STRENGTHENING REGIONAL INNOVATION: A PERSPECTIVE FROM NORTHEAST TEXAS

FIELD HEARING

BEFORE THE

COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

September 14, 2009

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September 14, 2009

STRENGTHENING REGIONAL INNOVATION: A PERSPECTIVE FROM NORTHEAST TEXAS

MONDAY, SEPTEMBER 14, 2009

HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY,
McKinney, TX.

The Committee met, pursuant to call, at 9:00 a.m. in the Ceremonial Courtroom, Collin County Courthouse, 2100 Bloomindale Road, McKinney, Texas, Hon. Bart Gordon [Chairman of the Committee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
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Field Hearing on

Strengthening Regional Innovation: A Perspective from Northeast Texas

Monday, September 14, 2009
9:00 a.m. – 11:00 a.m.
Ceremonial Courtroom, Collin County Courthouse
2100 Bloomdale, McKinney, Texas

Witness List

Dr. Cary Israel
President, Collin County Community College

Dr. Dan Jones
President, Texas A&M University-Commerce

Mr. Patrick Humm
President, Hie Electronics

Dr. Martin Izzard
Vice President and Director, Digital Signal Processing Solutions R&D Center, Texas Instruments

Mr. Bill Sproull
Vice-Chairman, Texas Emerging Technology Fund Advisory Committee

Mr. Tom Luce
Chief Executive Officer, National Math and Science Initiative

HEARING CHARTER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
Strengthening Regional Innovation: A Perspective from Northeast Texas

MONDAY, SEPTEMBER 14, 2009
9:00 A.M.–11:00 A.M.
CEREMONIAL COURTROOM
COLLIN COUNTY COURTHOUSE
MCKINNEY, TX

1. Purpose

On Monday, September 14, 2009, the Science and Technology Committee will hold a field hearing in McKinney, Texas, to examine the importance of regional innovation centers to the U.S. economy and global competitiveness, and the roles of Federal, state, and local governments in supporting such centers.

2. Witnesses

- Dr. Cary Israel, President, Collin County Community College
- **Dr. Dan Jones,** President, Texas A&M University-Commerce
- **Mr. Patrick Humm,** President, Hie Electronics
- **Dr. Martin Izzard,** Vice President and Director, Digital Signal Processing Solutions R&D Center, Texas Instruments
- **Mr. Bill Sproull,** Vice-Chairman, Texas Emerging Technology Fund Advisory Committee
- **Mr. Tom Luce,** Chief Executive Officer, National Math and Science Initiative

3. Overview

- In recent years, a growing consensus has emerged regarding the importance of science, technology, and innovation as the key driver of long-term economic growth and improved quality of life in America. Technological progress fueled by investments in research and development (R&D) is estimated to be responsible for as much as half of U.S. economic growth since World War II.
- In response to a request from the leadership of the House Science and Technology Committee, the National Academy of Sciences issued a report in 2005 highlighting these linkages. The report, led by former Lockheed Martin CEO Norm Augustine and titled *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*,[1] emphasized the challenges facing the U.S. economy as a result of globalization and recent technological advances, stating: "A substantial portion of our workforce finds itself in direct competition for jobs with lower-wage workers around the globe, and leading-edge scientific and engineering work is being accomplished in many parts of the world. Thanks to globalization, driven by modern communications and other advances, workers in virtually every sector must now face competitors who live just a mouse-click away in Ireland, Finland, China, India, or dozens of other nations whose economies are growing."
- The report recommended that the Federal government renew its focus on and support for research and development and science, technology, engineering, and mathematics (STEM) education as a policy priority. Congress, led by House S&T Committee Chairman Bart Gordon (D–TN) and Ranking Member Ralph Hall (R–TX), responded by passing the "America COMPETES Act" (Public Law 110–69), comprehensive legislation aimed at strengthening the Nation's scientific and technological enterprise in order to ensure it continues to lead the world in innovation and remains competitive in the 215 Century global economy.

[1] http://www.nap.edu/catalog.php?record__id=11463.

- Specifically, the America COMPETES legislation placed Federal investment at three key agencies that fund basic research on a path to double within the near term, and provided support for STEM education, authorizing multiple grant programs aimed at helping educate current and future teachers in math and science and education."
- In addition to the renewed focus on strengthening U.S. economic competitiveness through science and technology at the national level, there is also a growing interest in improving understanding of and support for the innovation ecosystem on a regional scale. The Council on Competitiveness, a Washington, D.C. think tank, has studied regional innovation as a driver in enhancing national competitiveness, concluding that:

  "National policies and national investment choices have much to do with the growth and capacity of the American economy. For innovation, however, the real locus of innovation is at the regional level. The vitality of the U.S. economy then depends on creating innovation and competitiveness at the regional level. In healthy regions, competitiveness and innovation are concentrated in clusters, or interrelated industries, in which the region specializes. The nation's ability to produce high-value products and services that support high wage jobs depends on the creation and strengthening of these regional hubs of competitiveness and innovation." [2]
- To this end, the Federal government has a strong interest in promoting innovation based on regional strengths. While the aforementioned Federal investments and policies such as funding for R&D and STEM education-are critical, State and local governments, as well as higher education and industry, also play key roles in fostering a robust regional innovation environment.
- The Council's final report identified the following factors and elements as most important to building and maintaining effective regional innovation foundations that advance U.S. competitiveness: [3]

  1. **A strong physical and information infrastructure is a baseline requirement to establish and sustain a prosperous regional economy:** Good quality roads, highways, airports, railroads, water, and power support the efficient movement of people, goods, and services as well as the quality of life of citizens.
  2. A strong K–12 educational system is important for developing local talent and attracting outside talent: The quality of K–12 education is growing ever more critical because it establishes the baseline of talent for entry-level jobs and the pool of specialized talent critical to cluster development. It also helps in the recruitment of individuals and companies.
  3. **Universities and specialized research centers are the driving force behind innovation in nearly every region:** Although companies and individuals do create a large number of innovations, universities and research centers institutionalize entrepreneurship and ensure a steady flow of new ideas.
  4. **Specialized talent and training are more important than abundant labor:** It is not abundant low wage labor that attracts innovative companies, but rather highly talented, specialized, and often expensive labor.
  5. **Government can have a significant influence on the business environment, both positively and negatively:** Government at all levels influences the business environment through policies and services that influence factor inputs, context for firm rivalry, demand conditions, and related and supporting industries.
  6. **Poor coordination among local jurisdictions impedes efforts to improve the business environment:** Regional economies encompass many political jurisdictions. Efficient coordination among them is important for maintaining and improving physical infrastructure (e.g., road, airports, water ports, communications systems), creating strong K–12 education, offering a business-responsive political environment, and promoting cross-cluster collaboration.

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[02] From the report *"Clusters of Innovation: Regional Foundations of U.S. Competitiveness";* http://compete.org/publications/detail/220/clusters-of-innovation-initiative-rectional-foundations-of-us-competitiveness.

[3] http://www.compete.org/images/uploads/File/PDF%2OFilesrCoC__Reg__Found__national__cluster.pdf.

4. Additional Background: Relevant information on the demographic, economic, and innovation environment of the Dallas-Fort Worth metropolitan area and Collin County

About the Dallas-Fort Worth metropolitan area:[4]

- Has a workforce of more than 3 million people and is a national leader in population gains and job growth (1st and 3rd, respectively, in 2007).
- Has a gross metropolitan product of $315 billion, making it the 12th largest metro economy in the world.
- Has the second lowest cost-of-living among the country's ten largest metro areas.
- Headquarters of 24 Fortune 500 companies, the fourth highest concentration in the United States.
- Is the sixth largest technology center among U.S. metros, with over 225,000 technology jobs in four major areas: advanced manufacturing, information services, professional and technical services, and bio-life sciences.
- Has a diverse technology-based economy. Legacy industries include aerospace, electronics manufacturing, data/IT information processing, and telecommunications manufacturing and services, and emerging industries include bio-life sciences, medical-device manufacturing, and intelligent medical systems.

About Collin County: [5]

- The fastest growing county in Texas, and one of the fastest growing in the country. Among counties with more than 500,000 people, Collin County has the highest sustained population growth in the U.S. since 2000—52.1 percent. Additionally, 8 of the 10 fastest-growing cities in North Texas are in Collin County.
- Has relatively low unemployment (6.9 percent in July 2009, well below the nationwide rate of 9.1 percent).
- Has an educated workforce—47 percent of those 25 and older have a bachelor's degree, double the national average.
- Ranked second in *Forbes* magazine's "Best and Worst School Districts for the buck".

5. About the Committee on Science and Technology [6]

House Science and Technology Committee Chairman Bart Gordon of Tennessee and Ranking Member Ralph Hall of Texas are tenured, knowledgeable and committed to careful oversight of the Committee's far-reaching jurisdiction.

That jurisdiction includes all non-defense federal scientific research and development (R&D) at a number of federal agencies, including (either completely or in part): NationalAeronautics and Space Administration (NASA), Department of Energy (DOE), Environmental Protection Agency (EPA), National Science Foundation (NSF), Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA), National Institute of Standards and Technology (NIST), Federal Emergency Management Agency (FEMA), U.S. Fire Administration, the U.S. Geological Survey, the Department of Homeland Security (DHS) and the White House Office of Science and Technology Policy.

The Committee is responsible for overseeing research and development programs at all of these federal agencies.

The Committee was established in the wake of the Russian launch of Sputnik in 1957 and in the beginning it was primarily focused on space exploration. In 1959, the Committee became the first new permanent committee established in the House since 1892. Over the years, the Committee's jurisdiction grew to include almost all non-defense federal scientific research and development [House Rule X(1)(o)]:

1. All energy research, development, and demonstration, and projects there for, and all Federally owned or operated nonmilitary energy laboratories.
2. Astronautical research and development, including resources, personnel, equipment, and facilities.

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[4] Adapted from information compiled by the Dallas Regional Chamber of Commerce: http://www.dallaschamber.org/index.aspx?id=DFWFacts.

[5] Adapted from information available on the Collin County government website: *http://www.co.collin.tx.us/business/numbers.jsp.*

[6] *http://science.house.gov/about/default.shtml.*

3. Civil aviation research and development.
4. Environmental research and development.
5. Marine research.
6. Commercial application of energy technology.
7. National Institute of Standards and Technology, standardization of weights and measures, and the metric system.
8. National Aeronautics and Space Administration.
9. National Space Council.
10. National Science Foundation.
11. National Weather Service.
12. Outer space, including exploration and control thereof.
13. Science Scholarships.
14. Scientific research, development, and demonstration, and projects thereof.

The Committee also has special authority to "review and study on a continuing basis laws, programs, and Government activities relating to nonmilitary research and development." [House Rule X(3)(k)]

6. Questions for the Witnesses

In preparing their testimony, witnesses were asked by the committee to provide an overview of their organization's technology, products, programs, or activities, and their role in and relationship to the Northeast Texas Innovation Economy. Additionally, witnesses were asked the following questions:

[All witnesses] What do you see as the most important elements necessary to develop regional innovation capacity and grow the high-tech economy? Relatedly, what if any recommendations do you have to strengthen Federal policies, programs, or priorities in support of both regional and national innovation? How can State and local governments best contribute to and facilitate an environment conducive to innovation and competitiveness?

[Dr. Israel and Dr. Jones] Please describe your experience with any Federal science, technology, engineering, and mathematics (STEM) education or research programs or awards that the college participates in, including how such programs help to further the goals of your college and how they might be improved.

[Mr. Luce] What priorities and recommendations do you have for Federal STEM education programs and funding?

Chairman GORDON. This hearing will come to order. I feel like I should say hear ye, hear ye since we're here in this courtroom. I want to welcome everyone to today's hearing entitled Strengthening Regional Innovation: A Perspective From Northeast Texas.

We appreciate everyone's attendance. And I'm certainly happy to be here with my friend and partner Ralph Hall. Ralph has heard me say this before, but it's the truth. When I was growing up, my grandfather used to always tell me that every time the Grand Jury met in Tennessee, the population of Texas increased.

Mr. HALL. Not so.

Chairman GORDON. Since a lot of my relatives were a part of that migration, I'm glad to follow them here today. Ralph and I have been working together for years to improve American innovation and STEM education.

He's played an indispensable role in developing legislation in these areas. Our bipartisan relationship carries over to the rest of the Science and Technology Committee, and that's why we've been able to get consensus and move forward on so many important issues.

As a matter of fact, every bill that the Science and Technology Committee has reported out, every bill and resolution has been bipartisan. Most all have been even unanimous. So it's really, unfortunately, an anomaly in Congress now. We're trying to hopefully promote that in other committees and on the House floor itself.

And as Chairman, I'd like to say that I don't care whether or not the idea is a Democratic or Republican idea. I'm only interested in good ideas, and that's why I'm here today, to see the good ideas that we can find here in Texas.

Because we are holding this hearing in Mr. Hall's district, I will now turn the gavel over to the distinguished Ranking Member Mr. Hall to preside over this hearing.

[The prepared statement of Chairman Gordon follows:]

PREPARED STATEMENT OF CHAIRMAN BART GORDON

Good morning, and thank you again Mr. Hall for inviting me to your district today to learn more about regional innovation in Northeast Texas.

As we all know, we live in an increasingly competitive world, where manufacturing jobs are rapidly being outsourced and we are importing more high-tech products than we are exporting. Our country increasingly needs to compete with better skills and higher productivity. To maintain our nation's high standard of living, we will need to sustain our world-class science and technology enterprise that creates innovative new products and high-paying jobs.

In order to sustain this science and technology enterprise, we need a workforce that is prepared in a world-class math and science educational system. The day our universities are no longer the most sought after in the world, the day we see a brain drain because our best and brightest young scientists and entrepreneurs can't get the funding to do their research and development here at home, is the day our innovation is outsourced. To help address this, last August the President signed into law the America Competes Act, which is comprehensive legislation developed by our Committee that seeks to ensure U.S. students, teachers, businesses, and workers will continue leading the world in science, innovation, research, and technology.

Regional innovation clusters are also a key component of our national competitiveness. Through collaborations and partnerships between industry, regional and local government, community colleges and Universities, this region and others have been able to make the most of their resources and build a vibrant local culture of innovation that creates good jobs and boosts economic development. Today, I look forward to hearing from our witnesses the ways in which Northeast Texas has leveraged its resources to create a regional center of innovation. I also look forward to hearing testimony about how the federal government can best encourage and support such efforts across the Nation.

I thank all of the witnesses for being here today and I look forward to your testimony.

Mr. HALL. How long can I keep it? Well, I sure thank you, Mr. Chairman. I'm honored to be here and all of the introductions and renewal of friendships with each of you. Thank you for being on this Committee. And I'm very proud of you.

I could take the rest of the day to brag on the Chairman. I almost say that even if the Republicans took the chair back two years from now, I wouldn't be at all put out if he stayed Chairman and I was second to him because he's a great guy to work with.

He's totally completely honest. He's bipartisan to the gill. And he has run the best committee of any Committee Chairman out there and that's why we've passed bills together. And I've been honored to work with Bart. Good guy. Good Tennessee guy. You can't beat one.

And all of the introductions have been going here, you know, in Washington we're accustomed to saying to the Congressman, will the defendant please rise. We're glad to be here and not be defendants in the courtroom.

Sam Johnson, I have not heard whether Sam is going to be on his way or not. Or is he on his way back to DC? But what a great guy he is and a lot of you here have him for your Congressman. He's the person that's suffering for us immeasurable years alone in a cell. Eight years. Half of that time by himself.

He's just a great Member of Congress. And he's not I don't say re-electing for that alone, but that's enough. But he's also really the heart and soul of the United States Congress because of his suffering for the country.

And when we have differences about whether or not we're gonna pull out of Iraq or we're gonna tell them when we're leaving or something like that, Sam tells them how he felt over there in that hotel there that they were all held in, how he felt when the nation was pulling out from under him.

So he's great. I hope he gets here. And I wouldn't brag on him that much if he's here because he gets a big head every now and then. But I'm the oldest guy in the United States Congress, and he can't tell me anything.

Well, thank you all. And, Mr. Chairman, I want to thank your for taking time in your busy schedule to be here. I don't just thank you for this trip. I lost my wife a year ago last Wednesday. He flew over from his hometown, canceled four situations there to be with me.

That's how good of friends we are. And you don't forget things like that. When you're hurting and you have friends that are hurting, it helps. So I thank you for your busy schedule, taking out and coming here and everyone else here that you brought with you.

And I want to thank Collin County Judge Self. He's gone to start the mission court off to go in there and his team here for letting us use his courtroom and those of you who agreed to it.

Let me start by saying a few words about what Chairman Gordon and I do in guiding the work of the Science and Technology Committee. There's no other Chairman that passed the legislation that he's passed. And maybe some people think that's not good, but basically it's been toward competitiveness. That's been the keyword that he's—that's his keyword in the Committee, and I support him wholeheartedly.

We have a responsibility for oversight for the most of the, I guess, technology—the work of the Science and Technology Committee and for the Federal Government's civilian science and technology programs and activities, all of NASA and our space program, all the research performed at the Department of Energy and its laboratories, federally supported research performed at universities, many other math and science education programs at both the K–12 level and at colleges and universities.

Another issue we worked on that cuts across all the activities I just mentioned is competitiveness, and specifically, looking at ways to improve our long-term economic competitiveness by strengthening science, technology and our entire innovation system, so we're still building on legislation.

I think Chairman Gordon spent a lot of time this past couple of years trying to identify the right policies and investment priorities to do with competitiveness, the thrust that he had. And in August of 2007, we were successful in pushing into law landmark legislation in 2007 known as the *America COMPETES Act.* And Bart took, of course, the lead in that.

So we're building on that legislation, and today's hearing is to give us an opportunity for us to learn more about the relationship between innovation and economic growth through the lense of Northeast Texas. And we listen to you all for that.

I just know that it's an opportunity for our Chairman and those with him that's supportive of him to hear it firsthand from our local leaders at the State and local level, in industry and small business and in higher education. So there's no better place to start then right here in Northeast Texas.

I want to brag a little bit. Collin County, for example, is the fastest growing county in Texas and one of the fastest growing counties in the country. Unemployment here is under seven percent, well below the national average.

And almost half the adults—and this is a major accomplishment here. Almost half of the adults 25 and older have a bachelor's degree. More than twice the national average. And that's thanks to Bob Collins, the President of our community college here.

And I think when I was in the Texas Senate, we had a 16 to 15 vote when they created the community college concept. I think it was the best act that happened there during my time in the Texas Senate.

Almost all of the adults here 25 or older have a bachelor's degree. And given data such as this, I think it's no surprise that this is a great area for technology. And let me just hit one more lick there.

This area is a technology powerhouse. The greater Dallas area is the sixth largest technology center in the country with over 225,000 technology jobs. I may have more to say a little bit later.

But I think the witnesses and organizations that we have here today represent the very best and the brightest of this area and are a very important reason why we've been relatively prosperous. And I look forward to hearing from them this morning. Mr. Chairman, I hand it back.

[The prepared statement of Mr. Hall follows:]

PREPARED STATEMENT OF REPRESENTATIVE RALPH M. HALL

I want to thank you for taking time out of your busy schedule to visit us here in Texas, and welcome you and everyone else here this morning to beautiful McKinney. I also want to thank Collin County Judge Keith Self and his team here at the courthouse for their great support in allowing us to use this hearing room this morning.

Let me start by saying a few words about what Chairman Gordon and I do in guiding the work of the Science and Technology Committee back in Washington. We have a responsibility for oversight of most of the Federal government's civilian science and technology programs and activities. This includes, for example, all of NASA and our space program, all the research performed at the Department of En-

ergy and its laboratories, Federally-supported research performed at universities, and many math and science education programs at both the K–12 level and at colleges and universities.

Another issue that we work on that cuts across all of the activities I just mentioned is competitiveness—specifically, looking at ways to improve our long-term economic competitiveness by strengthening science, technology, and our entire innovation system. Chairman Gordon and I spent a lot of time on this the past couple of years, trying to identify the right policies and investment priorities to do this, and in August of 2007 we were successful in passing into law landmark legislation in 2007 known as the *America COMPETES Act.*

We are still building on that legislation, and today's hearing is an opportunity for us to learn more about the relationship between innovation and economic growth through the lens of Northeast Texas. It is also an opportunity to look at not only what the Federal government is doing and should be doing, but also an opportunity to hear first hand from our local leaders—at the State and local level, in industry and small business, and in higher education.

I think it is especially important as we work our way through these tough economic times that we take the time to learn from how things are done at the local and regional level, and there is no better place to start that right here in Northeast Texas. We certainly haven't been immune to the recession here, but we haven't been hit as hard as a lot of regions, and our employment data and longer-term business growth trends are impressive.

Collin County, for example, is the fastest growing county in Texas and one of the fastest growing in the country. Unemployment here is under 7 percent—*well below* the national average—and almost half of adults 25 and older have a bachelor's degree—more than *twice* the national average. Given data such as this, it should be no surprise that this area is also a technology powerhouse—the greater Dallas area is the sixth largest technology center in the country, with over 225,000 technology jobs.

To close, I want to share with you an interesting anecdote that illustrates our economic standing in a different way. Recently, some economists have suggested that U-Haul truck rental rates may be a good way to compare and even forecast the economic strength of two areas—the cheaper the rate, the stronger the local economy. The idea is simply that if an area's economy is strong and growing, it will have a surplus of U-Haul trucks as a result of people moving into the area, and the excess supply of trucks leads to low rates.

Well we put this to the test. The cost to rent a 26-foot U-Haul in Los Angeles and drive it here to McKinney is $2,000. But the cost to rent the same exact truck here and drive it back to L.A. would be only $600!

Now that's not scientific, but I think it's another sign that we're doing *something* right. And in my biased opinion, I think that *something* has to do with how we foster the entrepreneurial spirit and the right kind of environment for technology and innovation, which we know over the long-term translates to jobs!

The witnesses and organizations that we have here today represent the best and the brightest of this area and are an important reason why we have been relatively prosperous. I look forward to hearing from them this morning.

Chairman GORDON. Thank you, Mr. Hall. You know, when you mention that 16/15 vote, you didn't mention how you voted. It reminds me of my—you know, the suffrage amendment that allowed women to vote passed by one state and by one vote in that state, and that was in Tennessee.

And my grandmother took me—at that time, you had to be 21 to vote. And she took me to register to vote. And she told me about that story and about all too long about the difficulties women had before that.

And then she just said it passed by one vote. And her father was in the legislature at the time. And she didn't say anything else. So I, you know, was a little hesitant.

I finally asked, "Well, how did he vote?" And she said, "Well, he really wasn't for it, but he was afraid to come home if he didn't vote for it." So Ralph, I'll ask you, how did you vote that on 16/15?

Mr. HALL. Well, I tell you, we had two people from San Antonio, one named Professor Bernal. He was a little professor there. And the another was Red Barry whose claim to fame was he drove a car for Al Capone.

And they hated one another. And they would never vote alike. And we ran that bill through them for the passage of the bill, final passage. And when Barry, one of them—you'll have to do it alphabetically to know who comes first, Barry or Bernal.

But whoever came first voted one way and the other one automatically voted the other way. We had to have them both. And we went over and rode out for Red how to say I move it to reconsider the vote by which the vote was taken. He had to read that off and finally, he did and we voted again and they did it again. The other one voted.

We went through three votes. And, finally, I made them vote before I voted. And then I cast the last vote which was the 16th vote, and we got the community college concept. It's been the very best thing for families and for youngsters.

We have a wonderful facility here. We have higher education in one and this the other. We have all kinds of—we have Martin Izzard here who is—he's here because he's brainy, but he's also a surfer from South Africa. He's won titles over there.

And I learned all this from Gray Mayes who is my contact to TI. Many times me and my wife's folks didn't have a job, and I just called her and sick her on them. She hadn't ever hired one of them yet, but she sure has talked to them.

But thank y'all for being here. Each of you have something very special about—Tom Luce who's a legend here in my background. I have my own school Texas A&M at Commerce. When y'all did that, you put me to sleep with an Aggie.

My wife, she graduated from there before. It was—it's a great school. My mother went to Mayo College there in Sam Rayburn a hundred years ago. He came to my breakfast table to tell my mother why he couldn't appoint me to the Naval Academy.

He said there are three reasons, all three of them are his grades. But we're all alike. Let me just go around another. We all have different thoughts and think a little bit different, kind of like the guy that was there watching his son—was studying while he's watching TV and listening to music and doing a crossword puzzle and watching radio and everything.

Father told him, he said, "When Abe Lincoln was your age, he studied books by the light of the fireplace." And his son replied, "Yeah, when he was your age, Dad, he was President." So it come back on us. I do yield back and I look forward to the testimony we have.

Chairman GORDON. Well, what did I start there? Let me——

Mr. HALL. I've got more.

Chairman GORDON. Well, let me just right quickly conclude by saying again thanks to Ralph for his kind words, but the fact of the matter is that we really are partners in everything that's been done, and that's the reason we get things done.

Let me tell you what I think is our really fundamental situation here in this country, and that is that there's six and a half billion

people in the world. Half of those that are working make less that $2 a day.

And so if my eight-year-old daughter and your kids and grandkids are gonna grow up as generations before and experience the American dream of being able to inherit a national standard of living from their parents, then we have to make some real changes in this country.

I'm sure you're gonna tell us about our competitiveness, and Tom has talked a lot about that and how math and science education is a key component of that. And certainly we're not just talking about a few Ph.D.'s. We're talking about a work force.

We're talking about high school graduates, hopefully community college graduates and beyond in working that higher skill level because they're making ten weeks to an hour in India or China. We've got it making 100 or 150 here.

Not only that, we need to be inventing widget concepts and develop the machines here. So we've got a lot to do. And I think your cluster concept is something that I want to hear more about. My home is Rutherford County, Tennessee. We are the fastest growing county in Tennessee and one of the fastest in the nation also.

And we have a university as well as some community colleges. And we're just starting an effort to try to develop a high tech corridor. And so I'm anxious to learn more about what you're doing here, how that can be replicated across our country so that we can have a stronger and more competitive nation.

So, Ralph, I yield back to you, and we'll move forward.

Mr. HALL. Okay. Let me just thank you and your staff too. I think you have Robert Etter with you and Bess Caughran my staff works with daily up there, Dan Byers, Zac Kurz and Janet Poppleton who is my aide in both the Federal and the State 4th Congressional District.

Chairman GORDON. Bess is a Texan and glad to come home.

Ms. CAUGHRAN. Yep, I'm glad to be here.

Mr. HALL. We have a witness list here and I will just go down through them. I tell you this, I got up at 4:30 yesterday morning to catch a 6:00 o'clock plane down here. I don't know what time you had to get up to get here by 8:00.

And I left a day before when we had 1,200,000 mad people in Washington, D.C. And they weren't mad at me, but yet I got 45,000 things of tea in my pickup back in my home garage there that they put on me. So that's how mad they are.

And even—they're there and it was a great sight. And they were peaceful, and everybody was fine. The President spoke to us the other night. And Joe Wilson was kind of his self-appointed prompter, but he shouldn't have.

I think he's sorry for it. But Bart will tell you he's one of the nicest guys in the world. I don't know why he blurted out like he did. You don't interrupt the President no matter who he is and disagree with him a whole lot.

I disagree with him a whole lot. But he is our President. And I wrote him the fifth day, Bart, after he was elected, and I said to you, Mr. President, the same thing Sam Rayburn and Lyndon Johnson said to General Eisenhower when he was elected.

″Mr. President, I didn't vote for you. My district didn't vote for you. My State didn't vote for you. But you're the President, and I'm gonna try to make you a good President."

I didn't see him again until about four or five weeks later. We sat together at the table and he had all of the chairmen.

Chairman GORDON. Yeah.

Mr. HALL. You can't be a chairman unless you're a Democrat up there, and that's not right. But it's the law. And we sat at the same table there. He had us all over there. And I shook hands with him.

He said, "I thought you were gonna try to help me?" I said, "Well, you wouldn't listen to me." I said, "Do you want to know why I voted no eight times in a row?" He said no.

He's pretty sharp. He knew I was gonna tell him because there wasn't a place to vote hell no. But he was good natured about it. I tell you how I really deep down feel about the President of the United States today.

I believe he wants what's best for this country. I believe he's trying to do what he thinks he ought to do for this country. I just—I appeal to him the same thing and he can say something if he wants to.

But I just don't think he knows the consequences of his either winning the battle for the bill he wants or losing the battle. I don't know which would be worse, but I think either one of them are bad for our children.

And Bart is a conservative Democrat that has a hard time supporting his own party and ideas for a lot of years there. And when I left, I didn't demean anybody or run anybody down because I didn't feel that way.

But we have—and a lot of guys that are Texas Members are having to vote some votes that they really would rather not vote, but they're trying to be good Members.

And I just say rather than to shout out at them to be fair with them and try to understand what their situation is because they probably—I'll say this. They're probably the best Democrats that can be sent up there from their districts. And I'm not anxious to beat any of them.

Chairman GORDON. Ralph, we better get on with our hearing here. We've got some folks that are——

Mr. HALL. All right. You want to go on with the witnesses.

Chairman GORDON. Yes, sir.

Mr. HALL. Dr. Cary Israel is the President of Collin County Community College. This is the man I can brag on for a long, long time. We recognize you for five minutes; but if you go over five minutes, we're not gonna say anything.

STATEMENTS OF DR. CARY A. ISRAEL, PRESIDENT, COLLIN COUNTY COMMUNITY COLLEGE DISTRICT

Dr. ISRAEL. Thank you, Mr. Chairman, and also Ralph—Congressman Hall. We appreciate it very much to have this opportunity to speak. I am Cary, current President of Collin County Community College district, and I am honored to share my thoughts today and to the Chairman of our board Robert Collins.

And this year we'll serve 46,000 students, to give you kind of a scope of our institution. Across the nation, as you know, most community colleges are experiencing record setting growth this fall.

We've been growing rapidly for the last 10 years; however, we just witnessed a tsunami of new enrollment. We went up 18 percent. Some of this is the result of our economy, but I firmly believe that some of it is a sign of the power and effectiveness of local—and I underline "local"—regional assets, regional and local planning and collaboration.

And so what I'd like to emphasize in my testimony is, local collaboration is the ideal venue to leverage resources for the benefit of our nation. If I look at the stimulus economic packages and some of the information coming out of Congress, it seems they are all very laudable and lofty initiatives.

I applaud everyone for working in this direction. However, we at our institution are concerned about the plan that too narrowly defines the objectives and the processes. For example, the Administration supports a system for delivering a collegic education online for efficiency purposes.

Our entire curriculum has been online for the last three years, and you can get a degree online at Collin. However, we were the first college in the nation for community college out of 12,000 and only one of the few still that you can get your degree on the weekend by going to weekend college.

And, again, we have to use some technology on the weekend, but we served over 4,000 students on the weekend; taking an asset that's not filled that we have to do 24/7 on security and heating and air-conditioning and filling it up.

Now, we meet Friday, Saturday and after church on Sunday, not everyone can say that. And this is an efficient and, I think, very cost effective way so that we don't have to continue to build new facilities.

But as I look at the packages coming out and the legislation coming out, we would not get any funding for this. Again, it's an innovative way, but it doesn't meet just an online concept.

We have a 10 university pre-admission partnership going, and it's been going since 2000. Again, by collaborating with the universities and working better together, we can shorten time of the degree, so instead of four years—5.2 years to get a four-year degree, it takes four years.

And, again, we don't see the opportunity or the latitude to have some local innovation. We created the first alternative teacher certification by a community college in the United States also in 2000.

There are now four hundred of those programs in community colleges across the country. More importantly, we are ranked one of the top 10 last year and got an Encore Grant from Metropolitan Life.

And what we are doing? We're taking 50-year-olds, 40 or 50-year-olds here, and we're bringing them back to become science and math teachers. And there's a great need, and we have a lot of the interest in the 50-year-olds.

We have a wonderful—we have a wonderful Convergence Technology Center. This is an advance technology education ATE Re-

gional Center of Excellence. The National Science Foundation in 2004 awarded us $2.46 million.

There is a growing need in our country in skilled specialist in the area of convergence technology and home technology. This field didn't exist. We created the curriculum for the country, and we're very proud of that. In fact, we just got a continuation grant to make this green IT.

Again, this happened at the local level without us being prescribed in what to do. We're one of the six—only six community colleges of the Cisco Certified Training Center, Cyber Security, Center for Advanced Study in Mathematics and Natural Sciences and biotech all at a community college.

We have our own Wide Area Network. We have a 54-mile loop. This county is looped in our network. Again, we don't duplicate cost. I have a short amount of time period.

I am going to end by saying that we are a leader in our healthcare field. Our nursing program was just named one of the top three programs in the State of Texas out of 90.

We have a healthcare simulation Lab that's been visited by physicians and nurses from Switzerland. And we're becoming nationally known. And so what we would like to do, much like our alternative teacher certification, first in the nation, much like the convergence technology, first in the nation, we really would like to—and, again, I don't think it's too bold, but we would like to become a Mayo or an M.D. Anderson for this region and to define a new campus in the eastern part of Collin County as it relates to healthcare, which is a growing need, and a shortage of physicians.

Again, we would hope that we would have the latitude and the opportunity to innovate even though right now we don't see that's a possibility. Thank you for the opportunity of speaking before you. And my written testimony has been submitted. Thank you.

[The prepared statement of Dr. Israel follows:]

PREPARED STATEMENT OF DR. CARY A. ISRAEL

First and foremost, I would like to thank Chairman Gordon, U.S. Congressman Ralph Hall and other members of the Committee on Science and Technology for hosting this hearing.

My name is Cary A. Israel, and I am President of Collin County Community College District {Collin College). I am honored to share my thoughts and those from Chairman Robert Collins and our Board of Trustees about science and technology in higher education. The faculty, students, and staff of our college very much appreciate your attention to the cause of higher education.

Conquering Challenges Through Higher Education

Across the nation, community colleges are experiencing record-setting growth this fall. Collin College has been growing rapidly for more than 10 years, but this year, we witnessed a tsunami of new enrollment. Certainly some of the 18+% growth is a result of our economy; but I firmly believe it is also a sign of the power and effectiveness of local/regional assets, planning, and collaboration. Regional and local collaboration is the ideal venue to leverage resources for the benefit of the entire nation.

If we look at the economic stimulus package and proposals from the administration, we see many laudable and lofty initiatives. However, we are concerned that the plan too narrowly defines the objectives and the process, which ultimately could constrain innovation rather than encouraging it. We wholeheartedly agree that community colleges will play a key role in the nation's economic recovery, but we ask leadership from Washington to outline goals without delineating the method. For example, the administration supports a system for delivering a collegiate education

online for efficiency purposes. Online courses are a staple of American higher education today, but they are not the only means to put Americans back to work.

Case in point: In 2005, Collin College launched Weekend College program, which allows students to earn an associate's degree in two years by taking classes on Friday evening, Saturday and Sunday afternoon. This is ideal for individuals who work frill-time but want to re-train or re-career in new fields like engineering and the sciences. Weekend College is also an efficient way to expand capacity *without* building new facilities since campuses are usually vacant on the weekend, but the college still pays for utilities, security, etc. By adding Weekend College, we reached out to a population of students who otherwise would not be able to go to college and leveraged an asset that was not fully utilized. Now, total enrollment in Weekend College is 2,728 this fall-up from about 2,000 last fall. Our next step is to work with one of our University pre-admission partners to offer a baccalaureate degree on the Weekend.

Collin College also created the nation's first alternative teacher certification program at a community college, to respond to the critical shortage of classroom teachers. Nearly 500 individuals have graduated from the program, and today there are 400 programs similar to ours. Last year, we were honored to be one of only 10 colleges or universities in the nation chosen for the "Encore Careers" Grant from Metropolitan Life to help re-career those from the math or science fields, who were 50 years old and above to serve as classroom teachers. More importantly, the program has also been listed as one of the top 10 alternative teacher certification programs in the nation.

All of this was accomplished through innovation at the local level, and this is the type of innovation we must encourage as we work on economic recovery. If the goal is to produce more engineers, teachers, scientists, etc., local elected and public officials in North Texas need the latitude to meet desired goals through hard work and ingenuity rather than a prescribed roadmap.

The Cutting-Edge of Science and Technology Education

"Creativity & Innovation" are among the Core Values at Collin College. We believe that advancement in science and technology begins in college classrooms and laboratories and libraries where individuals gifted with natural curiosity meet the professors who inspire them. Below are a few of our programs that have been recognized for innovation:

Convergence Technology Center, National Science Foundation

- The Convergence Technology Center is an Advanced Technology Education (Al E) Regional Center of Excellence originally funded in 2004 by a $2.46 million dollar four-year grant from the National Science Foundation to meet the growing need for skilled specialists in the area of Convergence Technology and Home Technology Integration. After September 11, 2001 and the "dot corn bust," businesses and colleges in the North Texas region collaborated on this grant to reconstruct the landscape of IT/telecommunications education for the entire country to match the then emerging need for convergence technicians . These technicians install, maintain and operate systems of voice, data, video and image across a secure network.
- As of September 1, 2009, the Center has been awarded a new grant in the amount of $1.56 million dollars to focus on the emerging needs of Green IT convergence technicians. This grant will support modifying curriculum to include Green topics, creating updated online courses, training faculty to teach convergence and Green IT, targeting Hispanic students for recruitment into this field and mentoring at least six community colleges yearly to enable them to launch their own convergence degree and certificate programs.
- The seven partner colleges who launched convergence programs on their campuses have seen a jump in enrollment in their IT departments as a result of the new convergence offerings. Over the last year over 4,000 students were enrolled in IT courses at the seven partner colleges.

Cisco Certified Training Center

- Collin College has been designated as one of only six colleges to become a Cisco Certified Training Center in the United States, serving the eight-state Southwest region. Preston Ridge Campus in Frisco, Texas is the primary site of Cisco Training, but Cisco lasses are also offered at other campuses.
- Collin College's Cyber Security program prepares/qualifies the student for the challenges faced by companies and government agencies in the areas of Cyber Security network management, system administration, technical support, hardware/software installation, and equipment repair. This program has

worked with companies such as EDS, Perot Systems, and Raytheon. With an eye toward hard working professionals, three of the four classes required for certificate completion can be taken online, as well as in the classroom. Nearly 1,000 students have participated in training over the past year in these vital fields.

Research and Innovation

Collin College has asserted itself as a leader of undergraduate research.. Many of our science students are gaining valuable experience with expert faculty doing research that they would not ordinarily see until graduate school. The outcome of this innovation has exhibited itself in a number of capacities.

Center for Advanced Studies in Mathematics and Natural Sciences

- The Center for Advanced Studies in Mathematics and Natural Sciences (CASMNS) is a specialized program for highly motivated and talented students majoring in mathematics or the natural sciences. The Center offers opportunities for students enrolled in select courses in biology, chemistry, mathematics, physics and geology to participate in a variety of undergraduate research activities.
- Last year, CASMNS student Helen Zhu and Chris Doumen, professor of biology, submitted the complete DNA sequence of a crawfish enzyme to the National Gene Bank. The enzyme, cytosolic manganese Superoxidase Dismutase (SOD), eliminates harmful free radicals produced when oxygen is used in cells. A local solution potentially solving worldwide problems.

Biotechnology

- Collin College's biotechnology program has been equally proactive in providing venues for undergraduates to get graduate-level experience while learning scientific and laboratory method and etiquette.
- These experiences have helped our students get positions in biological research and industrial laboratories around the nation. Research done in the biotechnology program pertains to agriculture, medicine, pharmaceuticals and other applications that impact the world.

Wide Area Network (WAN)

- All campuses and future campuses at Collin College are linked to each other and the globe via a dedicated high speed network. This has enabled us to implement a VoIP communication system throughout our District. We also provide excess bandwidth for local governments so that they do not have to run the same fiber over the same poles thereby saving millions of dollars for taxpayers. Additionally, the system allows for coordination of emergency response protocols in the case of weather, HIN1, pandemics, etc.

Solutions in the Business World

Today's business owners—no matter how small or large—face a different challenge than they did 100, 50 or, even, 10 years ago. Small business owners are no longer limited to marketing in their immediate area. Instead, they can compete on a national and worldwide marketplace.

During the last year the Collin Small Business Development Center (SBDC) has served 852 distinctive clients: 568 pre-venture clients; 136 start-up companies under one year in business; 148 established business clients; and 157 clients that were home based. The economic impact of these companies has totaled more than $5.6 million in increased sales and $3.6 million in Small Business Administration loans, commercial loans and lines of credit and/or private investments.

Of the 58 sciences and technology companies that the Collin SBDC has assisted this year, 13 of them are pre-venture, 20 of them are start-up ventures and 25 are established businesses. Eight of the science-type companies have produced or are in the process of producing products and 13 of the technology companies are in the same process.

Leading the Way in Healthcare

As the population in Northeast Texas has grown substantially over the past 20+ years, so has the need for healthcare facilities. Collin College is meeting the need for more nurses, respiratory therapists, surgical technicians, health information professionals, dental hygienists, EMTs, firefighters and police officers. However, we have a vision to expand to an entirely new level.

Collin College envisions being the home of a sophisticated regional hub for education and training in healthcare. We foresee a Center for Excellence in Healthcare equivalent to MD Anderson or the Mayo Clinic, for Northeast Texas. This would capitalize on the popular and award-winning programs already in place, but also take advantage of location and regional transit plans.

Intermoddal Facility

- The Collin County Commissioner's Court has discussed bringing an intermodal logistics park to Eastern Collin County as a rail and trucking hub and possibly tying to airport facilities. The intermodal area would provide for truck to rail and rail to truck exchange in incoming goods from around the nation and abroad. The hub would be convenient to the impending outer loop project that is near the college's future campus in northeast Collin County.

Award Winning Nursing Program

- Our nursing program is one of the top in state of Texas of the more than 90 programs. It was one of three recently honored for graduation and licensure success in Texas. Also, the Texas Higher Education Coordinating Board gave our nursing program an exemplary rating and this year, Dr. Nell Ard, director of nursing, was one of 21 fellows inducted into the Nurse Educator Academy from the National League of Nursing. The nursing program also hosts refresher programs for those returning to the nursing field. The nursing program has increased enrollment ever semester since 2005 and it currently admits 48 students twice a year. To put that into perspective, about 250 students apply to our nursing program each semester. The nursing program has also expanded curriculum to include a Certified Nurse Assistant course and developed a marketable skills achievement award combining nurse aide certification, EKG tech skills and phlebotomy certification.

Healthcare Simulation Lab

- One tool that makes Collin College's healthcare programs attractive is the state-of-the-art Simulation Lab, which operates five days a week and some nights and weekends to provide students from all programs the feel of caring for and attending to a real patient in a real hospital or emergency situation. This simulation lab is becoming nationally-known as innovative and has been visited by other programs, health facilities and even a physician and nurse from Switzerland. We are assisting METI, Inc. a provider of high tech mannequins, in developing computer-driven scenarios for their cutting-edge simulation mannequins. At our faculty's suggestion, the METI company is developing interdisciplinary scenarios for use in health science programs.

Health Information Technology

- This new program currently already has more than 850 students enrolled. In the same manner that we created Weekend College and the alternative teacher certification, Collin College would like to lead the charge in providing health information technicians for our hospitals and clinics through a Health Information Institute and develop a model for the rest of the country.

Collin College has expanded but there are still many needed areas that could not be implemented due to a lack of funding, such as radiology technology, imaging, etc. Again, local issues lead to local solutions that can be replicated and adapted around the nation and world.

Recommendations and Solutions

As you know, over time our country has fallen behind in science, technology and engineering. Yet as we gaze at the competition beyond our borders, we have the power to not only turn the tide but to lead discovery, invention and innovation to new levels through collaboration.

Centralized management certainly is needed as the situation demands. However, thoughtful rapid response and creative solutions should, as appropriate, be lead at the local level. We are presently exploring a new definition of the campus of the future for our East Collin County site. We expect this to result in another leap forward for higher education in our region.

As Americans lose their jobs and fear the loss of their jobs, they-and their children are turning to the local community college for a solid education and a new career. Community colleges contribute to the local economy by raising the standard of education in the market. We also provide public safety and healthcare personnel to serve our constituents in their times of need. Our success is inextricably tied to the community and positioned to contribute to the national recovery. As Americans persevere through an historic challenge, community colleges look forward to being

a part of the solution. With vision from Washington and innovative tactics at the local level we can accomplish great things.

Thank you, Mr. Chairman.

BIOGRAPHY FOR DR. CARY A. ISRAEL

Cary A. Israel is president of Collin County Community College District, a multi-campus operation serving over 46,000 credit and non-credit students annually. Under his leadership, Collin County Community College is nationally recognized for its outstanding and innovative programs. The College was named a National Bellwether winner for its Learning Communities Program, received Campus Compact's National Collaboration Award for outstanding partnerships with business and industry, earned (for the 10th consecutive year) the "Certificate of Achievement and Excellence in Financial Reporting" from the Government Finance Officers Association, and has received the coveted "Best of the Web" award from the National Center for Digital Government for its downloadable catalog/schedule system.

The first dual admission agreements in the State of Texas were also signed between CCCCD and the University of North Texas, the University of Texas at Dallas, Texas Woman's University, Texas A&M Commerce, Texas Tech University, Baylor University, Texas A&M College Station, Southern Methodist University, Dallas Baptist University, and Austin College.

In response to the crises-level need for classroom IC–1.2 teachers, CCCCD was the first community college in the state to gain approval for their alternative teacher certification program (first in the nation also by a community college) and received a $689,347 grant from the U.S. Department of Education for their "Preparing Tomorrow's Teachers" program.

Also under Israel's leadership, the District was designated as one of six CCNP (Cisco Certified Network Professional) Training Centers in the United States, named one of the first 18 campuses in the nation as a Microsoft IT Academy, designated an international CIW (Certified Internet Webmaster) Faculty Institute site by Prosoft Training and the National Workforce Center for Emerging Technologies, named the only Regional Academy for Security and Wireless training in the state of Texas, and chosen by Oracle Corporation to become a Workforce Development Program partner. In addition, under President Israel's leadership, a 54.5-mile 48-strand fiber optic network was constructed connecting all District facilities. Additionally, all campus facilities now have wireless capabilities.

President Israel has also established the Collin Higher Education Center, Honors Institute, the Convergence Technology Program (funded by a $4 million grant from the National Science Foundation), Weekend College, the Center for Scholarly & Civic Engagement, the Center for Advanced Studies of Mathematics and Natural Sciences (CASMNS) Program, Destination College, the first and only Student Leadership

Academy at a community college in Texas, and a model Academy for Collegiate Excellence (ACE) which is a rigorous leadership program designed to identify and cultivate leaders from within Collin County Community College District.

In spite of the tremendous time commitment of leading one of the largest community college districts in Texas, President Israel finds time to contribute his talents as a leader on a national, state and local level. He is a founding member, previous Chairman, and current Board member of the Texas Campus Compact, a member of the Texas Association of Community College Presidents Executive and Legislative Committee, and serves on the University of North Texas Bill J. Priest Graduate Advisory Committee. President Israel is also on the Board of Directors of the Medical Center of Plano, the Plano Chamber of Commerce, the Plano Economic Development Board, and the Plano Symphony Orchestra. Additionally, he sits on the national SunGard Higher Education Advisory Board, the junior League of Plano, and is a member of the Plano Rotary club.

Israel previously served as president of Raritan Valley Community College in New jersey, president of the Illinois Community College System (a 50 college system), and president of Front Range Community College in Colorado. He was named the CEO of the year by the American Association of Community College Trustees for the Eastern Region and last year was named the CEO of the year in the Western Region. Recently, he received the National Pacesetter of the Year Award from the National Council for Marketing and Public Relations. He has also received the National Leadership Award from the National Council for Continuing Education and Training. Additionally, he has received the Plano Community Forum's Community Award, the Collin-County League of United Latin American Citizens' Community Service Award, the Collin County Children's Advocacy Center Mentor Award, the

Special Award of Merit from the Plano Chamber of Commerce, and the Phi Theta Kappa Shirley B. Gordon Award for Distinction.

Cary Israel received a Bachelor of Arts. degree with highest honors from Michigan State University and juris Doctorate from the University of Detroit Mercy Law School.

Mr. HALL. And I thank you. And I'd be remiss if I didn't thank Bob Collins who is the Chairman for the Collin County Community College Board and is the guy that I couldn't even start to represent this district without his support and friendship. And I thank him very much.

I thank him also for working with young Barbara Goss who's the President of the Barbara Bush deal. It teaches youngsters about politics other than educating them. Bob's a great man, very valuable to us and very, very valuable to me as I represent you.

Now, from my alma mater almost. My wife graduated there and my mother. My mother and my only wife graduated from there. I got a grandson over there right now. I hope you're gonna look after him. He's A much better student than I was because I made four Fs and a D one time and my dad punished me for spending too much time on one subject. Not as bad at school as I was.

We have the President of Texas A&M University-Commerce Dan Jones. Good guy.

STATEMENT OF DR. DAN JONES, PRESIDENT, TEXAS A&M UNIVERSITY-COMMERCE

Dr. JONES. Thank you, Congressman Hall. And we are keeping an eye on your grandson, as we do all of our students. Chairman Gordon, Congressman Hall, other honored guests, we appreciate the opportunity to testify to this hearing on regional innovation in Northeast Texas.

Our university, A&M Commerce, plays an essential role in the continuing development of science and technology in Northeast Texas through innovative partnerships with industry and effective collaborations with community colleges and public schools.

These efforts are vital as we strive to support the economic vitality of this region. The key to the success of many of our initiatives is the constant support that Congressman Hall has extended the University for many, many years.

With his support, we have been able to implement a number of initiatives and strengthen the ties between education and industry and which we believe will help fulfill both our mission as a university and the intent of the Committee on Science and Technology.

As you are aware, universities nationwide are focused on science, technology, engineering and mathematics or STEM initiatives. At A&M Commerce, we have added another letter to this acronym; E for education in our project STEEM initiative.

Project STEEM focuses on enabling teachers and students to enhance their science, technology, education, engineering and mathematic skills through project based activities with scientist and research faculty at our university.

More than 300 students have been served in the summer programs, which have such exotic names as the X-Teems and the Infinity Institute, and more than 60 teachers from our rural districts have participated in these as well.

Two of our project STEEM students have received full scholarships for four years to attend MIT. These are students from small rural communities in Northeast Texas. We tried to get them to come to Commerce, but when beckoned, we didn't feel like we could hold them back.

We will work this year to disseminate and replicate the STEEM model to bring more opportunity to rural areas. We have also secured grants from a number of Federal agencies, including the National Science Foundation, which focus on increasing the number of students, especially at the K–12 levels, who aspire to careers in STEM fields.

Our faculty worked closely with K–12 teachers and students to expose them to cutting edge research and to inspire them with the benefits to society of their work. Fifty students are served each year in one of these projects and 35 teachers are pursuing a master's degree in science or math through projects supported through these NSF initiatives.

Surveys of student participants in both the STEEM and the M2T2 program—and there's details about that in my written testimony—indicate that a greater number of students are now considering careers in STEM fields which will positively impact the STEM workforce in our region.

Teachers report improved teaching strategies in STEM content areas as a result of their participation. Partnerships with industry also support our preparation in tomorrow's STEM workforce.

Through funding from L–3 Communications Integrated Systems in Greenville, our faculty have developed high-performance computing methods and capabilities which will provide our faculty and students with research and educational opportunities currently not available in the area. And I have some additional information on that project in the written testimony.

I'd like to talk a minute about our partnerships with community colleges, including Collin College, because they're extremely important to the work we do in Commerce.

In the fall of 2008, only 18 percent of our bachelorette graduates, graduates to whom we awarded degrees in December 2008 entered the university as full-time freshman, while 82 percent had entered as transfer students.

Fifty-six percent of these graduates have completed at least 30 semester credit hours at a Texas community college. Because of these unique demographics, we have actively pursued grants to build the capacity of community college students to be successful when they transfer into our STEM programs.

And through Dr. Cary Israel's vision, we are embarking on another program that will enable students here in Collin County to receive a bachelor's degree from A&M Commerce without having to go to Commerce through a partnership that will be implemented later this year.

Our faculty members in physics, biology and chemistry receive additional research grants from NSF and other Federal agencies enabling a large number of both undergraduates and graduate students to engage in cutting edge research.

This research experience has enabled these students to pursue doctoral degrees at prestigious institutions across the state and the

nation. The point I want to emphasize is that regional universities are sources for regional innovation.

Many tier I universities have wonderful research programs that target their efforts toward areas supported by large donors or the national research agenda.

Regional universities, on the other hand, serve the vital role of building regional capacity for innovation by having a deep understanding of the communities, the education systems and the available resources of the regions they serve.

Further investment in regional universities will allow our institutions to implement on a larger scale proven models for summer and school year programs that inspire students. In the case of students from small rural schools, these programs offer access to well-equipped classrooms and laboratories that their home districts simply cannot afford.

Our rural districts are tremendous sources of talent and regional universities are in the best position to mine these rich veins of intellect and aspiration.

We have also shown that investing in institutes and special programs for math and science teachers is important to help them renew their energy and to encourage them to persist in their teaching fields.

In addition, more opportunities for internships are extremely important so that university students have the opportunity to apply the skills they are learning as they pursue math, engineering and science degrees.

Incentives for industry to increase accessibility for these internships is important, especially as students in the regions are typically very much at home and plan on continuing their lives in this area and contributing to their local economies.

As a result of our commitment to improving STEM education from kindergarten through graduate school, and through our aggressive pursuit of extramural funding, Texas A&M University-Commerce has increased the success of our citizens through exposure to cutting edge research projects, state of the art equipment and effective faculty mentoring.

Each day we prepare new generations of scientists and engineers inclusive of all demographic populations to meet the STEM work force needs of our region, our state and our nation. Once again, thank you for the opportunity to share those thoughts with you today.

[The prepared statement of Dr. Jones follows:]

PREPARED STATEMENT OF DR. DAN JONES

Chairman Gordon, Congressman Hall, Committee Members, other honored guests, we greatly appreciate the opportunity to testify at this hearing on regional innovation in Northeast Texas. Texas A&M University-Commerce plays an essential role in the continuing development of science and technology in Northeast Texas through innovative partnerships with industry and effective collaborations with community colleges and public schools. These efforts are vital as we strive to support the economic vitality of Northeast Texas and our nation. Key to the success of many of our initiatives is the constant support that Representative Hall extends to the university. A number of initiatives have been successfully implemented at our university that strengthen the ties between education and industry and will help to fulfill the mission of our institution as well as the intent of the Committee on Science and Technology.

Nationwide, universities and agencies are focused on Science, Technology, Engineering, and Mathematics or "STEM" initiatives. At A&M-Commerce, we have added another very important letter to the STEM acronym: E for Education, in the formation of our STEEM project. With funding from the Greater Texas Foundation, Project STEEM focuses on enabling teachers and students to enhance their science, technology, education, engineering, and mathematics skills through project-based activities with scientists and research faculty at the university. The project includes two summer camps known as the X-Teems Academy and the Infinity Institute. We are tracking participants to monitor college matriculation rates and persistence in STEM fields. Two of our STEEM students have received full scholarships for four years to attend MIT. These are students from small rural communities in Northeast Texas. We will work this year to disseminate and replicate the STEEM model to bring more opportunity to rural areas.

We have secured grants from several Federal agencies, including the National Science Foundation, which focus on increasing the number of students, especially at the K–12 levels, who aspire to careers in STEM areas. Our faculty work closely with K–12 teachers and students to expose them to cutting-edge research and the benefits to society. In only its first year, the Maximizing Motivation-Targeting Technology (M2T2) project funded through NSF Innovative Technology Experiences for Students and Teachers (ITEST) initiative has increased STEM skills in middle school students and the motivation to excel in math and science. Video game technology is the motivation and high-level physics and other science concepts are explored in summer science camps. Fifty students are served each year in the M2T2 project and 35 teachers are pursuing a master's degree in science or math. Surveys of student participants in both the

STEEM and M2T2 programs indicate that a greater number of students are now considering careers in STEM fields which will positively impact the STEM workforce in our region. Teachers report improved teaching strategies in the STEM content areas.

Partnerships with industry also support our preparation of tomorrow's STEM workforce. Through funding from L–3 Communications Integrated Systems, our faculty have developed high-performance computing methods and capabilities which will provide our faculty and students with research and educational opportunities currently not available in the area. In addition, high schools, middle schools, and charter schools in both Commerce and Greenville participated in Operation Spark, which aims to:

- foster an interest in math and science among students in grades 6–9,
- increase proficiency in math and science among students in grades 6–9, and
- increase teacher proficiency in math and science instruction.

There are five components to the grant: Strands, Math and Science Saturday, Family Math and Science Night, Professional Development, and Scholarship. The curriculum components of Operation Spark were developed through discussions between the A&M-Commerce project leaders and L–3 Communications Integrated Systems contacts. The Strands are taught to A&M-Commerce undergraduate and graduate students who then go into the local schools to demonstrate and teach the content to students in grades 6–12. Strands is based on the notion that college students majoring in math and science will positively impact middle and high school students due to their closeness in age and experience, which will foster both learning and a positive perception of math and science in these students. This concept is known as peer-led team learning.

Community colleges are extremely important to A&M-Commerce. In the fall of 2008, only 18% of baccalaureate graduates had entered the university as full-time freshmen, while 82% had entered as transfer students. Fifty-six percent of these graduates had completed at least 30 semester credit hours at a Texas community college. Because of these unique demographics, we have actively pursued grants to build the capacity of community colleges students to be successful when they transfer into our STEM programs. Four different projects funded through NSF support community college students, either while they are still enrolled at the community college or when they transfer to the university. These are: Course, Curriculum, and Laboratory Improvement (CCLI); Scholarships in Science, Technology, Engineering, and Mathematics (S–STEM); Research in Undergraduate Institutions (RUI); and the Research Experience for Undergraduates (REU). Through these and other special projects, a great number of community college students have been involved in leading-edge research activities at our campus and have gone on to pursue bachelor's and master's degrees in STEM disciplines.

Our faculty members in physics, biology, and chemistry have received additional research grants, enabling a large number of both undergraduate and graduate students to engage in cutting-edge research. This research experience has enabled these students to pursue doctoral degrees at very prestigious institutions across the state and nation.

Regional universities are sources of regional innovation. Many Tier I universities have a wonderful research focus but target their efforts toward areas supported by large donors or national needs for research. Regional universities serve the vital role of building regional capacity for innovation by having a deep understanding of the communities, the education systems, and the available resources of the regions in which they are located. Further investment will allow regional universities to implement on a larger scale proven models for summer and school year programs that inspire students. In the case of students from small rural schools, these programs offer access to well-equipped classrooms and laboratories that their home districts simply cannot afford. Our rural districts are tremendous sources of talent, and regional universities are in the best position to mine these rich veins of intellect and aspiration. We have also shown that investing in institutes and special programs for math and science teachers is important to renew their energy and encourage them to persist in their teaching fields. In addition, more opportunities for internships are also extremely important so that university students have the opportunity to apply the skills they are learning as they pursue math, engineering, and science degrees. Incentives for industry to increase accessibility for these internships is important, especially as students in the region are typically very much "at home" and plan on continuing their lives in this area and contributing to their local economies.

As a result of our commitment to improving STEM education from kindergarten through graduate school and through our aggressive pursuit of extramural funding, Texas A&M University-Commerce has increased the success of our citizens through exposure to cutting-edge research projects, state of the art equipment, and through effective faculty mentoring. Each day we prepare new generations of scientists and engineers inclusive of all demographic populations to meet the STEM work-force needs of our region, the state, and the nation.

Thank you for this opportunity and I am happy to answer any questions.

BIOGRAPHY FOR DR. DAN JONES

Dr. Dan Jones is President and CEO of Texas A&M University-Commerce. Prior to his appointment, Dr. Jones served as Provost and Vice President of Academic Affairs at Texas A&M International University in Laredo, Texas; and as Dean of University College at the University of Houston-Downtown. He began his teaching career as an instructor of English at Casper College, Casper, Wyoming. Dr. Jones earned his B.J. in Magazine Journalism (with highest honors) and B.A. in English (highest honors) from the University of Texas at Austin. He has an M.A. in English from Rice University, as well as an M.A. in American Studies from the University of Iowa. He received his Ph.D. in American Studies, also from the University of Iowa. He was a charter member of Phi Kappa Phi at the University of Houston-Downtown, where he was also given the Service Excellence Award and the Student Government Association award for Outstanding Faculty Member. He was also a charter member of Phi Kappa Phi at Texas A&M International University. His professional memberships include the American Studies Association, the Far West Popular Culture Association, the Popular Culture Association, and Phi Beta Kappa. Born in Bartlesville, Oklahoma, he is married to Jalinna Jones, and has two daughters: Allyson, 26, and Aislinn, 11. He enjoys running, traveling, and spending time with his family.

Mr. HALL. Thank you very much and also I want to thank Bill Whitfield, long time mayor who just returned from Europe on a trip selling Collin County for people were trying to—Mayor, are you still with us? Thank you very much for your service. You're still working.

Now, Jerry Madden, our State Rep—is Jerry here? Thank you, Jerry. Jerry was on the Commissioner Court here for a lot of years. Next we have Patrick Humm, President of Hie. Am I saying that right, H-i-e, Hie? Can't hardly mispronounce that, can I?

But I was just in the back there and looking with Judge Self and others at the TeraStack Solution and what you could do with that. I know you're gonna talk about that a little bit.

But I just thought back to when my first days as County Judge out in Rockwall County in 1950, I had a big chief tablet, a cedar pencil and now, look what you have, what you brought here for us. Tell us more about that. We're honored to have you here. You do have five minutes. I appreciate it if you can stay within.

STATEMENT OF MR. PATRICK ALAN HUMM, P.E., CHAIRMAN AND PRESIDENT, HIE ELECTRONICS

Mr. HUMM. Thank you Chairman Gordon and Ranking Member Congressman Hall. It's my privilege to testify before the House Science and Technology Committee this morning as well as sit at the table here with Dr. Israel and Dr. Jones, Martin Izzard, Bill Sproull and Tom Luce.

My name is Patrick Humm, Chairman and President of Hie Electronics. Our company manufactures and sells the TeraStack Solution. There's one in the next room which you can take a look at. Our product is intended for government, commercial and industrial users.

Our system securely stores critical data for periods up to and beyond 50 years with high data integrity. Data storage is a huge and rapidly growing and expanding market which will have an annual spend of $55 billion a year by the end of the next decade.

Because our product is an innovative, green and secure means of storing our nation's data for such extended periods of time, our potential growth may result in as large as a $2.5 billion revenue business by 2017.

TeraStack Solution is a unique hybrid combination of the latest technologies in computing. It's a breakthrough for long-term data integrity, durability and reliability. While the data stored can vary, e-mails, electronic medical records, digitized documents, satellite imagery, video surveillance, data used in criminal records and criminal investigations and, in fact, we're being looked at for the Hubble Space Telescope.

The TeraStack Solution has one further advantage, it's an energy efficient, green data storage product. As compared to current data storage systems, our product is up to 90 percent more energy efficient and operates with a nominal power draw of 500 watts which is the power of a single 110 wall outlet. Our product significantly lowers the energy consumption and cooling cost of data centers, reducing electronic waste of energy.

We are actively involved in the Northeast Texas Innovation Economy, and have been for decades, its educational institutions and businesses. Our customers include architects, pharmaceutical companies, the U.S. Air Force and a Fortune 100 company.

Hie Electronics currently has a 30 person staff, and we're approximately $2 million a year in revenue, so we are an emerging tech company. We're located here in McKinney. Our employees have decades of experience with Texas Instruments (TI) and other local tech companies. TI's also one of our suppliers.

One of the most important aspects of our startup is the ongoing generational transfer of engineering process, what I've heard called

"engineering voodoo knowledge" to the younger staff that we have employed. Hie Electronics is proud to employ veterans and an active duty military spouse. Our company also pays it forward with an intern program that employs some local college students, SMU, UTD, University of North Texas, A&M, Texas Christian and, yes, Collin College. Several of our interns have become full-time employees with the company.

Hie Electronics is one of the companies that your Committee wants to see be successful. As a technology manufacturer and green job employer, we are developing a clean technology, contributing and maintaining our country's competitiveness, and creating jobs for the future.

The topic before us today is to identify regional innovation elements necessary for companies like ours to develop and grow the Nation's high tech economy. Simply put, in the beginning, it's a steady, available investment stream that helps launch a startup and then fuels the development of innovation and, ultimately, a competitive world market product.

Early stage capital funding is critical to small high tech companies. Private funding from angel investors of high net worth typically starts the process and then it moves to private equity groups. Often at this stage a venture capital firm will come in, take 50 percent control, and exit the founders and flip the company.

An alternative, state based funding like the Governor's Emerging Technology Fund can provide capital with different requirements. We might also mention McKinney Economic Development Corporation at this time.

Hard work by those who know the most about new technology can allow a company to fully contribute to the local economy. We actively seek support from all regional economic incentive vehicles and we'll be working with the ETF and the MEDC.

A thought for your Committee: consider how Singapore helps new technology companies with considerable tax incentives, double depreciation on first year capital expenses, perhaps giving tax deductions to angel investors who initially capitalize companies like ours and, of course, grants helping.

Regarding national innovation, we heartily thank you for your role in developing ARPA-E opportunities as well in streamlining the cumbersome government procurement process. The reality is it takes generally two years to be vetted by government agencies for the purpose of contracting and certification, and then you've got to get by the beltway entities who have the contracts already in place.

For every day a new technology waits in the wings of bureaucracy, the opportunity cost for the Nation increases, while our foreign competitions delivers products faster than we are able to. Viable contracts in capital funding for newly developed products are critical to our sustainment and growth.

Hie Electronics wants to be a green employer, expand our American-based manufacturing, meet the increasing demand for green, secure long-term data storage, and contribute to our Nation's effort to become energy independent.

Thank you. Personally it's humbling for me to have been asked to submit constructive input. We are persistent in our pursuit of excellence and need your help to deliver the promise of high tech,

good paying jobs for our youth through local innovation. Thank you.

[The prepared statement of Mr. Humm follows:]

PREPARED STATEMENT OF PATRICK ALAN HUMM, P.E.

Thank you, Committee Chairman Congressman Bart Gordon and Ranking Member Congressman Ralph Hall. It is my privilege to testify before the House Committee on Science and Technology.

My name is Patrick Humm, Chairman and President of Hie Electronics. Hie Electronics manufactures and sells the TeraStack© Solution. Our product is intended for government, commercial and industrial users.

Our system securely stores critical data for periods up to and beyond 50 years. Data storage is a huge and rapidly expanding market which is expected to have an annual market spend of over $55B within ten years.

Because our product is an innovative, "green" and secure means of storing our nation's data for such an extended period of time, our potential growth may result in as large as $2.5B in revenue by 2016 or 2017.

The TeraStack© Solution's unique combination of the latest technologies is a breakthrough for long term data integrity, durability and reliability. While the data stored can vary; e-mails, electronic medical records, digitized documents, satellite imagery, video surveillance, or data used in criminal prosecution; the longevity remains the same.

The TeraStack© Solution has one other fantastic advantage—it is an energy efficient, green, data storage product. As compared to current data storage systems, the TeraStack© Solution is up to 90% more energy efficient and operates with a nominal power draw of just 500 watts; the power of a single 110 wall outlet. Our product significantly lowers the energy consumption and cooling costs of data centers, reducing electronic e-waste.

We are actively involved in the Northeast Texas Innovation Economy, its educational institutions and businesses. Our customers include architects, pharmaceutical companies, the USAF and a Fortune 100 company.

Hie Electronics' currently has a 30-person staff and approximately $2M in annual revenue. Our office and manufacturing facility is located in McKinney, Texas.

Our employees have decades of experience at Texas Instruments and other local tech companies. TI is also one of our suppliers. One of the most important aspects of our startup is the ongoing generational transfer of engineering process—what I have heard called "engineering voodoo knowledge" to the younger staff.

Hie Electronics is proud to employ veterans and an active-duty military spouse. Our Company also "pays it forward" with an internship program that employs local college students (Southern Methodist University, University of Texas at Dallas, University of North Texas, Texas A&M University and Texas Christian University). Several graduates have become full-time employees with the company.

Hie Electronics is one of the companies that your committee wants to see be successful. As a technology manufacturer and green job employer, we are developing a clean technology, contributing to maintaining our country's competitiveness, and creating jobs for the future.

The topic before us today is to identify the regional innovation elements necessary for companies like ours to develop and grow the nation's high tech economy. Simply put, at the beginning it is a steady, available investment stream that helps launch a startup, and then fuels the development of innovation and ultimately, world market competitiveness.

Early stage capital funding is critical to small high-tech companies. Private funding from angel investors of high net worth typically starts the process. Traditionally the next stage comes from private equity groups and venture capital firms. Often at this stage the VC takes over 50% control, exits the founders and flips the company.

An alternative, state-based funding like the Governor's Emerging Technology Fund provides capital with different requirements. This funding vehicle allows technologies and companies to be built the old-fashioned way, hard work by those who know the most about the new technology, and this allows the new company to fully contribute to the local economy.

We will actively seek support from all regional economic incentive vehicles. For example, Hie Electronics will be looking for support from organizations like the McKinney Economic Development Corporation. The MEDC is a Texas 4a community based non-profit which supports economic growth.

A thought for your committee—consider how Singapore helps new technology companies with considerable tax incentives. For example double deprecation on first year capital expenses, or perhaps giving tax deductions to angel investors who initially capitalize companies like ours.

Regarding national innovation, we heartily thank you for your role in developing ARPAE opportunities. We look forward to utilizing this streamlined process. We ask your committee to continue to expedite the cumbersome government contracting and product certification processes. It is the government sector who calls now for innovation, green and secure products like ours. The reality is, it takes generally two years to be vetted by government agencies for purposes of contracting and certification.

For every day new technology waits in the wings of bureaucracy, the opportunity cost for the nation increases, while our foreign competition delivers products faster than we are able.

Viable contracts and capital funding for newly developed products are critical to our sustainment and our growth. Hie Electronics wants to be a green employer; expand our American-based manufacturing facilities; meet the increasing demand for green, secure, and long-term data storage; and contribute to our nation's effort to become energy independent and secure.

Thank you, personally it is humbling for me to have been asked to submit constructive input. We are persistent in our pursuit of excellence and need your help to deliver the promise of high tech, good paying jobs for our youth, through local innovation.

BIOGRAPHY FOR PATRICK ALAN HUMM, P.E.

SUMMARY:

Patrick Humm is the **Chairman and President of Hie Electronics,** innovator and manufacturer of the TeraStack© Solution, a green data storage product. Mr. Humm manages all aspects of this private corporation including; investor relations, product development, business planning, recruiting, staffing and daily management of the 35-person team. He is an active, "hands-on" leader excelling in dynamic cross-functional challenging work environments.

Hie Electronics developed the TeraStack© Solution, an extendible 50 terabyte optical data storage product, for use in applications where robust, secure storage is required. The system significantly reduces typical data storage power consumption and cooling costs. Hie Electronics manufactures and sells its TeraStack© Solution to commercial users and government agencies for security applications, medical imaging and healthcare data, and long term data retention requirements.

The versatile TeraStack© Solution currently provides enhanced security surveillance video management for a major government defense contractor, lifetime electronic document storage for the medical research industry, comprehensive hierarchical data storage management of 3dimensional design and constructional drawings to an international architecture firm and medical imaging storage for a military application.

Mr. Humm is a recognized leader in several aspects of the information systems sector, global project management, business startups and turnarounds, joint venture management, business development, acquisition and divestiture and business strategy and process development.

During a 30-year career at **Texas Instruments,** Mr. Humm acquired extensive program management and startup experience in the high tech sector with proven accomplishments in the management of complex, worldwide manufacturing operations and systems implementations. He has supervised the largest systems re-engineering and capital expenditure projects in Texas Instruments history as the **Worldwide Inventory Director** and the **Worldwide Information Technology Technical Director.**

In addition, as **MOSM Joint Venture Program Director,** Mr. Humm directed monthly supervision of joint venture business plans, commercial partnerships product portfolios, new technology transition, capital expansion plans, and Board of Directors governance. His expertise included international business startups, turnarounds, strategy and process development, acquisitions, divestitures and 1PO process.

Mr. Humm has a **B.S.** degree in **Engineering Design and Economic Evaluation** from **The University of Colorado at Boulder** and an **M.B.A**. from **The University of Texas at Dallas.** He has lived and worked in Japan, Italy, Singapore, Taiwan, Korea, and the United States.

Mr. HALL. And thank you very much. And what you said and what all of you are testifying to here will go into a record and be available to the other Members of Congress who really need to hear the things that you're saying there.

You can battle the destitute and nature over in South Africa, but you're getting into something that they really need to hear and I know the entire board and committee there agrees with you. Thank you.

At this time, I recognize Martin Izzard, Vice President and Director of Digital Signal Processing Solutions—I can hardly say it—R&D Center of Texas Instruments. Great company.

Sometime I'd like to talk to you about how Texas Instruments was started and how the great man that started it was going out to listen to it and see what we bought when he heard the Japanese were bombing Pearl Harbor.

As an engineer he was great; but as for timing, he was really super. Thank you. We recognize you.

STATEMENT OF DR. MARTIN IZZARD, VICE PRESIDENT AND DIRECTOR, DIGITAL SIGNAL PROCESSING SOLUTIONS R&D CENTER, TEXAS INSTRUMENTS

Dr. IZZARD. Thank you. Thank you so much. Chairman Gordon, Ranking Member, all, thank you for the opportunity to testify today. It strikes me being in this courthouse. The last time I was in a courthouse like this was when I was sworn in as a U.S. citizen in 2002, so it's nice to be back. Those are good memories.

Representing TI, I'd like to say TI appreciates the leadership of your Committee on so many critical issues, particularly the *America COMPETES* and the *National Nanotechnology Initiative Amendment Act*. TI also applauds the strong research investments provided in the stimulus and thanks you for your continued leadership on research funding.

TI has a nearly 80-year history of innovation. While our products have changed over the years, we remain essentially a company of engineers and scientists. We've always looked to the future by investing in research and development to the tune of 15 percent of sales in 2008.

My role at Texas Instruments as I direct the Digital Signal Processing Solution R&D Center—yes, it is a mouthful—which is a core technology that enables continuous real world signals, analog signals such as voice or images, to be converted into digital form and interpreted.

Our research focuses on communications, medical, video, vision and imaging, audio and voice and other applications that run in our integrated circuits. I also oversee our Kilby Labs which is a new and exciting initiative at TI with selective researchers.

Engineers currently in the company and folks from university research programs can work full-time on high risk, high reward projects for several months to a year.

Several projects are focused on power management critical to energy and medical applications, from chips that can better harvest the energy from the environment to ultra low power chips that are suitable implantable devices.

The research involves the collaboration beginning with university professors and graduate students. I'll focus my comments today on the partnership TI has formed with the North Texas Innovation Eco-System. Quite simply, regional innovation capacity boils down to talent.

A STEM educated workforce is essential to the success of companies like TI and to overall U.S. competitiveness. University research is essential for training graduate students and enabling breakthroughs by private sector innovations.

In 2005, the State of Texas created a $200 million Emerging Technology Fund which we believe has been a wonderful tool for encouraging research and innovation in Texas.

Recently the State Legislature approved new resources to grow additional in-state Tier 1 research capacity. Seven institutions were identified and received State funds to match other research sources such as those from TI.

On September 1, the University of Texas at Dallas announced it had received 16 philanthropic gifts totaling more than 16.8 million that were motivated in part by the availability of matching funds under this program.

In greater Dallas, TI has tremendous research capacity right in our backyard. TI has provided financial and technical support with medical and electronics research involving UTD, UT Southwestern, and UT Arlington.

In fact, we've sponsored research at UTD that has resulted in wireless medical sensors that are now being commercialized in a start-up company. Another example is TxACE, a $16 million collaboration between the Center at UTD that focuses on research in analog and radio frequency technology to address challenges in such areas as energy efficiency, healthcare and public safety.

TI lead the effort to establish the Center and has endowed the director, analog design chair, and graduate student fellowships and has committed $2.7 million for research over three years. The Semiconductor Research Corporation also provided $1.2 million per year for three years. UTD and the UT system are providing 3.7 million with the State ETF matching 4.5 million over three years.

This collaboration of academia, industry and state government is an excellent example of how regional innovation is created. In addition to our research efforts, TI has a strong history and involvement in K–12 education and efforts in Dallas. A full catalog was submitted for the record.

Last week the TI Foundation announced a $3 million grant to support teacher effectiveness for current math and science teachers in the Dallas area and to augment the UTeach Program to encourage math and science majors to enter teaching.

So in TI's experience, the model research collaborations involve not only industry and university, but are greatly enhanced by the engagement of federal agencies and state governments.

The most important step Congress can take is to provide regular, predictable, and sustained investments in basic physical science and engineering research, particularly at NSF, NIST, DOE, Office of Science, and job help.

In STEM education, there must be an effort to scale programs with demonstrated results citing student achievement. There

should be an emphasis on the fundamental math skills needed to succeed as STEM builds. As we build a STEM pipeline, we must also address immigration reform for highly educated professionals.

Nearly half of the master's degree and over 70 percent of the Ph.D.'s in electrical engineering from U.S. universities are granted to foreign nationals. I came to the U.S. on an H1B and received my green card in 1991.

Today hundreds of innovators at TI are stuck in multi-year works for green cards limiting the commercial potential and making international travel difficult. This process must be reformed if we are to attract and retain the world best's minds, especially those graduating from U.S. universities. I say again, especially those graduating from U.S. universities.

Thank you for the opportunity to testify today. TI looks forward to continuing our close working relationship with this committee. Thank you, sir.

[The prepared statement of Dr. Martin Izzard follows:]

PREPARED STATEMENT OF MARTIN IZZARD

Chairman Gordon, Ranking Member Hall, thank you for the opportunity to testify today on *Strengthening Regional Innovation.* Texas Instruments appreciates the leadership of the Science and Technology Committee on so many critical issues, but particularly the landmark *America COMPETES* legislation and the *National Nanotechnology Initiative Amendments Act.*

TI also applauds the strong research investments provided in the *American Recovery and Reinvestment Act (ARRA)* and 2009 omnibus and thanks you for your continued leadership on research funding. Historically, the federal government has been the primary source of basic research funds for universities and plays an especially important role in supporting higher-risk, exploratory research for which the economic benefits may not be realized for decades.

TI has a nearly 80-year history of innovation. While our products have changed many times over the years, we have always fundamentally been a company of engineers and scientists. We have always looked to the future by investing in R&D. Based in Dallas, TI is the second largest U.S. semiconductor company and the world's fourth largest. While our headquarters and substantial manufacturing are located in Texas, TI derives 85% of its sales from overseas markets.

TI is focused on developing new electronics that make the world smarter, healthier, safer, greener and more fun. We make chips that can improve energy production, distribution, and consumption—such as applications for renewable sources, smart meters, and energy efficient appliances.

In 2008, TI invested 15% of sales in R&D. Like most other high-tech companies, much of this was geared towards shorter-term product development, but this figure does include significant investments in longer-term research both in-house and in collaboration with universities.

I will focus my comments today on the research and education partnerships TI has formed within the North Texas innovation ecosystem. Quite simply, regional innovation capacity boils down to talent. A workforce educated in science, technology, engineering and math (STEM) is essential to the success of companies like TI and to overall U.S. innovation in a globally competitive environment. University research is a lynchpin for training graduate students and for enabling the breakthroughs vital to private-sector innovation.

TI Internal Labs

I direct the Digital Signal Processing Solutions R&D Center, which is the core technology that enables continuous real-world analog signals such as voice or images to be converted to digital form and interpreted. Our research has applications in communications, medical, video, vision and imaging, audio and voice. TI also recently launched in-house lab efforts focused on solar and light-emitting diode (LED) technologies.

I also oversee Kilby Labs—an exciting new initiative at TI. In conjunction with the 50th anniversary of the invention of the integrated circuit in 2008, TI launched Kilby Labs as a center of innovation designed to foster creative ideas for break-

through semiconductor technology. The new labs build on IC inventor Jack Kilby's legacy of revolutionizing our lives through chip innovation.

The lab allows selected TI researchers to work full time on a high-risk, high-reward project for several months to a year. The research often involves collaboration with university professors and several graduate students are assigned to the lab through TI's co-op program. A board of business unit technical experts selects projects on a competitive basis from TI employee submissions. Selected projects must have financial sponsorship from a TI business unit. Currently, there are 7 projects selected from over 90 submissions. Several of the current projects are focused on power management critical to energy and medical applications, from chips that can better harvest energy to ultra-low power chips suitable for medical implantable devices.

Texas University Engagement

TI has special relationships with Texas universities. TI founders Eugene McDermott, Cecil Green and Erik Jonsson helped establish the University of Texas at Dallas (UTD) in 1969 by providing the vision of a local science, technology, and research institution and donating the land for the campus. In 1986, UTD's engineering school was named in Erik Jonsson's honor.

In 2003, TI announced it would build a new $3 billion manufacturing facility in Richardson, Texas. Although incentives were offered by sites around the world, one of the key factors was commitment by the State of Texas to invest $300 million at UTD to further develop research and engineering capacity and improve the innovation ecosystem of North Texas. Since that time, UTD's graduate engineering program has risen 20 spots in the US. News and World Report rankings, 20 new faculty have been added, and annual research expenditures have nearly doubled to $65 million.

In 2005, the State of Texas created a $200 million Emerging Technology Fund which has been a wonderful tool for incentivizing research and innovation in Texas. The fund has three goals: invest in public-private endeavors around emerging scientific or technology fields that are likely to enhance the competitiveness of the state; match federal and other sponsored investment in science; and attract and enhance research talent superiority in Texas.

In addition, the State of Texas Legislature recently approved resources to grow additional Tier 1 research capacity in the state, which TI strongly supported—The Texas Research Incentive Program (TRIP). Tier-1 is defined as a non-medical research university that supports more than $100 million annually in research expenditures. Texas currently has three Tier-1 research universities: UT Austin, Texas A&M, and Rice. The Legislature identified seven Texas universities[1] that have made good progress towards this Tier-1 goal, and plans to make $25 million available to these institutions to match research gifts they receive. This mechanism enables these universities to leverage state funds based on new gifts that TI and others provide. As a result, these institutions will be better able to drive expansion of their own capabilities.

On September 1, the University of Texas at Dallas announced it had received 16 philanthropic gifts, totaling more than $16.8 million that were motivated in part by the availability of matching funds through TRIP.

In greater Dallas, TI has a tremendous resource in the research community right in our backyard. TI has provided financial and technical support for medical electronics research involving collaboration among UTD, UT Southwestern, and UT Arlington. We also are working closely with Baylor Health and Texas Health Resources. An early success story comes from UTD, where TI-sponsored research resulted in wireless medical sensors that are now being commercialized through a start-up company. The sensors use wireless technology to remotely monitor vital signs and transmit data. The larger MobileLab project on wireless health care at UTD has now received follow-on funding from Ericsson, Research in Motion, Samsung, and Apple.

Semiconductor Research Corporation

The Semiconductor Research Corporation is a consortium of semiconductor companies that collaboratively funds pre-competitive university research in semiconductor technology and design.

TI participates on technical advisory boards, routinely attends university research reviews and adds technical relevance to research efforts. TI's annual contributions

[1] UT Arlington, UT Dallas, University of North Texas, Texas Tech, UT El Paso, UT San Antonio, and University of Houston.

in the past five years averaged well over $10 million, enabling SRC to fund more than $70 million of semiconductor research and support more than 1,000 science and engineering graduate students annually. I will highlight three SRC programs as model collaborations:

TxACE, the Focus Center Research Program, and the Nanoelectronics Research Initiative (NRI).

TxACE

TI led an effort within SRC to establish a $16 million collaboration center at UTD that focuses on research in analog and radio frequency technologies to address challenges in such areas as energy efficiency, health care, and public safety, which are uniquely reliant on analog technology. The center involves Southern Methodist University, Texas Tech, Texas A&M, and UT Austin, as well as universities outside Texas including Stanford and UC Berkeley.

TI is providing $1 million to endow an analog design chair to serve as TxACE Director, is providing $500,000 to endow an analog design graduate student fellowship for the program, and has committed $2.7 million for research projects over three years. The SRC is providing an additional $1.2 million per year for three years, UTD and the UT System providing $3.7 million over three years with the State Emerging Technology fund matching $4.5 million over three years. This collaboration of academia, industry, and government is an excellent example of how regional innovation is created.

Focus Center Research Program

The Focus Center Research Program is a partnership between the semiconductor industry and the Defense Department (DARPA) to fund university research on semiconductor technology challenges at 38 institutions nationwide. All funding goes directly to universities, and supports research centered on the key technical challenges to extending and moving beyond current chip-making process technology (CMOS). Federal funds are leveraged through an industry match, which is very rare for a basic research program. Participating Texas schools include UT Austin, UTD, and Texas A&M.

Nanoelectronics

As my colleague Bob Doering testified before this Committee in April 2008, the NRI is recognized as a model collaboration that leverages funding and expertise from industry, the National Science Foundation, and the National Institute of Standards and Technology (NIST), and contributions from state and local governments.

NRI supports basic university research in nanoelectronics at four regional centers involving 35 universities across 20 states. NRI efforts are primarily focused on finding a new switch with improved speed, energy efficiency, and/or cost compared to the field-effect transistor, which is today's workhorse for processing information.

The NRI started as a result of the U.S. semiconductor industry recognizing that university research in nanoelectronics must be accelerated to retain technical leadership and capture the economic benefits. In 2005, six semiconductor companies, including TI, agreed to provide industry funds to form a consortium that would fund university research in nanoelectronics. From the beginning, it was clear that the scope of the challenge and basic science questions involved would require engagement and resources from the federal government, and conversations began with the NSF and NIST.

The third regional NM center, the Southwest Academy of Nanoelectronics (SWAN) is based at UT Austin and involves UTD, Rice, Texas A&M, as well as other universities outside Texas. In establishing SWAN, the State of Texas, the University of Texas System, and Texas industry collaborated to establish a complementary package of leveraged support. The resulting $30 million of matching funds is focused on attracting and supporting top academic researchers in nanoelectronics. Specifically, this is a three-way match, with the State of Texas contributing $10 million from the Emerging Technology Fund, the University of Texas System matching with $10 million, and the remaining $10 million being contributed by Texas industry for endowed chairs, including $5 million from TI.

The other regional NM centers provide similar state and local leverage to industry, NSF, and NIST funds. While the states have provided these resources to the four regional NRI centers, it is important to note that the regional centers are "virtual" and involve researchers from several universities outside these states, thus the local investments benefit research on a national level.

STEM Education

Talent is needed to sustain innovation in Northeast Texas—whether at TI, other innovative companies, or at our local campuses. It is critical that we both welcome talent from around the world and build the pipeline of U.S. students in the STEM disciplines.

Education is the highest priority for corporate philanthropy at TI—a heritage of involvement that traces back to the company's founders. Each year, TI and its corporate foundation make financial contributions totaling millions of dollars in grants and other gifts to schools, educational programs, and universities. TI seeks opportunities for fundamental change by developing and supporting programs with measurable success that can be replicated elsewhere. A full description of TI's community education involvement is attached to this testimony in Appendix 1 & 2. I'd like to highlight a recent announcement and a promising initiative in mathematics.

Teacher Effectiveness

Last week, the TI Foundation announced a $3 million investment to advance the effective, innovative teaching of STEM subjects. Two major grants of $1.5 million each will go to proven, successful programs:

- Laying the Foundation (LTF), to provide training and professional development for current math/science teachers in three Dallas-area school districts (Dallas, Richardson and Garland school districts), and
- UTeach, to train new certified math/science teachers, in conjunction with the National Math and Science Initiative and three area universities (the University of North Texas, UT Arlington and UTD).

LTF is a non-profit that provides a comprehensive pre-Advanced Placement training program including resource and planning guides, in-district training, summer institutes, conferences, and online resources. The goal is to support teachers as they prepare students in grades 6–11 to excel in AP and other college-level courses.

UTeach is an innovative teacher preparation program that recruits, prepares, and retains STEM majors to become qualified math, science, and computer science teachers. The grants will fund additional master teachers at two existing UTeach programs at UNT and UTD and will establish a new program at UTA, bringing the total number of UTeach universities to 14 nationwide.

This local investment will increase the output and effectiveness of qualified math and science teachers required in the Dallas area now and in the future.

MathForward

Math is the fundamental skill for science and engineering. It is easy to get students excited about science and engineering, but this opportunity to attract students is wasted if they cannot do the math. TI's Education Technology business developed and implemented *MathForward*, a research-based program that combines instruction, professional development, curriculum integration and classroom technology to help middle and high school students build confidence and achievement in mathematics, particularly focused on algebra and algebra readiness. The intervention program has proven successful in significantly raising the test scores of students who previously failed state math assessment tests. Most pilot participants were African-American or Hispanic and most were from economically disadvantaged circumstances. First launched at a junior high in the Richardson Independent School District, today more than 40 schools from eight states participate.

Community Colleges

Community colleges are an important element of the economic development, workforce, and educational ecosystem of our community and should be contemplated when developing national strategies for creating climates conducive to economic growth.

One of the essential roles community colleges have historically played in North Texas regional workforce development is providing manufacturing technician training. TI's manufacturing facilities, or "fabs" require technicians to have an associate's degree. Fab technicians perform technical tests and engineering experiments, and need to be able to apply advanced math skills and pass a test on basic electronics, applied physics, and basic chemistry.

The community colleges serving Dallas and Collin counties (Texas)—Dallas County Community College District (DCCCD) and Collin Community College District (Collin)—have combined to receive over $27 million in workforce training grants from local, state and federal sources in 2008–09. Those investments have been de-

ployed to establish and implement a variety of training programs that range from English as a Second Language to Lean Manufacturing and Six Sigma.

Increasingly community colleges also serve as a critical pathway to a bachelor's degree. Community colleges serve close to half of the undergraduate students in the United States.[2] Currently, more than 600,000 students are now enrolled in community colleges in Texas; that enrollment represents 75 percent of all freshmen and sophomores in Texas and 78 percent of all minority freshmen and sophomores as well.[3]

To increase college going rates, the TI Foundation, since 1999, has supported *Rising Star* scholarships to enable Dallas County students in the top 40 percent of his or her high school class to attend any Dallas County community college. *Rising Star* scholarships go to students who might not otherwise be able to afford college, and include tuition, fees and books for the two-year degree. More than 9,000 Rising Star students have enrolled in the Dallas County Community College District since the program's inception. Additionally, TI created a $1 million endowment for Collin College in 2004 for the Science, Math, Advanced Research and Technology (SMART) Educational Initiative. SMART provides scholarships for academically qualified community college and high school students who intend to continue pursuit of four-year degrees in engineering or related fields or to take college-level coursework. The goal is to fuel a pipeline of highly skilled professionals in careers in science, math and engineering disciplines. By the end of 2008, approximately 32 scholarships had been awarded.

Recommendations

As illustrated by TI's experience, model research collaborations involve not only industry and universities, but are greatly enhanced by the engagement of federal agencies and state/local government. One of the most important steps Congress can take is to provide regular, predictable sustained investments in basic research. NSF, NIST, DOE Office of Science, and DARPA are the key agencies that fund physical sciences and engineering research-critical disciplines for the semiconductor industry that unfortunately have been relatively underfunded for decades.

Industry can play an important role in establishing the translation of basic research into commercialization by providing insights on appropriate goals and needs for both "directed" basic research and its potential commercialization. This input is provided through advisory panels, consortia, and various industry advisory liaisons' input into federal agency merit review processes. For example, I serve as an industry advisor on NIST's Technology Innovation Program, which supports translational projects in areas of national need such as energy, security, infrastructure, and medical. Direct agency partnership with pre-competitive industry consortia is also a very effective mechanism to achieve close industry-government collaboration and facilitate commercialization of promising research.

State governments also play an important role in leveraging federal funds and facilitating commercialization from universities to industry. Several states like Texas have mechanisms to support these efforts. In addition, state governments are also critical in supporting public research universities from an overall budget perspective.

While both Congress and many states have focused on the importance of STEM education, there must be an effort to scale programs that are demonstrating results tied to student achievement. In particular, there should be an emphasis on the fundamental math skills needed to succeed in STEM fields.

Finally, we must address immigration reform for highly-educated professionals. Nearly half of the master's degrees and over 70% of Ph.D.'s in electrical engineering from U.S. universities are granted to foreign nationals. While we continue to grow the U.S. STEM pipeline longer term, we must retain this talent. I came to the U.S. on an H–1B and received my green card. Today, hundreds of innovators at TI are stuck in multi-year waits for green cards, limiting their promotion potential and making international travel difficult. This process must be reformed if we are to attract and retain the world's best minds, especially those graduating from U.S. universities.

Thank you for the opportunity to testify today. TI looks forward to continuing our close working relationship with this committee.

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[2] American Association of Community Colleges (2005).
[3] Texas Higher Education Coordinating Board.

Martin Izzard

Martin Izzard is Vice President and Director of Texas Instruments' Digital Signal Processing R&D Center. In this role he directs an R&D Center developing new circuits and systems for existing and future markets. Laboratories in the Center include Communications, Medical, Video, Vision and Imaging, Audio and Voice. He also has responsibility for TI's new Kilby Lab, which is developing breakthrough circuit technologies. The R&D Center serves all TI Divisions – Analog, Digital, Wireless, and Embedded Processing.

Martin grew up in Durban, South Africa; he earned a BSEE and MSEE at Natal University in South Africa, and a PhD on the Physics of Thin Film Transistors for LCD Displays from Cambridge University, England (Trinity College). He was awarded a post-doc Research Fellowship (Title A) at Trinity College. He joined Texas Instruments in 1991 and designed an embedded serial interface (serdes) for gate arrays in the VLSI Design Laboratory; this work is the basis for the serdes technology used across Texas Instruments today. He managed DSP and Datacom circuits and architecture teams in the R&D Center in the mid-90s and moved to the TI ASIC business to manage the Circuit Design organization in 1998, later assuming a P&L Manager role for the Datacom ASIC business. In 2001, he joined the Analog Division as a P&L Manager and in that role led TI's entry into the Optical Module chip market and started a new niche Clock IC market aimed at providing reference clocks for chips with serdes interfaces

K-12 Education

Texas Instruments

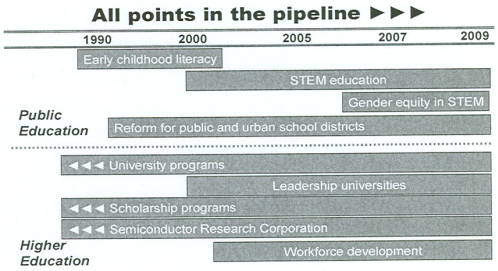
About TI and TI Foundation support of education:

Excellent schools and well-educated citizens are critical building blocks for economic vitality and a desirable quality of life in the communities where we live and work. Not only do high-tech companies need technologically skilled people, but the next generation of every nation needs a strong work force and business leaders to prosper and innovate.

We recognize that supporting education today is critical to our success tomorrow. For decades, TI and the TI Foundation have played leadership roles in driving innovative education programs – a heritage of involvement that traces back to the company's founders.

Programs from K-12 to university

We partner with educators at secondary schools and community colleges to support student achievement, promote effective teaching and advance ethnic and gender equity in science, technology, engineering and math (STEM) education. We actively advocate at the local, state and national levels for legislation to improve education and support a range of initiatives at all points in the education pipeline.



In 2008, TI and the TI Foundation contributed approximately $13.1 million in grants and other gifts to schools, colleges and educational programs. Volunteer hours, equipment donations and in-kind contributions significantly extend the impact of our commitment to education. Key areas of TI and the TI Foundation support are:

Supporting Student Achievement

Advanced Placement Incentive Program™
The AP Incentive program is designed to encourage students to take more rigorous college-level course work in high school. TI believes this program prepares students for high-tech careers, and the TI Foundation supports it by funding incentives for both Dallas Independent School District teachers and students. In 2008, 1,407 students received qualifying scores in math, science and English Advanced Placement exams, up from 157 students when the program began in 1995 (a nearly 800 percent increase).

Dallas Achieves
To help the Dallas Independent School District ensure every graduate is ready for college and the work force, the TI Foundation contributed an additional $225,000 in 2008 to its Dallas Achieves program. The TI Foundation and other donors are helping the district achieve academic excellence with a goal of winning by 2010 the nationally coveted Broad Prize for Urban Education. This prize honors urban school districts that demonstrate the greatest overall performance and improvement in student achievement, while reducing achievement gaps among ethnic groups and between high- and low-income students.

Destination: Graduation
Since 2005, the TI Foundation has partnered with the United Way of Metropolitan Dallas to improve graduation rates among Texas students in select Dallas and Collin County schools. The program targets freshmen using college preparation, interactive parental involvement classes, and mentoring programs to educate students and parents on the long-term benefits of a high school diploma.

In 2008, the TI Foundation committed an additional $200,000 to the initiative, which supported almost 900 students, parents and staff in Dallas and Plano schools during the 2007-08 school year. To date, the TI Foundation has given $700,000 and donated significant volunteer hours to support this program. For participating students in the original program offering, the promotion rate improved 20 percent.

In 2008, TI reached thousands of students, teachers and policymakers through programs designed to generate interest in and funding for science, technology, education and mathematics research and innovation. We achieved this by purchasing technology for classrooms, providing academic enrichment opportunities, expanding an algebra improvement initiative, awarding scholarships, sponsoring math and science fairs and competitions, and by recognizing educator excellence through a regional awards program.

TI issued $8.7 million in grants to support U.S. K-12 and university STEM research and education programs in 2008.

Additionally, the TI Foundation provided more than $4.3 million in grants to support education institutions. Almost $1 million of this amount was used to match gifts made in 2008 from TI directors, employees and retirees to support educational institutions. For the first time, these contributions provided funding beyond higher education, including K-12 public, private and charter schools.

HiTECCC

TI co-founded the High-Technology Education Coalition of Collin County (HiTECCC) in 2004 as a unique collaboration that includes a local school district, community college, university and regional industry partners. The mission of the coalition is to promote high-quality science, technology, engineering and math education for North Texas students.

Since the program's inception, 80 high school students have participated in University of Texas at Dallas (UT Dallas) science/technology research internships. UT Dallas has awarded $185,000 in scholarships for Collin College students. Eight Collin faculty members also received or are pursuing doctoral degrees and 150 Plano Independent School District high school girls attended physics camps. These camps enabled 53 percent more girls to pass AP physics exams.

Additionally, volunteers from TI and other industry companies conducted HiTECCC's *Engineering Your Future through Math and Science* program in 2008, which reached more than 1,100 7th and 8th graders. The program reinforces the importance of science, technology, engineering and math (STEM) to increase interest in related careers.

Infinity Project

Created by TI and Southern Methodist University's (SMU) School of Engineering in 1999, the Infinity Project was among the first in the country to help school districts incorporate state-of-the art engineering and advanced technology into the high school classroom. The program makes math and science more relevant by incorporating real-world applications, such as MP3 players and digital cameras, instead of just textbooks. It is designed to encourage high school students to choose science and math to prepare for high-tech careers. The program has expanded to include a middle school curriculum. At the end of 2008, more than 350 schools in 37 states and the District of Columbia had implemented Infinity Project curriculum.

MATHCOUNTS®

MATHCOUNTS is a national enrichment, coaching and competition program that promotes middle school mathematics achievement through grassroots involvement in every U.S. state and territory. As a national sponsor, TI provides financial support to more than 6,700 math coaches and 115,000 math students through the National MATHCOUNTS Foundation. We also distribute our latest Education Technology to approximately 225 "mathletes" participating in the national competition and to each state teams' math coach. In 2008, TI gave $55,000 in cash and in-kind donations to support the program.

Mentoring

By serving as role models and mentors, TI employees counsel students in elementary schools in our communities. Through these efforts, these students have shown marked improvements in test scores, attendance and capabilities. TIers have mentored hundreds of students through Big Brothers Big Sisters programs and other employee initiatives as well. Through the Mentornet program, our employees also have served as e-mentors to more than 600 U.S. engineering students since 2005.

Rising Star

Since 1999, the TI Foundation has donated a collective $1.5 million to enable any Dallas County student in the top 40 percent of his or her high school class to attend any Dallas County community college. Rising Star scholarships go to students who might not otherwise be able to afford college, and include tuition, fees and books for the two-year degree. More than 9,000 Rising Star students have enrolled in the Dallas County Community College District since the program's inception.

Robotics Competitions

Texas BEST (Boosting Engineering, Science and Technology) challenges middle and high school students to build remote-controlled robots. Founded in 1993 by two TI employees, the competition annually attracts entries from nearly 700 middle and high schools and more than 10,000 students across several states each fall. In 2008, TI gave $20,000 and hundreds of volunteer hours to the program. To date, we have invested $500,000 in Texas BEST, which has reached more than 80,000 students.

Additionally, TI is the official technology supplier for *FIRST: For Inspiration and Recognition of Science and Technology's* robotics competition, a multinational contest that brings professionals and high school student teams together to solve an engineering design problem. *FIRST* engages high school students in mentor-based programs that build science, engineering and technology skills that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication and leadership. In 2008, TI gave a $100,000 in-kind donation of analog chips used in the controller systems for the robots.

Effective teachers are integral to student achievement, particularly in science, technology, engineering and mathematics (STEM) curriculums. Research indicates that it has a greater impact on learning than students' ethnicity or family income, school attended or class size. As a result, in 2009 TI and the TI Foundation will accelerate and extend our investment in strategies and programs that help improve the quality and increase the quantity of secondary STEM educators.

Additionally, we will continue to refine our portfolio of programs that help students, particularly those from traditionally under-represented ethnic groups in STEM, including women, achieve academic success and pique their interest in STEM-related university degrees and careers.

Scholarships

The Jerry R. Junkins Memorial Merit Scholarships, named in honor of TI's former chairman, president and CEO, are awarded to National Merit Program finalists who are sons or daughters of active, retired or deceased TI employees. In 2008, 21 students received $4,000 each. The scholarships have been awarded annually since 1996.

SMART Educational Initiative

TI created a $1 million endowment for the Collin County Community College District (Texas) in 2004 for the Science, Math, Advanced Research and Technology (SMART) Educational Initiative. SMART Educational Initiatives provides scholarships for academically qualified community college and high school students who intend to continue pursuit of four-year degrees in engineering or related fields or to take college-level coursework. The goal is to fuel a pipeline of highly skilled professionals in careers in science, math and engineering disciplines. By the end of 2008, approximately 32 scholarships had been awarded.

TI Math*Forward*™

Launched in 2005, TI Math*Forward* combines instruction, professional development, curriculum integration and classroom technology to help middle school and high school students build confidence and achievement in mathematics. Leading mathematicians, researchers, educators and administrators assisted TI in the development of this research-based program. In 2008, more than 40 schools from eight states participated. In the Richardson Independent School District, the pass rate of students in the TI Math*Forward* program rose 57 percent in one year.

Visioneering

TI annually sponsors this unique event at Southern Methodist University, which brings together middle school students, working engineers and innovators to explore the ways that engineering makes a difference in the world around us. Since 2001, more than 7,000 students, teachers and industry volunteers have participated in the program. More than 750 students, teachers and volunteers attended the annual Visioneering event on the SMU campus in Dallas in 2008 to experience real-world engineering and applications.

Promoting effective teaching

Innovations in STEM Teaching Awards

The TI Foundation established the Innovations in Science, Technology, Engineering and Mathematics (STEM) Teaching Awards in 2007 as part of a three-year commitment to recognize instructors at the secondary level who enhance student achievement and increase interest in high school classrooms in the Dallas, Plano and Richardson independent school districts.

As STEM Fellows, the teachers participate in a unique annual professional development day at TI's facility designed to expose them to interesting, everyday uses of math and science in the technology business world. Recipients also each receive $10,000, of which $5,000 is directly awarded to the teacher. The other $5,000 is to be used at the teacher's discretion for professional development or instructional technology. In the first two years, the TI Foundation inducted 20 teachers.

Math Scholars

In 2008, the TI Foundation continued funding our five-year, $1.1 million grant to the Math Scholars program at the University of North Texas Dallas campus, which is designed to encourage more students to seek mathematics degrees with math teacher certification. Students selected for this program must agree to teach in Dallas-area school districts for a minimum of two years upon graduation. To date, the program has met its admittance milestone of 30, with 19 students expected to graduate with math degrees in the 2009-10 academic year.

Teachers Teaching with Technology (T^3)

Sponsored by TI's Education Technology business, this endeavor was founded on the principle of teachers teaching other teachers. The T^3 program includes both face-to-face and online professional development institutes at which more than 100,000 educators from around the world have been trained on the latest methods in teaching math and science. In 2008, 79,971 math and science educators from around the country were trained through T^3.

Corporate citizenship:

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Advancing diversity and gender equity in engineering education

Faculty endowments

In 2008, the TI Foundation granted $2 million to Southern Methodist University endow the TI Distinguished Chair in Engineering Education. Delores M. Etter, Ph.D., a renowned engineer, academician and innovative technology leader, was named to the chair and will also become the director of the school's new Caruth Institute for Engineering Education. The institute was established to become a nationally recognized center of excellence that provides the environment for the collaborative development of strategies, programs and public policies to reinvigorate engineering education

Hispanic Engineering Science and Technology (HESTEC) Program

TI sponsors the HESTEC program, which is organized by the University of Texas-Pan American (one of the country's top Hispanic serving institutions) to address the critical shortage of U.S. scientists and engineers. In 2008, TI's Education Technology business contributed $10,000 in cash and $15,000 in technology to support the program. We also hosted technology workshops and presented on the importance of STEM education for college and career preparedness in the 21st century.

National Society of Black Engineers (NSBE)

As a member of the NSBE's Board of Corporate Affiliates, TI promotes its mission to increase the number of culturally responsible black engineers who excel academically, succeed professionally and positively impact the community. The organization boasts more than 30,000 members and 266 chapters nationwide.

In addition to providing more than $750,000 to NSBE over the past five years, TI has supported tutorial programs, group study sessions, high school/junior high outreach programs, technical seminars and workshops and professional chapters. We also have contributed to the NSBE national magazine, and participated in NSBE national and regional conventions for more than 20 years.

In 2008, TI CEO Rich Templeton challenged more than 8,000 young engineers to champion innovation and set their sights on making a difference during a keynote address at the NSBE's 34th annual national convention. Templeton also accepted the Corporate Diversity Leadership Award on behalf of the company and presented TI Senior Vice President, Arthur L. George, with the 2008 NSBE Lifetime Achievement in Industry Award.

Texas Prefreshman Engineering Program (TexPREP)

The TI Foundation gave $310,000 in 2007 as part of a three-year commitment to the Dallas-based TexPREP, which identifies achieving middle and high school students with an interest in engineering, science, technology and other mathematics-related areas and strengthens their potential for careers in these fields. With a focus on building a high-quality and diverse 21st century work force, women and members of minority groups, traditionally underrepresented in these areas, serve as special target groups.

TexPREP's success statewide is clear. As of 2008:

- 83 percent of the college attendees graduated from college.
- 79 percent of the college graduates are members of minority groups.
- 49 percent of the college graduates are science, mathematics or engineering majors.
- 75 percent of the science, mathematics and engineering graduates are members of traditionally underrepresented groups in these fields.

Urban League

TI employees support the Urban League of Greater Dallas Young Professionals, which engages in various community service projects. It also generates programs in the area of economic empowerment and professional development. TI has given more than $40,000 in grants to the Urban League since 2004 including $11,500 in grants in 2008.

One of the grants TI's Community Involvement Team (CIT) invested in for 2008 was the EDGE (Establish Principles, Develop Skills, Guide Dreams and Empower Actions) program, which serves more than 150 Dallas high school students. More than 20 TI volunteers also were involved in a one-day program at TI headquarters to prepare these students for college, promote science and math careers, and provide mentorship.

Questions? Feedback?

Let us know if you have questions or feedback on www.ti.com\csr

Women of TI Fund

In 2000, a group of senior TI female executives decided to pool their resources instead of making individual contributions and formed the Women of TI Fund. Their mission is to expand math, science and technology education for girls in the Dallas area.

The "High-Tech High Heels" strategy – a three-pronged gender equity approach – was designed to:

- *Reduce math and science educator biases through gender equity training programs.*
- *Dispel stereotypes through guidance counselor workshops.*
- *Increase girls' confidence through summer physics camps for girls to increase enrollment and passing rates of female students in AP courses.*

In 2008, the TI Foundation committed $349,000 to the SMU School of Engineering for these gender equity programs.

TI University Programs

Texas Instruments

About TI and TI Foundation support of universities:

Building tomorrow's work force through higher education has been a commitment of TI for more than 60 years. TI works to develop partnerships and programs, contribute financial resources, offer expertise and donate equipment all with the specific goal to make higher education – particularly focused on science, technology, engineering and math – better and more accessible. TI's efforts reach the top university engineering programs around the world.

Building the engineering work force

TI has been dedicated to building tomorrow's work force through higher education for more than 60 years. We develop university partnerships and programs, contribute financial resources, offer expertise and donate equipment, all with to the goal of making higher education – with particular focus on science, technology, engineering and math – better and more accessible. TI's efforts reach the top engineering university programs around the world.

International students account for nearly half of masters' degrees and 70 percent of Ph.D. graduates in electrical engineering from U.S. universities. TI supports improved visa policies to allow us to attract and retain the world's best talent, particularly graduates from U.S. universities.

In addition, TI is doing its part to grow the domestic pipeline of engineering students. TI works with U.S. universities to prepare their students to become the future engineers that our company, suppliers and customers need. In 2008, TI and the TI Foundation made grants and investments totaling more than $20 million to colleges and universities.

Through the TI University Program, more than 100,000 students across the world use our technology in labs each year to help bring their innovations to life. These global programs are currently a part of the strategy for TI's analog, embedded processing and medical businesses.

Student development

TI has offered scholarships and helped develop curriculum and degree programs with universities.

Texas Engineering and Technical Consortium (TETC)

As founding members, TI and the TI Foundation invested $2.5 million over five years in the TETC. This unique collaboration among industry, federal and state government and universities seek to increase the number of graduates in engineering and computer science from Texas universities to meet the state's increasing market demands.

Our investment and in-kind contributions have been leveraged to provide more than $27 million in 84 grants at 25 higher education institutions across the state. To date, TETC-funded programs have increased the overall number of electrical engineering and computer science graduates at a faster rate than schools nationwide.

Advancing semiconductor research

TI engages with universities worldwide to develop programs that train engineers to design with our products and to research critical technology breakthroughs for our industry.

Leadership universities

TI began our Leadership University program in 1999. We have committed more than $12 million to participating universities since the program began. Leadership universities work with TI on long-term research projects and collaborate with TI's top analog and embedded processing technologists. Universities in the regions provide strong regional leadership links in research and education. Universities that are a part of this program include:

- *Georgia Institute of Technology, U.S. (1999)*
- *Massachusetts Institute of Technology (MIT), U.S. (1999)*
- *Rice University, U.S. (1999)*

Corporate citizenship:

Learn more at
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- *Tsinghua University, China (2007)*
- *Shanghai Jiaotong University, China (2007)*
- *University of Electronic Science and Technology, China (2007)*
- *Indian Institute of Science (IIS), India (2007)*

Late in 2007 TI announced investment of $15 million to fund medical technology research at selected universities worldwide. The multi-year funding effort began in 2008, and monies are being used primarily to support research and development of key emerging medical technologies in such areas as personal medical devices.

Labs and facilities

TI funds labs and facilities to help students and faculty at universities stay at the forefront of semiconductor silicon technology. Investments have ranged from TI products for design work, to lab equipment, to funding to build or upgrade engineering facilities.

As part of TI's decision to build a state-of-the-art manufacturing facility in Richardson, Texas, UT Dallas received $300 million from the state of Texas, the UT System and other entities. Some of these funds were used to build the Natural Science and Engineering Research Laboratory at the university that opened in 2007.

In 2008, in conjunction with the 50th anniversary of the integrated circuit, TI opened Kilby Labs at our research facility in Dallas, Texas. A center of innovation designed to foster creative ideas for breakthrough semiconductor technology, the new labs will build on IC inventor Jack Kilby's legacy of revolutionizing our lives through chip innovation. The new facility, though, will bring together university researchers and leading TI engineers to discover life-changing opportunities for semiconductor technology.

Semiconductor Research Corporation (SRC)

The SRC is a consortium of semiconductor companies that collaboratively funds pre-competitive university research in semiconductor technology and design. TI is a core member of this group, which helps ensure a steady stream of university research contributions and graduates with advanced degrees in science and engineering fields related to semiconductor technology. These students work on critical technology barriers that will benefit our industry.

TI participates on technical advisory boards, routinely attends university research reviews and adds technical relevance to research efforts. Our annual contributions in the past five years averaged $10.3 million, allowing SRC to fund more than $40 million of semiconductor research and support more than 1,000 science and engineering graduate students at universities in a given year. In 2008, TI gave $11.8 million to the program and plans to award another $11.2 million in 2009.

Southwest Academy of Nanoelectronics (SWAN)

TI contributed $5 million to help launch the $30 million Southwest Academy of Nanoelectronics (SWAN), a collaboration that includes the University of Texas (UT) system, the state of Texas and other industry partners. SWAN's goal is to advance nanoelectronics education, research, commercialization and manufacturing. TI funds are targeted toward faculty endowments at UT institutions – the University of Texas at Dallas and the University of Texas at Arlington.

In 2008, Dr. Robert Magnusson, founder and chief technology officer for Resonant Sensors Inc., was named the TI Distinguished University Chair in Nanoelectronics, at the University of Texas at Arlington as part of this program. Magnusson has developed a new class of nanostructured photonic devices that have applications in laser, sensor, solar cell and display technologies, which could make diagnostic tests happen in real time instead of waiting hours, days or weeks for results.

Questions? Feedback?

Let us know at
www.ti.com\csr

Faculty Endowments
The TI Distinguished Chair in Engineering Education at Southern Methodist University and the TI Distinguished Chair in Nanoelectronics at the University of Texas at Arlington were endowed by the TI Foundation and TI, respectively.

Texas Analog Center of Excellence (TxACE)
TI was part of a $16 million collaboration among academia, industry and government that focuses on research in analog and radio frequency technologies to help address some of the world's biggest challenges in such areas as energy efficiency, health care and public safety.

TI Science & Technology Innovation Fund
The TI Foundation issued a three-year $332,400 grant to the University of Texas at Dallas to support innovation and entrepreneurial development camps for high school juniors and seniors to increase their interest in careers in science and technology. The grant also will fund scholarships to UT Dallas engineering and science students who take entrepreneurship courses.

Worldwide University Programs
TI's university program investments span the globe. With participation in every region, the TI Worldwide University Program brings TI technology to more than 130,000 students in 2,000 labs worldwide each year. Using TI analog and embedded processing evaluation modules, chips and software equips the next generation of engineers with the skills to tackle tomorrow's problems.

Programs continue to grow in the Americas, Middle East and Europe and are expanding rapidly in Eastern Europe, China and India. Areas of interest extend beyond traditional electrical and computer engineering to include biomedical, computer science and green energy departments.

Having a long history of consistent support is important to partnering with universities. TI's university program has consistently supported member universities with access to teaching materials, textbooks, the latest equipment, training and support through discounts or in-kind donations of TI technology for their lab equipment for 27 years.

For example, our program in China began in 1996 and the Chinese Ministry of Education agreed in 1998 to provide the latest DSP technologies, development and teaching tools to set up DSP labs. Through 2008, TI has invested in 228 labs in 154 universities, touching more than 40,000 graduate and undergraduate students per year.

Another example of explosive growth has been in India, where six major states have made DSP a compulsory part of their higher education engineering curriculum. TI embedded processors and analog technologies now impact about 45,000 engineering graduates each year from TI-equipped labs that operate across 711 engineering colleges. India produces approximately 360,000 engineering/science graduates each year.

TI also supports undergraduates directly by providing chips and evaluation modules to help them build their capstone or senior design projects through analog design contests. The students' creative design inventions range from small medical monitoring devices to facial recognition software.

Regional design contests are held, from a large tournament in China to the Engibous Contest in the United States. These attract thousands of students and teams compete for cash prizes. Through these contests, students receive access to the latest technologies, which encourages their pursuit of technological careers.

Mr. HALL. Thank you. I know you'll express our appreciation to Eric Johnson and his family and Gene McDermott. Who was the other one that was such a great leader at TI? Milton——

Mr. IZZARD. Cecil Green.

Mr. HALL. Cecil Green, great man, University of Texas at Dallas. They all hook in there and made major contributions to establishing that facility here in the Texas area. Thank you.

Next we'll hear from Bill Sproull, Vice Chairman, Texas Emerging Technology Fund Advisory Committee, and we've asked him to kind of go into describing the Texas Emerging Technology Fund and its objectives and also talk to us about the most important elements that are necessary to develop regional innovation capacity and grow the high tech companies.

That's the basic thrust of why we're here, is to point that out and to see how we can do it better and how we get recognition for what we also do. Thank you.

Mr. SPROULL. I'll try to do it in my five minutes.

Mr. HALL. All right, sir.

STATEMENT OF MR. WILLIAM C. SPROULL, VICE CHAIRMAN, TEXAS EMERGING TECHNOLOGY FUND ADVISORY COMMITTEE

Mr. SPROULL. Chairman Gordon, Congressman Hall, thank you for inviting me here today to talk to you about two subjects I'm deeply passionate about: ETF, as it's known, and regional innovation. I've made a career out of professional economic development on both the local and regional level and interestingly was Economic Development Director of this town, here in McKinney back in '96 to 2000.

Chairman Gordon talked about fast growth. This town was about 30,000 in population. I think we're at about 125,000 now. It's grown rather quickly. And you also spent time in Dallas and Kansas City and other places.

Most of my professional career the last few years has been focused on technology of economic development, and that's how I got involved with our Governor Rick Perry back in 2005 in helping create the Texas Emerging Technology Fund.

It really has three purposes. The first is to invest in early stage companies that have potential to create jobs and wealth in Texas. The second is to make grants to research consortiums composed of industry, government, universities and others to apply research that leads to commercialization.

The third to make grants to public universities to recruit world renowned or nationally ranked researchers who will take basic research from the bench, take it to applied research and commercialize that by creating new companies and patents that can be utilized. Much of the impetus for the creation of this fund had to do with this fact.

Back in about 2005, Texas public universities were prolific at drawing down Federal research finance and private research contracts. In fact, at this time, we're funding—operating about $2 million per biennium in externally funded research.

But unfortunately, the licensing revenue that got patents that had produced all that research was only about 20 or $30 million

a year. And it just seemed like we were not getting the bang for the buck out of all this research.

So there wasn't a significant collaboration occurring with industry trying to commercialize those results. So in 2005, the Texas Legislature created this legislation. The ETF put $200 million in the bank for us to use.

The legislation prescribed that we create regional centers of innovation and commercialization that are really the entry points for the fund. We have seven of those in different regions of the state and one statewide for life science companies.

But there's a 17 member advisory board—I'm the vice chair currently— that would take applications from regions, get them and then recommend to our trustees for approval as trustees of the Governor, Lt. Governor and Speaker, and they have to unanimously approve an investment out of the fund.

So what's the result today? Since 2005—and the legislature, by the way, has appropriated an additional $275 million into the funds, so we've had close to a half a billion dollars. We funded a total of 106 projects, early stage company investments, research matching grant consortiums and research talent acquisitions.

They've been awarded over $240 million of ETF money with another 31 projects in the pipeline worth almost $60 million. By year's end, we'll probably have about 100 companies in our portfolio that I would say were in an area that some of us describe as that "valley of death" of pre-revenue growth where they are trying to commercialize their technology.

Others that are more optimistic call it the "mountain of opportunity". And I think that we'll have a number of great successes out of that. We've also landed 45 world class researchers on our teams and 14 public universities and we've invested $74 million to recruit those teams.

And industry has followed on—as an example that TI gave, of adding another $200 million on top of that. So we know that we're leveraging private dollars in the amount of seed money that we're putting through public dollars.

We're technology agnostic. It can be semiconductors, biotech devices. We just want the best opportunities to create wealth, and as you said, Mr. Chairman, really raise the standard of living for all Texans. We've had over 1,000 seasoned experts helping to get these proposals that volunteer their time like I do on the board or on regional centers around the State.

And every company that we fund has to have a collaborative relationship with one of the institutions of higher education in the state, so we really make sure that we're leveraging that research step. And in North Texas, we've had almost 30 products worth $60 million that we've funded out of there.

So I can safely say I think this has been a great catalyst for wealth creation, job creation in our state. It's helped to create new cultural entrepreneurials in the state, particularly in our universities.

I want to use the remaining couple of—a minute just to talk about regional innovation and capacity very quickly. Clearly Dr. Izzard referred to the importance of continued Federal funding for science. He referenced the fact that we recently passed legislation

to create more Tier 1 research universities in Texas to have a matching grant formula for that.

It continues to be important that we have an entrepreneurial culture that tolerates risk and rewards success, that we have developed state funding. But I want to underscore one thing that he mentioned about high skilled immigration.

There's a tsunami out there in industry. My paying job is that of leading the largest trade association in Texas. And I can tell you that a lot of our employers, they're facing a massive amount of pressure over the next couple years with baby-boomers retiring out of the work force.

And it's a number game. Where are we gonna get the workers from? The high school, folks, and clearly part of that solution has to be a better way to handle high school immigration to this country to make it easier to retain talent that we're educating in our own universities.

And then the other piece that Mr. Luce talked about that is vitally important is inspiring more U.S. born kids to university STEM disciplines. So I thank you for allowing me to come here and talk with you for a few minutes this morning. I'll be happy to answer any questions you may have. Thank you.

[The prepared statement of Mr. Sproull follows:]

PREPARED STATEMENT OF WILLIAM C. SPROULL

Chairman Gordon and Congressman Hall, good morning. It is my honor and pleasure to have been asked by you to come and testify at this field hearing of the House Science & Technology committee. You have asked me to describe the Texas Emerging Technology Fund, its objectives, activities and successes, and its role in and relationship to the North Texas innovation economy. You have also asked me to tell you what I see as the most important elements necessary to develop regional innovation capacity and grow the high-tech economy. I am happy to answer both these questions and others you might ask of me today.

It might be important for you to know a bit about my background as it relates to the topics I'll cover this morning. I've been in the career of professional local and regional economic development ever since I graduated from college. Much of my professional focus over the last several years has been on technology-led economic development, the innovation eco-system, and entrepreneurship.

Interestingly, I used to work as President of the McKinney Economic Development Corporation, the community we're in today. At the time I started here in 1996, McKinney was just about 30,000 in population, and now has grown quickly to over 125,000. I've also worked in much larger cities, like Kansas City, where I began my career, and in Dallas, where I ran a large regional economic development organization. Today, I head a trio of organizations, of which the one most pertinent to today's discussion is the Metroplex Technology Business Council. It is the largest membership based trade association for technology companies in the state of Texas.

Because of my background in economic development and technology, I became involved with our Governor, Rick Perry, in the creation of the Texas Emerging Technology Fund back in 2005. It is an economic development fund whose purposes are:

- To invest in early stage technology companies who have the potential to create jobs and wealth in our state;
- To foster research consortiums between industry, universities, the federal government and non-profits to do applied research leading to commercialization of new products; and
- To make grants to public universities in Texas to recruit world-renown or nationally ranked researchers who will translate basic into applied research in their given domain expertise and help launch new products and companies.

Much of the impetus for the creation of this fund had to do with the fact that Texas universities, who have a prolific ability to draw down federal and private research dollars, have by and large failed to capitalize on their massive research spend in terms of translating that into intellectual property with the potential and

support to become commercialized in the private marketplace, thus creating new jobs and wealth. To give you a sense of the depth of this problem at the time, our universities were performing almost $2 billion of externally funded research per biennium, yet the licensing revenue from the patents produced was only in the tens of millions of dollars. In addition, few universities had the infrastructure, culture or incentive to foster an entrepreneurial climate in and around them.

So, in 2005, the Texas Legislature approved Governor Perry's vision by passing legislation to create the Emerging Technology Fund, or ETF as it's known, and initially fund it with $200 million. Since then, the legislature has twice met and appropriated an additional $275 million into the fund. The legislation also called for the establishment of regional centers of innovation and commercialization that would take applications to the fund and build an entrepreneurial ecosystem. There are now 7 regional centers throughout the state and one state-wide center just for life science companies. The legislation also established an advisory committee, or Board, of 17 people, on which I have served since its inception in 2005, and for which the Governor just reappointed me to serve as the Vice-Chairman for the next two years. This advisory board considers applications that make it through the regional innovation centers, considers them, and recommends which ones should be approved by the Fund's Trustees, namely, the Governor, Lt. Governor and Speaker of the House. A decision to make an investment out of the fund requires the unanimous support of all three Trustees.

So, what have been the results?

- A total of 106 projects (early stage company investments, research matching grant consortiums, & research talent acquisition) have been awarded over $240 million in ETF money, with another 31 projects worth almost $62 million in either the contract or final approval stages.
- By year's end, we'll easily have over 100 early stage companies in our portfolio, making the ETF the most active early stage investment fund in the country, and creating a global competitive edge for Texas. National recognition has given to the fund as a model to be replicated on both the federal and state levels.
- Also since the creation of the fund, 45 world class researchers and their teams with the experience and culture to commercialize their research have been recruited from around the world to 14 Texas public universities. Today, the fund's investment of over $74 million to recruit those teams has resulted in attracting over $200 million additional dollars from private and federal sources into those institutions . . . and we're still counting.
- The fund is open to all technology sectors for investment and currently has a very diverse portfolio of medical devices, energy, nanoelectronics, semiconductors, pharmaceuticals, biopharmaceuticals, IT, biotechnology, robotics, nanomedicine, defense, aerospace telecommunications, and software.
- Over 1,000 seasoned experts (investors, entrepreneurs, economic developers, researchers, and industry representatives) volunteer their time on the state advisory committee and the 8 regional centers around the state to evaluate, coach, mentor and select quality investment opportunities for the state to invest in.
- The innovation capacity of the state's rural areas has been dramatically improved since the inception of the fund. Those areas have seen significant success which has resulted in investments into multiple companies and universities in those regions. Additionally, angel investment funds have formed in these regions to invest in early stage technology companies that didn't exist before.
- Every company receiving an investment from the ETF has a collaborative relationship with one or more Texas institutions of higher education. Thousands of entrepreneurs have been counseled through the ETF process.
- In North Texas, the ETF has funded 28 projects to the tune of over $60 million, which has been matched by private and other public investments in the millions of dollars. Our universities have a greater capacity for and relationship with the entrepreneurial ecosystem, and cutting edge applied research is being done in conjunction with industry in areas such as advanced semiconductors, atomically precise manufacturing techniques, and nanomaterials and nanoelectronics. Better linkages now exist between the 9 incubators in our region, the universities and our angel and venture capital communities.

I can safely say that the ETF has been a catalyst for the creation of new companies, a new entrepreneurial culture in our universities, and new wealth and jobs in

our state, at precisely the time when we have needed it the most since the dot-com bust in the early part of this decade. The ETF model leverages federal research and private investment dollars with a relentless focus on commercialization of intellectual property.

You've also asked me to comment on the requirements for regional innovation capacity and how to grow the high tech economy. The other speakers today certainly will address some of these items in more detail than I, however, let me lay out in short order the key components I see as necessary, and then we can have a more in-depth discussion on any or all if you like.

Regional Innovation Priorities for Growing the High-Tech Economy in North Texas.

- Continued federal leadership in funding basic research, and regional leverage of federal and private research in a collaborative model that stresses basic and applied research science as well as commercialization results.
- Knowledge intensity—creating more tier one research universities in North Texas, which the state laid the groundwork for this past legislative session with the passage of House Bill 51. It creates a system of incentives for those 7 public universities in Texas, 3 of which are located in North Texas, to get awarded state dollars for successfully competing for federal and private dollars, so that they can grow faculty, research and facilities.
- Maintaining and enhancing an entrepreneurial culture in both the public and private sector, one that is tolerant of both risk and failure, and rewards success.
- The availability of early stage funding for companies. While the ETF and the angel investment community in North Texas have made a difference, the venture capital model here and throughout the country is undergoing a transition of funding availability, exit strategies, and pricing expectations, with the result that there is a shortage of this type of growth capital now. It is interesting to note that 20% of all Americans work for a company that was at one point funded with venture capital.
- The continued need for high-skilled immigration. With a growing number of baby-boomers retiring out of our technology industries over the next 10 years, and the fact that we don't have enough U.S. born kids in the pipeline today to fulfill our workforce needs, even in this current economic climate, the tech industry needs to have the ability to recruit from abroad.
- A workforce development program that gets more U.S. kids interested and engaged in science, technology, engineering and math, and adequate numbers of teachers to teach and inspire them. You'll certainly hear some great ideas and initiatives on this from Mr. Luce.

I hope the comments that I have shared with you today have been helpful and will assist you in continuing to craft and support a progressive federal policy on innovation. I want to particularly thank the Chairman, Congressman Gordon, for his leadership in passing the America Competes Act, and for Congressman Hall's persistent support of federal science and technology policy and for his constituents here in North Texas.

I would be happy to answer any questions you might have, and thank you for having me here today.

BIOGRAPHY FOR WILLIAM C. SPROULL

Sproull is President and CEO of the Richardson Chamber of Commerce, Metroplex Technology Business Council and the Richardson Economic Development Partnership. This unique and complex set of organizations he runs has two separate Board of Directors and a City Council to whom he reports.

He has led the revitalization of Richardson's tech based economy through focus on diversification and technology start-ups. Sproull is credited with bringing two of the largest economic development projects announced in the U.S. to Richardson: A 5,000 employee Countrywide Financial operation in 2004, and a $3 billion Texas Instruments semiconductor factory in 2003. He also helped lead a statewide coalition that got legislation passed in 2005 to create the Texas Emerging Technology Fund, a half-billion investment fund.

Previously he held the senior economic development positions at the Greater Dallas Chamber, the McKinney Economic Development Corporation and at the EDC of Kansas City, Missouri. Sproull is a graduate of Baylor University, where he received a B.A. degree with a double major in Economics and Political Science.

Sproull is on the Boards of Directors of the International Economic Development Council, the University of Texas at Dallas Development Board and the North Texas Commission. He was reappointed by Texas Governor Rick Perry in 2009 to the Board of the Texas Emerging Technology Fund for his third two-year term and serves as Vice-Chair.

Sproull's industrial recruitment experience was recognized by the editors of Site Selection magazine when they selected the $3 billion Texas Instruments project as the Top Development Deal nationally of 2003, and in 1996 when he was recognized for the establishment of Blockbuster's 818,000 square-foot North American Distribution Center in McKinney. His teams have been selected three times by Site Selection as one of the top 10 development groups in the U.S. in 1994, 1997 and 2004. He is also a two-time recipient of the American Economic Development Council's "Best of Class" marketing award.

Mr. HALL. I thank you very much and thanks for answering the questions that we asked you to answer that were very, very important. And we'll now hear from Tom Luce. I don't have enough time to describe Tom. He's just a legend.

And he and his family and friends are major players in everything that's good for this county and this part of the country and very, very helpful to me when I got under way in my political goals. And I still thank you again and again.

I don't know if you did—you did me a wonderful lot of favors. I don't know if you did much for the country. We recognize you.

Mr. LUCE. Well, I did by helping you, Mr. Congressman.

Mr. HALL. Well, I needed it. Thank you. We recognize you, Tom.

STATEMENT OF MR. TOM LUCE, CHIEF EXECUTIVE OFFICER, NATIONAL MATH AND SCIENCE INITIATIVE

Mr. LUCE. Thank you, Mr. Chairman and Congressman Hall. Thank you for the opportunity. And I want to set the stage to talk about how do we leverage what's happening regionally and locally which we all know needs to be happening, but how do we then make that happen across the country because we have a national competitiveness issue.

When I started on education reform in 1983, a report had just come out that said we were a nation at risk, a greater risk from the decline of our education system than we were from communism. And at the time, we were number one in the world in high school graduation rate and college graduation rate.

Today, 25 years later, we are 14 and 15, and we said we were at risk in 1983. We won the Cold War. Capitalism prevailed. And we have three billion new competitors, and they are running very fast, and we are falling behind, period, paragraph.

That to me is a national competitiveness issue. The issue we must confront is that we are trying to educate 55 million children in our public schools. 55 million.

So when we have a local success which we have here in North Texas, and we have a program that works, and it helps 5,000 students or 20,000 students, that's fantastic, but we have to learn how to help 55 million students.

And the way we do that is by scaling proven programs. I like to say and I would say in addressing your specific question, one of the worse violators of this is the Federal Government. We have lit more pilot fires in this country, but we've never lit the central heat and air-conditioning system.

We fund pilot program after pilot program after pilot program and yet we've got to stop and say, look, we're spending $3.5 billion to help K through 12 in math and science, but we're doing that through 125 programs.

And we haven't stopped and said which are the best programs that we can take the 55 million kids. It may have to be implemented in a different way at Middle Tennessee and A&M Commerce, but what did we learn about the best way to educate, let's say, math and science teachers.

So what we're about at the National Math and Science Initiative—my real nickname for our foundation is Scale Up, Inc. We want to scale proven programs. We've started with two; one is UTeach, which is a new way of training math and science teachers so that they have a true content degree in four years in the college of natural sciences and math. And they get a teaching certificate all in four years.

You know, the question was raised, well, will other universities replicate a program started at another university? Well, we answered that in the first round of grants when the University of California at Berkley applied to replicate a University of Texas at Austin program.

I can assure you that's an unnatural act for them to apply to replicate a University of Texas program. And yet we had 53 universities apply to replicate that program which is recommended in the *America COMPETES Act* which you all passed, but there's not separate funding for that program.

Through private sources, we have now taken that program thanks to TI, ExxonMobile, the Gates Foundation, the Dell Foundation—the private sector has invested $140 million, and we're taking that program now to 17 universities. But we have another 40 who have applied to do that; and if we could fund those 40, we could reach the goal that was in *Rising Above the Gathering Storm* of 10,000 teachers, we could do it.

On our own in the 17, we'll produce 3,000. So the goal of 10,000 is doable if we can get Congress to consolidate and focus on a few proven programs. In the high school arena, we're doing one program that encourages particularly minority students and convergent students and rural students to take and pass AP exams in math and science.

In our first year of operation, we produced an increase in individual schools in six states, a 53 percent increase in the number of students taking and passing AP math and science courses in one year. The minority increase went up 123 percent. Why did it go up? Because we trained the existing teacher core to teach Advance Placement courses that are higher standard, critical thinking skills.

And the data shows that if a high school student takes and passes one AP course, one in any subject, the college graduation rate for Hispanic students goes from 15 percent to plus 62 percent. African American students, 17 percent to plus 60 percent.

So we must concentrate on raising standards, raising expectations to produce the K–12 pipeline, and then we must produce the next generation of teachers. If there's one thing your Committee could do, it would be to urge NSF, Department of Energy, Department of Defense, all of these agencies to help with their funding

for K–12 to get behind some of these programs and add their weight and help do it.

For instance, the regional labs could have these UTeach teachers there in their summer program. They could have the AP students there. We've got to find a way to leverage the money that's being spent behind some volume, if you will, so that we can catch up quickly. We're falling behind very, very quickly.

So that's what I would urge you to consider doing. We've proven that scaling works in our UTeach programs. From grant to enrollment of the first class only took three months for a university.

Now, I think most people would agree if you give a grant to most universities, they'll spend a year or two forming a committee to decide the curriculum. We gave them the whole course and they enrolled 1,100 students in three months.

That's the kind of quick progress we need to make and those are the kind of numbers that we need to address by finding out the best operating programs all over the country and scaling them with the help of Federal resources because if you invest $1 in the National Math and Science Initiative, the private sector's already investing, our state government is investing and your state, as you know it, Tennessee, the State of Tennessee is gonna pay to have two universities start the UTeach program.

So the Federal Government has an opportunity to leverage state dollars, private dollars and local business dollars such as TI if we get behind and collaborate on some programs. Thank you very much.

[The prepared statement of Mr. Luce follows:]

PREPARED STATEMENT OF TOM LUCE

Mr. Chairman and Committee Members, thank you for the honor and the opportunity to testify before you today on the topic of innovation. I commend you on your leadership on this issue as well as your commitment to identifying best practices in business and education that will foster innovation, which is so essential to maintain our country's competitiveness in today's global economy.

Brainpower has always been key to American economic power—from the cotton gin to the telegraph . . . from the light bulb to synthetic fabrics . . . from miracle drugs to the microchip. We have surged ahead for the last two centuries on the strength of our education system.

But times have changed. Just 25 years ago, the U.S. led the world in high school and college graduation rates—today we have dropped to 14th in high school graduations and 15th in college graduations among industrialized countries.

Today U.S. students rank behind Canada, Japan and Western Europe in math and science—behind emerging Eastern European countries like Slovenia, Estonia and even tiny Liechtenstein.

What has happened?

Some of you may be tennis fans and followed the recent U.S. Open competition—for the first time since they've had rankings in that premier tennis championship, there was only one American in the quarter finals. Was that because American tennis players have gotten worse? No, it's because other countries have gotten better. The same thing applies to education—we now face more competition from people in the former Soviet bloc and from people in the rising countries that used to be called Third World countries. We now are faced with billions of new competitors who are vying to beat us at our own economic game.

The warning signs are all around us: In the 1990s, the U.S. economy created around 2.2 million jobs a year. But from 2000 to the end of 2007, the rate dwindled to only 900,000 a year. Our growth engine is running out of fuel. Nearly 60 percent of U.S. Patents in information technology now originate in Asia. Only six of the top 30 companies in the world for solar power, wind power and battery development are American. Just as science and technology are fueling new growth around the world,

the number of American engineers and scientists graduating has declined-by 20 percent.

As one of my colleagues put it the other day, we are producing more science in the world today than ever before-but we are teaching less science in the U.S. than ever before.

We must do better. We believe the key ingredient to improving innovation—and stimulating high-value job creation—in the U.S. is improving the math and science education our young people receive. If you think about it, almost every major innovation that we need to pursue as a nation—medical breakthroughs, economic growth, renewable energy sources, homeland safety and security or space exploration—requires the new standard of literacy in STEM fields: science, technology, engineering and math. As a result, we need a vastly increased pipeline of highly qualified math and science teachers and students who are excited about science, technology, engineering and math, to keep the U.S. from losing ground to its foreign competitors.

Two years ago, we established the National Math and Science Initiative to address this critical need. We identified specific programs with proven results that would directly and significantly improve math and science education in the U.S. We then leveraged the investment of both the public and private sectors to replicate the programs across the country. And we have already seen tremendous results.

The *Advanced Placement Training & Incentive Program* is based on a model that was initiated in Dallas more than 12 years ago. This program focuses on bringing more rigorous coursework to more students as well as increasing teacher effectiveness and student achievement. And we know it works.

Last year, we implemented this program in 67 high schools in six states, including Alabama, Arkansas, Connecticut, Kentucky, Massachusetts and Virginia. In just the first year, we have dramatically increased the number of public high school students enrolling in college-level courses, as well as those taking and passing AP exams in math, science and English.

- Our Year One data, which was released last month, demonstrated a *52 percent increase* in AP exams passed in the 2008–09 school year. *This is more than nine times the national average.*

Equally important, the results show that NMSI has helped close the achievement gap in math and science, particularly among under-represented students.

- For example, we recorded a *134 percent increase* in AP math, science and English exams *taken* by African American and Hispanic students, in addition to a *72 Percent increase* in AP exams *passed* by these students.

We have essentially helped to eliminate the barriers to entry to rigorous coursework, which bodes well for American students. Passing AP exams is directly correlated with a significant increase college graduation rates.

The **UTeach** program is based on a model developed by the University of Texas at Austin. UTeach is an innovative teacher preparation program that transforms the way colleges and universities recruit, prepare and inspire new math and science teachers.

In the 2008–09 school year, NMSI partnered with colleges and universities in 13 states to enroll more than 1,100 math and science undergraduate majors in the UTeach program. We anticipate that this first cohort of future math and science teachers will impact more than one million students over the course of their teaching careers.

In Texas, NMSI is proud to partner with and implement the UTeach program at the University of Texas at Dallas, the University of North Texas, the University of Texas at Tyler and University of Texas at Arlington. We know that this innovative program will produce outstanding math and science teachers who can transform education here in our own state and contribute to our region's and state's long-term economic growth and prosperity.

We believe this kind of public-private model that NMSI has put together is the way of the future. We are grateful to have corporate support for our work—including Texas Instruments, Exxon Mobil Corporation and the Michael and Susan Dell Foundation—and to have strong support from state agencies such as the Texas Education Agency and national organizations like the National Council on Teacher Quality. These public private partnerships have allowed us to leverage limited resources to achieve incredible and sustainable gains in a short time.

Going forward, it will take continued collaboration and dedicated resources on a national level to multiply this success, and we commend federal legislators and policymakers on making STEM education a priority. The federal government has a leading role to play in turning the tide in STEM education in our country. You can

fund educational programs with a proven record to create regional centers of excellence and innovation like we're working to build here in North Texas.

Taking proven educational programs and replicating them nationally will require a significant commitment. But we must be prepared to invest in the next generation. This is not a theoretical issue, it is about changing lives and giving the next generation the survival tools to compete in today's global marketplace.

You can't put a price tag on that. We must do what it takes to educate a modern workforce, keep our country competitive, and provide a quality of life for our children and their children.

NMSI is proud to be part of the solution by tapping into the unrealized math and science potential of our young people. With your leadership, we are confident we can equip our young people with the education they need, help our country work smarter and help America lead the way again in innovation.

Thank you for focusing on this urgent challenge, and I look forward to answering your questions.

BIOGRAPHY FOR TOM LUCE

Tom Luce is the CEO of the National Math and Science Initiative, a non-profit dedicated to expanding programs with a proven impact on math and science education in order to help the U.S. maintain its leadership position in the global economy. Mr. Luce served as United States Assistant Secretary of Education for Planning, Evaluation and Policy Development from July 1, 2005 until September 1, 2006. At the department, Mr. Luce championed policies that would enhance American competitiveness.

An attorney, Mr. Luce received his undergraduate and graduate degrees from Southern Methodist University and has been honored with the SMU Law School and University Distinguished Alumni Awards. He was a founding partner and managing partner of the law firm of Hughes & Luce, LLP until his retirement from the firm in 1997.

In addition to his law practice, at various times Mr. Luce has served on the boards or as guest lecturer at a number of schools of higher education, including the Kennedy School of Government at Harvard and the LBJ School of Public Affairs at The University of Texas at Austin.

Following his resignation from the Department of Education, Mr. Luce rejoined the board of Dell Inc. He previously served on the Dell board from 1991 until 2005. He also has served on the boards of the Texas Education Reform Caucus and multiple community and charitable organizations. He served as a member of the National Commission on Teaching and America's Future and on the Executive Committee of the Dallas Citizens Council, an organization composed of CEOs of Dallas's largest businesses. In addition, the United States Senate appointed Mr. Luce a member of the Library of Congress Trust Fund Board where he served until 2005.

Mr. Luce also has been appointed five times to major posts by Texas governors, including Chief Justice pro tempore of the Texas Supreme Court. He is perhaps best known for his role as the Chief of Staff of the Texas Select Committee of Public Education, which produced one of the first major reform efforts among public schools in 1984.

Mr. Luce was a co-founder of the National Center for Educational Accountability and served as Chairman of the Board from its inception until 2005. He also founded Just for the Kids and served as its Chairman until 2005. In 1995 Mr. Luce wrote Now or Never How We Can Save Our Public Schools, a book that defined his educational philosophy and outlined a preliminary plan for educational reform that called for broader support for public education. His second book, Do What Works, was published in December 2004 and received numerous positive reviews.

Mr. Luce and his wife Pam live in Dallas, Texas. Together they have three children and seven grandsons.

Mr. HALL. Mr. Chairman, that completes the testimony. That's the major purpose that we're here was to extract from you the knowledge that made you successful and cause us to look to you for leadership here. Mr. Chairman, I yield to you. We have 15 minutes. We have to be on an airplane.

Chairman GORDON. Okay. Let me then—I'll try to—let me make a quick statement, then I have a couple questions. Interestingly, Mr. Luce, we are on the same wavelength in a lot of ways.

I certainly agree with you in terms of scaling out successful existing programs. For over a year now, we've had a fellow on the Committee that's been working to try to ferret out the various math and science programs across at least those areas of the jurisdiction we have.

If you just go to the budget line and look under math and science education or somewhere, you find it's just the tip of the iceberg. We have found a number of programs with little or no coordination whatsoever.

So we're continuing our effort to try to inventory those, at which time we then want to come out as we did with nanotechnology and some other areas where we're looking at a coordinating council across all agencies that is—we might even potentially give them some priorities.

The main thing is, let's coordinate. Where is all this money? How is it being spent? Can it be incorporated in a better way? Can we be focused in a better way? A part of making a larger investment in the math and science is spending the money that we do better. So we are undertaking that.

I think you will see if not the remainder of this year, certainly first of next year we will have an initiative that will settle that umbrella operation.

Dr. Izzard, let me ask you—first let me say that you are an example of why we want to continue to bring the best and brightest around the world here to create more jobs for us. I think we all recognize that getting a continuing education beyond high school provides a variety of benefits, but with unemployment approaching 10 percent, one of those benefits is a job.

Now, from your standpoint, what are the skills, you know, working with our higher education institutions, what do they need to be providing in terms of work force? What are the skills that you need so we can have the jobs for our kids when they're coming out?

Dr. IZZARD. You know, I think that actually when I look at the STEM program—I recently got involved in it maybe a year or ago myself. I think those are the fundamentals. To me, if I look at the STEM program, it hits—and actually, often mathematics is left at the end of the acronym, and I prefer to put it near the front. Mathematics I think is the fundamental model that we use to understand the world around us and, you know, engineering is built on top of mathematics, and science is built on top of mathematics.

And I think that if we focus on that, on giving people the language the technologies are built on, if we give people a strong grounding in mathematics, I think that's the key and engineering and science and technology follow.

So in my part of the world and my view of the commerce, it's all technology or Internet. The folks who we need to have fit into our work force fundamentally are people with a good fundamental understanding. And that begins at school. That begins in K through 12.

And, you know, I hear the commentary about somebody who gets—passes one AP class has tremendously increased execution in college. That doesn't surprise me. You know, in my view, success breeds success. People are successful early, it gives them the confidence to run faster and faster.

You have to catch them early when people are missing any piece of the underpinning. And a lot of the time it's mathematics, then they lose the confidence to continue to grow faster and faster.

Chairman GORDON. Well, one thing that Mr. Luce noticed and has awakened us to recognize and that is, you have to have your teachers on STEM education and math courses who better understand those courses.

My father was a good example. He was a farmer. He went to World War II. And when he came back, he wanted to be a better farmer. So he went on the GI bill to MTSU in my hometown and got a degree in agriculture.

When my mother—when I was born, she was working in a cafeteria. And she lost her job and so my father had to get a second job. So he applied to teach high school, and he got the last teaching job at Smyrna High School.

Since he was the last one hired, he was required to teach high school science and coach the girls' basketball. And I'm not sure which he knew the least about. You know, we're trying to make some changes now, and we know we've got to get to those teachers.

But I guess the question that I have I'll to ask Mr. Luce and all of you, we understand and it's fairly easy, I guess you would say, just putting money behind it, taking existing teachers like my father and bringing them back to school and helping them to get a better core education but—and we know we're setting up programs for those new teachers, the next generation that will go into math and science and education degree to teach.

But what do we do to encourage those students when they're freshman or sophomores to get into these programs before they teach?

Mr. LUCE. Well, one thing they do under UT's program, which has been remarkably successful, is they simply—and that's one of the things we fund—they say to an interested student who comes to College of Natural Sciences or Math, "we'll give you a free two-hour course," which is in effect practice teaching.

They take them into the classroom the freshman year. They get a free two-hour credit because we want them to be exposed to the classroom. But we also find—and this has fantastic results in UT's program—what is remarkable is all the graduates in the past 11 years from the UT Austin program, 85 percent are still teaching five years later.

In other words, they stay in the classroom. The reason they stay in the classroom is they're not frustrated. They've learned content knowledge. They can make a youngster's eyes light up, so they get excited about it because it is a basic, you can't teach what you don't know.

And if you're trying to stay a day ahead of the student, it's very hard to inspire students in math and science and, therefore, producing teachers that have content knowledge is terribly important.

I think the other thing that happens, Congressmen—it's hard to prove this with data. The students are more likely—this younger generation wants to serve. Well, having the security of having a STEM degree, if they don't like teaching, gives them great confidence to go try teaching because they know if they decide to drop out of teaching, they can go get a job at Hie or TI.

But with that content degree, they have the confidence and they end up liking to stay in the classroom.

Chairman GORDON. Dr. Jones, have you had any success or any models on getting, again, those freshmen and sophomores that want to go into these programs?

Dr. JONES. I think one of the best investments you can make to increase both the production and retention of young teachers is to invest in summer programs, because typical students who are coming through as undergraduates, you know, they go for the year and then in summer they go off and try to find a job at McDonald's or something so they can earn enough money to come back for a better job.

But we have a couple of programs, the research experience for undergraduates, where we pair faculty members with undergraduate students and they engage in actual research projects. And it's not make-believe research. It's not kind of meta-gospel research.

It's pairing them as research assistants at an early point in their academic career. And that raises their aspiration level. It raises their imagination. It stimulates the imagination. And there are some programs out there.

A wonderful program we're applying for this year from NIH, it's called Bridges to the Baccalaureate. And it's aimed at tackling one of the most vexing problems that we face and that is how do we get students to start at Collin College, get their associate's degree and encourage them to transfer and complete their bachelor's and even go on for masters.

And this program targets those students. It gives them positive summer experiences. It pairs our faculty with community college faculty. And it produces results. The problem is only six new programs are being funded this year in the current cycle.

So this is an example that some of my colleagues here have testified, if we want to go with proven programs, this is one that works. It creates positive summer experiences for undergraduates. It turns them into scientists and engineers and teachers in those fields and with additional funding, we can scale it.

Chairman GORDON. Just for your information, there are some programs being set up now with national labs for both high school teachers as well as—both for the teachers to come in, hopefully get excited about what they're doing and then take that excitement back home, and then also for undergraduates to come in to the national labs to see what's going on.

Dr. ISRAEL. Mr. Chairman.

Mr. HALL. Yes, sir.

Dr. ISRAEL. I'd like to look at something we might be missing. I don't know if the UTeach program is in any community college, but we'd really like UTeach to be at Collin County Community College. The pipeline for higher education in this country is the community college.

Chairman GORDON. Well, in the COMPETES field, we recognize that, and there are some specific programs for it.

Dr. ISRAEL. Right, I understand. But what we're talking about, we have a Center for Advanced Studies in Mathematics and Nat-

ural Sciences that specializes in highly motivated students in math and natural sciences. They do undergraduate research.

Our institution, when I came here 10 years ago, we couldn't even offer any type of degree in teaching, and now in the State of Texas we can have an Associate of Arts in Teaching. Seventy percent of all undergrads in Texas started at community college freshman and sophomore.

Seventy-eight percent of all minority undergraduates started at community college. Nationwide we're approaching 50 percent. We don't start linking community colleges a little bit better with some of these major wonderful initiatives that have been talked about, I think we're going to have a problem getting the people at this level because we're talking about K–12.

We're talking about universities, but we're missing the boat and that's the community colleges. And how can you create a two plus two plus two so that we can get all these individuals to have the STEM degrees that we're working on.

Mr. LUCE. Mr. Chairman, I would just point out that our program at the University of Kansas has formed an alliance with a community college in Kansas. They will be part of the program this year. So we recognize what you said in the *America COMPETES Act*.

Mr. HALL. Mr. Chairman, with your permission, we'd like to leave the record open to where we might want to—with these bright youngsters that we have with us today, I think some things that we've missed and inquire where we can put them on the record. Can that be done.

Chairman GORDON. Certainly.

Mr. HALL. And I just say to Tom, thank you for your discussions. And for the amount of money you're asking for with the huge amounts that they're playing with up there now, more money than I've ever seen in any vision of government, like the bailout, that first bailout, $800 billion.

They lose more money than you're talking about going from doggone committee room to the next up there. And it's a shame that we can't tie into them. And you tie into them with information that y'all have provided here. That's the way we write bills based on what people smarter than we are and more intelligent than we are to give us the information.

And I want to thank you for that. I guess that's probably——

Chairman GORDON. Well, I'd like to open up one more little area, if I could, please. Mr. Humm, you had talked about the difficulty in getting through, for lack of a better term, bureaucracy, in terms of different types of plans at DOE.

And maybe you and Dr. Izzard could give us some suggestions. On the one hand, we certainly want to be and we have the responsibility to be good stewards on the taxpayer dollars, and so we can't just say here's a check, you know.

How do we mix that combination of trying to be good stewards while at the same time not overburdening those individuals, whether through RFPs or whatever it might be, to be able to come in with a good idea and to get funding.

Mr. HUMM. Well, thank you very much for the question, Chairman Gordon. Our efforts over the last really three years have been

focused on getting, you know, what's know as DIACAP/NIACAP certification from the Department of Defense as well as Federal networks.

Now, to typically get into that certification process, you have to have a customer on the inside who wants to pull the product in. And that gateway may be controlled by a large defense contractor who's got a capability contract, and so you've got to engage with that guy who's got a trench dug across his profit line and he's not gonna let you cross for hell or high water.

So we finally were able to get through that barrier by engaging with the Air Force Surgeon General on a very important project associated with traumatic brain injury research for our returning Iraq wounded. 65 percent of the Iraq wounded have had their head shook up.

Chairman GORDON. So once you sort of breakthrough, get the certification in one area, it goes for everything——

Mr. HUMM. It's still so slow.

Chairman GORDON. So what's the better way to do it?

Mr. HUMM. Personally it would help our company to get a green technology fast-track certification that relies on Federal agencies, very similar to how the hybrid automobiles were selected for the Federal agencies.

There was a core group of product that was certified. They went in to the GSA schedule and the other procurement processes as being authorized or certified.

And so if we're going to beat this energy stranglehold that's been placed on us by energy consuming data processing products that may consume 24,000 watts an hour and probe 44,000 BTUs a piece, you have to have two V16 diesel generators——

Chairman GORDON. Let me—I'm trying to get to more—thank you. I don't mean to——

Mr. HUMM. No, you're fine.

Chairman GORDON.—be disrespectful. But how about, Dr. Izzard, do you have any kind of bureaucratic horror stories in any way that anything we might do to be able to streamline this process to make you more efficient.

Dr. IZZARD. A few comments and, you know, I guess that I'd start by saying that how to access government research money right now is an active discussion inside TI, but I'll be also completely honest and say that, you know, we wring our hands about it because over the years that we focused on being a diversified company with both systems and semiconductor components, we've become more and more of a focused semiconductor company.

We've consciously relied or found ourselves relying on our own funding of research and development. I told you some of the numbers. We very much appreciate the government tax credit for the research and development that we do.

But actually accessing direct funding is something that only the reason is the debate given the availability of stimulus funding. And we are examining actively, but we have only very small programs in place right now and that is because we found that it's really necessary for us to work as sub-contractors to folks who already have the appropriate certification or mechanisms in place working with government funding.

So I don't have any specific recommendations to you; but if it could be made easier to do, I think we'd certainly be interested in it, you know.

Chairman GORDON. Well, I guess one area in particular comes to mind with you as I mentioned earlier, we passed the National Nanotechnology Initiative. There's about $3.5 billion dollars being spent on nanotechnology across six different agencies. We want to better focus that.

One of the things that we did was to talk about nanotechnology in the next, you know, once they're going to come after the citizenship. So I would hope that we can make that public/private type of effort together.

Dr. IZZARD. And I'll add a comment that you remind me of about the Nanotechnology Initiative. I also really appreciate the darker support of the Semiconductor Research Corporation, something I am involved in in a way in which government funding can be brought to bear on helping private funding, provide research dollars.

And, you know, for me also specifically I'd like to comment that while many people are concerned about the high risk side of research because often research doesn't directly produce technology, or by definition high risk, means not many times does your research money turn in to revenue money. But one of the things I want to comment on is that one of the guaranteed offerings of research programs—we saw it come up in our education discussion.

One of the guaranteed offerings of research money is well-educated people. So while we should continue on focusing towards getting innovations out of our research, we should remember that even when projects fail, it provides really well-educated people for us.

Chairman GORDON. Well, thank you. Mr. Hall's telling me that—I guess some of you are old enough to remember Bulla Bufford. I think Bulla has passed. But we want to continue these discussions.

I mean, but to me, what I see here as the common denominators is that there does need to be a public/private partnership to create that work force. There does need to be a public/private partnership I think in the research area and that there are some things that are basic research that you're gonna have to have some federal help to get started.

But we need to get the private sector involved early enough so whether it's the mountain or the valley, that we get over that. And the sooner we get them involved, the easier it is to make that application on out to jobs is what we want in the work force format. So thank you all for this stimulating conservation and, again, we'll continue that.

Mr. HALL. Yeah. And thank you for your very valuable time. I wish we had more time. Dr. Israel, you helped on my question about the primary goals of the COMPETES Act and what you're doing about that. We could go into that at length.

I'd like some time to know more about why we're not producing as many engineers; seven to one from China or three or four to one from India and others. Those are things that maybe we'll go in to the next time we get a group like this.

Maybe you come to DC and testify for us at the Chairman's invitation. Thank you, Mr. Chairman. Thank you and thank you again. And thank everybody that appeared here.

[Whereupon, the Committee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Dr. Cary A. Israel, President, Collin County Community College District

Questions submitted by Representative Ralph M. Hall

Q1. You mentioned in your testimony the importance of community colleges in supporting a strong technical workforce. We hear a lot in Washington about the importance of producing more scientists and engineers with advanced degrees, but there is a tendency to overlook community colleges. How is the Federal government—and the National Science Foundation in particular—doing at targeting programs and activities in this area, and is there anything that can be improved upon?

Q2. One of the primary goals of the America COMPETES Act was to get more students interested in and prepared for pursuing math and science degrees at the college level. In your observations, are we doing a better job at this and are the Federal government's programs helping? Do you recommend any policy or program changes to improve upon these efforts?

Q3. One of the issues that we have been considering in Congress is the affordability of higher education, and student loan programs in particular. Please share your thoughts on the challenges you face in keeping your tuition costs affordable and any advantages or disadvantages you have as smaller schools in keeping costs down and attracting students.

Dr. Israel had not submitted responses by the time the hearing report went to press.

ANSWERS TO POST-HEARING QUESTIONS

Response by Dr. Dan Jones, President, Texas A&M University-Commerce

Questions submitted by Representative Ralph M. Hall

Q1. One of the primary goals of the America COMPETES Act was to get more students interested in and prepared for pursuing math and science degrees at the college level. In your observations, are we doing a better job at this and are the Federal government's programs helping? Do you recommend any policy or program changes to improve upon these efforts?

A1. Data provided from the Texas Higher Education Coordinating Board indicate our institution has increased declared majors each year from 2007 to present in mathematics, biological sciences, and physical sciences. Therefore, I believe we are doing a better job and that the Federal government's programs are helping, although whether this is a causal relationship is difficult to determine without further analysis. I do believe our institution needs to be more aggressive in securing funding provided through this legislation. The only policy or program change I would recommend is an investment in more programs similar to Project STEEM that targets middle and high school students from rural school districts. I completed the Project STEEM final report and can send that to you if you would like. The major finding is that bringing high aptitude students together and providing a peer support network is critical to motivating students from rural school districts to pursue STEEM degrees.

Q2. One of the issues that we have been considering in Congress is the affordability of higher education, and student loan programs in particular. Please share your thoughts on the challenges you face in keeping your tuition costs affordable and any advantages or disadvantages you have as smaller schools in keeping costs down and attracting students.

A2. The full Federal Pell grant award of $5,350 for the 2009/2010 academic year at our university completely covers tuition and mandatory fees for an undergraduate resident student enrolled as a full-time student (12 credit hours). However, many of our students are nontraditional and are responsible for also providing for themselves and families. STEM courses are often difficult and require additional study and research. Many capable students shy away from these majors and look for the shortest path to the degree. Subsidized and unsubsidized loans are not adequate to supplement income and provide for families. Independent students qualify for up to $9,500 ($3,500/$6,000 unsubsidized) for their first year. Dependent students qualify for $5,500 for their first year. The amount increases to a maximum of $12,500 for third year and beyond for independent and $7,500 for dependent students (with a lifetime limit of $31,000 for an undergraduate dependent and $57,500 for an independent). Increasingly, we are seeing many students who do not qualify for Federal financial aid benefits because their parents choose not to complete the FAFSA and, yet, these students are responsible for all of their living expenses. The U.S. Department of Education considers a student a dependent up until the **age of 24** except in certain circumstances.

Small institutions struggle with maintaining a tuition and fee structure that is affordable for its student population and providing financial resources to attract and retain quality students capable of being successful in the STEM disciplines.

Competition for outstanding faculty in areas such as science and business is intense. The supply of experienced professionals with terminal degrees is small. This drives up human resources costs as universities compete for the best people.

ANSWERS TO POST-HEARING QUESTIONS

Response by Patrick Alan Humm, P.E., Chairman and President, Hie Electronics

Questions submitted by Representative Ralph M. Hall

Q1. You outlined some very high goals for Hie Electronics in your testimony, and you talked about some of the challenges you face as a small startup company trying to raise capital and sell your product. What are the most important next steps for your company to be successful and grow to the next level?

A1. One of the most important next steps is to gain additional capital for product manufacturing, product marketing, and further product development.

As the administration seeks to build green jobs, Hie Electronics, an American-based manufacturing company with 35 employees, is exactly what the country is identifying as important to our nation's economy. As a green job provider in an energy management technology, we would like to be considered for Federal small-business hiring and investment incentives. This could be key to our growth over the next five years as we move from the start-up phase to small business.

One possible example for Congress' larger consideration is how Singapore helps new technology companies with considerable tax incentives, including double depreciation on first year capital expenses.

Tax policy favoring investment by individuals in companies like ours can help in the formation of capital. In this economy, stimulus matching funds equal to the amount of private equity invested in "Emerging Technology Development" or "Green Tech" could go a very long way towards the creation of jobs in this sector. Tax deductions or double investment incentives given to companies after they purchase Green Data Storage devices are another idea.

An additional example relevant to your committee, while ARPA–E promotes national innovation in the energy sector, our hope is that ARPA–E's scope will move to fully include technologies like ours which will reduce national energy consumption (our TeraStack Solution can reduce data storage power consumption from 60 to 90%). We look forward to attending the ARPA–E conference scheduled in March to learn more.

ANSWERS TO POST-HEARING QUESTIONS

Response by Dr. Martin Izzard, Vice President and Director, Digital Signal Processing Solutions R&D Center, Texas Instruments

Questions submitted by Representative Ralph M. Hall

Q1. Please elaborate on the high risk research "Kilby Labs Initiative" that you mentioned in your testimony? We sometimes hear that companies are moving away from high-risk research as a result of the short-term pressure to turn a profit. Is it difficult to justify an investment like this on the balance sheet, and how will you measure the success of this initiative given the high-risk nature of the research?

A1. The justification in financial terms for a high-risk initiative is difficult, but we achieve this by keeping the effort affordable (about 1% of our technical workforce is employed at any one time in the initiative) and by observing that, while the chance of achieving a breakthrough is small, the payoff can be large, and so we should not "do nothing."

The success will be measured in two ways: impact on products both existing and new and development of the workforce. While the first outcome is uncertain, the second outcome is almost guaranteed since we will use a mechanism of rotating engineers who wish to try a high-risk idea in and out of the Labs and during their tenure, they are bound to learn and get new perspectives.

ANSWERS TO POST-HEARING QUESTIONS

Response by Tom Luce, Chief Executive Officer, National Math and Science Initiative

Questions submitted by Representative Ralph M. Hall

Q1. One of the primary goals of the American COMPETES Act was to get more students interested in and prepared for pursuing math and science degrees at the college level. In your observations, are we doing a better job at this and are the Federal government's programs helping? Do you recommend any policy or program changes to improve these efforts?

A1. We are doing a better job but are far from accomplishing the preparation of a sufficient number of students in the K–12 pipeline who are prepared to pursue math and science degrees at the college level. It is our experience that the most efficient and effective way to increase this pipeline is to replicate the Advanced Placement Incentive and Training Program into more high schools in our country. The National Math and Science Initiative has demonstrated that replication can work and the limitation to expansion at this time is money.

Q2. You noted in your testimony that your goal is to replicate the success of the National Math and Science Initiative nationally. Aside from funding, what are the biggest obstacles and/or most important elements to achieving this?

A2. Aside from funding, the biggest obstacle is the lingering belief that our students cannot achieve at higher standards, notwithstanding the evidence to the contrary achieved by the National Math and Science Initiative.

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