so on. If you look at what the customer really wants, I think you'll see you're falling short.

We've already talked about customer orientation. I think another factor that's very important is the growth of disintermediation. That has really been a big factor in the insurance sector. It's a big factor now in the general economy. What it amounts to is knocking out the middle man. You see this beginning in the biggest way with the brokerage firms. Of course, the discount brokers come in and perhaps give a knock in the head to the Merrill Lynchs because what they're doing is removing the intermediary who is providing you with advice. Schwab is telling you how to think about the market, giving you information, and letting you make the judgment. They just execute because that's the thing you really need them for.

In moving the physical goods, that's going on at a greater pace. For example, you're probably going to receive 40–100 catalogs this Christmas season. Let's just say you decide to buy something out of Acme's catalog, and you order three things. Your mental model is that there is a gigantic warehouse somewhere with 10,000 items in it, and a little robotized wagon will go around and pluck them off the shelf. Or maybe somebody is going around with a shopping cart, pulling them off the shelf and assembling your order. That's history. They take your order, break it up into three parts, and send it to three suppliers, who have their own wrappings, mailing labels, etc. Each of those suppliers fills the order, and as far as you're concerned, you got it from Acme. Disintermediation. There is no warehouse for Acme's 10,000 products.

Disintermediation is a big factor. As you get disintermediated, you have to look at the question of whether you're going to be a victim of that and how you can maintain that intermediate organization. The answer is very simple in principle, but very difficult in practice. You have to offer the customer something that's new and unique.

Many people see, for example, the death of the car dealership. Why would you go to a car dealer, when you can go on the Internet, get the best possible price, which is likely to be a fixed price, get everything you want on that car, and avoid all the hassle of the car dealer? You can get the whole deal done within an hour on your computer. Now if those car dealers are going to survive, they better shape up. What's going to kill them is their complacency. They say, "Where else could they go to buy a car? They gotta come in and sit in the car. They gotta kick the tires. We know how to deal with those people." Well, when you're talking about saving $3,500, you might not feel so strongly about kicking the tires.

Let me look at some of the effects that are going on in genetics, because this is the area that's probably going to have the biggest scientific effect on insurance and the insurance sector. Basically, the following things that we've discovered in the last 50 years are beyond dispute. All the inheritable characteristics of people and other living things are carried by a chemical called deoxyribonucleic acid (DNA). We now know the structure of that material. It's a long, long, long chain. In fact, it's in every cell of your body. If you unravel that chain from any one of those cells, it would roughly be as long as you are tall. This is packed into every single cell in your body. It consists of two entwined chains that are in opposite directions. It's made up of four basic components, let's just call them A, B, C, and D. A, B, C, and D are a code for producing proteins. Those proteins are all catalysts or, in the biological term, enzymes. They work everything else to build the animal, the plant, the insect, and the microorganism.

We have deciphered the code. We know how the code works. We know what the code does. We know how to synthesize DNA, we know how to take DNA apart, and we know how to put it back together. We've also learned that you can take the synthetic DNA, add it to the natural stuff, and it makes no difference. Furthermore, there's nothing more democratic in the galaxy than DNA. You can take DNA from one species, put it into the DNA of another species, however remote they are, and if the environment is right, internally and externally, whatever that bit of DNA says to do will be done.

For example, somebody took the DNA that makes fireflies light up, put it in a tobacco plant, and the perimeter of the tobacco plant glows in the dark. It's not hot enough to light a cigarette, but here you have something where there was no connection between plants and insects. The DNA carries a message and if the circumstance permits, that message will be acted on. So we have a technology of DNA—we can take it apart, put it together, synthesize it, and analyze it. We can determine what it does.

The most interesting project now underway is the human genome project. That collection of DNA and the genes that it represents is called the genome. So the human genome is now in the process of being deciphered. There are about 3,500–4,500 human diseases and disorders that are genetically determined or based. For example, if you carried the gene for Huntington's chorea, on average in your fifth decade of life, you'll blow all your fuses upstairs and you'll spend the next six to eight years dying an extremely unpleasant death for you and everyone around you. There are no ifs, ands, or buts about it. If you carry that gene for Huntington's chorea, that is your absolute destiny!

On the other hand, let's look at tuberculosis. There are no genes in people for tuberculosis, but there are susceptibility genes. If you carry those susceptibility genes, don't worry. Lead a clean life, don't let people cough at you, don't sleep in a damp basement, and you'll have very little to worry about. Every one of those 4,000 diseases and disorders is somewhere between destiny and probability.

Virtually every week we're learning about a genetic connection. They've identified the spot on that human genome that causes a certain disease. The gene has been identified. Many of the earliest of the discoveries are coming about from diseases that are caused by a single gene. There are other diseases, like schizophrenia, which is probably caused by two or three genes. It's obviously more difficult to find the linkage to multiple genes than to single genes, but as this unfolds this is what is likely to happen.

Look at your own family. Aunt Milly, Uncle George, and cousin Harry all died of this same thing. I feel pretty good, though. I don't have to worry about that. That was just the way it was. We all get caught up in that kind of biological complacency. What happens when we identify the thing that killed those three is genetically determined, and it's due to a dominant gene. If you have it, you get the condition. My dismissal is stupid. My dismissal is foolish. I can have a test done to tell me if I carry that gene.

Now, let's go back to the specifics of Huntington's chorea. It hits in the fifth decade. I'm about to get married to a very nice woman. We obviously want to have a family. Am I going to blow my fuses when I'm 45? I can now have a test. If the test indicates I don't have the gene I have no worry. If the test is positive, now we have an interesting question. Should we have children? I'll be gone when they're growing up. I'll be gone in their teenage years. She'll be stuck with them. We probably won't have enough money to maintain all of that. We now have a question we never had before. Let's say we decide to have children anyway.

When the child is in the womb, we can now take a cell sample and analyze whether that fetus carries that gene. If the answer is no, no problem. If the answer is yes, we now have two choices. Do we keep that child or do we abort? Tomorrow the options will be different. Let's fertilize the egg in a petri dish. That fertilized egg splits until we have a blastocyst (eight cells). We can take one of those cells and subject it to a genetic analysis. If it's no good, it goes down the drain. If it's good, we have seven cells left and we can try to implant them in the would-be mother and have a Huntington's chorea-free child. These are the kinds of things that this information is going to lead to. It's going to change the whole way in which we relate recreation and procreation because it's going to be driven by whether you want to run the risk of the disease or not.

The more horrendous the disease, the more likely it will be that you're going to want to know about the genes. What we see emerging out of that is every time a new disease that has a large constituency is discovered, those people are going to say, "Why should so much research be going into AIDS? Why shouldn't I have some research into arthritis? Why is so much research going into so and so when 450,000 of us have this condition? Why shouldn't more research be going into this variety of arthritis, with 3.5 million people suffering from it? Why should it be going into that disease?" There's going to be a big open struggle, not only about the government allocation of R&D but also the corporate allocation.

Let's say Merck has never put a nickel into my disorder. Let's all ban Merck products! They're going to push those companies into putting research into the disease for which you are a constituent. It's going to be a very interesting situation because we're talking about 4,000 diseases.

How do you deal with a disease? There are two kinds of developments that are underway. Once you identify the gene locus of the disease, you can set up a diagnostic test fairly simply. It's relatively low cost. What now costs a few hundred bucks, the day after tomorrow, will cost $10, or $1.50. That's just the nature of the testing.

How do you treat the disease? There are two broad strategies. Every genetic defect shows up for one of two-and-a-half reasons. First, there's something there that shouldn't be there, so the problem is to eliminate that. Or there's something absent, which should be there, so the problem is to provide for that. The half is that many diseases are diseases not because there's something present or absent, but because the particular cell receptor site is defective. So you can say that's a case of something being absent. You have a defective receptor cell. We're talking about these processes being highly geometric—complex-shaped things fitting into complex-shaped receptacles. So the receptacle may be defective.

How do you deal with these things? The two generic strategies are first, since this is a genetically-based disorder, let's go back and find out what the defective gene is, and let's somehow or other put that gene back into the person. One of the conditions by law in the U.S. is that you can't do anything to anyone which passes on to the next generation. You can only do gene work that will be limited to a particular person.

The strategies for getting that gene back into the person are numerous. Many have been tried, but basically all have failed. That's the nature of this exciting, brilliant new research. One of the most interesting strategies is finding a carrier.   What carries to specific tissues in the human body? Viruses do. There are viruses that affect the nose. Viruses that affect the chest. Viruses that attack other parts of the body. Let's take that virus, let's knock out the deadly part of it, and let's put the gene that we want to go into place onto that train. Let it go to that site. We know it'll find that site and then maybe it will function. There are other ways to approach it. But the gene therapy strategy consists of a dozen different methods, and they're all under intensive research. The second strategy is altogether different.

As that gene for Huntington's chorea is lying inside your head or your body for five decades, what is it doing? There must be some fascinating biochemistry as that thing lies there for five decades, ready to explode! Let's understand that biochemical pathway and intervene there. We intervene, not genetically, but through something that looks like traditional pharmaceutical approaches. In the short run there will be a boom time for the pharmaceutical industry as it follows either strategy A or strategy B.

That's the exciting stuff that's coming out of human genetics. Related things are happening with plants, animals, and microorganisms that are affecting agriculture, farming, manufacturing, chemical production, food, nutrition, and on and on. I think the way to think about these things is to set almost any goal you would like that doesn't involve a self-contradiction. The chances are that goal is achievable.

Now if you look at mental functions, you'll see the research is controversial. The research has highly political implications. As we read the last half century of research on stuff going on above the neck, 60% of all mental activities are genetically determined. There are some people who would argue it's 40%; others would argue it's 80%. You can't go wrong by saying 60%.

The other 40% is due to environments of all sorts—all the way from a intrauterine environment to the social environment you're exposed to. Let's say 60% of all our mental functions are genetically determined. We now have not just the opportunity

to treat disease, but we now have the opportunity to enhance our mental lives—aspects such as memory, personality, or other things.

Does anyone know a kleptomaniac? Within the past year, it's been found that the cause of kleptomania is due to a certain spot in the brain where my two fingers intersect. Kleptomania is caused by a biochemical lesion on the brain. It happens to be adjacent to the spot that causes obsessive compulsive behavior. We now have a new way to deal with kleptomania. Suppose you have a gene for kleptomania. We will find that. There is a possibility of eliminating it. The interesting possibility that lies ahead is that we're now the first species to be able to directly influence its own evolution. Along with that capability, in the short run, comes the capability for human enhancement. Have you never laughed at a joke in your life? That's a genetic defect. Do you have a short fuse? Do you blow up at people at the slightest provocation? It's probably a genetic curse. Do you have no real memory for numbers? Do you have no spacial sense? All those things are mental defects.

From the Floor: How about criminal behavior?

Mr. Coates: That's another question. Many of the things that we see as undesirable in our lives are going to turn out to have a genetic base, and we may want to eliminate them. In my own case, I did a genetic inventory. I found eight genetic deficiencies. There may have been a ninth or tenth that blinded me to 10, 11, and 12. I'm near-sighted. I have very dry skin. I would not like to pass either of those on to my kids. I itch and squirm for about six months of the year. I'm entering that season now. I'm going to squirm from now until April dealing with very dry skin. I have an interesting hearing defect. I also have no memory for music. I enjoy music and go to the symphony regularly, but every experience is a new one. I bought $700 or $800 worth of stereo equipment, and I had only 1 cassette—Beethoven's Fifth. People got puzzled as to why I had 1 cassette and $700 worth of equipment. So I bought another 100 cassettes. I mark them down and I code them—good, bad, like, dislike. I just play them. It doesn't make any difference. Wouldn't it be nice to be able to remember the music that you've heard? I would like to have my children enhanced with that kind of capability. We have lots of that trivial stuff that we want to correct. The step beyond that, of course, is the enhancement. That's the other side of that capability. The genetics is really big stuff. I want to look at health. I think that the important thing about health is that it has become the great American hobby. The middle class is hooked on health, especially the baby boomers. They're going to push this on to their children. Many more things are happening in health than just that. The end of life is becoming controversial and more important. We have learned about a technological tour de force to keep the corpse alive. Nature says I'm dying. Nature says I'm dead. Nature says let go.

Largely because of the technological tour de force, and maybe a marginal threat of liability, the hospitals and doctors are ready to dump hundreds of thousands of dollars into keeping that corpse alive.

This is largely a middle-class baby boomer problem. They grew up in the period in which death was effectively unfamiliar. As their parents are reaching the death threshold, and as they're beginning to see people die, they're not ready to accept it. America needs massive education about death. We also have a death care industry. For those of you who have never heard the term, it's funeral parlors, florists, cemeteries, grave diggers, and so on. One of the interesting future opportunities is to integrate the health sector into the death care sector. You use that transition from one to the other. It's not a trivial thing. It's probable that the third largest expenditure you'll have in your family life is burial. First will be your house, second will be your car, and third will be your funeral. So there are tremendous opportunities for change there.

But we're witnessing the emergence of new diseases or the emergence of newly important diseases. There is the resistance of tuberculosis to medical treatment, and the rise of a new virus, for example the possibility of ebola. There might be a sudden surge of a disease that had been around a long time, but we didn't know about it. There's Legionnaire's disease. These things are occurring at the rate of one ever year or two. New diseases are going to become very important and some of them are coming as a result of anthropogenetic activity, which is the misuse of antibiotics. Others are coming because of mutations in the organisms themselves.

The other thing that's going on is that we're moving towards more and more medicalization of conditions. You used to know drunks. There are no more drunks. They're alcoholics, and they now have a disease. You used to know drug addicts. Some of them are still bad characters, but we're rapidly medicalizing drug addiction and treating it as a disease. I've already mentioned we're going the same way with Kleptomania. Kleptomania used to be a moral condition. You might have gone to a shrink about it, but it was basically a moral condition. Now we know it's caused by a biochemical lesion. We're medicalizing more and more problems and introducing them into this health rubric.

Other things that are happening with regard to health is that we're moving toward countermedicine. That's coming in two forms. It's coming basically out of a lack of trust of the medical apparatus, as well as the middle-class search of its own autonomy. The cultural theme is I'm in charge of my body. If I'm in charge, I have to be sure I know enough. We hear, "I heard about crystals." "I heard about chiropractors." "I heard about homeopathy." "I know about vitamins." "I know this." "I read that." "I saw it in *Vogue*," "I saw it in *Time*." "I read it in the mail."

"I read about it in a pamphlet." If you're in charge of things, you have to look at that stuff and seriously consider it.

We have the growth of alternative medicine, and it has reached the point where the National Institute of Health has set up an alternative medicine office to see which of those alternative medical approaches have any validity. My own feeling is they're going to find acupuncture and acupressure really heals patients but is not necessarily for everyone. They're going to find hypnosis is real but not for everyone. They're going to find crystals are a total hokum. They're going to find mixed values for chiropractors. Whatever your forecast is, they are going to be introduced when these things are found valuable into the traditional medical armamentarium, and that's going to create pertubations on the whole medical package.

The other thing that's coming out of the distrust of medicine is the growth of countermedicine which is largely the result of the search for either confirmation or independent diagnosis. Let's say I go to my doctor and he or she tells me I have so and so and such and such. This is what's going to happen and these are the choices that we have to follow. It is as if God has spoken!

I was stuck with that 25 years ago. God's white jacket has given me the word. I have a different strategy. I get on the Internet. I find the affinity groups with the condition. I probably will find three affinity groups for that condition. I can now put myself in contact with hundreds of people who are at various stages of that disease or condition. I can get entirely independent information from them, confirming, disconfirming, contradicting, or expanding on what my physician told me. I now have an entirely new view or set of views of my condition. I can go back to the doctor and say, "I learned about so and so and such and such," and my doctor might tell me, "That's an experimental procedure. It really hasn't been proven. Let me tell you about some of the side effects. I'll tell you about that, work with you on that, but keep in mind that we really don't know what the side effects will be."

Right over the horizon is a new thing. We will see the emergence of the health kiosks. You'll go into the shopping mall and get immediate instructions: prick your finger, put the blood dot on the paper, set it in the machine, urinate in the bottle, spit in the test tube, and set them in the appropriate receptacle. While the kiosk is examining these samples, you sit down at Cadceus. Cadceus is the name of a software package that will run a medical examination with you, similar to the first things that your doctor does on your first two visits. All that information comes together in 35 minutes, and Cadceus will tell you that it looks like you may have so and so, or it could be such and such. There's also a possibility of this and that. It

will say, "We need to do the following." Or Cadceus might say, "This is serious stuff. I'm not going to tell you anything more. You must see your doctor." Or it might say, "You're really in tip-top shape. I don't think there's a thing to worry about. Come back in six months." So that's going to be the kind of thing that the middle class, who is suspicious of medicine, is going to try out. This is for the people who wonder whether they have Alzheimer's disease or syphilis. You can get a little private consultation from Cadceus about all of this.

Many of us have conditions that we don't want to talk about or we're worried about. Others have conditions that we think we don't want people to know about. For $3.50 I can visit Cadceus. That kind of countermedicine will become important. Everything to do that is in place. Cadceus actually exists. It can diagnose 615 medical disorders. And it's not dendritic. It doesn't do it by a process of exhaustion, going through a process of elimination. It does exactly what Dr. Jake Myers does. It takes all the information and does an integrated judgment. In terms of everything you tell it, it lists the possibilities. It costs $60 million.