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ECONOMIC DEVELOPMENT THROUGH TECHNOLOGY TRANSFER

HEARING BEFORE THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY OF THE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY HOUSE OF REPRESENTATIVES

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Mr. WALGREN. Thank you very much. It is very interesting. All right, let us turn to Mr. Pearsall.

STATEMENT OF DUANE PEARSALL, CHAIRMAN, COLORADO ASSOCIATION OF COMMERCE AND INDUSTRY, AND GENERAL PARTNER, COLUMBINE VENTURE MANAGEMENT INC.

Mr. PEARSALL. Thank you, Mr. Chairman. I, too, am very privileged to appear before this hearing and especially, Congressman Skaggs, whose career I have watched and participated in for a long time.

I think this hearing process is a very valuable way to look at this major problem involving a major amount of tax resources going into research and development.

I apologize that I do not have written testimony. This is entirely oral. I did not have an opportunity to prepare it.

Mr. WALGREN. No apology is necessary.

Mr. PEARSALL. Let me start at the beginning.

My name is Duane Pearsall, and I am a general partner of Columbine Venture Fund, a typical institutional venture fund. I am also chairman this year of CACI.

I might point out that my background and reputation have always been in small business, and for CACI to use a small business person or have a small business person as chairman, demonstrates that our business organization in the state is broad based.

Mr. WALGREN. CACI is what again?

Mr. PEARSALL. CACI is the Colorado Association of Commerce and Industry, in effect, the state Chamber of Commerce.

I wanted to appear at this hearing because I see the direction of our country relative to our loss in technology leadership being a very serious problem. And before making a statement, let me just identify where I come from and the perspective that I have so that you can place it in context.

I have been, as I said before, a small businessman for 25 years, and I developed the home smoke detector back in 1970. It was very successful, and as a result of that company I was named small business person of the year in 1976 nationally. As a result of that, I was appointed to a number of committees, beginning with the Equity Capital Committee of the SBA in 1976.

The small business cause became an obsession with me for the next four years, and I spent about 90 percent of my time running back and forth to Washington. I testified before the U.S. Chamber, before the FTC, and before Senate and House committees on the general subject of stimulation of the economy through small business, and the inadvertent impediments to small business that exists in our national policy, not by intent but by inadvertent action.

In 1978, I served on an advisory committee for industrial innovation and technology, which was to be a policy review committee involving about 95 Fortune 500 key personalities, usually the chairman or the president of those companies. Five members of that were small business people.

Simultaneously with the development of that committee, the SBA, through Mr. Milt Stuart, then chief counsel for advocacy, de-

veloped a small business high tech committee. That committee became a part of the ultimate report, though it was not part of the formal committee, which was a compliment to the Department of Commerce for incorporating it.

Out of that small business committee came the seeds of the development of what is known now as the Small Business Innovation Research Act of 1982. That act, in my view, has created more commercialized technology than I have seen visible from all of the government labs. This is not an indictment of the government labs. I have not seen signs that the government labs might produce developments that are commercially viable, and I am concerned with this.

At ten o'clock last night, I asked the chancellor of the University of Denver, Dr. Dwight Smith, if I could paraphrase him in this hearing this morning. He reported, in a conference on superconductivity a few months ago, jointly sponsored by the Japanese Export Trading Office and the Colorado School of Mines, a key statement. At the end of his report he stated that the government should look at the \$12 billion currently going into government labs, and look at the meaning to this country in terms of output, and consider diverting a large portion of that into university research where it is more accessible to commercial viability, or to commercialization.

I think he is right on. That editorial appeared in the Denver Post a few months ago, and I saw very little comment to it. I think that it is time that we look at the entire \$50 billion of government research, and as he said, the \$12 billion to government labs, and look to see if that cannot be more effectively used in university research.

Let me spend a minute on the venture capital industry, if I might. Now, I come from a bias. Venture capital industry had only about a hundred million dollars invested in small portfolio companies in 1974. Today, there are over \$25 billion. That is not frivolous investment. Those investments are made through institutional funds and SBIC funds that are a program of the Small Business Administration. That pool now is over \$25 billion, and there is about \$3.5 billion per year of new money going into the venture capital industry.

I consider the venture industry in the United States to be America's secret economic weapon, and very few people recognize it as such. It affects the State of Colorado rather dramatically. Colorado currently ranks seventh in the amount of funds going into small, 99 percent high tech businesses in the State of Colorado. That money is going into usable commercial ventures because the profit motive drives it.

Now, Colorado ranked fourth or fifth for five consecutive years. Only in 1987 did it become superseded by the States of Connecticut and Illinois. In looking into why we slipped in our position, you have to attribute part of the reason to state initiated seed capital funds in those two states. As a result, CACI is supporting a bill which has passed, as of day before yesterday, the Senate House Affairs and Labor Committee of the state. This bill establishes at least two small seed capital funds with the state acting as a facilitator. The funds will be managed by the private sector who will use

the profit motive, and the funds will receive state loans which match equity investments from the private sector.

The first distribution of funds will go back to retire the state loan, and the private sector will remain at ultimate risk. We expect to attract private capital into it because they will get an equity gain of twice their investment.

This raises the issue of capital gains. If I could put in a plug for restoring capital gains, I would like to do it.

Let me amplify that venture capital is America's secret economic weapon. Look at Japan, and see if you can duplicate the venture capital process there. I know it intimately because the largest venture capital company in Japan is an investor in our fund.

You see in Japan, individuals are taught loyalty and diligence from the day they are born. They go to work for life. The last thing in their mind is separating themselves from an industry to start a company on their own. And, yet, that is the mechanism that feeds the venture capital industry in the United States.

So it is unlikely in the next couple of generations that Japan will establish a venture capital community that even compares to a small extent with the United States.

Mr. WALGREN. Let me understand that again.

In Japan, you have employees loyal for life.

Mr. PEARSALL. Yes.

Mr. WALGREN. And that is in sharp contrast to our system.

Mr. PEARSALL. Exactly.

Mr. WALGREN. And is that good or bad?

Mr. PEARSALL. I think it is excellent. In the United States, the person is free to leave a major corporation with an idea to start a company.

Mr. WALGREN. And this you see as a hindrance to Japan?

Mr. PEARSALL. Absolutely.

Mr. WALGREN. Okay, I just wondered how you were approaching it.

Mr. PEARSALL. Take Europe or take Switzerland specifically as an example. It is not a viable mechanism there. In Switzerland, the shame of losing a family's fortune in a business enterprise, and leaving debt, is a blight on the family. The pressure against starting a business as a result is far more severe in Switzerland.

Here, we feel failure is a contribution to the background of an individual. We have invested in people that have been failures before, and we say in a very rational way, they have learned a lot about what not to do.

So United States is unique in this basic structure and the thought process of people, and that causes the venture capital industry to survive. Now, we invest in institutional funds that go into high technology businesses. But in my view, this act, the Stevenson-Wydler Act, has been totally invisible.

In attending association meetings, we see a number of high tech companies displaying their potential. They are constantly in discussions with other venture capitalists throughout the United States. It is a big fraternity. We exchange information, we co-venture all the time. It is an immense resource that the government currently is not using. In talking to all those people, I have yet to hear of a

company getting help from a government lab or getting technology out of a government lab.

To close, let me just emphasize something in the SBIR program, Small Business Innovative Research. Colorado ranks seventh in the amount of awards granted to companies, demonstrating that Colorado is a high tech center. Colorado is also a high tech center for the management of venture capital funds. There is more here than there is between Chicago and California.

But the SBIR program now involves 1.25 percent set aside of R&D funds for all government agencies that have a budget in excess of \$100 million. To my way of thinking and what I have seen come out of it so far, and we invest in a number of SBIR companies, that has been a very valuable program. If I could put in one more plug, Congress should consider increasing that set aside from 1.25 to 3 percent minimum. It has been a very effective program. I believe the agencies will react positively as well as the venture capital community.

Mr. WALGREN. Let me be sure that I understand.

The one and a quarter set aside goes both for research efforts that are responding to a subject area request by the lab, and also fund the lab in response to a suggestion by the private sector; is that right? Both things occur; is that correct?

Mr. PEARSALL. The mechanism is that each agency once a year puts out a manual with a list of technologies that they would be interested in that have commercial viability. Anyone may apply for a Phase 1 grant to demonstrate valid technology. In doing that, they get a \$50,000 grant, and six months to perform that task. At the end of six months, then they can apply for a Phase 2 grant, and that process usually takes another six months. Being awarded a Phase 2 grant, they receive up to \$500,000 and two years to develop that technology. But the basis of that Phase 2 grant is its commercial potential. So that mechanism of government is the only thing I have seen that orients research grants directly to commercial potential.

Mr. WALGREN. In the eyes of the federal agency.

Mr. PEARSALL. Yes, that is correct.

Mr. WALGREN. In other words, they are the one that is judging whether something is commercially viable at that point.

Mr. PEARSALL. That is correct.

Mr. WALGREN. Interesting. And it is a \$500,000 cap at that point?

Mr. PEARSALL. It is up to \$500,000 and two years to do Phase 2.

Phase 3 requires private funding to move the company into the commercial marketplace.

In our portfolio of 31 companies, I would judge that we have at least six companies that have at least one Phase 2 award, and it is a resource for us for technology. Since the SBA tabulates these awards of all of the agencies, it gives us a great resource to follow.

I do not have any constituency to worry about. I am not connected with a large corporation. I am not speaking for the business community. I am speaking as an individual. And I want to correct the governor on one thing.

I am also on the advisory committee of CATI, and it started six years ago, and six of us spent a year raising the first money from the private industry to get the thing started and ultimately sold it

in pieces to the state legislature which now funds it. It is an excellent program. CACI is strongly behind it.

Mr. WALGREN. Well, thank you very much. We appreciate that testimony.

Dr. Stromberg.

STATEMENT OF DR. ROBERT P. STROMBERG, REGIONAL COORDINATOR, MID-CONTINENT REGION, FEDERAL LABORATORIES CONSORTIUM

Dr. STROMBERG. Yes, sir. I also thank you for the opportunity to testify before you. My comments are primarily addressed, because of your request, to the Federal Laboratory Consortium, but I intend to follow up at the end with a few suggestions of ways in which we see barriers still present.

As I say in the testimony, which I will not try to read, I would say to Mr. Pearsall that I think upon closer examination of the record of many of the federal labs, you will find that there are a fairly significant number of technologies flowing from the laboratories.

As an example, for a five-year period at our laboratory, which is one of the large ones, we did search through our labs to find out just exactly what kind of a record existed. We found that in that five-year period some 200 technologies were transferred to some 900 companies. And I think your staff has seen the reports that describe that kind of transfer.

So, we feel that there is a flow. It is publicized very little, so perhaps that is one of the reasons he is not aware of it.

It is definitely growing as time goes on now, too. I think through the actions of the national legislature, as there are now some seven or eight bills, starting with the Stevenson-Wydler, Bayh-Dole, and on down through the bill you passed in the fall of 1987. Each one of these has been in the right direction for moving the authority of management and dissemination of technology further down the federal chain, and delegating it to the federal laboratories.

As a matter of fact, you covered all but a very small section of labs which unfortunately happens to include us. We are one of the types of laboratories that has been excluded from that legislation, of which I am sure your staff is well aware.

But even with that, we have still been able to move things in those cases where there was not an absolute requirement for exclusivity. However, the problem has been when there has been a requirement for exclusivity before investment would be made.

The Federal Laboratory Consortium was started because of something that was recognized many years ago by people in federal labs when we had a very outrageous condition. A person, for instance, like Mr. Pearsall, might call me at Sandia National Laboratories, and ask about our activities in bioscience and inquire if we could offer some technology.

Without the Federal Laboratory Consortium and some sort of networking, the answer had to be, "Yes, Mr. Pearsall, we understand your question. But our laboratory does not work in that area. Why do you not try one of the other 200 labs," a terribly outrageous answer to give to a person with a question like this.

So some 12 years ago people in these federal laboratories began to get together and try and form an informal network so they could make a referral and say to Mr. Pearsall, "Well, why do you not go talk to Dr. Jones at Los Alamos, or Dr. Smith at Bureau of Standards, because these people are working in that area." This is the germ of that idea that you have now supported last year with the bill that even gave us access to some funds to set up an electronic mail system and carry this on more efficiently.

I think one of the other large functions of the Federal Lab Consortium right now is due to the delegation of authority to these federal labs. We find almost every day a person at a new federal lab being given the assignment to take this problem on seriously as a full-time staff person and generate, in some cases, even additional staff.

As those people then look around to see how to do this, they find they can go to a Federal Laboratory Consortium meeting and exchange information with those officers at those labs that have been in this business for awhile. We have a very active training program to try and help those people benefit from the experience of other members of this community of people trying to move technology out of the labs.

Mr. WALGREN. Let me be sure folks in the back can hear. I do not know how good our microphones are in projecting this. Are you all able to hear? Maybe if you do pull that microphone in and speak directly into it, it will project.

Let me invite those of you in the back who cannot hear to come down a little bit closer, and invite you to project towards that microphone as best you can.

Dr. STROMBERG. I will try as best I can.

The Federal Laboratory Consortium, in its organization, has broken the country into six districts. The reason I am here speaking to you is because I am the Mid-Continent Regional Coordinator. I am the person trying to help emphasize the coordination and gathering of information from the federal laboratories in the center of the United States, starting with New Mexico, Texas and Louisiana on the south, and up through North Dakota and Montana on the north, a 15-state region in which Colorado would be just about a central state.

Also in this area we have the chairman of the Federal Lab Consortium, Gene Stark at Los Alamos Laboratory, so we are actively involved in it. And as I mentioned in my notes, I think Dana Moran at the Solar Research Institute and Al Taylor at the Fish and Wildlife Bureau within Colorado are also active members in the Federal Laboratory Consortium.

As I have said before, we have operated in the past in a relatively informal way in having meetings where we became acquainted with one another, and therefore could make referrals. We are gradually improving that process and are now setting up a resource directory of the federal laboratories where we will attempt to gather rather specific statements as to the areas that federal labs might be approached from a private commercial point of view to find technologies in their area.

This is a growing movement within our laboratory. As I also mentioned, I would say that the training sessions that we conduct

are probably the other major one, because as I mentioned in the notes, we are surprised to find approximately 30 new people showing up at each of our meetings. When we have our next meeting which will be in May, in Washington, D.C., I am sure there will be somewhere in the neighborhood of 25 or 30 new people at the Capital Holiday Inn. They will be there to find out just how this works.

It is interesting, too, that having delegated to us the kind of authority you have, representing the Federal Lab Consortium in January, I went to the Air Force Human Systems Laboratories in San Antonio. It was a very interesting experience to hear the uniformed Air Force officers asking very serious questions of an experienced licensing woman we brought to that meeting, because they now find this new assignment coming to them. That is, the assignment of actually dealing on a business basis with the technologies that may come from that laboratory. So your legislation is having far-reaching effects.

Unfortunately, though, our government agencies are huge. And because our government agencies are huge, it is a very slow process to go from the legislation passed in our Congress to the regulations that finally get all their t's crossed and all their i's dotted, and actually get down to the working level.

I mentioned a couple examples of that. As of right now, the Department of Defense is still working on its regulations based on your 1986 law. They are anxiously anticipated at the lower levels within the various services. It takes time for those things to move.

In the agency that I am involved in, the Department of Energy, the 1984 law just reached its culmination this past year with many of the Department of Energy Labs' contracts being changed to reflect the 1984 law. So there are some large delays associated in a large system of government which tend to work to the detriment of these kinds of programs, and slow them down essentially.

Mr. WALGREN. How do you estimate the impact of just pure size versus the failure of the administrators in those Executive Branch agencies to reach and move?

Dr. STROMBERG. Within large agencies, there are large numbers of people who concur in new policy, and the process of moving through those many people is, in my mind, one of the large impediments.

It is hard for me to evaluate that. As I said, though, in the notes, it is clear that there are still many, many people within the federal laboratories and in the federal agencies who feel that exclusivity is something that may result in an unfair advantage. This is something that was a cult that was present for many years. I think many civil servant people have difficulty with that concept. Whereas we recognize that our laboratory in many cases, without this *position*—and my venture capital friend here could speak to that eloquently—without this *position*, he will not invest his money and other people will not invest their money. They want to be sure that it will not—a short time after they market their product—suddenly be copied and duplicated and be brought forth by some other person to cut off their access to a larger market. So there is a cult that I have to admit I even shared five or six years ago probably more than I do today in that regard.

That came out in my second point here where I mention that this is still a practice of government procurement practices giving equal access to all. That has created a very strong tradition among governmental people that they should advertise and make public and make available to all. And it turns out, having been to licensing executive society meetings, which I have gone to for course work, I find that those who handle licensing of technology in the commercial world clearly do not follow anything resembling the practices of government procurement.

They make a deal with who they feel is the best commercial user of their technology, who will do the best job of commercializing it, because they will then benefit to the greatest extent in terms of royalties. So there is a different mindset here that is creeping over the country as a result of the pressure by your legislation, but it takes time.

I want to come then to my final point, and say that if I were to make any one suggestion here this morning, I would make the suggestion that you take a careful and complete and thorough look at the question of software.

It has been badly neglected I think in this country. It is not recognized what dramatic value there is in it, and I would suggest to you that it is a form of intellectual property that is quite different than a patent. Software usually is the tool that makes the part rather than being the idea that is used to generate the part.

I think within the agency that I come from, there is still a difficulty for us in making specific exclusive arrangements in the appropriate way that we would like with private companies. And I would suggest to you that it be a subject for very serious review through your legislative process. I think it has been overlooked too long as an extremely valuable source.

I will give you one example. We are not in a position at our laboratory to exclusively transfer software any under circumstance. The current practice is to distribute it through a central sales point.

We recently had a case. We are, by the way, a laboratory that makes micro chips that are used by many other agencies. Because of some unusual circumstances, we actually manufacture a chip, believe it or not, very special chips.

We took software from a commercial software house and modified it, and improved it to a significant extent. Then our staff people found that their friends at other companies in American industry wanted copies of that improvement. But we are in a difficult position because we can not make it available on any other basis but through a public release.

We entered into an agreement with that software house so they would clean up our work on their software and supply us with the improved version. We were not able to promise them that we would not pass that on to their competitors. But even on that basis, they have given us access to about \$2.5 million worth of the completed product. So that is an indication of the value of simply helping this one company improve a software that we want to use in our little chip factory.

Had we been able to promise that by no means would this be transferred also to competitors, I am certain that that value would have been significantly higher to that company.

Thank you very much.

[The prepared statement of Dr. Stromberg follows:]

Testimony, House Subcommittee on Science, Research & Technology
 Robert P. Stromberg
 Federal Laboratory Consortium Regional Coordinator, Mid-Continent Region
 Technology Transfer Division, Sandia National Laboratories
 February 5, 1988

My name is Robert P. Stromberg. I was invited to testify on "how the FLC works, what the FLC has to offer in the Denver area, and what has been the FLC experience under the Federal Technology Act of 1986."

My comments are personal, and not the official position of either the Federal Laboratory Consortium (FLC); my employer, Sandia National Laboratories, a Department of Energy prime contractor; or the Department of Energy.

Technology transfer from federal laboratories has been on a steady increase in effectiveness over the last eight years, as its economic benefits are recognized. Also, a series of acts of Congress and Executive Orders are forcing changes in attitudes in government agencies and labs. Technology transfer is alive and well in the region. We estimate some 50 significant new technologies move from our lab each year. Last year Sandia transferred a major new technology to Kaman Sciences of Colorado Springs, along with three key employees. The new technology, called a high speed multichannel data recorder technology, is based on photonics. This is a technology for using light instead of electrons for obtaining large amounts of data at extremely high speed. Kaman is using this technology to develop a new system for recording data. With the increased autonomy now moving to labs, I'm sure you can expect a growth in the rate of new commercial activity based on lab technology. Unfortunately, our laboratory and others either operated by a large business, or funded by nuclear weapons money, are still excluded from the liberalizing legislation of the past eight years.

A vital function of the FLC is to assist commercial interests in finding the government laboratory that can help them with a problem. By networking with other labs, the FLC can make referrals to all other federally-supported labs. Denver area businesses can use the FLC to find the right federal laboratory to help them with a problem, or offer them a new technology for commercial development. Our government has no formal ties across agencies to perform this task, and the FLC is working to fill this need.

The Federal Laboratory Consortium was an unofficial organization for 12 years until Congress formally recognized us with provisions in the Technology Transfer Act of 1986. Funds that Congress recently gave us for five years are allowing us to expand our activities. We have an active training program, hold national meetings every six months, are organizing a more efficient way to locate specific technologies in the labs, and we have many other activities to promote transfer from government labs.

The Federal Laboratory Consortium is divided into six regions based on geography. I represent the Mid-Continent Region, which includes 15 states from New Mexico, Texas, and Louisiana on the south, to Montana and North Dakota on the north. We have 18 active contacts in the region, including the FLC Chairman, Dr. Eugene Stark, at Los Alamos National Laboratory. At present, the facilities most actively supporting FLC in Colorado are the Solar Research Institute at Golden, with Mr. Dana Moran an elected member of the executive committee of FLC, and workshop organization by Mr. Alan R. Taylor of the Fish and Wildlife Service in Fort Collins.

Testimony, House Subcommittee on Science, Research & Technology
Robert P. Stromberg

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February 5, 1988

In the past, the volunteer FLC members have worked in a rather informal way. A request to a member lab would be referred to other FLC members in other laboratories, based on personal knowledge, and access to scientific specialists in several labs, who had a depth of knowledge of other workers in the field.

Using funds provided by the new legislation, we are improving this system by obtaining detailed lists of active technology development at the various laboratories, and establishing a file of laboratory data called a "resource directory." As the resource directory becomes more complete, referrals will be more accurate.

Other valuable training services of the FLC are presentations and private conversations at the meetings, where new technology transfer personnel at the laboratories can learn how to operate efficiently. Every meeting has perhaps 30 new persons in the "New Representative" workshop, a regular part of the meeting format.

I assure you the FLC is moving ahead to increase the economic impact of federal laboratories.

The charter for this hearing asks for information about barriers to transfer from federal labs. I would list the following:

1. Slow reaction of agencies to new laws and regulations.
 - a. DOD is working in 1988 to implement regulations based on the 1986 law.
 - b. DOE completed new laboratory contract modifications in 1987 to implement the 1984 law.
 - c. I'm told by our FLC Washington Representative, Lee Rivers, that "most agencies are working on regulations to implement the 1986 law."
2. Private firms ready to risk capital are discouraged by their inability to obtain exclusive licenses.
 - a. Government procurement practices of equal access to all, therefore, no exclusive opportunity, is still a common point of view.
 - b. The commercial reality that investors many times need exclusive control is still not widely accepted in government agencies.
 - c. DOE nuclear and large company contract laboratories have not been included in legislation, therefore, cannot offer exclusive rights.
3. Software management policies have not kept pace with the rapid rise in its importance.
 - a. Previous laws are cited as requiring universal dissemination.
 - b. Software must be treated as another form of technology, and managed in a way similar to new methods now being implemented for other forms of federally-developed technology.

Thank you for the invitation to testify.

Mr. WALGREN. Thank you very much. We appreciate that testimony.

Congressman Skaggs?

Mr. SKAGGS. Thank you, Mr. Chairman.

Let me make one administrative remark. I do not know whether all of the witnesses, both this panel and others that will be testifying, were properly invited to the luncheon that will be held at the Brown Palace for all of you and the committee and committee staff at 1:30. If you did not get that invitation, I wanted to make sure you received it now, and hope if your day permits, you can join us down there.

One of the things that might happen there on a small scale sounds like it also needs to happen on a large scale, which is to get the Mr. Strombergs of the world talking to the Mr. Pearsalls of the world, which is exactly one of the practical benefits to come out of a day like this.

But it sounded as though there is, from your testimony, a significant success story to be told which is valuable in its own right, but also because it can stimulate the imagination and interest of the venture capital community. And Mr. Pearsall observed that his colleagues represent a resource that the government simply has not taken adequate advantage of.

And I just wanted to invite you two to talk to each other publicly for a minute about how we can effect that kind of linkage.

Duane, do you want to lead off?

Mr. PEARSALL. Well, you know, the critical element between research and commercial product is somebody's judgment. And let me give you some numbers that throw a damper on the enthusiasm for taking technology out of universities or out of government labs. And these are national statistics. We have a very accurate bean counter in Massachusetts that keeps track of investments made by venture capital. Typically, when we receive a business plan, it is the considered judgment of an entrepreneur who has put a lot of his personal life's savings in to it. He believes that it is a good program. When we get a hundred of those business plans, out of that we will take a second look at only 10 percent, and we will invest in only two. That is a national statistic. And I would submit that an idea coming out of the government lab might not have better credibility for commercial viability than one of those business plans.

Now the punch line is that after we have invested in 20 companies of that 2 percent, we find that 70 percent of our decisions were wrong.

Now you put those two numbers together, and it is a very small percentage of technology that ultimately can find its way to a commercial product. That is a damper on enthusiasm, but I do not think the analogy is that far off.

Mr. SKAGGS. Well, it sounds as though that also plays off of what Dr. Seebass was saying; that what really makes it go are people with their talents moving from a lab, whether university, government, whatever, and deciding to put their talent to work.

Dr. SEEBASS. Yes, I think the principal and major difference between technology transfer from federal laboratories and from universities to the private sector is that we educate people and they carry technology with them.