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FEDERAL TRADE COMMISSION

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HEARINGS ON GLOBAL AND	)	
INNOVATION-BASED COMPETITION	)	

Monday,
October 23, 1995

Federal Trade Commission
Sixth and Pennsylvania Avenues
Room 432
Washington, D.C. 20580

The above-entitled matter came on for hearing, pursuant to notice, at 2:00 p.m.

SPEAKERS:

ROBERT PITOFSKY
Chairman, Federal Trade Commission

ROSCOE B. STAREK, III
Commissioner, Federal Trade Commission

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Director, Policy Planning

DEBRA VALENTINE
Deputy Director, Policy Planning

CLAUDIA R. HIGGINS
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ELIZABETH A. JEX
Attorney, Merger I Division, Bureau of Competition

SPEAKERS (Continued):

CHARLES COONEY
MIT, Sloan Foundation Pharmaceutical Study

WILLIAM G. GREEN
Chiron Corporation

DEREK SCHAFER
Schafer International Incorporated

STEPHEN A. STACK, JR.
Dechert, Price & Rhoads

ALLEN BLOOM
Dechert, Price & Rhoads

P R O C E E D I N G S

CHAIRMAN PITOFSKY: Good afternoon, everyone. I'm Bob Pitofsky. And we resume I think on our fifth day our hearings on the question of the nature of global and innovation-related competition and the possibility that there are adjustments in competition and consumer protection laws that would make our enforcement program more relevant to current trade practices.

Today, for the first time, our principal emphasis is less on global competition and more on innovation, particularly innovation in the biotech and pharmaceutical industry.

We are very fortunate in the group of people who have been willing to come down here and share their thoughts with us.

I have asked the various speakers, to the extent possible, summarize their testimony. Their full testimony will, of course, be in our record. Then we will have, to the extent possible, some Q and A afterwards and then maybe some summary Q and A at the end of the afternoon session.

Our first speaker is Charles Cooney co-director of the program on the pharmaceutical industry at MIT. He is also a professor of chemical and biochemical engineering and executive officer in the Department of Chemical Engineering at MIT.

He joined that faculty in 1970. He has been a full professor since 1982. Before that, he worked briefly at the Squibb Institute for Medical Research.

Professor Cooney currently serves as a consultant to and director of several biotech and pharmaceutical companies. And he sits on several editorial boards of professional journals.

Professor Cooney, it's a pleasure to welcome you to these proceedings.

MR. COONEY: Thank you, very much. I'm delighted to be here and to have the opportunity to share with all of you some thoughts that have evolved out of work we have been involved in at MIT.

As was mentioned, I have been involved with the program in the pharmaceutical industry at MIT that was established through funding from the Sloan Foundation in New York.

Our Executive Director, Dr. Dan Finkelstein, also is with me and in the audience today as well.

This program was established as a teaching and research program at MIT in recognition of the tremendous change that was taking place -- and is taking place and will continue to take place -- in the global pharmaceutical industry.

And in response to that, we have established a

portfolio of research projects that deal with various aspects of competitiveness and productivity within this industry. And it's from the work of myself and my colleagues that I would like to summarize this afternoon.

In particular, I would like to focus on a couple of questions. One of these is: What is the basis of competitiveness in the pharmaceutical and biotech industry?

How does innovation occur in these industries?

And what is the impact of innovation on competitiveness amongst the firms?

Now, to address these questions, I would like to take a look at the structure of the industry as we see it today and some of the dynamics that it's undergoing.

I would like to talk about where innovation is coming from; where the barriers are to innovation in the industry; and, in conclusion, try to bring you through some of the thoughts that we think are important in understanding the future of a very exciting industry.

The global pharmaceutical industry today is a $250 billion-a-year industry. The industry is highly fragmented. It's fragmented by product. It's fragmented by geographic location. It's fragmented by firm. And also it's fragmented by technology.

If you look at the geography, you find that 33 percent of the $250 billion is spent in the United States,

29 percent in Europe, and 21 percent in Japan, with the rest of it going to the rest of the world. It's an industry whose growth rate has slowed. It's down to 7 percent for 1994.

When you look at the industry and its structure in terms of the number of firms, you find that the largest firm is less than 5 percent of the total industry sales. When you look at the top 10 firms, they represent 32 percent of the global sales.

And what surprises me is that when you look at the distribution of sales amongst the top 10, top 20 firms for the last 10 years, this hasn't changed. In 1984, the top 10 firms represented about 32 percent of the global market; and the top 20 firms, both in 1984 and 1994, represented just under 50 percent of the total market.

In terms of products, the single largest product in sales is only about $3.7 billion.

So, again, there's a wide degree of fragmentation in terms of the nature of the products that are made. And this single product represents only 1.5 percent of the total market.

Now, at the same time that we see this global structure, we see an industry whose structure is in some flux. We see a considerable amount of merger, acquisition, partnering, alliances that are being formed. And, of

course, one of the questions that is of interest to those here today is what does that have to do, what does it mean, how does it impact competitiveness of the firms within that industry? And I would like to address some of those questions.

One of the things that I find useful to do is to think about the structure of the industry in the following way:

There are a series of pressures on this industry that are causing it to change. The biggest pressure of all, of course, is pressure on revenues. And when you look at this, you see that the pressure on revenues is coming from a number of different directions.

There's the question of the changing market, the changing buyer. The buying groups are much larger. There is a government pressure both as a buyer as well as a regulator that is tending to keep the prices in this industry constrained. And when you look at price increases, when you look at the revenue increase on the industry, you find that that seems to be having a very significant effect.

Other pressures that continue to incur are from the regulatory side. The regulatory pressures include not only all the FDA, but they include agencies such as the EPA with increasing regulatory pressure on how one can manufacture, how one can produce goods; and also OSHA in

terms of standards in the workplace as well. And one expects that these pressures will continue to occur

When you look at the industry from the supplier side, traditionally, the supplier pressure has not been a major influence. Although, one is beginning to see some changes that I'll speak to later with regard to relationships between the pharmaceutical industry, as manufacturing industry, and its suppliers.

So the net effect in today's pharmaceutical industry is one in which we see pressure on pricing which is capping the available revenues.

Well, another way to look at it is the following picture, and this is a picture that I'll use to illustrate a number of points in my comments.

We have this industry that globally is $250 billion. We see a pricing pressure that is trying to shrink the amount of drug sales. At the same time, when we ask: Well, what is that makes firms competitive within this $250 billion-a-year industry?

The basis of that competitiveness is the ability of firms to acquire new products for future sales, otherwise known as a product pipeline. The pressure on developing that pipeline is the very high cost of drug development.

So two of the numbers that we want to keep in mind is this large global market on one hand and also the very

high cost of developing successful new drugs on the other, typically cited as, on the order of $350 million per successful drug entering the marketplace.

Now, how are firms in this industry going to be able to complete with one another and to be able to compete in the broader health care industry?

The amount of funds that one can spend globally for drugs is finite. And that's the pool of money that is seeing a lot of pressure.

How is the industry going to compete within this scenario? Well, first of all, it can seek new markets. Two markets are available. One is unmet medical needs, because drugs which fall into this category represent, open up new markets. Presumably they represent a change of current therapy to a drug-related therapeutic practice, hopefully one that is more cost-effective.

Second, there is the opportunity to strive to emerging markets. One can see that much of the world -- or that most of the world represents a minor fraction of the global market so that there should be opportunities within the rest of the world -- outside of Europe, Japan, and the United States -- to expand and sell pharmaceuticals.

Now, the problem is that as the industry faces expansion to try to seek a greater pool of funds to fund its development, there are two very different strategies. To

meet the pricing goals of emerging markets, one has to implement a very different research and development strategy than to meet the demands of unmet medical needs. Firms need to be able to enter both of these with differing strategies, both of which are steeped in research.

Now, the strategy that has often had an impact on the industry is one of therapeutic substitution. When you look at the existing medical markets, this $250 billion, this represents what we're willing to pay today for pharmaceuticals.

When you have new drug developments that are therapeutic substitutes for existing therapies, what happens is you now need to compete for what is a shrinking amount of revenues.

And herein is part of the dilemma that firms face as they begin to compete for the future. As they begin to develop that product portfolio for future sales, they need to decide whether or not they will meet or go after unmet medical needs or to compete in existing medical markets with improved medication.

We can see the impact of this in a few moments on some of the issues of drug development.

But when one looks at this model, you can see that in order to capture the market and be successful, one has to have a strategy based on new products to sell in this global

market.

Now, how is research funded? If the competitiveness, in fact, is based on new research products, where do the funds come from?

Traditionally, this industry has been able to fund its success based on profits from sales, with the exception of the biotech companies. The biotech portion of the pharmaceutical industry has had a somewhat different scenario in which its R&D has been funded predominantly from equity funds.

So when we look at the barriers to success on the participants in this industry, we can see that, one, they're dependent upon either generating profits from their drug sales or the ability to raise capital to underwrite R&D costs; and, two, they are going to be dependent upon how they manage their R&D expenditures, this magic number of $350 million per successful drug, if they want to have a reasonable portfolio.

So when we think about competitiveness, we need to think about how it impacts from the revenue stream; and we need to think about how they're able to improve the research productivity in order to have a successful portfolio of products.

Now, let's think for a moment about the pipeline for drug development. It is very well established that

there is a shrinking pipeline as one moves from discovery, through development, through the phases of clinical trials, to the marketplace.

You begin with a very large number of candidate drugs. You then begin, as you sift through those possibilities, to eliminate many of them as you go into Phase I clinical trials. Of the 10 drugs that enter clinical trials, perhaps less than half of those will make it into Phase II clinicals. Of those that make it into Phase II, maybe one half will make it into Phase III. And of those coming from Phase III, perhaps 50 to 60 percent will make it into the marketplace.

So a tremendous amount of the cost of R&D, this $350 million, is spent on those drugs that do not make it to the final marketplace.

Second, because the timeline is so long, because one can expect an average of 10 to 12 years from discovery to the market, one has the time value of money very much factored into the high cost of drug development.

So let's go back to competition. How are firms able to compete in this market? Well, the answer depends upon where they are.

If we look at the phases of drug development, we can see that, in the early stages of discovery and development, the barriers are predominantly technical

barriers. The cost is relatively new. One can access a wide variety of new technologies in order to explore new lead compounds for the development of drugs.

Once you begin to get into the clinical, the costs go up, and the predominant barriers become your ability to manage movement through the clinical trials. They become predominantly regulatory barriers. And once you enter the market, one then has market barriers to entry. And it's predominantly the technical barriers that I would like to focus on right now.

We see a number of interesting changes that are taking place. Again, the strategy needs to be: How can you take a finite amount of resources, whether it comes from profitability in the existing drug sales or whether it comes from equity markets, and effectively bring it into new drug development?

And it's been a very interesting time, because when you look at the pharmaceutical industry, you see the large companies, the large firms, spending on the order of 12 to $14 billion on research; and those firms are trying to manage a very large portfolio.

You see another set of firms, which represent the approximately 1300 entrepreneurial biotech firms, of which about 250 are public firms, spending on the order of 5 to $6 billion a year. Most of that money -- or at least until

recently -- was not from profits but rather was from the equity markets.

How are these companies able to survive?

Well, the fragmentation I spoke of earlier, you also see very much in terms of fragmentation of the technology. One of the interesting changes over the past five to eight years has been in drug discovery. Drug discovery once was considered to be the province of the individual firms, not to be out-sourced, to be retained as a resource as a unique competitive advantage.

As a consequence of new techniques -- of combinatorial chemistry, combinatorial biology, screening of a large number of molecules against very specific targets -- the issue of drug discovery to find those initial nuggets of lead compounds has become the province of not just the large companies but very many of the small companies as well, whether it be screening, remote jungles in the world, or using combinatorial techniques that allow you to play this numbers game more effectively.

Second, we find that when you look at our understanding of the molecular biology of disease as it has evolved in the past 15 years, the ability of both small and large firms to identify targets has also changed dramatically. So one can create a competitive advantage in a particular therapeutic area through fundamental science of

the molecular and cell biology associated with the disease.

This has cause a tremendous amount of opportunities. One can now go in and begin to intervene in a disease at a very early stage where you're dealing with the processes at the genomic level through a variety of therapies; or one can identify the biochemical process of a disease and interfere at specific sites later in the cascade of biochemical developments.

So the opportunities to identify targets, the opportunities to screen large numbers of molecules and, I believe in future, the opportunity to apply rational computer-aided design techniques for drug discovery, are going to make this game a very different game of drug development than we saw before, looking back only 10 years. And it means that the number of players in terms of small companies and large companies is very large and can continue to be very large.

That's on the positive side.

On the negative side, in order to be able to play this game, the amount of resources that one needs as a critical mass are also increasing. And as a consequence of this, one sees a lot of merger, acquisition, and partnering and alliance formation in order to gain some economy of scale, some economy of scope and take advantage of the spillovers that occur when you have different disciplines,

different approaches working together within the same organization.

Now, let me jump back to the question of how does one fund such development -- and the model that I think is very useful to keep in mind is shown here -- that when we look at funding such developments from profitability, that we look at an industry whose revenues are capped, where there's an existing pressure on the revenue line, yet the R&D costs are going up. The cost of developing a new and successful drug continues to increase; and, as I said before, it increase both because of regulatory pressure, that increases the timeline, and it increases because frankly, we've discovered the easy drugs; and the amount of work that goes into drug development is much greater now than it ever has been before.

So the R&D line within the industry is increasing at the same time that the revenue line has seen a lot of pressure.

Well, this has caused the firms to look at other aspects of their business. Manufacturing, for instance, which was once considered not to be so important strategically for this industry, all of a sudden becomes an opportunity for improvement and the ability to save money in manufacturing to fund the R&D effort. And you begin to see some restructuring of emphasis within the firms.

For instance, in the industry, on average, 25 percent of revenues represents the cost of goods; whereas, 17 to 18 percent represents the R&D line.

Now, this means that if we can save 4 percent per year in manufacturing costs, we should be able to expand our R&D budget on the order of 7 percent without having to diminish shareholder expectations and being able to still pay out taxes.

Firms are beginning to see this. And as we look around in the industry, we're find the firms beginning to look at their manufacturing organization as a point in which they can exert a competitive advantage in terms of improving that manufacturing operation, reducing the cost of goods, and being able to contribute the resulting increased gross profitability to the R&D line so that things like manufacturing -- and one can say the same thing for marketing -- represent a new source of revenues within those firms that are currently profitable.

And this is causing many of the companies to, again, look at how they can consolidate with other companies, how they can consolidate their manufacturing operations to again gain some economy of scale as well as scope.

Now, the other part of this picture is what do they do with those funds? And here you can see that, when

they use that profitability to fund the R&D line, their ability to generate new products depends upon the slope of that curve, which is the research productivity.

Those firms able to manage R&D in a very productive way are able to gain a competitive advantage in terms of their future product portfolio.

Now, let's again go back and you can see that I'm trying to iterate between competitive advantage gained by controlling the revenues, gaining access to increased revenues for research on one hand, and competitive advantage gained by managing the R&D line on the other.

Let's take a look at this development line for pharmaceutical products. We see that it's in the neighborhood of about 10 years long, with the discovery process itself taking two to five years, and the various stages of clinical trials representing another six or more years.

If you were to plot money versus time, you would find that the expense would go up exponentially, meaning that one has to manage this process of product innovation by intervening very early in the lifecycle of a new product.

And perhaps the biggest success is getting rid of those products that aren't going to make it at an early stage so that you can focus your efforts on those that are likely to make it in the latter stage.

When we look at this product development line, we see three areas of innovation. The first is, in the early stage, product innovation. What can be done to create new and successful products? Well, today, many of the competitive products are not only those that are felt to be new products that could be protected vis-a-vis patent for composition of matter, but also new products that have less side effects than existing drugs. And a lot of the drug discovery effort has been focused on finding drugs that are more specific where their action is well defined and where the side effects are minimized. It's at this point where one can effectively use new techniques of drug discovery and drug design.

The second area of innovation occurs in the process development. One needs to pay attention to the cost of goods in manufacturing not when you're in the business of manufacturing but many years before that when you develop the process.

This is particularly true for biologicals where the process and the product are intimately coupled together. In biological, such as the products of the biotech industry, the product is defined by the process, as opposed to drugs which are typically more well defined chemically, the product and the process can be developed a little bit separately.

The third area of innovation represents manufacturing. And as I have already mentioned, this is an area where firms are continuing, and increasingly so, to focus on opportunities to reduce the cost of goods produced.

Many of the manufacturing innovations come not just from the technology of manufacturing but how that manufacturing itself can be managed.

One of the other points I would like to draw your attention to and build upon is this issue of innovation in manufacturing.

To understand manufacturing in the industry, one needs to understand the structure of the pharmaceutical industry globally.

And we find that not all firms do all value-added steps in the synthesis of a product. In fact, many firms only do part of the work.

We can look at the participants in the pharmaceutical industry as having three major components. There's the fully integrated brand name pharmaceutical firm in which the drug discovery process is taken through active ingredient manufacturer, formulation, fill, finish, marketing and distribution of the drug.

Many firms, however, participate differently in this business. There are the generic manufacturing firms which manufacture the bulk active ingredient, and then there

are the multi-source firms which will purchase bulk active pharmaceutical drugs worldwide and distribute to a variety of markets.

And you can see from this figure that these constituencies are very much intertwined, and the competitiveness of each of these types of firms, of course, differs.

When you look at drugs that are generic drugs, have been on the marketplace for sometime, are not protected by patents, there is the opportunity to produce them anywhere. The barriers to entry are less than when you have a patented product.

One of the interesting trends we see is that bulk active ingredient manufacturers become increasingly global. There is an increased amount of offshore production of active ingredients when then can be accessed by either multi-source firms or even the fully integrated pharmaceutical firms.

You have with the brand name pharmaceutical firms the opportunity to take a drug all the way through to its final package form. Yet, when a drug has gone off patent, traditionally, as ancient ago as 10 to 15 years, these firms would not continue to necessarily participate in those same products because they wouldn't have the same leverage in terms of profitability. And this became the opportunity for

the multi-sourcing firms.

However, today one of the things that you find from some of the consolidation activities within the industry is one in which the brand name firms are becoming very much intimately involved with generic practices, both in making bulk active ingredients as well as having their own multi-sourcing operation for distribution of generic products.

So one is seeing the structure of the industry in terms of the participants, how they behave, and how they carry out the activities from synthesis through distribution to change dramatically.

Now, let me summarize some of the observations with regard to manufacturing that we've made in looking at this part of the industry during the past several years.

Manufacturing has become a point of competitive advantage. As I mentioned before, 25 percent of the total revenues are spent on cost of goods. The industry is finding that it can become more competitive by attacking that number and trying to bring it down in order to provide additional funds for support in R&D. This alone can't be done as an effective competitive strategy, and it needs to be done in concert with improvement of research productivity.

And when you begin to look at the actions of firms

in the industry, you find that on one hand they're seeking to improve their revenue stream to the R&D line and, on the other hand, trying to improve their R&D expenditures in order to be successful in their product portfolio.

Well, one can look at this picture and begin to write what one might call a prescription for competitiveness for this industry. And the items that I have outlined here are not meant to be all encompassing but to represent where firms are focusing in order to increase their competitiveness where, again, competitiveness is access to future products, clearly a variety of issues that are focused towards improving research productivity.

Those firms that are able to spend less than the $350 million a year per successful drug will have a significant competitive advantage. And they, of course, can do that by shortening the time line or reducing the cost outlay for unsuccessful drugs so they can focus their research dollar.

Second those firms that have focused on unmet medical needs are looking at dollars from an expanded market and not from a market receiving increasing and intensive pressure on the revenue line.

Third, firms who have developed a strategy to go to emerging markets where when you look at the rest of the world, while representing less than 20 percent of annual

drug sales, is one that is expanding relatively quickly.

Essential to this prescription is the ability to create and maintain an environment that is conducive to innovation. That requires financing. Any barrier which restricts the flow of dollars into R&D is going to have a detrimental effect on the competitiveness of these firms.

Regulation is one of those often cited barriers to constraining the cost of drug development.

Yet, the question becomes not an absence of regulation as a goal but rather a balance of the appropriate amount of regulation insuring safe and efficacious drugs on one hand in the absence of over-regulation or perhaps even worse unclear regulation for the process of drug development.

The support of government research in the biomedical community has been a unique competitive advantage for firms in the United States because of the very large medical community both within the government and the academic institutions that we have.

In addition to this list, excellence in manufacturing is leading this industry to, again, generate revenues for support of the R&D line; and one has to be able to respond to this changing customer with a greater amount of buying power than the customers have ever had before.

We look at the pharmaceutical industry as a

responsive industry, one that is undergoing considerable change, being subjected to considerably pressure, primarily from the pricing side, but one that is responding increasingly effectively.

And I think that a title to an article that appeared in the New York Times on the 18th of October read, "Drug Makers' Results Hold Up In Spite of Pricing Pressure." And I think this particular headline describes the pressure which is very characteristic of this industry.

Yes, it's under pressure. But on the other hand and on the positive side, it's a responsive industry which is going to meet these pricing pressures as long as it can competitively develop a portfolio of products for the future.

And I will stop there and would be glad to address any questions.

Thank you.

CHAIRMAN PITOFSKY: Thank you, very much Professor Cooney.

You have been watching this industry for awhile now -- 20 years, maybe more -- to what extent do you feel that it's become more international?

It was international 20 years. Companies were selling into each others' markets. But has that changed? Is that all the more so in the last 20 years?

MR. COONEY: Yes, I believe it has.

It's interesting when you look at the distribution of drug sales around the world and you find that, over the last 10 years, 33 percent of the market has been in the United States.

Yet, you find that the successful companies who are participating in these markets, if they want to participate, they must participate globally, that even though the distribution of sales has been relatively stagnant -- "stagnant" is not the right word -- has been relatively constant in order to be competitive in that environment, you need to enter the marketplace globally.

For instance, it's very clear that it's faster to get a drug approved and to see revenues from that drug in Europe than it is in the United States.

So you find that many of the new drug entries are first generating revenues abroad before they're generating revenues here. And that becomes important to a firm's competitive position.

The drug sales in Japan for instance, representing 21 percent of the world's market, are very substantial with very high profit margin. And there you compete with an industry that is much less innovative in its new drug development than the Western European or U.S. headquartered firms.

So, again, you find that it becomes an attractive market that you really must participate in.

So for a number of reasons it has become very international.

CHAIRMAN PITOFSKY: Thank you.

And perhaps some of the other speakers will want to address this, but I want to give you a chance to as well.

On your prescription for competitiveness, which looks about right to me, have you encountered people who say that antitrust has been a problem in getting to those goals?

MR. COONEY: There have been concerns that some of the consolidation which has been driven by the need for economy of sale, economy of scope, could be looked at from an antitrust point of view, that that would be a barrier.

There have been concerns raised about possible antitrust action that would relate to technology transfer and consolidating technology positions to develop a competitive position.

So it's an issue which has been raised and is some concern, but it has been secondary to the barriers of raising capital, on one hand, and meeting regulatory demands from other agencies on the other hand so far.

CHAIRMAN PITOFSKY: Thank you.

Commissioner?

COMMISSIONER STAREK: On one of the overheads, you

had a graph of various barriers that were encountered by pharmaceutical companies. And you talked extensively about some of the problems with regards to regulation by other agencies and some of the barriers that were encountered during development stages.

On that chart there was also a section which described markets barriers. And I was wondering if you could elaborate on, or discuss, what market barriers you had in mind?

MR. COONEY: Not as well as a I can discuss the other areas, which is why I stopped short in elaboration there.

I think some of the market barriers that we have looked at in our program include the pressure that's being brought to bear by consolidation of buyers: The larger the buyer, the more pressure you have on pricing.

The government, as a buyer, is certainly one of the constituencies that has put considerable pressure on the pricing line.

The regulatory constraints associated with labeling often affect the size of the market and the speed with which you can get your product on the market. And when you realize that if you take a drug that's selling $100 million a year, that's roughly $300,000 a day on a seven-day week, so that days of delay into the market place have a big

impact on generation of profits to pay back the very large expense in drug development.

So these are some of the kinds of issues. There are many other issues in the market; and I think, perhaps, colleagues here would be better able to address some of those than I'm prepared to do this afternoon.

COMMISSIONER STAREK: Thank you.

CHAIRMAN PITOFSKY: Sue?

MS. DeSANTI: I have a question. I was a little bit confused in talking about the drug discovery phase.

MR. COONEY: Yes.

MS. DeSANTI: On the one hand, the positives were that there were a large number of players and that new techniques, such as combinatorial chemistry were enabling more players to enter into that.

On the negative side, I heard that it was costing more.

I'm wondering what your sense is of whether there are just as many players trying to get into drug discovery as there were 10 or 15 years ago or whether there has been a change in that?

MR. COONEY: Oh, there has been a dramatic increase in the number of firms seeking to be in the drug discovery business.

When you look at the 12, 1300 biotechnology firms,

most of which are private, most of those are in some aspect of the drug development business, in many cases have identified a single molecule around which they are investing their limited resources.

In other cases, they are building businesses around the ability of drug discovery, and then they leverage that with a partner.

For instance, you find an increasing number of companies, whether they be genomically based or whether they are based on rational drug design or using combinatorial chemistry and combinatorial biology that are seeking to partner with larger biotech firms as well as major pharmaceutical firms in very specific disease areas.

So the number of players, the number of discreet activities within a large number of firms in drug discovery is quite high. It's gone up very, very quickly.

MS. VALENTINE: You, I guess twice, mentioned -- once initially in your talk and then later in responding to the Chairman -- that the mergers were taking place to take advantage of economies of scale and scope to contain spillovers that might otherwise benefit competitors.

Can you be a bit more specific about what economies of scale and scope really are in various instances of this business, when they're real, when we would know them, things like that?

MR. COONEY: Well, the objective for a successful firm is to develop this portfolio of products to go forward in the future. The larger the firm, the larger that portfolio, both in terms of numbers of compounds as well as therapeutic areas.

In the research stage, there can be economies of scale with some of the areas of research -- toxicological testing, for instance, some of the discovery efforts, some of the pre-clinical development -- that you get by developing a number of drugs in parallel so there can be some economy of scale and also scope and spillover associated with research.

You also have the opportunity to improve your manufacturing organization. Many of the traditional firms have a large number of manufacturing plants. And, in fact, there's a tremendous excess of manufacturing capacity worldwide. A lot of this excess capacity has occurred as a consequence of geographic barriers to markets. These geographic trade barriers within Europe, within Latin America have been greatly reduced. So the need for this distributed decentralized manufacturing capacity is much less.

And you find that by consolidation of the manufacturing organization, you can reduce the number of plants, get a better distribution of your plants and satisfy

world needs.

So there's an economy of scale as well as scope in those operations as well. And, likewise, in market distribution, there are additional economies of scale.

So the economies come from several different activities.

CHAIRMAN PITOFSKY: Claudia?

MS. HIGGINS: Hi, Professor Cooney.

You mentioned at the outset of your talk that the structure of the industry is rapidly evolving and also that there are many more price pressures on the products once the pharmaceutical manufacturer is fortunate to get a product that succeeds and gets it on the market.

Have those two factors affected, from what you know, the way that the pharmaceutical firm decides which research to follow to completion?

MR. COONEY: Yes. Given that there's not only pricing pressure today -- and I think it's fully expected that pricing pressure will increase with time; it's not something that's going to go away -- and with greater knowledge of the cost of drug development, each individual firm must be more strategic in its selection of drugs that it can invest resources into.

Firms that have chosen to go after more modest markets -- perhaps those that are defined by the Orphan Drug

Act where you have some protection when you enter the market -- can be attractive. And without that Orphan Drug Act to protect certain classes of products in smaller markets, you probably would have, where there's an expectation, there would be less companies vying for those market opportunities.

When you look within the firms and how they view a drug development effort, they're very concerned about the issue of reimbursement and about how they're going to be able to justify the cost that they'll need to cover their development costs, a price to justify reimbursement of their development cost.

So we see changes in how their strategizing about which products to go after, how to deploy the resources. It has an impact on how they can build and grow a research organization, how they'll focus their research efforts.

Yes, it does have a significant affect.

MS. HIGGINS: Do acquisitions, in your opinion, have any affects on that as well?

MR. COONEY: Absolutely. And one of the strategies that has become increasingly common -- in fact, just during the past '93 to '94, the number of acquisitions -- or alliances, rather, that have taken place has approximately doubled between smaller firms and larger firms, largely to gain access to technology and/or product

lines for development.

When you look at a 10- or 12-year development cycle, costing per successful entity, over $300 million, most of that money -- most of that cost is associated with the opportunity cost of the money that you investment.

So it becomes very logical to look at an acquisition of a product opportunity when somebody else has already spent money to get through some of the early development stages.

So you find firms acquiring opportunities of products as they're now into the clinical trial stage or pre-clinical or later into the clinical trial in order to manage the risk.

So this large number of -- you know, this 12 or 1300 firms, many of which will consolidate, some of which will disappear, many will consolidate because they provide opportunities for drug development by larger firms.

Personally, I think this is a very healthy environment and one that maximizes the opportunity to transfer technology from the university, from the government research labs into therapeutic practice.

So I see it as a very healthy environment in that regard and one that I think will prove to be more cost-effective in the long term.

CHAIRMAN PITOFSKY: Thank you.

Moving on, our next participant is William Green, Senior Vice President, Secretary and General Counsel at Chiron Corporation in Emeryville, California.

Before joining Chiron, Mr. Green was a partner at Brobeck, Flagger in San Francisco where, among other things, he Chaired the Professional Compensation Committee and served as the Practice Group Leader in Corporate and Financial Services.

In the past nine years, Mr. Green has served as Director of the California Foundation for Molecular Biology. And for the past eight years, he has been a Director, as well as Chair, of the Audit and Finance Committee for the Irwin Memorial Blood Centers of San Francisco.

Mr. Green?

MR. GREEN: Well, thank you, Mr. Chairman.

The company that I represent is Chiron corporation. It's named after the Greek centaur in mythology that delivered the healing arts from the God to Aesculapius. The name was thought up by the founder's son who happened to be studying Greek. And I keep telling that story mostly because gets it Chiron and Chiron wrong the first time out.

Chiron is able, I think, to bring to this audience a couple of more focused perspectives. We are in the biomedical research and development business and not more

globally in the pharmaceutical industry. I guess we are part of the more global pharmaceutical industry, but I would liked to be focused with you today on the product information part of biomedical research and development.

That segment of activity is intensively innovative. It's producing now products that I think have the prospect for transforming the practice of medicine, in addition to transforming the economic and commercial industry in which that occurs.

Perhaps because of that highly innovative component of product development, it's a very useful paradigm for this group to be studying in terms of understanding innovation and understanding innovation in a complex, technical environment and an environment where there is, undoubtedly some prospect for a role for competition analysis.

I would like to make essentially four points with you today. The first of them are, I hope, a factual delivery of testimony; and the last is my opinion.

First, biotechnology and biomedical R&D is highly innovative and is, therefore, socially highly desirable.

Second, that that biomedical R&D is translated into commercial utility, largely through the incentives provided by the intellectual property law. There is almost no biotechnology R&D that goes on anywhere in the developed

world that isn't subject to patent applications with the result that the patent monopoly and attendant intellectual property rights are every where present.

I think a case can be made that without those incentives, the translation of research into commercial products would be dramatically less effective, particularly when the fruits of the R&D are coming from governmentally funded and university supported research institutions.

Third point, biomedical R&D relies very heavily on collaborative active and cooperation among private and public entities in order to translate this technological innovation into commercially realizable products.

Chiron is highly collaborative. It participates in a very large number of joint activities in the research and development process for biomedical products. By it is, by no means, unique. Essentially all of the major products that have come to the health care industry from biotechnology are the creature of some collaborative effort, and frequently complex collaborative effort that involves university or public sector activities followed by private sector activities by entrepreneurial companies and then downstream commercialization activities by the major pharmaceutical companies.

My last point, which is essentially conjecture, is that, at least in the area of R&D that I'm familiar with, I

don't think that the emergence concepts of antitrust regulation based upon a mark for innovation provide a very robust theory, yet.

I don't think they provide sufficient rigor to have a useful or predictive or predictable framework in terms of describing what might be potentially distortive anti-competitive effects. And I think that the application of those kinds of theories before they are robust and rigorous have some risk of imposing a cost or a tax on the innovative process here which I think is critical.

This outline departs a little bit from my outline that I provided to you earlier. I did that for two reasons. One, I thought it made more sense because I didn't really like the outline very well after I read it again. And, second, the outline contains an embarrassing Freudian typographical error.

On page 2 where I say that I'm going to talk about highly cooperative activities which confine technologies, that should be "combine technology" not "confine technology."

I can't imagine talking to the FTC about "confining technologies."

Let me go first, then, to the innovative nature of biomedical research. We are in the process of, I think, creating products which will, in fact, transform the

practice of medicine. We are beginning to introduce products that are providing treatments, for the first time, for major unmet medical needs.

I think over the course of the next 5 to 10 years and maybe well beyond that, this transformation can have a very significant affect upon society and public health.

At Chiron, we have recently introduced with our partner Burlex the first treatment for multiple sclerosis that has ever existed in Beta Interferon.

We are in the very late stages or very early regulatory stages of approval with our partners from Sefalon for the first treatment for Lou Gehrig's disease, which is a debilitating, always fatal neurodegenerative disease. The product there is called Insulin-like Growth Factor 1.

Interestingly we a cloned and expressed that product in 1982. That product was in development with other partners for 11 years without finding a successful home, without finding a disease which it could effectively treat.

The application of IGF-1 for neurodegenerative diseases was not obvious. And our partner Sefalon undertook the risk of investing in that program. It now appears that we're going to, for the first time, have a treatment for Lou Gehrig's disease in a circumstance where all of the smart people in the world, including ourselves, didn't think that the application was possible.

These transformations in the medical practice are likely also to result in structural changes in the health care industry.

Some of these relate to the fundamental change which is possible in the value cost model that new technology can bring to health care.

For example, it has to be more economic from a society perspective to rely upon vaccination and disease prevention than it is to rely upon new treatments for diseases once they are incurred.

The investment by biotechnology companies generally in new models of vaccination and immuno-prevention and immuno-therapy have the real prospect of resulting in an aggregate reduction of health care for society.

The same is true of finding new ways to diagnose disease and new ways to provide information from diagnosis to the practicing clinician so that the clinician, in real time, can judge the effectiveness of currently available therapies or prospectively created therapies.

What are the characteristics of innovation in the biotechnology research market? Well, first, as Professor Cooney pointed out, it's expensive. Biotechnology offers some process maybe of reducing the aggregate cost of that if we can get to be better at predicting those things which will work well from those things that won't work well. We

aren't there yet.

And it's quite unlikely that we're ever going to get to a reduction of those costs by an order of magnitude because of the heavy component in those costs of the clinical trial process, which is required here and elsewhere, in order to gain regulatory approval for these products.

Further, the innovation occurs in an environment where it is not always -- in fact, it is rarely -- predictable what the outcome will be. Most of the cost are a good part of the opportunity costs associated with that expense to develop successful products relates to the cost of bringing along unsuccessful products.

And biotechnology, while it is getting better at helping people understand the mechanism of action of disease, is not perfect at that. In fact, it's far from perfect, with the result that our innovative activity is also occurring in an environment in which innovation occurs in a non-predictable, non-linear.

Professor Cooney has pointed out to us the long lead times associated with this, typically 10 years, occasionally up to 15 years, from laboratory or concept discovery to product introduction, during which time very substantial investments have to be made in order to realize on the commercial opportunity.

This long lead time and high expense means that substantial investments get made prior to the time that you even know whether commercial reality is going to provide you with a pay back.

Professor Cooney points out that the pharmaceutical industry as a whole and the biotechnology industry is highly fragmented in the research part of biomedical research. It's even more fragmented than that, because the number of players that are participating are probably in the multiple hundreds, perhaps thousands, because you have to include the hundreds of universities around the world that are seeking money to perform research activities for their own purposes.

Some of that is funded by national entities here, the National Institutes of Health, and other countries; but a large portion of it is also funded by private capital.

These players are all competing for research money and, in some respects, are all sources of innovation within the biomedical community.

Further, at the very early conceptual level of understanding what it is that is invented that makes a difference in biotechnology and biomedical research, it isn't a very expensive proposition. A laboratory with 10 people is probably an efficient and effective entity for early stage, basic research.

Now once that basic research has occurred, it dramatically increases in scale and scope in order to develop that into a product. But the innovative activity, which is generating the enthusiasm in biomedical research occurs in quite small economic units.

And there is no real barrier to entry of that other than knowledge of the participants. And knowledge of the participants is not difficult or not terribly difficult. It isn't an insurmountable barrier in any event, in this area, because of the high degree to which research results are published.

For ethical, scientific, academic, prestige, other reasons, most of the founding technology in biotechnology, at least in the medical arts, is published in peer reviewed periodicals almost as soon as it occurs. The only gating item on that is an effort to secure patent protection prior to the time the publication occurs. But it's nearly instantaneous.

The results of product innovation in biomedical research, obviously, fall into output markets or product markets. These, I believe, are essentially global, and they are highly regulated. And they are regulated with differing regulatory regimes in differing countries, which presents some geographic differentiation with respect to market entry.

But all players seeking to commercialize products of biomedical research, I believe, seek to use those results essentially in the entire developed world. And the process is really a question of cost and time in order to get the regulatory approvals necessary to do that in each jurisdiction.

Professor Cooney points out that the market is becoming increasingly price sensitive as buyers become more concentrated and as more governmental entities, particular in Europe and Japan, become more increasingly involved in establishing the prices of products in those markets and as reimbursement or private insurer entities in the United States and elsewhere become stronger and more sensitive to price and cost of health care delivery generally.

So how does the industry deal with these high costs, these high levels of uncertainty, it's rapid evolution?

The answer is that it does it by collaborating. And I believe that collaboration is essentially the only way that we, then, manage -- we have been able, successfully, to translate the developments in the industry and in universities from the mid 70's on, into commercial products.

Chiron has been a significant participant in collaborative activities. We have had, over the past five years, several hundred funded programs with over 50

universities. We have about 650 currently active agreements in which we provide biological materials for research purposes to others, principally universities.

We have, currently, over 300 active collaborations with other companies in private industry. Those run the whole gambit of activities from straightforward licensing, to transfer of material and information in a sharing environment, to research for hire, to more complex commercial collaborations that seek to have us participate in downstream activities in addition to the basic research activities that have been our strength.

These collaborations, as I pointed out earlier, are frequently complex. They frequently involve public sector activities. They almost always involve an entrepreneurial, smaller company and in the end, typically, have involved major pharmaceutical companies in commercialization, manufacturing, marketing, and selling.

The first product of biotechnology is an excellent example of that. It's recombinant human insulin, which was first commercialized in 1982. It's a product of research work funded by the NIH and others at the University of California, San Francisco, and the City of Hope Hospital in Los Angeles. The fundamental applied research activity was done by Genentech and the product was ultimately commercialized by Eli Lilly.

The same is true of the most important of the largest product of biotechnology, Uretroproiten (Phonetically), which was discovered in the University of Chicago, exploited by Amgen and Johnson & Johnson; and our first product, which is a vaccine for Hepatitis B, which was, essentially discovered in the University of California, San Francisco, developed by us and commercialized by Merck.

The reasons for collaboration are obviously. Whether it's risk sharing, it's portfolio diversification, it's seeking to get downstream cooperative complementary assets necessary to translate the product of basic research into a commercial activity.

Those items are not available typically. They aren't easily exploitable at all by researchers in universities, of course. There are relatively few biotechnology companies that are vertically integrated. Chiron is close to being one. There are probably a handful of others that are vertically integrated.

But even for vertically integrated biotechnology companies, it's not possible to develop all or even most -- or even some, in some case -- of the fruits of the early research into products.

While these generally, complementary, vertical aggregations of skills and technologies are necessary in order to commercialize products, they aren't the only

collaborations that we have done; and they aren't the only collaborations that are being done sponsored by the pharmaceutical industries generally.

There are other collaborations in which it's necessary to bring together different sources of technology and different technologies.

In drug discovery that's now under way and more particularly in efforts to understand future, better, the existing mechanisms of action of disease and to find channels for bringing useful therapeutic agents to a disease site, it's frequently necessary to combine extensive knowledge of biological activity with delivery systems, with methods for delivering the biological agent to the site of the disease, for causing that biological agent to be effective, bringing together the components of that is an artform in collaboration, because essentially no university and no company, including the major pharmaceutical companies, have all of these technologies internal to themselves. And even if they did, it would be impossible to maintain those at the state of the art.

Therefore, to move technology at the state of the art from the laboratory to commercial product, I postulate, that it's always going to be, or at least for the foreseeable future, likely to be necessary to have substantial, technology collaboration between participants

in the biotechnology research environment.

A good example of the analysis that might have underpinned a look at this kind of bringing together of complimentary technologies is the recent acquisition that we made of Viagene, which is a gene therapy company located in San Diego, in the course of the Hart-Scott-Rodino review of that acquisition, I had the good fortune to chat with several of our participants on the table here about whether the existence of a gene therapy program in Chiron was additive to the gene therapy activity Viagene, with a view of understanding whether there really was a market for innovation issue presented by that combination.

I think the straightforward answer was that there were easily a half dozen private companies that were pursuing gene therapy as a technology. And there probably were a dozen universities that had substantial programs in gene therapy. And there is an unknown number of major pharmaceutical companies that also are pursuing gene therapy techniques, so that the basic methodological approach is not something that was concentrated at all by this activity.

For fundamentally, however, it seems to me that the relevant analysis was, and should be, how is gene therapy being applied by Viagene and Chiron or two other companies that are proposing to collaborate in this way?

And that requires some look at what might be the

desired applications for the gene therapy approach, where the most obvious one for considering in that case was seeking a gene therapy approach to treating AIDS.

There are, however, probably a half dozen other known approaches to AIDS that are approaches that are being pursued by others independent of gene therapy. These including straightforward biological programs and immune stimulation programs and the like.

And the number of participants that are seeking non-gene therapy approaches to AIDS probably is in the 50 to 100 level as well, with the result, it seems to me, that we have fairly easily demonstrated the notion that there was no competition or consolidation issue with respect to that technology.

What, then -- if I can be allowed to postulate for just a minute on market for innovation? What, then, does biomedical research tell us with respect to the emerging concepts of markets for technology or markets for innovation in the antitrust context?

I just don't believe that biotechnology provides substantial support for these theories as are now articulated. I don't believe that the analytical approaches are strong enough to provide a replicatible or predictable analytical approach to the facts as we see them as likely to emerge in biomedical research over the near term.

Plainly, there is a generalized market for innovation. That is you can buy R&D. But it's utterly fragmented, and there are thousands of participants in that market. And as I indicated earlier, it's easy to enter; universities are the big player; and the public sector is as well. There is essentially no market concentration, no sense of market power, in the generalized market for innovation as it relates to biotechnology.

An analysis of product or output markets that are characterized by a substantial innovation is also, I suspect, possible; and biotechnology and the biomedical research area certainly is one. There is, in this area, a great deal of flux, a great deal of change, triggered by technology and science.

But the analysis, again, here has to start with a definition of what the useful output market is. And it seems to me that the conventional tools of antitrust analysis, likely, are sufficient to provide protection of those output markets to the extent that they are definable.

To the extent they aren't, either because of global issues or the notion that innovation operates over time to transform markets, then I wonder whether we aren't looking into too foggy a glass if we attempt to apply innovation market analysis to biomedical research.

I would note, for example, that the

Roche-Genentech case in 1990 before the Commission, called up as one of its issues the overlap between the two companies of their seeking research programs to find a CD-4 cell-based therapy for AIDS.

Well, they weren't the only ones trying to do that. We were, too. It's now five years later, and there is no such product.

So I have to suggest one will find it hard to predict what product overlaps for biomedical research are really likely to have near-term product implications.

In fact, I suggest that it isn't really easy to predict success before the end of Phase III clinical trials.

Professor Cooney points out that a substantial fraction, maybe 40 percent, of products in Phase III clinical trials don't work. That being so -- and that being so late in the development scheme -- that's in the ninth or tenth year of development; that's after $300 million plus or minus has been invested in this. Still, with that level of unpredictability, it seems to me that it isn't at all obvious that a close scrutiny of the facts in those circumstances are going to yield particularly predictive or replicatible results.

It further is not possible to predict performance attributes of products even after Phase III clinical trials. And performance attributes are products which can plainly

shift market share. It will depend typically on the claims that ultimately are allowed to be advertised by the FDA and comparable regulatory regimes in other jurisdictions.

Those claims aren't knowable with any certainty until the regulatory agency speaks and are only dimly perceivable at the end of a Phase III clinical trial.

I may be beating a dead horse. So I will stop here on that note?

CHAIRMAN PITOFSKY: Well, I have some questions here for you.

MR. GREEN: Let me make one further comment, Mr. Chairman, if I can; and it's a fairly obvious one.

And that is that, if an analytical tool is not highly predictive of the outcome, then the application of that tool is a cost to the subject matter that's being regulated.

And I submit that if the subject matter that's being regulated is innovation in health care, it's a high cost to society to subject it to that kind of a burden without having sufficiently robust and sufficiently rigorous analytical approaches to provide predictable results.

And with that, I will retire.

CHAIRMAN PITOFSKY: Thank you. You raise some fascinating issues.

I agree with you that the predictive ability, when

you're talking about R&D markets, is far less than when you're talking about production or sales markets. But let me understand what you're saying.

You mentioned gene therapy. You mentioned the merger that your company was involved in. I wasn't clear whether you were saying: Look, why worry about a merger in that area? There were six other companies and a cluster of universities who were doing similar work.

Or are you saying that even if the six companies in that industry all got together and merged or got together in a single joint venture, that there's really nothing to be lost in society, that one is as good as six or, in any event, it's so hard to predict that we ought to keep our hands off?

MR. GREEN: Well, we were benefitted by having both those arguments available to us in our review with the Commission.

I guess I would submit that it is not obvious that the combination of parallel technology programs presents an antitrust risk in a clearly definable output markets sufficient to justify an extensive analysis of it. Now that's a pretty aggressive position, and I don't know that I have to defend that to the end.

CHAIRMAN PITOFSKY: Well, spell it out for us. I mean doesn't rivalry and competition have something to do

with stimulating energy in the research market as well as the sales markets?

MR. GREEN: I think biomedical research innovation is stimulated by activity that is much earlier than the kind of activity that we are now talking about in the late stage of development.

Plainly the fundamental innovative stuff that goes on in universities is not driven by commercial competitive activity.

Further, I believe that the 1300 or so privately financed biotechnology companies that are pursuing opportunities are doing it without a close scrutiny of competitive activity. There is a general awareness of what others are doing. But I don't believe it's spurred by competition, per se.

I don't think that competition is harmful here at all. No, competition, plainly, is a useful factor.

CHAIRMAN PITOFSKY: Let me clarify one other point that you made. Or maybe I just didn't get it right.

You were talking about Merck and Lilly and the fact that when you get further down the line, you're going to want a company who has complementary abilities to market the product.

How early in the process do you commit to that marketing company? I know it varies. But, in general, do

you commit to a marketing company at the very early stages of R&D? Or do you wait until you move down further?

I know you talked about needing money to finance the R&D; although, the capital market is certainly generous to the biotech firms and thinks very well of them.

How does that work with dealing with the marketing company?

MR. GREEN: I think it varies with the biotechnology company. Typically earlier in the research program that you can gain support from a corporate partner, one, the more that validates your technology and makes you attractive to capital markets; but, two, the smaller share of the downstream pie that you get.

So to the extent you can afford to and have the competency to move a product downstream, in applied research and maybe into pre-clinical development you're going to be able to obtain a better price for the technology when you transfer it.

And, by far, the dominant fraction of biomedical research activities by the smaller biotechnology companies are in that model.

There is an effort to bring them as long as far as you can and then to partner up.

CHAIRMAN PITOFSKY: Susan?

MS. DeSANTI: I have a couple of questions.

One, I was intrigued by your comment that a lot of the research is visible because it's all published in the journals.

Is there a point at which the research becomes invisible or secret?

Are you talking primarily about certain processes? Or is there a distinction?

Because the impression that I always had was that R&D was always conducted with a great deal of secrecy.

MR. GREEN: I think that there are a couple of unique aspects of this industry that cause the research activity to be more visible than might normally be the case.

The first is the large component of it that goes on in public institutions and academia.

The second is the ethical issue associated with having discovered an important health issue and keeping it secret. I think the industry, in all of its dimensions, is very good at publishing information that can be beneficial to others in developing complimentary technology and the like.

Now, they do it after patent applications have been filed. But there's quite a lot of publication here.

Now, further, is, obviously, trade secret-type R&D that goes on with the industry, too, most of that I think is downstream activity. It's process development activity or

it's methodological things. It's: How do we approach these kinds of problems? Which are tools of the trade which can be valuable.

But I think as to the product breakthroughs, the kinds of things that result in compositions of matter or approaches that would be translated into commercial products as opposed to processes for creating products, I think that tends to be quite open.

MS. DeSANTI: One follow-up questions to one of the Chairman's question.

Talking about whether there was any firm that would follow from a combination of parallel R&D tracks, six tracks going to one, isn't there a potential of a loss of what may, in fact, turn out to be the right track?

We have talk a lot about how many tracks turn out to be the wrong path way.

If you go through and you combine six into one, isn't there a potential that you're going to lose the one that actually would have worked out, and then you'll have a delay getting the product to market?

MR. GREEN: I guess, conceptually there's a possibility of that happening.

If I had six paths going on with a single company -- and, in fact, Chiron does have four different paths underway to discover a therapeutic for HIV.

Now, it's doing because it doesn't know enough -- neither does anybody else -- to be able to select among those paths. But as it becomes able to do so, because one looks more promising than another, it's going to select the more promising of those paths.

And I submit that that's part of efficiency. That's something that you would like to have happen.

MS. DeSANTI: Right. But if the decision is made simply because there's a combination of companies, rather than there's a decision made that this is, in fact, not a worthwhile endeavor compared to the results you're getting in some other path.

I mean, isn't that a potential cost?

MR. GREEN: I think it would be a potential cost; but I don't know, as a matter of fact, of any such circumstance. So my factual testimony to you is, I don't think that happens very much.

MS. DeSANTI: To what extent does Chiron have simultaneous different R&D tracks going on directed towards the same potential application?

MR. GREEN: It's quite rare. HIV is really the only one.

MS. VALENTINE: Actually, both you and Professor Cooney, too, I think this research diversity issue is quite interesting.

Both of you, in terms of intra-firm and inter-firm research diversity, how much is that diversity determinative, both of the costs of any one company, and its results? And how much would it be determinative of results among or across companies? Having more or less diversity?

MR. GREEN: I'm not sure I understand the question well enough to answer it.

MR. COONEY: That's why I was passing it to you.

MS. VALENTINE: All right. To what extent does research diversity in itself, let's say in your firm, become a significant factor in your costs?

And to what extent, also, is it a significant factor in your results?

That is, do you want it very much because it is what tends to get you good results, if you don't start out with your four tracks, you won't even find the one?

And to what extent, however, is it also a cost, which I think I'm hearing from you and that you want eliminate the costs as quickly as you can focus on the one?

And does it make a difference when you're looking at it within one firm and across many firms?

MR. GREEN: Maybe I can dodge that question artfully.

I'm not sure, as a lawyer, I'm very well skilled in answering the question on whether diversity and

innovation is constructive or not.

My impression, generally, is that a single firm would drive to efficiency and would want to be focused as early as possible. And the elimination or reduction of alternative diverting activity should be a goal. I'm not sure that it always is, but I would think that would be the model.

Now, across firms, maybe we can ask Professor Cooney to comment.

MR. COONEY: The question of research diversity within a firm is one that's a difficult balance of cost, as was pointed out.

First of all, one of the important ways that the research programs have evolved in pharmaceutical biomedical research in the last decade or so is the ability to focus on the molecular basis of disease.

Now, in order to develop very targeted drugs in the most efficient competitive way, you need to invest a fair amount of money into understanding the molecular basis of disease from the point of transcription of DNA all the way to expression of proteins and their subsequent actions in the cell.

This requires some diversity in research and molecular biology, cell biology, molecular genetics, and the like.

As a consequence multiple therapies have evolved. For instance, I know of a number of firms where the use of gene therapy versus a protein replacement therapy versus small molecule design as possible mechanisms for treating the same disease are under active consideration.

When the opportunity is big and it's an important target, that diversity, I think, is important to competitiveness.

And I think in the Chiron case where he described HIV, that's an example. But the firms are very selective when they create that kind of diversity.

Diversity amongst firms is very common, because, again, when you develop a strategy for drug development, you recognize today that there are multiple targets.

We aren't screening 500,000 compounds against virus or an infection or some disease process; but rather we're saying: Here's a receptor to which we would like to bind a molecule, or: Here's a transcriptional event in the cell which we would like to inhibit so the different firms take on different strategies based on their core technology. And it's that core technology amongst different firms that creates a diversity across the firms.

So there is some of both. And there is a high cost associated with diversity. And you can only afford to do it if you have the revenue stream and the target is big

enough.

CHAIRMAN PITOFSKY: Claudia?

MS. HIGGINS: Hi, Mr. Green. I assume that since we talked about the Viagene acquisition and even though our theories are somewhat less than well developed, we came to the right decision; is that --

MR. GREEN: Yes.

MS. HIGGINS: Okay. As you, inside Chiron, look at your Phase II, for example, development drugs -- drugs that are in Phase II, I know, are costly, but they only get even more costly as you move into Phase III -- how does the number of other companies working in Phase II in the same area affect your decision about whether to spend the research and development to go into Phase II?

MR. GREEN: There probably is an increase in the hurdle rate of predictive success that you would have to have if there were a great deal of other companies or significant other companies and you knew them to be ahead of you.

The trade offs are pretty obvious. By the time you get into Phase II, you will have invested four years, five years, plus substantial dollars. And if you think that you have a good shot, fair shot, some shot at coming up with a product which is differentiatable or yours will work and theirs won't, it's quite likely you'll pursue it.

So my sense is that people tend to pursue those opportunities if they think there's a reasonable basis for success and differentiation in the ultimate product.

MS. HIGGINS: If it looks like your product may be the fourth B-2 product would you pursue it?

MR. GREEN: No. I mean, there's obviously a declining slope there.

MS. HIGGINS: Would the third or the second be yes? Or where can you draw the line?

MR. GREEN: It must be something where you would balance the opportunity of the size of the ultimate market and the technological risks that are in front of you.

I think, typically, people do pursue second products. At least they do if the first product is still in trials itself.

MS. HIGGINS: And fourth is probably typically not? Whereas third is the middle range?

MR. GREEN: I'm guessing.

CHAIRMAN PITOFSKY: Okay. Let's take a very short break to allow the reporter to catch his breath and get a new supply of paper.

But we can resume in about five minutes, I think.

(Whereupon, a brief recess was taken.)

CHAIRMAN PITOFSKY: Resuming these proceedings, our third participant is Derek Schafer, Chairman and Chief

Executive Officer of Schafer International, an international technology transfer group that provides opportunities for technology commercialization, especially in health care and biosciences.

From 1990 to 1994, Dr. Schafer was President and CEO of British Technology Group U.S.A. and Executive Director of the United Kingdom-based parent.

During his 20-year career at BTG, Dr. Schafer was responsible for various types of technology transfers, primarily in the area of pharmaceuticals and biotechnology.

In addiction, he led many of BTG's licensing campaigns, including one that established MRI scanner patents as a major source of revenue for the organization.

Dr. Schafer has the unusual vantage point to comment not only on innovation technology but innovation technology in a global context.

It's a pleasure to welcome you here.

MR. SCHAFER: Thank you, Mr. Chairman.

As you have said, I have spent most of my career taking technology from a variety of different sources and moving it, transferring it, to a variety of different companies and working with those companies to develop the technology, put it on the market.

And what I wanted to do was to provide some fairly general observations on the subject that we are looking at

today from that vantage point.

I think the first observation that I would make is that the commercial world has changed dramatically in relation to new products and innovation, and I think that's quite general. Companies have to find new products. If they fail to innovate, they lose out in the marketplace.

What was possible some years ago to have a dominant position with products which had been around for a long time and were not the best products is no longer sustainable. Indeed, I think what we have witnessed in a variety of industries in recent years is companies, as they fail to innovate and rapidly and effectively, in comparison with their competitors, actually are finding themselves fighting for their very survival.

So I think the overall conclusion is that technology has moved to the top of the list of factors which determine market performance and, indeed, which the regulators have to look to when analyzing market dominance.

And what I've tried to do is, in relation to the biotech and pharmaceutical industries, is to distinguish two different types of technological resource, if you like, which impacts on success in those industries. And I think they have rather different consequences.

The first is basically a critical in-depth ability to deliver the products through the whole innovative process

to market.

And the second is the process of inventiveness, if you like, for making those imaginative steps forward that create products that make a real difference.

Now, in relation to the first of these, the depth developmental expertise and professionalism that's needed is really dictated by the nature of the industry. It may be a matter of ensuring product safety, dealing with regulatory bodies, meeting a whole variety of standards, or just the sheer technical complexity of the area.

But whatever it is, there's usually a very substantial amount of expertise and depth needed in order to compete.

And in the pharmaceutical industry, as we have heard already today, the requirements for proving safety and efficacy to the satisfaction of the FDA and other regulatory bodies around the world, embodies clearly -- and has to be -- a international industry; and, indeed, of satisfying those requirements because it's sensible and wise to do so, means that companies have to build up resources which really require a great deal of concentration of expertise. The process is a very lengthy one. And that ability to go through all of the development phases, conducting clinical trials, and so on and the sheer organization of that. It has proven to be very difficult to build up and to break

into by new participants in this marketplace.

For many years, it appeared to be a really insurmountable barrier to entry into the pharmaceutical industry, which is not as serious an issue, because, as Professor Cooney has pointed out, this is a very and has remained a very fragmented industry in terms of having a large number of players.

But that's not because it's very easy to become a pharmaceutical company.

Now, I think that in this context, the development of the biotechnology industry has been a very, very important issue in terms of competition in the marketplace.

When I say "biotechnology," I'm really using it as a shorthand for what are now quite a diverse range of companies which are focused on new innovation approaches to the pharmaceutical market whether that be by biological products or by combinatorial chemistry, a whole variety of very technically sophisticated approaches.

For the reasons that both of the previous speakers have touched on, the biotechnology industry, which has been fueled by a combination of venture capital -- and the United States is absolutely outstanding in its record with these companies -- and innovative science, they have tended to find their initial strength in the introduction of new products in the whole process of innovation.

And I think my particular recommendation in relation to the biotechnology companies is that antitrust needs to recognize them as a very positive force for competition in the pharmaceutical industry and in particular to ensure that the development of antitrust doesn't hinder their ability to raise capital and to compete.

I think it is important to recognize that an industry which is dependent upon investment capital and investor sentiment, rather than on cash flow from existing products, has a financial strength which can fluctuate quite substantially over relatively short time scales.

The development of sizeable presence in the marketplace is not easy to achieve. And the companies, again as William Green in particular has pointed out, have to rely on often complex commercial and technical relationships with both other companies and diverse sources of technology.

And I think we need to ensure that such relationships are, by and large, treated sympathetically by antitrust.

As I say, the other ingredient of technological success is a difficult to define quality of inventiveness. And here, my observations over many years are that the ability to protect those innovations -- and in this industry, patents are absolutely crucial -- that that

ability is uppermost in terms of making sure that the process of innovation works.

So, again, it seems extremely important to me that patents are integrated into antitrust thinking in a very positive and constructive way.

And I think we should dwell for a moment on this whole business of patents, because I think it's not intellectually immediately obviously that a patent should be such a positive force in innovation. It is, after all, a limited monopoly that's granted to the innovator.

And I think the underlying truth is that monopoly promotes competition. Perhaps that's not something one should say too loudly in this building; but, of course, monopoly also has adverse effects on competition.

But in the area of technology, the limited monopoly granted by a patent is vital in stimulating the process of innovation. It provides both the financial incentive and the protection of the investment, without which the invention of new products would not happen.

And the limited monopoly granted by a patent, in my view, should not be regarded as in conflict with the antitrust laws but of really defining the border line of an area where the pro-competitive effects of monopoly exceed the anti-competitive effects in the area of technology.

And I think this translates also into commercial

transactions involving patents. For example, while the division of a market between companies who would otherwise compete is clearly a legitimate area of concern for antitrust, I would take the view that the division of a legitimate monopoly in the form of a patent between competitors should be regarded -- or at least should be presumed pro-competitive, absent clear evidence to the contrary.

Finally, however, I think technology can be argued to allow companies to acquire market dominance beyond that anticipated by the patent laws and in a way which may not be in the best interest of society.

But I also support some of the concerns of the earlier speakers, and William Green in particular, that one has to be very careful in extending that concept too far away from the actual reality of competitive products competing with each other or being prevented from competing with each other in the marketplace.

But I think genuine concerns do arise where a company acquires or mergers with a competitor or competitors and in the process effectively controls all products which are in the pipeline, where they can be clearly seen to be in the pipeline and where those products are not created solely by their own inventive efforts.

And clearly, the concerns of this sort have been

raised in relation to recent mergers and acquisitions in the pharmaceutical industry, which I'm sure we will see many more.

In my view, the changes in the industry are fundamental. And it is those changes which is prompting the merger and acquisition activity rather than any desire simply to concentrate market power.

I think, indeed, the pharmaceutical industry has been a model of competition in the area of innovation in which the natural response to the development of an innovative product protected by patents has not been to attempt to buy the company or the product but to go out and develop a better product and use the protection of a patent to protect the effort and the investment needed to compete in that way.

But I think it is right that in looking for concentrations of market power which are not in the public interest, antitrust should be looking to public pipelines as well as existing products. I think that's in the pharmaceutical area, in part because the time scale of development of those products, makes the potential impact visible for some considerable time out.

I will come onto that again in a moment.

But the general concept is fine. I think that antitrust faces a great deal of special problems in seeking

to alleviate concerns based on technology-based accumulation of market power.

As I said, pharmaceutical development is spread over time scales of many years and usually is very visible because research and development is, again, as earlier speakers have commented, largely conducted in the public domain, particularly at the clinical stage in an open and publishing environment.

On the other hand, it is absolutely critical to recognize the risk of catastrophic failure in that process, which means that a product at a relatively early stage of development can't be regarded as having the capability of contributing to this concentration of market power without also taking into account the very substantial probability that it may not appear as a product at all in the marketplace.

And all of the other issues which antitrust is familiar with in analyzing these things, such as market definition, can be made more problematic when you look at technology-based markets.

There's a risk, I think, in being lured into a narrowed market definition by technical distinctions which can be drawn between products; but then, on the other hand, it is clear that new products with substantial advantages can fundamentally change a market.

And one of the traditional approaches of dealing with -- obviously, the Commission is involved in dealing with perceived anti-competitive -- a factor of a merger acquisition is divestment. And I think divestment of a technology of a product under development is something which raises a great many new and perhaps unfamiliar problems for the Commission.

They're problems which, to some extent, are familiar to those already engaged in the business of technology transfer and licensing. Firstly, a product development program is not an entity which you can separate from all other company activities. On the contrary, the program is usually made up of contributions from throughout a company's development function, most of whom will not be the subject of divest when a product is transferred out.

The transfer of information, data, and technology to someone else at new staff, new laboratories is a very difficulty process to carry out without damaging the integrity of the asset.

And timing, again, can be absolutely critical. This process of hand over of a development of a product from one company to another at a critical phase in the product's development can raise all sorts of difficulties and may, indeed, dictate a completely different recipient of the asset.

And, thirdly, the commercial basis for transfer is frequently problematic. Again, as one of the fundamental problems, I think, encountered in the business of technology transfer, is valuation of technology. And basically the timing and assessment of the risks of failure are critical to the process of valuation and very difficult to forecast.

To some extent, licensing, rather than absolute disposal of a product or absolute transfer can address some of those uncertainties of valuation. But, then, it may not amount to a divestment in the sense intended by the Commission.

And even in that case, I think there are some fundamental difficulties reflected by the pharmaceutical industry which is one of the most sophisticated technology transferring licensing industries, still carries out much of its technology transfer by a process of bartering of assets rather than simply buying and selling them, rather like commerce before the invention of money.

The FTC has turned to people outside the Commission to help in the process of divesting of technology-based assets. And it's my privilege -- and I should admit -- to being involved in one such situation, the Glaxo-Wellcome merger.

And my experience leads me to conclude -- it doesn't help you a great deal -- each case requires a very

careful analysis of all the facts and there's no easy way to see rules or to set rules as to what should or shouldn't be done in each case.

But I think a final general comment, I think in recognizing the importance of technology-based markets, the Commission is becoming an important force in this business of technology transfer. And I think there may be an opportunity for the Commission to work with technology transfer professionals and organizations to try to find ways of securing efficient technology and to explore creative solutions to technology-based antitrust issues.

Thank you.

CHAIRMAN PITOFSKY: Thank you very much. I agree with you. These are among the hardest competition policy questions that we encounter.

Let me ask you the same question I asked Professor Cooney. My take on innovation markets is that antitrust -- not just here -- but antitrust for 100 years has been very generous and, by and large, almost never interferes with a joint R&D venture, cross licensing, and so forth.

Have you run into situations in which antitrust rules or, perhaps more importantly, a lack of clarity in antitrust rules have actually slowed down or impaired innovative developments?

MR. SCHAFER: I think it's a difficult question to

answer with a clear yes, because I think the impact of perceived antitrust regulations is to prevent things from happening.

And so I have a sense, but I can't think of any very good examples where certain collaborations and cooperations may have not taken place because of concerns about the antitrust issues.

CHAIRMAN PITOFSKY: But none that you were directly involved with?

MR. SCHAFER: I can't really identify in my mind any good examples of that.

CHAIRMAN PITOFSKY: You haven't seen it yourself in your own businesses?

MR. SCHAFER: Well, certainly in the business activities I have been involved in, concerns about antitrust have always been present, particularly in making arrangements to transfer technology to move a product from one place to another.

One has been concerned about the way in which the antitrust laws have impacted on that.

Frankly, that was more of a concern in past years than in recent years. I think the developments in the United States have made the business of technology transfer easier rather than more difficulty. And I'm not sure that I would say the same thing about developments in Europe.

CHAIRMAN PITOFSKY: That's very helpful.

Anybody else?

MS. VALENTINE: A quick question. Both you and Mr. Green talked about the value of patent protection to competition innovation in the biotech industry.

And I'm wondering -- there obviously have been studies done and different industries respond differently in terms of how important patents are as opposed to simply being first or having a first-look advantage or having even better marketing services -- is there something about the nature of innovation in biotech that makes patents at least so successful in each of your eyes?

MR. SCHAFER: First of all, in pharmaceuticals, generally, I think that industry has worked the patent system in a way which has been very effective in the sense that I think patents have applied to discreet products, and competition has then been to develop other equally protectible discreet products aiming to be better at meeting the needs of the end customer.

I think in the biotech industry -- and Mr. Green may have more insightful observations to make -- but I think there, to some extent, that is also true; but then the nature of the products, perhaps, small chemical entities are more easily protectible in a distinct way than some of the biotech industries.

But patents certainly have been, I think, very important, both in providing the incentive to develop and in providing the basis for the collaborations which are critical in that industry, too.

Certainly there have been other industries where patents have not been treated in quite the same way. And I think that's -- I mean, certainly in the medical imaging industry, it's often quite a considerable difficulty to identify whether or not what a company is doing is covered by a particular patent or not. In a way, which I think is more -- perhaps as a chemist, I can complain that physics isn't more difficult to patents than chemistry.

MR. BLOOM: Could I answer that question as well?

CHAIRMAN PITOFSKY: We have a patent lawyer here. Bob Bloom will be testifying in a moment.

MR. BLOOM: One of the factors that are present in the pharmaceutical and biotechnology industry is the generic drug industry.

And the FDA only allows a very small window of exclusivity. And unless that window is extended by patent protection the time to recover the investment will not be there.

So with the availability of vociferous generic competition, as soon as the patent expires, the generics will be on the market; and, generally, the pioneer drug

company -- or biotech drug company, will lose enormous market share very quickly.

So the patent protection is needed in order to insure recovery of the investment.

MR. GREEN: I would just reiterate that same point, maybe with two separate perspectives.

The first is, obviously, if you're dealing with a 10-year product development cycle that generates costs in the hundreds of millions of dollars, it's kind of hard to take that on without having some assurance of being able to obtain a payback from it.

The second point -- and perhaps the unique point to biomedical research -- is that a big part of it is the translation of NIH-sponsored and university-sponsored research, which is being done much more effectively in the United States than it's being done elsewhere in the world, in part because of the university willingness to apply for patent protection.

Many universities in Europe are doing interesting biomedical research, but there is no comparable translation of that research into commercial products or much less comparable translation of that into commercial products, in part because of institutional, legal, or societal reluctance to use intellectual property laws to protect that and to permit a commercial opportunity to be developed and

exploited.

The Baye-Dole Act in 1980 encouraged cooperativity at the NIH level and encouraged the patenting of government-sponsored research results, specifically in order to cause that commercialization to occur.

And I believe that the patent law is absolutely critical to the realization of the societal advantages associated with this research.

I don't believe it would occur without patent protection.

MR. COONEY: Can I just add an additional point?

You raised the question: Is there something special or different --

MS. VALENTINE: Right. I'm not doubting what they are saying. I hear them. And in fact in the studies I think that often one sees that the pharmaceutical and biotech companies are the ones that will name patents as the best way to protect some of their investments as opposed to other industries.

What I'm really to trying to get at, I think, was a bit more of the initial issue of if it's discreet as opposed to cumulative?

I mean what is it about that innovative process that so benefits from the patent protection where we hear often from other industries that patents don't particular

help us; it's far more important simply to be there first or whatever.

MR. COONEY: I think there are several aspects to addressing that.

One is that, first of all, in the biotech part of pharmaceuticals, there has been a tremendous amount of new discovery. New discovery sets up the opportunity for intellectual property production. And then the patent activity in this area has been exceedingly high.

Second, the new science that has evolved has also generated new technology, a new technology both as part of the discovery process; new technology aimed at diagnostic around a health care; and new technology aimed at manufacturing.

And we have looked at the issue, particularly from the process side, and found a tremendous amount of activity in the process aspects of bringing biotechnology products into commercialization.

So the strategies that companies have evolved have been a combination of a labyrinth of patents around the composition; functional opportunities, where possible; diagnostic opportunities, whether they wish to use them or license them away; and process patents in order to enhance a position in the marketplace.

So in pharmaceuticals in general and biotech in

particular, it's been possible to create a barrier of labyrinth around the intellectual property that's proved very important as one can see from some of the litigation that's taken place in creating very nice markets for some products.

Could I address your --

CHAIRMAN PITOFSKY: Yes. Absolutely.

I think we ought to move along if we are going to stick to our schedule here.

Our last participants are Stephen Stack and Dr. Allen Bloom.

Steve Stack is a partner at Dechert, Price & Rhoads where he Chairs the firm's Antitrust and International Trade Practice Group. His practice focuses on a spectrum of antitrust issues with special emphasis on acquisitions, joint ventures, and intellectual properties.

He counsels several pharmaceutical companies on antitrust issues.

In 1993 and 1994, Mr. Stack served as Vice Chair of the Antitrust Section of the ABA. And in addition, he recently Chaired the Task Force responsible for the ABA Antitrust Intellectual Property and International Sections Comments on the '95 intellectual property guidelines.

Dr. Allen Bloom is a partner in the business department and a member of the Intellectual Property Group

of Dechert, Price & Rhoads.

Among other things, his practice focuses on pharmaceutical, biotechnology, medical device, and chemical patent law.

Before joining the firm, he was Vice President, General Counsel, and Secretary of the Liposome Company. And before that he was associated with Phizer and RCA.

Steve, do you want to lead off?

MR. STACK: Well, we are offer complementary assets here, as you can see from the bios.

What I thought we would do is have Dr. Bloom just stress some of the points in our written remarks that have not already been covered. Many of them have already been discussed. And then maybe I'll add a few thoughts after that.

CHAIRMAN PITOFSKY: Dr. Bloom?

MR. BLOOM: The area that I would like to add some remarks to regard the establishment of patent positions in the biotechnology industry, why they occur, as they occur; some comments about licensing in potential new products for when the company licensing in those products already has products on the market; and, thirdly, just a minor comment about the unpredictability of success just to reiterate some of the comments that others on the panel have already made.

Because, as the other panelists have indicated,

there is a huge cost of developing a product in the pharmaceutical/biotechnology industry, they really are the same, the earlier approach may be different; but ultimately it is the same pharmaceutical industry.

In order for the small biotech company to receive significant funding, there has to be some assurance that there will be exclusivity for the product that emerges at the end of the 10- or 12-year discovery and development pipeline.

In order to do this, it's quite common when a new company is either starting out or is staking out a new direction to survey the literature and see what is out there in the world of patents as well as in publication.

Generally, the source of the technology will be either university-based or federal laboratories, such as the NIH, or it can be a technology that is licensed from a larger pharmaceutical company or from a biotechnology company that, for whatever reason, is not interested in pursuing the technology.

Generally, the analysis begins with looking at whether the inventions that will be the core technology and lead to products are protectible. If the technology is not protectible, either because there's nothing new in it or else there's a thicket of patents that others have, often the funding will not materialize; and that avenue will not

be developed.

If, on the other hand, the breakthrough is significant and a way appears to be establish a significant patent position that will prevent copying of the product, then the several approaches could occur.

If the invention is from a university, generally they license into the university, and that will be the core of the company's technology.

If there are other universities or other players or companies or universities laboratories that also have intellectual property, early on an announcement will be made: One, whether the technology can be licensed in to form part of the core protection for the proposed product; or, secondly, whether the patents will expire before the product hits the market; or, thirdly, whether the patent is such that it is generally believed -- thought this is, again, would be a high-stakes bet that the patent is invalid for whatever reason.

In order for a new entity or even existing entity to engage in a research direction, it is important that the entity have the flexibility. We have heard that most things don't work. And that's certainly true with the early stage of research. And it's important that when one starts a research program one knows that there are alternative ways to go so that if one avenue is unsuccessful, then there is

another avenue, related but different, that may be successful. And they may be done in parallel or, though often for cost restraints, there's a prioritization of which approach to take.

And it is generally preferred to try and assemble some sort of patent portfolio at the early stages that gives you that freedom of action.

Also, the cost of assembling a portfolio is much cheaper at the early stages since the failure rate is so high, generally the price for putting together such a portfolio is relatively inexpensive.

I might add that because there was so many approaches -- and in the pharmaceutical industry, biotech industry, if there is a significant market, either a significant patient population or a disease that can be addressed -- there are so many people trying so many approaches that the possibility of establishing a patent position that will keep all players out is really impossible.

Plus there's so many new innovations going on at all times, particularly in universities, but also in industrial laboratories, that it's real a fool who trys and stop all competition and all approaches.

The primarily goal is to obtain exclusivity for the likely products that will be developed from research.

And the focus is generally generic competition and how long the product life will be after approval before generic competition enters the market.

Because once that occurs, essentially, in this day and age, the run is over. The market share declines extremely rapidly, and it's of no interest to whoever has that product on the market. They may continue selling it and make some money from it, but it's really not significant at that stage.

Since the time to market is so long, 10 to 12 years, sometimes the earliest stage acquisition of patent and patent applications is really insufficient because if one looks at the lifetime which is now 20 years from the filing date of a patent application and given the length of the regulatory approval cycle, there can be relatively short amounts of time left in the patent.

So one of the bets and one of the necessities is that additional innovation be made along the way that will add additional life to the product. And that is unpredictable but necessary at a fairly early stage in order to allow the development process to go forward.

Patents and patent applications are also important from a cross-licensing point of view, since it's virtually impossible -- other patent applications that were kept secret may arise. Where one was unable to get a truly

exclusive position, it may be necessary in the future to have trading cards to cross-licenses so that one or two -- both parties that are developing the same or similar parties with products will be able to reach the market without having to have a blood letting in the patent litigation.

Also, a patent portfolio can allow cross-licensing to occur with another entity that may have a stream of product candidates but a relatively weak patent position; and the combination of the two will allow products to be developed where they might not otherwise.

Another area that I wanted to talk about a little bit was the licensing end of product candidates by a company that already has a product on the market, because, as I said earlier and others have said, competition is so fierce among biotech companies and pharmaceutical companies to develop new and improved products, the fact that one has an existing product on the market is really not very relevant as to what the position will be in a few years down the line when other products will also be entering the market.

In order to do that analysis, since the ability to reach the relevant physicians and purchases is available to many companies and the fact that one has an established marketing presence with one group of doctors, is really not all that important when a new product is coming on the market that may have enhanced attributes of safety or

efficacy or costs.

Plus, there will soon be generic competition for almost any product of any size so that the idea of obtaining product candidates and not developing them is really not a very rational strategy.

I've had one experience where the antitrust laws almost got in the way of a deal.

The question you have been asking everybody else.

CHAIRMAN PITOFSKY: Yes.

MR. BLOOM: It was in a product area where there was an old product on the market that had been there for a number of years, and my company had come up with a new approach that improved the safety and efficacy of the product.

And the large pharmaceutical company did what they said was an antitrust analysis, and very narrowly defined the market and essentially defined the market to include the existing product and our improvement.

And there was not enough clarity at the time -- this was eight or nine years ago -- for them to easily conclude that there were no antitrust issues.

In fact, a large number of other products have subsequently entered the market and many others are in development; and the narrow approach really made no sense.

But, nonetheless, this was an instant where a

large, respected pharmaceutical company almost didn't do a deal because they were afraid of that fact that they already had a product on the market.

My last comment would be that one uniqueness of the biotechnology industry is that they have had spectacular failures in late stages product development.

There have been several cases in which products have failed to win approval after Phase III clinical trials and submission to the FDA.

So essentially, all the money had been spent, all the work had been done; the stock market was already anticipating a bonanza; and the FDA found that the product was not suitable for approval. And the stock, in all instances, plummeted, shareholders suffered, management and employees suffered; in some cases, the companies were essentially out of business and had to merge; in other cases they've had to rely on other products.

But to somehow say that once you're in Phase III or even finished with Phase II you somehow know for sure that you're going to have a product on the market and you're going to know what the attributes of that product will be is really not the case.

I would like to thank the Commission for the opportunity to speak with them. Our prepared remarks go into more details on this and on other points.

MR. STACK: Just a couple of other thoughts.

One thing that hasn't been stressed today, which I think is the fact, is the tremendous externalities that come from developing a new drug product.

The value of that product is never fully, or even largely, captured by the people who develop it. If you look at the example of the H-2 antagonist anti-ulcer drugs, for example, when you compare the amount of benefit from those drugs given the form of therapy that was in place at the time -- a lot of which relied on surgery -- with the amount of money that the companies that introduced those products actually generated, I think there was a tremendous improvement there; and there's no way that the companies who developed those products realized the full benefit of that.

And I think what others have said earlier about the limited window that you have because of the combination of large buyers now, managed care, and governmental, and generic competition when the patent expires, that's always going to be the case; and it's more so the case now than before.

The point of that is that we're all balancing costs and benefits here, and there is a risk in interfering with the drug development process and the putting together of complementary assets. And the risk is that some product may not get on the market at all.

On the other hand, the benefits of having that product on the market might far outweigh whatever concern antitrust enforcement authorities might have about competition within the patent life.

Second comment has to do with innovation markets, and I second what Mr. Green said.

Let me bring it down a little bit to the more technical level where I operate, and that is in advising companies that are doing transactions to put together put together complementary assets.

When you define an innovation market in this industry broadly, I think, for the reasons people have already stated, it has no meaning. There is so much innovation going on. It's such a diverse cross-section of diverse population of entities that you're not going to get any helpful antitrust analysis.

If you, on the other hand, define it very narrowly, I think you get bad results. I think the reason you get bad results is that it alleviates the burden of having to prove that products in development are actually going to be introduced into the market, which is something you would have to prove if you took a product-based orientation and applied the normal potential competition doctrine.

And I think in this industry, that's a problem.

It's a problem because of the high rate of failure and the high risk involved. If you look at Phase II, for example, the question that Ms. Higgins raised earlier, about 24 percent of the drugs that go into Phase II emerge from Phase II to Phase III.

If you go back to the pre-clinical stage and run the same calculation, you'll find that about 92 percent of the drugs that enter pre-clinical testing don't get out of Phase II.

With that kind of statistical evidence, it seems to me very difficult to make the case that any compound in Phase II should be considered a likely potential entrant in any market.

Yet, if you define the market in terms of innovation, you've essentially finessed that issue; and I don't think you get the right result when you do.

The question of whether antitrust is a problem, I can't point to any transactions that I've been involved in that haven't been done because of fear of antitrust attack; but it is a problem, and it does impose costs; and they're not costs that are all a function of government enforcement.

For example, you enter into transactions that are less efficient because of patent misuse considerations. When you're settling interferences you might enter into transactions that are less efficient. You might settle

patent cases earlier and on more unfavorable terms as a result of the way antitrust approaches patent issues.

And this really leads me to my final point. And it's a hope that one of the results of these hearings -- which I think are a tremendous idea and I think will be very, very fruitful -- but I would like to see the Commission consider whether they could have more transparency in the decisional process with respect to this industry in particular.

What we see is a very small and incomplete view of the Commission's thinking in this industry.

I was interested, for example, in the interchange between Ms. Higgins and Mr. Green about the issue of what I consider to be limited product space. The third and fourth me-too drug is not going to be introduced here. Well, it's interesting to know that the Commission is sensitive to and recognizes that as a significant issue. If you read at intellectual property guidelines, you would not see that.

Secondly, when you see the use of innovation markets in merger cases, it does create concern -- well, concern among some companies, perhaps, doing mergers; but I think more to the point, concern for the day-to-day type transactions which are being put together at a very early stage in product development and which the Commission will never see and don't have the benefit of knowing how the

Commission would ever look at those transactions just from the few little bits and pieces that we get from reading merger cases and the treatment of products in development in those cases.

So one of the things the Commission might consider, for example, is some kind of statement of position to the effect that, perhaps, there ought to be a presumption that a product is not a likely potential entrant until at least it is well into Phase III. And even then, it would be a rebuttable presumption.

I think that would certainly relieve a lot of people that are looking at things in this area.

Thank you.

CHAIRMAN PITOFSKY: A couple of questions.

Dr. Bloom, let me make sure I understand your point about somebody being already in a market perhaps being a dominant company and then buying the next technology.

MR. BLOOM: Yes.

CHAIRMAN PITOFSKY: Is that what you are saying? Are you saying, take Librium and Valium when they were on patent, antitrust should not be concerned if Hoffmann-La Roche at that time had bought a company for this technology, for Librium and Valium?

MR. BLOOM: Well, for example, it's not uncommon -- and it happens throughout the pharmaceutical industry --

for somebody who has a product on the market, let's say, that has a three times-a-day delivery to try and develop a once-a-day delivery system.

They would do it for several reasons. Number one, there's obviously benefit to the patient, of patient compliance of having once-a-day delivery.

It also, of course, as a result, if there's a new patent covering that new formulation, allow it to continue to sell the product.

But, of course, that may be concern because you are extending the life of this product by putting it into a new formulation. But you really have a different product in many ways because it is now once-a-day product than a three-times-a-day product.

And there's been a considerable amount of innovation in doing that. Also, it does not preclude other companies from coming up with other tranquilizers that inherently have once-a-day dosing or otherwise have other safety or efficacy benefits.

So the fact that Hoffmann-La Roche has extended the life of Librium and Valium by putting it in a new formulation or getting a next-generation product, doesn't mean that other companies will not also be developing next-generation products. And that has generally been the way things have worked in the pharmaceutical industry.

Many companies -- if there's a big market for tranquilizers, since the lead time is so long, if there is a new opportunity with a new approach, other companies will be involved in that. So the fact that Hoffmann-La Roche is also involved in a next-generation really is not decisive.

CHAIRMAN PITOFSKY: Would it bother you, if antitrust turns away, that the entrenched company will bid more for the new technology because it's not only bidding in profits down the road but it's protecting existing profit stream?

MR. BLOOM: Well, in a sense, it's not, because if you look at the existing product, the Librium or Valium, once the patent expires, there will be tremendous price competition. So the markets for that product will quickly erode. You're really talking about a new product. And that new product can come from Hoffmann-La Roche; it can from anybody else, because, in fact, the barrier for entry for another pharmaceutical company getting into that business is relatively low.

If you look at the behavior of pharmaceutical companies, they tend to cherry pick indications. The fact that their current product stream would not, let's say, include an H-2 antagonist, if they get a lead in a new product that's going to be valuable in that area, they will develop that product.

And the fact that they are not currently marketing in that area is generally of little concern because they can either -- it's not that difficult to establish a marketing position or deal with one of the dozen companies already in that position.

CHAIRMAN PITOFSKY: Good. Thank you.

Roscoe?

Susan?

MS. DeSANTI: I wanted to clarify a couple of things.

Steve, when you were talking about your concerns about the use of the innovation market and you were focusing on what you saw as an absence of the discipline of having proved that, in fact, these are likely potential entrants, these are going to be products that actually will come to market.

Is it your view that there is no actual competition going on between companies in different phases, at different stages in the clinical trials during that?

Is there no actual competition in research that is taking place if there are two or three or four companies that are all pursuing lines of research for a product application that would be the same?

MR. STACK: I guess the thought is -- there is competition, I guess, in some sense. In some final sense,

the company's ultimately want to introduce a product in the market.

But what I'm saying is, even if you had four viable products from a strictly technical standpoint where you have an industry that has limited product space, you might not find that you really have potential competition that's meaningful in the sense that only one of those, and probably the best one or the best two are going to get to the market.

So I think you have to focus your concern on that question.

And, secondly, I think that there's a very good chance that none of them will get to the market; and you have to balance against the possibility that that rivalry actually means something. And I question how much it really means in terms of ultimate results against the possibility that you are depriving firms of actually a greater chance of getting the market through a marriage of complementary assets.

MS. DeSANTI: Suppose the companies that are merging don't make any arguments to us about why this particular acquisition or merger is going to result in the merger of complementary assets or particular economies of scale or scope but is simply an add-on to the other things that are being merged because these two companies are coming

together, do you have the same level of concern?

MR. STACK: I guess I don't have the same level of concern. If they can't identify it, then perhaps you're making a bet that at least has some value on the side of preserving that competition against no value on the other side. You have that choice in a lot of mergers.

If you posit that situation, I agree I have less concern

MR. GREEN: Could I make a comment in response to that?

CHAIRMAN PITOFSKY: Yes, please

MR. GREEN: While I agree with that analysis in the merger context, I do think there is a potential chilling affect in the day-to-day collaborative activity circumstance, if the analysis is being performed and is being published in a way which is not rigorous or reproducible or predictive.

And, therefore, even though in the specific transactions you're worried about, there may be no countervailing benefit or no countervailing benefit asserted and, therefore, it's okay to worry about the competition for innovation, it seems to me you would need to be careful about how the spillover affect of that may influence other activity.

MS. DeSANTI: Let me just follow up and make sure

I'm understanding your point.

Okay. Suppose whatever the explanatory document was, whether it was the "Complaint" or the "Aid to Public Comment," or whatever it was made clear that, in fact, there were no arguments that had been advanced for why this particular combination would combine complementary assets that result in particular economies of scale or scope, would that be helpful to you?

MR. GREEN: Yes. But my thesis is that, in the main, we don't know enough about these products in order to apply a rigorous analysis to them at an early stage in their development.

I don't know whether the right stage to count them as potential products is when they're in the FDA or when they're in Phase III or something else.

But early on, I don't believe we're able to make valid potential product competition-kinds of analysis about them.

So to discuss this in terms of an innovation market, it seems to me, creates the aura that there is an important innovation protection interests that is being afforded here and I think has the potential of having some chilling affect on collaborative activity.

MS. DeSANTI: Let me ask what your understanding is of early on.

What do you mean by "early on" as opposed to later in the process? When do you think you have better predictive ability? At least to weed out the likely losers.

MR. GREEN: The statistics that we've heard suggests that the dice are still being rolled in the Phase III clinical trial process.

Prior to Phase III, I don't really think there's a chance of being able to make a good prediction.

MS. DeSANTI: Does Chiron ever weed out efforts before Phase III? And if so, on what basis do you do that?

MR. GREEN: Sure. But the assumption here would be that the management of the enterprise has made the decision to go forward; and, therefore, you're conclusion would be somebody's made a critical judgment if there's a high enough probability in order to continue to invest in it

And I think there's maybe some merit in that, too.

But I also think that it isn't certain that that's the case; and, therefore, I would argue, why should the engines of public policy be policing this?

MR. STACK: If you look at the statistics, there are a lot of weed-outs, if you will, well before Phase III, you know, some 92 percent. And not all of them are due to technical failures. Some are weeded out because of what Professor Cooney said earlier: The product space is limited; and if you're going to efficiently use your R&D

resources, you're not going to be spending a lot of money developing the third me-too drug in a particular pipeline.

CHAIRMAN PITOFSKY: Okay. Well, I wanted to mention that this is not the first time we have heard the suggestion that transparency would help everybody involved, and that's an issue that we're going to have to deal with in an eventual report here, possibly thinking about some explanation of reasons why we don't take action as well as reasons why we do.

MS. HIGGINS: Could I throw a question out? I mean, as a company -- this really goes to Mr. Green, I guess -- when we do make a decision as the Federal Trade Commission about whether to challenge or not to challenge a transaction in which you're involved, how can we provide the public the information you're asking us to provide without disclosing the kind of confidential information you had to provide us to make that decision?

That's what keeps us from telling the public forum.

MR. GREEN: I don't have a good answer for that. And I also support the notion of transparency and the notion of guidelines.

And I think the guidelines that can provide clarify and predictability, which means some certainty about the scope and practical application of safe harbors is

important here.

CHAIRMAN PITOFSKY: Well, thank you very much for an insight into an unusual and, therefore, unusually interesting pair of industries.

We stand adjourned.

(Whereupon, at 4:45 p.m., the hearing was concluded.)

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C E R T I F I C A T E

DOCKET/FILE NUMBER: P951201

CASE TITLE: GLOBAL AND INNOVATION-BASED COMPETITION

HEARING DATE: October 23, 1995

I HEREBY CERTIFY that the transcript contained herein is a full and accurate transcript of the notes taken by me at the hearing on the above cause before the FEDERAL TRADE COMMISSION to the best of my knowledge and belief.

DATED: October 26, 1995

SIGNATURE OF REPORTER

Gregg J. Poss

(NAME OF REPORTER - TYPED)