

Exploring Innovation Frontiers Initiative

Diversity.

Southwest Regional Dialogue
Talent, Diversity, Accessibility, and Inclusion in the U.S. Innovation System

UCR ARTSblock
Riverside, California
November 23, 2015



Compete.
U.S. Council on
Competitiveness

Diversify. Southwest Regional Dialogue Talent, Diversity, Accessibility, and Inclusion in the U.S. Innovation System

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Competitiveness**

Table of Contents

Letter from the President	6
Participants	7
Agenda	8
Findings from the EIFI Southwest Regional Dialogue	
Executive Summary	12
Innovation Keynote	16
Diversity in the U.S. Innovation Ecosystem	19
Accessing the Crown Jewels of the U.S. Innovation System: Socioeconomic Diversity in Higher Education	21
Planting the Seeds of Innovation: Geographic Diversity in the U.S. Innovation Ecosystem	23
Diversity of Outcomes: Exploring the Distribution of Innovation's Benefits	26
The Path Forward	29
Closing Keynote	31
Next Steps	33
About the U.S. Council on Competitiveness	34

EIFI SOUTHWEST REGIONAL DIALOGUE

Letter from the President

On behalf of the U.S. Council on Competitiveness (Council), I am pleased to release findings from the Southwest Regional Dialogue of the Exploring Innovation Frontiers Initiative, held November 23, 2016 at the University of California, Riverside ARTSblock in Riverside, California; the second in a series of dialogues as part of the Exploring Innovation Frontiers Initiative.

The Exploring Innovation Frontiers Initiative (EIFI) is a national, public-private effort to accelerate the over-the-horizon, transformative innovation models that will drive U.S. competitiveness in the coming decades. Sponsored by the National Science Foundation (NSF) Directorate of Engineering, Office of Emerging Frontiers of Research and Innovation (EFRI)—EIFI is a qualitative analysis that will collect, synthesize and disseminate broadly the experiential knowledge of active innovation practitioners. This information will be used to provide academicians with direction for future research in innovation, business leaders and strategists with insights to inform future business models, and policymakers with knowledge to enact public policies that create a supportive environment for sustained innovation-driven growth.

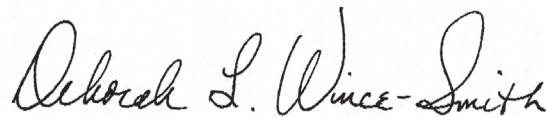
I would like to extend a special thanks to Dr. Kim A. Wilcox, Council member and Chancellor of the University of California, Riverside for co-hosting and leading a strategically important meeting for our country's future with over 30 leaders from industry, academia, and national laboratories.

Contained within this report is a summary and synthesis of the conversations that took place November 23, 2015 at the ARTSblock at the University of Cali-

fornia, building on the outcomes of the EIFI launch and initial dialogue at the Georgia Tech Global Learning Center, in Atlanta, GA on June 9, 2015. The further we delve into the impact of diversity on U.S. competitiveness, the more aware we are to the innovation potential of bringing new experiences and perspectives to existing challenges.

The Council on Competitiveness looks forward to continuing to work with national and regional leaders in industry, academia, national laboratories and government as it captures insights and recommendations to leverage U.S. innovation and ingenuity to meet the goals of the Exploring Innovation Frontier Initiative.

Sincerely,



The Honorable Deborah L. Wince-Smith
President & CEO
U.S. Council on Competitiveness

EIFI SOUTHWEST REGIONAL DIALOGUE

Participants

CO-HOSTS

Dr. Kim Wilcox
Chancellor
University of California, Riverside

The Honorable Deborah L. Wince-Smith
President & CEO
Council on Competitiveness

KEYNOTE

Dr. Susan Wessler
Home Secretary, National Academy of Sciences

Neil A. and Rochelle A. Campbell
Presidential Chair for Innovations in Science Education
University of California, Riverside

ATTENDEES

Dr. M. Katherine Banks
Vice Chancellor for Engineering
The Texas A&M University System
Dean of Engineering
Texas A&M University

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Senior Vice Provost for Research & Graduate Education
Northeastern University

Ms. Lynne Brickner
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ARCS Foundation, Inc.

Dr. Paulette Brown-Hinds
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VOICE

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Santa Ana Watershed Project Authority

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President & CEO
Georgia Research Alliance

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ISCA Technologies, Inc.

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Graduate Student Researcher
University of California, Riverside

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Graduate Student Researcher
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Vice Chancellor for Research
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Mr. J. Adalberto Quijada
District Director
Santa Ana District Office
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Dr. Sheldon Schuster
President
Keck Graduate Institute

Mr. Michael van Ter Sluis
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Council on Competitiveness

Dr. Grace Wang
Deputy Assistant Director
National Science Foundation

Dr. Judy White
Superintendent
Moreno Valley Unified School District

EIFI SOUTHWEST REGIONAL DIALOGUE

Agenda

MORNING

8:00 Registration and Continental Breakfast

8:30 Welcome: Exploring Innovation Frontiers Initiative

The Honorable Deborah L. Wince-Smith
 President & CEO
 U.S. Council on Competitiveness
 @dwincesmith

Dr. Kim A. Wilcox
 Chancellor
 University of California, Riverside

Dr. Pramod Khargonekar
 Assistant Director—Directorate of Engineering
 National Science Foundation

8:50 Participant Introductions

9:30 Exploring Innovation Frontiers Initiative: Vision, Goals, and Objectives

Mr. Chad Evans
 Executive Vice President
 U.S. Council on Competitiveness
 @chadevans1019

9:45 Keynote Speaker

Dr. Susan Wessler
 Home Secretary, National Academy of Sciences
 Neil A. and Rochelle A. Campbell Presidential Chair for
 Innovations in Science Education
 University of California, Riverside

10:05 Diversity in the U.S. Innovation Ecosystem

As the country becomes more ethnically diverse, concern is growing among innovation stakeholders over the impact under-representation in science, technology, engineering, and math (STEM) will have on the U.S. innovation system talent pipeline. This panel will explore the successes and challenges faced by public and private innovation institutions (universities, industry, etc.) along the path to greater diversity, accessibility, and inclusivity in the innovation ecosystem—with the goal of soliciting broader reflections from all participants based on experiences at their respective organizations. A particular

focus will be placed on ideas put into practice at UCR—building communities of support around groups under-represented in the science, technology and innovation (STI) ecosystem. While the participants should draw from personal and professional experiences in their respective regions, the discussion will ultimately focus on lessons applicable to a national innovation strategy.

Guiding Questions

1. Why are women, minorities, and low-income students under-represented in the STEM fields?
2. What interventions have worked at your organization? What has not worked?
3. What are the origins of STI communities of support, and how do we replicate and scale these support systems in communities where they are not available?

Moderator

Dr. Pramod Khargonekar
 Assistant Director—Directorate of Engineering
 National Science Foundation

Discussants

Dr. M. Katherine Banks
 Vice Chancellor for Engineering
 The Texas A&M University System
 Dean of Engineering
 Texas A&M University

Dr. Leslie A. Hickie

Vice President of New Business Opportunities
 and Project Management
 BioAtla

Dr. John E. Leonard

Senior Vice President, Development
 Vaccinex, Inc.

Next Generation Innovator

Ms. Katherine Espinoza
 Student
 University of California, Riverside

11:05 Coffee & Networking Break

11:20 Accessing the Crown Jewels of the U.S. Innovation System: Socioeconomic Diversity in Higher Education

As the costs of tuition grow, as public investment in education wanes, as the demand rises for higher education, and as selectivity increases in both public and private educational institutions, college applicants are finding it increasingly difficult to access the crown jewels of the U.S. innovation ecosystem—research-grade universities. This panel will explore U.S. higher education through the lens of socioeconomic diversity with the goal of teasing out ideas, insights, or recommendations that can be applied to a national innovation agenda.

Guiding Questions

1. Is the current model of higher education aligned with society's changing needs? If not, what other models are emerging as a result?
2. How can America's educational infrastructure reorient to handle projected enrollment demands?
3. What threats to the innovation ecosystem are created by the rising costs of education, and the concomitant increase in student debt?

Moderator

Dr. Kim A. Wilcox
Chancellor
University of California, Riverside

Discussants

Ms. Lynne Brickner
President
ARCS Foundation, Inc.

Dr. Judy White
Superintendent
Moreno Valley Unified School District

Next Generation Innovator

Ms. Monica Natividad
Graduate Student Researcher
University of California, Riverside

AFTERNOON

12:20 Lunch

1:00 Planting the Seeds of Innovation: Geographic Diversity in the U.S. Innovation Ecosystem

The United States has some of the most creative, productive and robust innovation clusters in the world. At the heart of these clusters are the innovators themselves—scientists, engineers, and entrepreneurs that provide the energy that drive these dynamic communities. Yet, these centers of excellence are concentrated in select regions of the country. To spread the economic and social benefits of innovation, innovation ecosystems must be seeded in every corner of the nation. The panel will explore the successes and challenges faced by communities around the country in the development of local and regional innovation ecosystems—with a focus on the human element of innovation. The broader goal of this session is to tease out insights, lessons, success factors, etc. that could inform a national innovation agenda.

Guiding Questions

1. What are the trends on the horizon—organizational, technological, etc.—with the potential to transform the ways people engage in the innovation ecosystem?
2. How do we create and/or attract the talent and mindset needed to drive innovation to regions historically disconnected from the communities of science, technology, innovation, and entrepreneurship?
3. How do regions without research institutions build innovation ecosystems?

Moderator

Dr. Michael Pazzani
Vice Chancellor for Research
University of California, Riverside

Discussants

Dr. Sheldon Schuster
President & Professor
Keck Graduate School

Mr. Jay Goth
Executive Director
InSoCal Connect

Dr. Sean Gallagher
Chief Technology Officer
UVP

2:00 Diversity of Outcomes: Exploring the Distribution of Innovation's Benefits

Across the nation, wages are stagnating, and the country is divided into economic “haves” and “have-nots”. The fastest growing sectors of the economy are services sectors on either end of the wage spectrum—while middle class jobs, such as those in the manufacturing sector, are harder and harder to find. The national narrative maintains this bifurcation of the workforce and the resulting income stagnation is due, in part, to globalization and technological change. This panel will explore the second and third order effects of technology and innovation in communities across the United States, and begin to discuss and define public policies with the potential to help Americans better adapt to rapid changing economic environments.

Guiding Questions

1. Does the average American have what it takes to compete in a globalized, innovation-driven, 21st Century economy?
2. What are, if any, the negative or harmful effects of innovation? Are there populations in the United States disproportionately affected by technological disruption?
3. If so, should these effects be mitigated? Or, are they a natural element of a healthy and dynamic innovation-driven economy?

Moderator

Mr. J. Adalberto Quijada
District Director
Santa Ana District Office
U.S. Small Business Administration

Discussants

Mr. C. Michael Cassidy
President & CEO
Georgia Research Alliance

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Chief Executive Officer
ISCA Technologies, Inc.

Dr. Paul D'Anieri
Provost & Executive Vice Chancellor
University of California, Riverside

Next Generation Innovator

Mr. Jeffrey McDaniel
PhD Candidate
University of California, Riverside
Department of Computer Science and Engineering

3:00 Coffee & Networking Break

3:15 The Path Forward

A stated goal of the Exploring Innovation Frontiers Initiative is to craft with national and regional stakeholders a national innovation action agenda that positions the United States as a global innovation leader for decades to come. This final session of the day will reflect on the day's conversation—opportunities, challenges, priorities, etc.—and work to crystalize this discussion into action recommendations that the U.S. Council on Competitiveness will transform into a national innovation strategy.

The moderator will ask each participant to respond in 1 to 2 minutes to the following question:

Reflecting on today's conversation, what idea or ideas presented at this dialogue can be scaled nationally to drive greater inclusion of women, minorities, and/or low-income communities in innovation ecosystems across the country?

Moderator

Dr. Kim A. Wilcox
Chancellor
University of California, Riverside

4:15 Closing Remarks

Dr. Kim A. Wilcox
Chancellor
University of California, Riverside

The Honorable Deborah L. Wince-Smith
President and CEO
U.S. Council on Competitiveness
[@dwincesmith](#)

4:45 Conclude & Reception

Findings from the EIFI National Launch Dialogue

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Executive Summary

At the leading edge of transformational changes and one of the most economically diverse universities in the country, University of California, Riverside was an ideal setting for the Southwest Regional Dialogue of the Exploring Innovation Frontiers Initiative (EIFI). On November 18th, Kim Wilcox, Council Member and Chancellor of the University of California, Riverside, hosted a deeply thoughtful conversation of business, academic, government, national laboratory, and non-profit leaders.

The day-long combination of plenary sessions and student interventions—together with keynote remarks from Susan Wessler, Home Secretary of the National Academy of Sciences, and Neil A. and Rochelle A. Campbell Presidential Chair for Innovations in Science Education at the University of California, Riverside, and Kim A. Wilcox, Chancellor of the University of California, Riverside, dove into the ways different types of diversity—geographic, socioeconomic, gender, and race—impacted the potential for innovation in America. There is little question that diversity represents unique perspectives that inject new ideas into existing problems, increasing opportunities for innovation and as such it is critical to ensure diversity is represented in America's innovation ecosystem.

The dialogue took place over a single day and consisted of several panel discussions highlighting different diversity metrics, their impacts on America's innovation ecosystem, and methods to overcome perceived barriers raised during discussion. Participants shared best practices and new approaches to being more accommodating to women, under-represented minorities, and other under-represented groups in STEM disciplines, focusing on methods to inspire students and generally improving the accessi-



Dr. Kim A. Wilcox, Chancellor, University of California, Riverside; The Honorable Deborah L. Wince-Smith, President & CEO, U.S. Council on Competitiveness.

bility of technical education. America has the capacity to maximize its human capital greatly contributing to U.S. competitiveness, but effectively doing so is a consistent challenge as the world continually changes. In addition to specific policy recommendations from each panel, the willingness and ability to flex to meet the needs of the next generation must be at the core of each strategy.

Panel Synopsis—Diversity in the U.S. Innovation Ecosystem

The day's first discussion was designed to explore the successes and challenges to increasing race, gender, economic, and geographic diversity in the U.S. innovation ecosystem, hitting on a foundational theme of the EIFI initiative: The lack of diversity in the U.S. innovation ecosystem. **Participants agreed diversity was a key driver of innovation, but that diversity was a step removed from the true problem to spurring interest in STEM disciplines.** Adding



Dr. Pramod Khargonekar, Assistant Director - Directorate of Engineering, National Science Foundation.

to the issue of interest in stem is overcoming the cultural barriers encouraging student, especially girls, to leave home at 18 to pursue their education. To overcome these challenges, **the panel focused primarily on how we communicate STEM to young students, and helping them understand what opportunities exist in STEM fields.**

Along those lines, the panel recognized that the most important time for developing an interest in STEM is at a very young age, building a deep passion for the topic so students will not be discouraged later in life when they encounter a setback such as a poor grade, which may turn off students who encounter STEM later in their academic career. In a similar vein, participants encouraged bridging the high school and undergraduate experiences, to create cohorts of support for students who may be at elevated risk of failing were they to move away from home to begin their undergraduate education.

Questions Raised for Future Dialogues

- How can we more effectively generate interest in STEM during primary education?
- How do we inspire the next generation of innovators to pursue STEM disciplines?
- Are unique incentives required to attract students of different genders, race, or socioeconomic background?
- What can EIFI do to support career mentoring or provide resources to those concerned about employment prospects in their field?

Panel Synopsis—Accessing the Crown Jewels of the U.S. Innovation System: Socioeconomic Diversity in Higher Education

The purpose of this second plenary session is to explore socioeconomic diversity of the U.S. higher education system with the goal of teasing out ideas, insights, or recommendations that can be applied to a national innovation agenda. **The panel came to the consensus that access to higher education in the U.S. is in a state of flux as schools are caught between the opposing forces of increasing demand for student resources and decreasing financial support from government.** Despite claims from participants that educating students is lower than it has ever been, the cost discrepancy is being passed on to students, elevating the influence of a student's resources on their overall success. This generated great concern among the panelists that financial concerns are impacting a student's willingness and ability to pursue an education for fear of the amount of debt accumulated by the end of their academic career. Panelists surmised that over time this would negatively impact the STEM pipeline for

the future. Beyond limiting the number of students in the STEM pipeline currently, future students would see less STEM graduates and may not consider it a viable academic or professional career path, further stifling growth.

Panelists suggested capping debt of students when graduating through work programs or grants, but felt there was no single response—identifying the problem as circular in nature. To help students succeed requires financial resources, which schools don't have.

Questions Raised for Future Dialogues

- Is leveling the playing field for higher education solely a matter of increasing funding?
- How will the United States maintain its lead in higher education?
- What can be done to lower the cost of education for students?
- Has the value of a degree changed?

Panel Synopsis—Planting the Seeds of Innovation: Geographic Diversity in the U.S. Innovation Ecosystem

The premise of this session was that communities around the country do not have the same access to the U.S. innovation ecosystem. This plenary was intended to explore the experience of developing local and regional science, technology, and innovation ecosystems. **Panel members agreed that some regions have a natural draw, such as desirability or access to talent, but by bringing components of the innovation ecosystem to new regions can create new draws to their location and capture the attention of the community to invest in STEM.** Currently, centers of innovation

are located around other centers of innovation, but this is because the resources to develop and support innovation have been more tightly integrated throughout the community. Many similar resources exist in communities around the country, but have not yet been connected in a way that innovators can take advantage of.

According to panelists, part of this integration is reconsidering the academic and professional career as a single branching pathway and developing those opportunities locally with partnerships, rather than the current sense of a single path that without deviation. Innovation is most effective when expertise is brought to problems experienced in the community, rather than silo-ing experience in a particular domain or career track. **The panel stressed that the most important aspect of developing a successful innovation community in different regions across the U.S. is to actively engage a spectrum of individuals and organizations to build better partnerships across a region.**

Questions Raised for Future Dialogues:

- Should regions claim unique innovation disciplines, or spread all innovation capacities throughout the United States?
- Are regions appropriately incented to develop innovation ecosystems?
- What methods to regions have to broadcast progress developing innovative communities?

Panel Synopsis—Diversity of Outcomes: Exploring the Distribution of Innovation’s Benefits

This fourth plenary explored the secondary and tertiary effects of science, technology and innovation in communities across the U.S. and the impact of innovation on the average American. **Panel participants felt strongly that innovation is a source of opportunity for the country, but shared concern that the gains from innovation are not equitably distributed across Americans. The path to more equitable distribution of innovation’s benefits, panelists agreed, is through education that enables individuals to engage with and adapt to new innovations.**

Resurfacing from discussions earlier in the day, the topic of education suffering its own equality issues was highlighted as a material concern. Access to knowledge is greater than it has ever been in history, thanks to the rapid advancement of communication technology over the past several decades, but access to high-quality education is divided. These issues are mirrored in the job market and entrepreneurship, where opportunities are not equally distributed.

While participants were not enthusiastic about the state of innovations distribution of benefits, they agree that it has improved prospects for all Americans. However, panelists agreed it is critical for the future of American competitiveness that the benefits and opportunities afforded by innovations be accessible by everyone to capitalize on Americas collective capacities.

Questions Raised for Future Dialogues

- Are the liberal arts focus on teaching students to think and vocational training incompatible?

- What are more examples of successful methods to increasing the accessibility of Innovation’s benefits?
- Will resolving distribution require modification of existing structures or building anew?
- Are these issues felt more strongly in certain regions more than others? How would resolutions differ based on the region if at all?

The Path Forward

The last panel of the day invited all participants to reflect on the day’s conversations and contribute any point they felt was not discussed. The room agreed the issues facing the science, technology and innovation ecosystem were not impossible, but there must be a concerted effort to attract more students of all types and create an environment where they can thrive independent of outside influences. As one participant highlighted, “talent is universal, opportunity is not.” We cannot allow students to be discouraged by why they perceive is a system stacked against them.

The Council will continue this national conversation in the second half of 2016 together with President Deavid Leebron of Rice University. Rice University offers a unique setting for the third EIFI regional dialogue for their reputation as a science and technology leader in higher education and residence in a large state located along the U.S. border along with a growing and rapidly diversifying population. Understanding how Rice successfully cultivates an environment conducive to student interest and success in STEM is critical to the success of the Exploring Innovation Frontiers Initiative.

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Innovation Keynote

Dr. Susan Wessler

Home Secretary, National Academy of Sciences
Neil A. and Rochelle A. Campbell Presidential Chair
for Innovation in Science Education
University of California, Riverside

Today I would like to talk about bridging the upstairs and downstairs of American research universities. After 17 years at the University of Georgia, I taught my first undergraduate class, Intro Biology, with 400 students and I absolutely hated it. I left the students downstairs and walked upstairs to my research lab where students, undergraduates, graduate students, and post-docs were literally bouncing off the walls with excitement. This led me to realize that our research universities are really composed of two worlds. We have the upstairs, which are the research labs that are recognized as the best in the world, period. Upstairs we're expected to be creative, innovative, and use cutting-edge technology. We're funded competitively largely by money from U.S. taxpayers and from private foundations. We generate valuable networks for students that are essential for their careers.

Demographically, most of the students in the labs I have worked in both at Georgia and at Riverside as well as most of the labs of my colleagues are comprised of international students. They used to stay in the United States and many of them are the faculty at our top universities, but increasingly more are returning to their home country.

Now, the downstairs is a different situation. It's the undergraduate classrooms and labs. As I said before, the introductory courses are huge. There's usually the "sage on the stage," impersonal. Our student labs are, for the most part, using old equipment. To speak



Dr. Susan Wessler, Home Secretary, National Academy of Sciences, and Neil A. and Rochelle A. Campbell Presidential Chair for Innovations in Science Education, University of California, Riverside.

in generalities, they're pretty boring and taught by a TA who is usually an international student from "upstairs."

One of the startling statistics is that 60 to 70 percent of Californian under-represented minorities and students in general drop out of STEM¹ and they go into a different field while the very well-trained post-docs and graduate students "upstairs" leave and return to their home country.

I noticed this disconnect between the "upstairs" and "downstairs" in 2006. I applied, and was awarded, a Howard Hughes Medical Institute Professor grant (HHMI) to replicate my research lab as an undergraduate classroom where students learned how to do cutting-edge, authentic research that originated from my laboratory. It was tidbits of experiments on transposable elements in plant genomes. Half the

1 Peter Arciniacono, Estaban Aucejo, V. Joseph Hotz, CEP Discussion Paper No 1223, "University Differences in the Graduation of Minorities in Stem Fields: Evidence from California" (June, 2013) <https://core.ac.uk/download/files/67/16380147.pdf>.

course they would learn the techniques and just like a real research lab, these techniques were both computational and experimental. When I moved to Riverside in 2010 we built the Campbell Learning Laboratory, which accommodates 300 freshmen a year that go through our alternative introductory biology laboratory.

We're increasing the number of sections every year. By 2018 we'll be up to 24 sections of 24 students each and that still is only about a third of our incoming science majors. In order to expand the program I've had to recruit other research professors who have taken ownership of different sections, and this is really the major bridge between the quality "upstairs" and our undergraduate "downstairs" laboratories. We call this process of getting faculty involved a plug-and-play model where my staff provides most of the student training and the faculty come in at the end with projects for the students. It's a five-week period of time, limiting the projects to tidbit projects, but it gives them experience.

So, for example, in my lab we're now looking at the citrus genome for obvious reasons and we look at the transposable elements in the genome. Like most areas of genomics there's a huge amount of unanalyzed data waiting for discovery, which is what most of these labs are about. We have professors that are using MAL cell lines. We have professors that are involved in our course, mosquitoes, yeast, essentially all organisms that are easily grown in a lab environment and have a complete genome sequence. The problem is how to keep students interested when the projects occupy just one quarter in the freshman year.

We've developed the Dynamic Genome Program where graduates of our course can access a whole menu of other opportunities, the most important

being independent research. We know that the students that come out of our course are all well-trained in current techniques and they know how to design experiments. They learn concepts rather than memorization.

We have also started a program of university laboratory assistants that are graduates of our program as opposed to TAs that are international students and may not be appropriate peer mentors for our students. We pick the best students and because of HHMI funds we pay them. This is important because 60 percent of our students are on Pell Grants.

We offer significant career counseling to these freshmen students. 90 percent of the students come in as pre-med with very specific interests, such as pediatric oncology. Only about 50 of our students each year actually go to medical school. So what happens to the rest of them? Our career counseling involves counseling about biotech, science and biotech, and summer research. We have something like 25 stipends to support our students.

The most important and exciting opportunity is a hybrid program with Keck Graduate Institute (KGI), which offers a professional science master's program. Most students know nothing about KGI or realize what is going on in the real world in terms of opportunities. 95 percent of the students that graduate from KGI have a job within six months and the jobs pay on average \$75,000. They are interesting jobs located in the region. Most of our students come from Southern California and most of them want to stay here. However, if they went into academia very few would be able to stay here. What we developed was a hybrid summer program where we interview students and select our best 20 to 25 Dynamic Genome graduates to stay on campus, pay-

ing them room and board as well as a stipend. KGI faculty and students come to teach our students. A component of the program is focused on science industry where our students learn about intellectual property and regulatory affairs. They learn how to put together a business plan and how to raise capital. They learn about production, and a host of other things that are never taught in a typical STEM.

We're also planning on expanding it to transfers from community colleges which is currently in the works, funded largely by a grant from the USDA Hispanic-Serving Institutions.

The other component of this is assessment. The two things we're assessing are the persistence in STEM major and their involvement in independent research.

What we need to fulfill is vision is controlled by faculty themselves. One is promotion and tenure guidelines. If somebody is really good at teaching, it doesn't count nearly as much as doing a spectacular job at research. So we have to incentivize good teaching, and this begins at the department level. For example, professors involved in our course don't get teaching credit.

Two is our curriculum committees. They currently largely discourage experimentation "downstairs". So essentially if you want to have an alternative course that's largely failing, you have to do a lot of what that failing course is doing. The idea of risk in the "downstairs," unlike risk in the "upstairs," is something that's not looked upon favorably.

We need facilities for active learning. In order to do the experiments in education, universities need to collect data on student outcomes. If we're going to do experiments, we need control groups. Universities are leaving money on the table because, though funding opportunities continue to grow, funding

opportunities demand rigorous, well-controlled experiments that require data from the university. We need to understand and identify the class section, or class scene, better. Which are the problem classes? Which classes are giving the students problems?

This leads me to the last point, which is we need to change the mindset in STEM education that the goal of these introductory classes is to weed out students. When we interview a lot of our dynamic genome students when they're done, interviewing them for these research opportunities, and we noticed they have a poor GPA in many cases because of poor grades in STEM classes. UCLA was so fed up with working with their math department to change calculus and make it more friendly, to make it more relevant to the real world that they decided to teach calculus in the biology division. It turns out the students that took the biology calculus did better in physics than the students who took the math department calculus.

It's hard to get into the UCs. It's the top ten percent of our undergraduates and especially at UCLA it's probably the top three percent. Why should we be weeding these people out? We should be nurturing these people.

I want to end by saying that UCR has been incredibly fertile soil for our program. The next step is to develop a pipeline for our diverse students to join the scientific workforce, whether it be industry, academics, government, or other sectors. But we have to get them to persist in science.

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Diversity in the U.S. Innovation Ecosystem

The day's first discussion was designed to explore emerging concerns among innovation stakeholders that a lack of diversity in STEM disciplines will artificially limit innovation potential. Dr. Pramod Khargonekar, the Assistant Director of Engineering at the National Science Foundation (NSF), led a thoughtful conversation, including: Dr. M. Katherine Banks, Vice Chancellor for Engineering for the Texas A&M University System and Dean of Engineering at Texas A&M University; Dr. Leslie A. Hickle, Vice President of New Business Opportunities and Project Management at BioAtla; and Dr. John E. Leonard, Senior Vice President for Development at Vaccinex, Inc., touching on the state of diversity in STEM disciplines and reasons to be hopeful that the innovation ecosystem is one its way to becoming more inclusive.

There is a clear problem in the U.S. Innovation Ecosystem in that it lacks diversity. Women and non-white students regularly represent a small fraction of engineering and science students at the undergraduate, master's, and PhD levels, which is a shame according to Dr. Khargonekar, as women submitting proposals have been shown to succeed at a higher rate than men.. Current students are the pipeline for future faculty, and as a result, faculty across the country are similarly lacking in diversity. This creates a perpetual issue around the innovation ecosystem. Students don't see adults that look like them in academia or in the workplace, and are less encouraged to pursue a STEM education as a result. This creates two problems within the institutions of the innovation ecosystem. The first is attracting students to universities with demographics that students may not be comfortable with, require relocating to an area out of their comfort zone, or may be out of step with family expectations. The second is keeping students enrolled when they are discouraged by a poor mark



Dr. Leslie A. Hickle, Vice President of New Business Opportunities and Project Management, BioAtla.

or do not have a support group close to rely on. As put forth by **Dr. Banks**, **“The recruiting issue is complicated just because of the geography and cultural background of many of our students. In some first-generation households, it’s very difficult particularly to encourage your girls, your daughters to leave home at 18 and that’s a challenge.”**

The conversation generated several proposals to resolve these issues, each dealing with the problems of recruiting and retention at different stages in a student's academic and professional career. Starting with the youngest generation, it is important that STEM reach children early in an inclusive manner to start them thinking about exploring a career in a related field. Ideally this will make them less likely to deviate from that path later in life. **Dr. Banks summed up this point stating “The way we talk about engineering to our youth is incorrect, and quite frankly, offputting. If a young woman or under-represented minority student had a negative impression of engineering by third grade,**

the likelihood that they will move into an engineering or technical field is minimal, third grade. So the problem is with K-12, is that we start talking about engineering in high school. We've already lost those children. So what we need to do is start thinking about how we can integrate engineering into kindergarten and develop curricula that will allow teachers to do that."

The issues of recruitment and retention come into play again as students begin preparing for their undergraduate education in STEM. Texas A&M was brought up as a unique example of bridging the gap between home and college life, developing engineering programs for students to learn at community colleges and establish a support network before matriculating as a group to a larger university. Texas A&M operates several educational programs at community colleges around the state, where students are co-enrolled at the community college as well as Texas A&M students and are learning from Texas A&M faculty to establish connections to the school. Ideally, these students create their own mentoring and support network, so they and their families are more comfortable when they move to Texas A&M with the ultimate goal of making these students more successful.

Current STEM undergraduate students looking to the next steps after their degree face difficult choices: face a job market with questionable employment prospects or continue in academia for another several years to complete advanced degrees to attain the credentials preferred by employers. This constantly connected generation has more information available to them than any other generation before them, and is keenly aware of the challenges that

women and minorities face in science and engineering. Dr. Hickle proposed that in response, many have opted to pursue other career paths based on this information. To keep them engaged, noted Dr. Leonard, they must feel there are jobs waiting for them after graduation that do not require PhDs.

Part of the responsibility lies with the industry. **Dr. Hickle noted, "Industry is creating the pull. It's creating the opportunities for the students coming out of the universities, so there has to be a little better connection between them so the transition is not so traumatic."** Participants discussed a solution that would resolve the issue of instructor engagement in higher education as well as creating industry partnerships. One frustration raised, especially at research universities, is that faculty do not feel teaching is their role. At the same time, most professors have no industry experience. Dr. Banks added to this thought by suggesting engineering programs should create "professors of practice" bringing in professionals with 10-15 years in the field to teach. This brings more practical experience into the classroom while also ensuring schools are teaching material employers will find useful, which will also smooth the transition from academia to the workplace. Regularly bringing in new experienced staff interacting with students also creates a feedback loop with industry so higher educational programs are always aware of industry needs and industry can hire with the knowledge that their new employees have been exposed to desired skills.

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Accessing the Crown Jewels of the U.S. Innovation System: Socioeconomic Diversity in Higher Education

This session explored socioeconomic diversity of the U.S. higher education system with the goal of teasing out ideas, insights, or recommendations that can be applied to a national innovation agenda. The panel, led by Dr. Kim A. Wilcox, Chancellor of the University of California, Riverside, was populated by Ms. Lynne Brickner, President of ARCS Foundation, Inc.; and, Dr. Judy White, Superintendent of the Moreno Valley Unified School District. The panelists agreed that schools are currently caught between two opposite forces: decreasing financial support from government and increasing demand for student resources. According to **Dr. Wilcox, “states across America have cut [educational] support so drastically that we simply can’t cut the cost fast enough”** and schools are forced to pass costs onto students in the form of higher tuition, limiting the accessibility and ultimately, diversity, of higher education. Panelists came to a consensus that socioeconomic diversity in higher education hinged on support for students at home and at school, and runaway costs at institutions of higher education needed to be addressed.

The rapidly rising cost of higher education has put socioeconomic diversity at the forefront of concerns limiting the potential of future innovation in the United States. If higher education is the key to a higher wage, but that path is unlocked only to those with the financial resources we find that **“the biggest predictor of success is your parent’s zip code”** according to **Ms. Brickner and echoed by Dr. Wilcox**. Ms. Brickner continued explaining to the group that for those students that are able to navigate the issue of cost at the undergraduate level, they may not be able or willing to take on the



Dr. Douglas Ray, Director of Strategic Partnerships, Pacific Northwest National Laboratory; Dr. Judy White, Superintendent, Moreno Valley Unified School District.

additional financial burden of continuing their education at the graduate level less they risk missing other financial milestones related to the American dream such as purchasing a house. As **Ms. Brickner explained, the “issue of course is what happens to these students if they’ve had huge loan debt. We hear a lot about other graduate debt as stifling future studies, future work in graduate school. It is a huge, huge obstacle.”** This is a systemic challenge that over time threatens the STEM pipeline for the future. If this results in lower numbers of STEM graduates, the next generation of innovators may not see STEM as a viable academic and professional career, leaving even fewer future students to take up a concentration in STEM. The participant group was made aware of how some schools are combating the problem of student debt, like Caltech, which has a commitment not to let their undergraduates graduate with more than \$5,000 in undergraduate debt.

The conversation then moved away from higher education into the realm of K-12, where the panel spoke of opportunities to break the correlation between a parent's zip code and a child's success. Ultimately efforts were successful when students were supported inside and outside the classroom. Dr. White reflected on her personal experience raising the high school graduation rate in Moreno Valley, CA from 68 percent when she arrived as Superintendent to 83 percent today, sharing that **“especially in the case of STEM, if the teachers don't believe that the students can do it, they will [unconsciously] provide a sub-standard education to them.”** This unfortunately leaves them poorly prepared for college, if they have not been discouraged from attending at all. There must be support systems to show students are capable in STEM environments and give them the opportunity to succeed. In a sense, it becomes less about the student, and more about the success of the community. Supporting this finding, the Moreno Valley has found great success with the innovation grant *Families Going to College* teaching parents parenting skills, teachers instructional skills, students leadership skills, and a mentor. According to **Dr. White: “We're trying to change a complete community. It's not just about the students in our district, but it's about a community.”**

The conversation switched topics when the student innovator was asked to share her story. The child of a middle-class family with two highly educated parents, a chemical engineer and a mechanical engineer, she matriculated to University of California-Riverside for financial reasons, noting that the school was not her first choice. The decision took into consideration the student's desire to continue to graduate school without debt, a decision made with guidance and

mentorship from her support network at home and in high school. Though she has taken advantage of the mentorship available to her at UCR, her academic career is still in jeopardy; required classes are often full before she has an opportunity to register.

This is not an uncommon issue, according to Provost of University of California Riverside, **Dr. A'nieri, who admitted “every state has a slightly different story about disinvestment and about increased demand in STEM courses. And we solve them all the same ways, we push section sizes up. We use this word impacted, which is big word to say. ‘students don't get the classes they need on time.’”** Ensuring students can take the classes they need comes in two forms: opening more sections—which is costly, requiring more faculty and teaching space—or increasing class sizes, which leads to each student getting less attention. The end result of either scenario is the degrading of accessibility of higher education for students.

Dr. Wilcox tied together the solutions and problems surfaced during the panel summarizing, **“We need to provide more support, do things to help them succeed, which all costs money. And ironically, those are the school districts, those are the communities, those are the universities, those are the ones that struggle the most for money. So this split in the socioeconomic status of the country is kind of exacerbating itself. It's regenerating itself. Because the group most in need of a hand up have the fewest resources to provide those hands up across the educational scheme.”**

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Planting the Seeds of Innovation: Geographic Diversity in the U.S. Innovation Ecosystem

This panel was intended to explore the successes experienced and challenges faced by communities around the country in the development of local and regional innovation ecosystems—with a focus on the human element of innovation. The United States has some of the most creative, productive and robust innovation clusters in the world. At the heart of these clusters are the innovators themselves—scientists, engineers, and entrepreneurs that provide the energy that drive these dynamic communities. The panel, led by Dr. Michael Pazzani, Vice Chancellor for Research at the University of California, Riverside, was populated by Dr. Sheldon Schuster, President and Professor at the Keck Graduate School; Mr. Jay Goth, Executive Director at InSoCal Connect; and Dr. Sean Gallagher, Chief Technology Officer at UVP. Their stated goal was to pull lessons from their experiences and conversation to inform a national innovation agenda. Among the panelists there was broad agreement that location matters and individuals must often be sold on geography before committing to a location. Some regions are likely to attract more innovative individuals than others by dint of their characteristics (climate, access to higher education, high-skill available talent). Efforts are needed to bring components of the innovation ecosystem to different regions of the country that as a whole represent the innovation capacity of the United States.

Dr. Pazzani began the conversation referencing the problem at the center of the panel. “The U.S.” he began, “has many robust innovation centers, but they’re not geographically distributed uniformly. Not everywhere has the same opportunity for entrepreneurship.” Creating new pockets of innovation around the country is often



Dr. Michael Pazzani, Vice Chancellor for Research, University of California, Riverside.

challenged by the notion that certain regions are known for hubs of innovation that can be difficult to replicate elsewhere. **Dr. Bernstein, speaking as a member of the audience shared his frustration that “on the East Coast we take a look at Silicon Valley and wonder why we can’t be like them and we always hope that people in Silicon Valley are looking at Boston and saying they could be like us. If you look at Boston, 400,000 students arrive there in the fall and there are 60 universities. It has arguably some of the finest universities in the world. It has an incredible success story in Kendall Square in the biotech industry. So you would think that it really is a hotbed of innovation and then it’s not.”** This was not a unique story around the country. Many municipalities and regions have tried to develop their community as a contributor to the innovation ecosystem in the United States, only to fall short of their goals.



Dr. Sheldon Schuster, President & Professor, Keck Graduate Institute.



Mr. Jay Goth, Executive Director, InSoCal Connect.

In many cases, the resources to develop and support innovation in a community is already present, **“We just need to integrate them and utilize them more successfully with our educational system” explained Mr. Goth.** Industry, government, and academia all exist in their own silos, making it difficult to build ecosystems that attract people to the region. **Dr. Schuster delved into the silos present within academia, sharing “We can’t think of this as three different worlds, K-12, college, and career. Students think of it as one continuous pathway.”** Speaking specifically toward students completing their time as a student, she continued, **“most of our PhDs come out with the faculty-inspired attitude that any career other than an academic career is giving up your science. But we have to give them the understanding that the most important thing in the world may or may not be that little thing they’ve focused on for a PhD.”** The benefits to innovation are when those students bring their expertise to problems experienced in the community,

creating innovations that support not only their community but benefit national competitiveness. Panelists credited University of California Riverside for the work they’ve done improving education within the community, highlighting that much of their success comes from the university’s work with local K-12 schools.

The way the University of California connected with local schools is a lesson that can be learned by industry as well, explained Dr. Gallagher referencing his history as an entrepreneur, **“that’s the great thing about having a campus so close by with groups that you can interact with and you talk about establishing an innovation ecosystem.”—a realization that was also strongly supported by panel audience member Dr. Mafra-Neto.** This lesson in partnering extends beyond just academia and industry; individuals willingly participate in the community and the innovation ecosystem itself. This requires addressing their personal and career needs, which turns out to be an unexpected challenge of



Dr. Sean Gallagher, Chief Technology Officer, UVP.

creating innovative new businesses. **Dr. Gallagher again drew from experience, explaining “one of the ways that I try to keep people at the company is that we can certainly sell all the passion that we’ve got going on in the company, and we do really cool things with cancer research, and so on. We work with various labs. There comes a point where they also want something more out of the job. And if you can’t give them career advancement what I like to be able to do is give them educational advancement.”**

Existing organizations, like individuals, can be incentivized to move as well, and act as the catalyst to transforming communities. Participants shared their experience seeing academic and professional organizations move into new territory in search of less expensive real estate as they establish more campuses. This creates tremendous opportunities to add depth to communities looking to establish their place in innovation ecosystems. Mr. Goth pointed out that sometimes this can require some prodding, creating incentives for companies to move by starting the

community down the path of economic development. His experiences were bolstered by experiences brought forth by other attendees, who agreed that creating an environment conducive to partnerships across and within academic, industrial, and governmental silos represented critical infrastructure for potential investment from outside the community. Mr. Goth accomplished this by creating an innovation center fashioned after incubator models with shared space, making the draw about more than just inexpensive real estate. Audience participant Dr. Ray described industrial internship programs leading to master’s degrees. Schools partnered with companies to understand what the company expects of the intern, and the school can adjust their programs to match the needs of the employer. **“I see a lot of entrepreneurship going on with people from all stages of the economic stratus, and really what it comes down to is giving people an opportunity and making an open communication environment. It can happen anywhere if you put the community behind the idea” summarized Mr. Goth.**

Finally, participants stressed that communities shouldn’t wait for others to realize an innovation ecosystem has appeared in a region; it is important to broadcast progress. Show others how you are creating a new environment will attract attention, in turn attracting more attention breeding on itself. Ultimately, the panel concluded, people tend to be drawn to areas for a multitude of reasons: family, access to services, climate, and so on, and some regions are more appropriately suited for types of industry than others. The panel stressed through example that the most important aspect to the successful participation of a community in the U.S. innovation ecosystem is actively engaging different groups to build better partnerships across a region.

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Diversity of Outcomes: Exploring the Distribution of Innovation's Benefits

The premise of this panel was to explore the second- and third-order effects of technology and innovation in communities across the United States, exploring how innovation is impacting the average American and its effects on American competitiveness. The panel was led by Mr. J. Adalberto Quijada, District Director of the Santa Ana District Office for the U.S. Small Business Administration, was populated by Mr. Michael Cassidy, President and CEO of the Georgia Research Alliance; Dr. Agenor Mafra-Neto, Chief Executive Officer of ISCA Technologies, Inc.; and Dr. Paul D'Anieri, Provost and Executive Vice Chancellor at the University of California, Riverside, with remarks from a next-generation innovator, PhD Candidate Mr. Jeffrey McDaniel. The conversation was wide-ranging, touching on the disparity between innovation's impacts on different income segments, and the future opportunities afforded to groups based on access to various educational experiences. While the group agreed the sources of growth in the United States over the past several decades are shrinking, they were confident that innovation is a source of opportunity, detailing solutions to most effectively take advantage of resources available today.

The conversation began with the realization by many on the panel that the types of jobs in the America are quickly changing. Mr. Cassidy noted that over the last 30 years the digital revolution has displaced many of the mid-skill jobs that underpinned the 20th century middle-class life. Looking forward, Dr. Khar-gonekar referenced a 2013 study which projected that 47 percent of all U.S. jobs are at risk of automation². What most struck these panelists was not



Mr. J. Adalberto Quijada, District Director, Santa Ana District Office, U.S. Small Business Administration.

that certain jobs have been or will be disappearing, but that the prosperity unleashed by the innovation is disproportionately benefitting the highest skilled workers and owners of capital rather than widely distributed. This raised the question during conversation of the best method to more create equitable pathways to accessing the benefits of these innovations. That pathway, they agreed, was through education that enabled individuals engage with and adapt to new innovations.

As the conversation delved into education, it became clear that education is currently suffering its own inequality in the ability of students to find quality education at an affordable cost. **Mr. D'Anieri echoed conversations from earlier in the day, reiterating that university education must be more accessible. "Public institutions tuition has gone up but the actual cost of educating students hasn't. It's simply been transferred from the state and taxpayers to the students."**

2 Frey, Carl Benedikt, and Michael A. Osborne. "The future of employment: how susceptible are jobs to computerisation." Retrieved September 7 (2013): 2013. < http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf >



Mr. C. Michael Cassidy, President & CEO, Georgia Research Alliance.



Dr. Agenor Mafra-Neto, Chief Executive Officer, ISCA Technologies Inc.

Furthermore, the true value of Pell Grants has fallen dramatically while the student's cost of education has risen considerably. This creates distance in educational opportunities between those reliant on grants and loans to fund their education compared to those without similar restrictions.

Several participants noted steps they are taking to attempt to extend the reach of education to those unable to participate in the traditional educational model. The digital revolution can democratize the education system as access to educational material is much easier than it has ever been in the past. Massive Open Online Courses (MOOCs) were one highlighted as an option to drive down the cost of teaching for its ability to reach a great number of students for relatively low cost, but is hampered by its inability to interactively engage students. MOOCs are limited in their utility in that while they make education more widely available, students who have not yet learned how to learn are not best served. Self-driven learning like MOOCs have the greatest success with people who already have college degrees and in particular

with people who already have advanced degrees. The kinds of skills that needed for the contemporary economy: critical thinking, communication, listening, are not necessarily are those that are served best in MOOCs which are especially good at transmitting information. Other alternative methods of education were noted as being more robust and successful at reaching students but are significantly more costly, limiting their adoption to institutions with more resources. **Mr. D'Anieri recognized the conflict, sharing his experience that less expensive alternatives, like MOOCs, are more often adopted at places with fewer resources, such as state universities and community colleges, where students often need more support.** However, the panel was confident this does not mean state universities and community colleges are doomed to rely on tools that are a poor match for their students. There was broad agreement that institutions should support efforts such as the University Innovation Alliance to disseminate and scale the most innovative ways to connect with students.



Dr. Paul D'Anieri, Provost & Executive Vice Chancellor, University of California, Riverside.

The issues discussed at length surrounding unequal access to education also extends into the job market and entrepreneurship. **Mr. Cassidy noted that the world is changing faster than education infrastructure can adapt, making it difficult to supply students with the skills they need to start a career or build their own company.** The next generation innovator, Mr. McDaniel, felt similarly as he provides insight into the experience of a PhD student on the verge of completing his degree. Technology has changed so quickly during his career in academia in the past ten years that entirely new courses of study have been built around concepts that didn't exist when he began. More telling was his experience of those who had graduated before him. **"Students have been trained through their education to apply for work as a professional," he explained, "but are rarely prepared for the tasks the job entails."** Ultimately, extensive on the job training is required for students to transform into productive members of the organization. Apprentices-

ships, brought up at various points during discussion, are an appropriate alternative method of education which would teach the skills required by employers, as would spaces open to anyone to create and explore their interests, such as MakerSpaces, which creates opportunities for individuals to experience the newest technology hands-on as it becomes available. The University of California Riverside has a similar approach with the National Science Foundations (NSF) I-Corps program that encourages entrepreneurship, running student research through an Small Business Innovation Research (SBIR) Small Business Technology Transfer (STTR)-type grant to test its market viability and entrepreneurship of students. This type of experience is especially important in diverse areas of the country, as Mr. Quijada shared "entrepreneurship rates are more than three times lower for minorities in general." "And the only way that we can reach the full economic potential is by making sure that everyone has access to a seat at the table."

Participants were very optimistic about the future of innovation in the United States, but noted that the rising tide of innovation has lifted all boats. **Dr. Khargonekar observed "Thinking of innovation's benefits globally, hundreds of millions of people around the world have risen into the middle class over the past several decades. Inequality within nationals may have grown, but inequality globally has decreased."** Jobs may be lost—not an unexpected consequence of creative destruction left in the wake of innovation—but innovation creates opportunities as well. It is important that Americans are able to take advantage of these new opportunities to remain competitive in an increasingly competitive global arena.

The day's final segment invited all participants to reflect on the conversations that had taken place

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

The Path Forward

throughout the day and contribute any point made they felt could be scaled nationally to drive greater inclusion of women, minorities, and/or low income communities in innovation ecosystems across the country. There was broad consensus in the room that many of the problems facing the innovation ecosystem were not insurmountable, and could be overcome with targeted efforts to improve educational infrastructure and developing attractive career paths.

Citing challenges to the innovation ecosystem, participants lamented declining support for academia from government, at a time when schools are expected to offer more services to remain competitive in the eyes of students and rankings. The result is schools are forced to raise tuition limiting access to those with significant financial resources. As noted by one participant, **“talent is universal, opportunity is not.”**

Furthermore, this is problem is not limited to higher education. The inability to access high-quality education is a challenge at every level of learning. Primary and secondary education was consistently recognized as a fundamental period of development. One participant restated a comment from earlier in the day that resonated them: **“if we wait to talk to children about an engineering or technical field until high school, we’ve already lost them.”**

Academia also came under criticism for its seeming inability to relate to a broad spectrum of students. Throughout the day participants heard how diverse groups of students showed interest in science, technology, engineering, or mathematics at an early age, but through some form of attrition lost sight of STEM as an academic or professional career path. Participants theorized this may be the result of several different influences: students are not properly mentored



Dr. Kim A. Wilcox, Chancellor, University of California, Riverside.

and do not discover their passion; a single teacher inspires or discourages students, often having a much larger impact on the student than any other teacher; or, students may be interested in a field of study but don't feel there is a future for them should they follow that path.

While these problems were widely cited as complex, there was a clear consensus that solutions to these problems exist. Increasing funding to universities and K-12 is an incomplete answer as the education infrastructure isn't well equipped to use it effectively. Building more efficient education systems are critical, but are not sufficient when changes are needed in the short term. In the face of complex systems it may seem complex solutions must be constructed, **“but in fact,” started one participant, “sometimes the solutions are much simpler than sometimes we make them.”**

The most cited example of simple solutions involved creating partnerships and networks to expose stu-

dents to new ideas they may not have had opportunities to explore before. Several participants referenced bringing high school students into science labs so they can be closer to STEM careers, especially for underrepresented students, and appropriately engaging people to generate interest in more technical areas of study.

The key is finding partnerships that worked at a small scale, and can be analyzed for scalability before committing to action. Successfully demonstrated small scale projects are the best opportunities for a positive return on investment. Innovative partnerships are taking place around the country—expanding accessibility to education, and as a result improving the economic, gender, and racial diversity of the innovation ecosystem—we merely need to see what is already happening in small pockets around the country, in academia or other sectors and be clever about scaling that work.

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Closing Keynote

Dr. Kim A. Wilcox

Chancellor
University of California, Riverside

The U.S. Innovation system has many parts. If we think just about the higher education system, our research capabilities leading the world in discovery remains pretty much unchallenged. We have a great research innovation operation and a culture that supports it.

By contrast, the curriculum is just the opposite. One of the most defining characteristics of a university is the curriculum. Once a university writes down the curriculum, it's pretty much set. And it stays untouched in its core for years and generally decades. In large part, it determines who will be hired, the kinds of students that want to go to the university, and how we spend our time once we're there. Very unlike the research side, we have not build a culture around our curriculum that invites and encourages innovation. When we think about ways of including and exciting students into this new economy and into the world of ideas and science, we have a challenge. It is, I believe, the curriculum. Imagine trying to change the curriculum at any one university, and then of course, all universities. We need to make small changes that over time will inflect the changes we want to see.

A great example of this is the learning communities described today. They exist on many university campuses and we're proud of the fact that over half of our freshmen now are engaged in learning communities. What started as a small activity is now a large activity. They are turning these curricula on their head so that we can think differently about how students engage. Let's say we're successful at the University of California, Riverside. That's 22,000 stu-

dents out of about 10 million. That's not many. And so we have to, each of us, continue looking for small changes.

It's hard to find best practices in these areas. That's partly the reason that we joined the University Innovation Alliance. Because we believe we're going to have to look for best practices from an array of partners and vet them with each other, and then determine how to deal with the scalability. Again, we're dealing with a problem nationally that's deals with not hundreds or thousands, but millions of students.

I greatly appreciated the emphasis on mentoring, because this is something that's bigger than universities can manage. We have to have engagement in lots of ways. And the extent to which the mentors become part of the solution is key. More importantly, the extent to which the mentors become part of the transformation of what we do is probably equally or more important. And if it's true for higher education, it's probably equally or perhaps more the case for K-12 education. There the curriculum is even more difficult to change because it's not just a matter of the teachers, it's a matter of the school board, the politicians, and the citizens.

In the mid-19th century schools were about simply transferring the given truth. You learned your arithmetic. You learned your history. You simply learned the material. Schools were never designed to be exciting places to foster innovation. They were places where you transferred stuff, and all the students were supposed to gobble it up. That hasn't changed so much. Here we are in the 21st century, and what do we do? We do standardized testing, which is increasingly how schools are judged and how they organize themselves. We don't track how many students you excited but how many students could list

these five topics in this particular area of study. So we have some impediments that are inculcated into our very institutions that are supported, unfortunately, by the communities we all have agreed need to be so engaged in our future support.

I'm a self-identified optimist. I'm more than optimistic. I worry that I'm not going to live long enough to see everything that I believe is going to happen. But I really do believe in the things that we're starting to do now and the growing awareness of the opportunities to do things in such a much more engaging way, it's just more satisfying for the instructor and for the student to do things differently from what we have done in the past. The more examples that are visible and able to be copied, the more we have a snowball that will eventually get rolling. But we have a very big hill to push. So I appreciate all of your commitment to this very important task. I worry about the shifting winds and sands of innovation, while we try to speed inclusion of under-represented groups. So we've got to be doubly earnest in our efforts.

But again, I remain optimistic that we'll be able to make this happen. And I'm particularly optimistic because we have a national group, the Council on Competitiveness, that is not only committed to the same values but is a national platform for engaging groups across this important set of areas, higher education and private industry in particular.

FINDINGS FROM THE EIFI SOUTHWEST REGIONAL DIALOGUE

Next Steps

The Council will continue this national conversation in 2016 together with President David Leebron of Rice University. Rice University offers a unique setting for the third EIFI regional dialogue for their reputation as a science and technology leader in higher education and residence in a large state located along the U.S. border along with a growing and rapidly diversifying population. Understanding how Rice successfully cultivates an environment conducive to student interest and success in STEM is critical to the success of the Exploring Innovation Frontiers Initiative.



Mr. Michael van Ter Sluis, Vice President, U.S. Council on Competitiveness; Dr. Michael Pazzani, Vice Chancellor for Research, University of California, Riverside; Dr. Pramod Khargonekar, Assistant Director - Directorate of Engineering, National Science Foundation; The Honorable Deborah L. Wince-Smith, President & CEO, U.S. Council on Competitiveness; Dr. Kim A. Wilcox, Chancellor, University of California, Riverside; Mr. Chad Evans, Executive Vice President, U.S. Council on Competitiveness; Dr. Grace Wang, Deputy Assistant Director - Directorate of Engineering, National Science Foundation.

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The U.S. Council on Competitiveness is a nonpartisan leadership group of CEOs, university presidents, labor leaders and national lab directors working to ensure U.S. prosperity. Together, we advance a pro-growth policy agenda and promote public-private partnerships in the emerging “innovation ecosystem” where new technologies are born.

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The Council Operates by:

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