Conference Proceedings

Tradition, Innovation, and Creativity: *Undergraduate Learning for the 21st Century*

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Advancing Undergraduate Education in America's Research Universities

Introduction to the Proceedings

Tradition, Innovation and Creativity: Undergraduate Learning for the 21st Century

Faculty, staff, and administrators from U.S. research universities came together at the fifth national conference of the Reinvention Center in November 2010 in Crystal City, VA, to share best practices and to deliberate on the issues confronting those of us charged with oversight of the undergraduate academic mission for our campuses. The themes for the conference emerged from the evaluations and commentary collected from participants in the 2008 conference: the critical role of science and technology in the undergraduate curriculum, the continuing need for fine arts and humanities education, and methods of assessing teaching and learning inside and outside our classrooms.

This volume makes the highlights of the 2010 conference available both to attendees who were unable to hear all of the papers, and to educators who share our interest in these issues but were unable to join the conference in Virginia.

For those unfamiliar with the Reinvention Center, it is worth reviewing a bit of history. This organization was founded on precepts rooted in the Boyer Report for Undergraduate Education, published in the mid 1990s. Uneasy about the caliber of undergraduate education at research universities, the Boyer Commission laid out a series of programs its members believed would enhance the experience of undergraduate students. In order to facilitate the implementation of these programs, the Reinvention Center was established so that member institutions could work together on this retooling effort.

Now well over a decade old, the Boyer recommendations have been embraced by most institutions. Most of our campuses have well-functioning first year programs, and undergraduate research centers are almost as common as financial aid offices. We have invested in programs that provide graduate students with mentored teaching experience.

Still, many significant challenges confront our research universities:

- As our keynote speakers persistently reminded us, a sobering financial climate impedes our ability to make the kind of program investments we would like to pursue.

- Internal and external partners have encouraged us to scale back our emphasis on curricula and become much more attuned to student learning outcomes.

- International issues were largely absent from the Boyer Report, but all research universities now realize that their survival may be tied to developing a sound global strategy.

By both formal and informal measures, our 2010 meeting was considered a great success. We heard from many participants how much they appreciated the balance between plenary sessions and hands-on workshops embedded in the schedule; after listening to a keynote address comparing today's challenges to those of previous generations, they could hear from a workshop speaker about, for example, what kinds of rubrics work best in a particular kind of class. Over the course of two long days, in small conversations and in large lectures participants lectured, listened, and learned. Planning for 2012 has already begun!

Patricia A. Turner
Executive Director

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Proceedings

"Navigating the Modern World"

Speaker:

Bernadette Gray-Little, Chancellor, University of Kansas

When I initially submitted my paper, "Navigating the Modern World," it had a subtitle, "What Our Students Need to Know." The subtitle was motivated by a quotation that I had seen, which said: "Most successful job candidates need to have the skills, experience, and comfort that would make them ready to go anywhere." In other words, the focus was on education to prepare students for a global society and a global workplace. This topic fits well with the Reinvention Center's long-standing focus on internationalization and globalization.

About three months ago, I called the Reinvention Center office and asked that they remove the subtitle from my address. The reason? Increasingly, my attention was being captured not so much by what our students needed to know to be successful in a global context, as by what we as faculty, staff, and administrators should be thinking about – that is, the context for undergraduate education. What do **we** need to know to navigate our modern world? Answering that question may have implications for what our students need to know and, especially, for how we instruct them.

Background

Not only did I attend the first Reinvention Center conference in 2002, but I had also worked with Wendy Katkin and others in planning that conference. There was a good deal of excitement about that first effort, about our common purpose, and about the changes we hoped to see in undergraduate education at research universities. These efforts were especially meaningful to me, as I had recently completed my tenure as senior associate dean for undergraduate education at The University of North Carolina, and hoped to bring an emphasis on undergraduate excellence into my new position as executive associate provost.

I looked back at the conference agenda and reviewed the document that was the impetus for it: the Boyer Commission report, "Reinventing Undergraduate Education." The Boyer report's concern was that research universities – and I thought perhaps especially public research universities –shortchange their undergraduate education programs.

As Tobin (2009) noted, research universities require world-class scholars, who warrant high salaries and reduced teaching loads, and who in turn attract talented graduate students. The Boyer report argued that – given the increased focus on faculty members' scholarly productivity, research funding, and academic accolades – the well-being of undergraduate students was beginning to take a back seat, with responsibility for their instruction relegated disproportionately to graduate students and lower-ranking faculty members.

So, how could we ensure a focus on quality undergraduate education in research universities?

By the time the second conference rolled around in 2004 I was again a participant, but this time as the dean of the College of Arts and Sciences at Chapel Hill, so that I had oversight – though one step removed – for some of the programs (such as first-year seminars, the undergraduate research office, and efforts at internationalizing the curriculum and expanding experiential learning) that I had helped to organize just few years earlier. In other words, the strong development of the Reinvention Center and its programs occurred at a time that reinforced what I was doing professionally.

There was a great deal of support for strengthening undergraduate education from other organizations as well. The Association of American Colleges and Universities stands out as an important example.

Here we are, eight years since the first Reinvention Center conference. We have made substantial progress in several areas. Many colleges and universities have renewed their general education offerings to emphasize connections, problem solving, and experiential learning.

Because we are the institutions where much of the research and creative activity occur, research universities are distinctly prepared to offer undergraduate research as a type of experiential learning. We have a special opportunity (and obligation) to ensure that our students learn the values and methods of the disciplines we teach.

While it seems natural for us as research universities to involve our students in research, many liberal arts colleges have also embraced undergraduate research as one hallmark of their success. In fact, liberal arts colleges often engage a higher percentage of their students in undergraduate research than research universities. Moreover, it is no longer rare for community colleges to tout undergraduate research opportunities for their students.

Undergraduate research is now a buzzword everywhere. Indeed, the involvement of undergraduates in research has been described as one of six high-impact practices that enhance the quality of undergraduate experience (Kuh, 2008; Shouping et al., 2008). Although the benefits of research participation are not limited to high-achieving students, there are unfortunate and predictable disparities in participation by ethnicity and academic preparation.

There is an important complement to focusing on research as a key part of undergraduate education. If we think research is important, then we should also incorporate evidenced-based practices in our teaching and curriculum development, a point made so effectively by Carl Wieman with regard to science education. In the third Reinvention Center conference both of these aspects of undergraduate research were prominent items on the agenda.

At the second and third conferences several speakers also addressed globalization and the internationalization of curricula. The encouragement of study abroad has also expanded apace in the last ten years. Although economic worries may slow down study abroad growth, this emphasis also has been outstandingly successful, both in terms of increasing participation and in the differences such experiences make to college students.

Study abroad experiences are among the most frequently cited experiences about which I have heard students say, "This changed my life; this changed my worldview." I even met one alum who credited his study abroad experience with enabling him to meet his wife. My impression is that alumni donors, especially from the business community, have supported efforts to expand study abroad opportunities, and often have been willing to contribute to study abroad scholarships.

Thus, my assessment is that the Reinvention Center conferences have been associated with very important, successful developments in enhancing the quality of undergraduate education.

The areas outlined above reflect changing practices and emphases in an environment that we feel we control: renewing our own curricula, emphasizing student participation in our research, making students aware of approaches to knowledge, emphasizing globalization in our curricula, and encouraging study abroad. We are well aware, however, that universities do not operate in a vacuum.

The Ground of Our Existence: Changes in Our Foothold

While we have successfully undertaken a number of initiatives aimed at improving undergraduate education, we also face changing circumstances -- not only changing expectations from students, policymakers, donors and employers, but also shifting financial resources and a new competitive environment.

Thus, as we consider what we need to know to navigate the modern world, we first must look at how that world is changing. How do we respond to a world where universities are expected to do more, while also doing it more quickly and cheaply? How do we adapt to an economy that entices students to pursue academic careers that are more specialized and less focused on a broad liberal arts education? And how do we compete in an environment where a college education is supposedly just a mouse click away, available from the comfort of your own home, and at a time convenient for you?

Of course all of this is occurring during a period when financial resources are stagnant at best, and often in decline. There is no question that we have witnessed a significant disinvestment in public universities as a result of the recession. In virtually every state, institutions of higher education have seen state funding reduced, often by double-digit percentages.

In response, we have instituted layoffs and eliminated positions in the ranks of faculty and support staff. Furloughs are widespread, as are salary cuts. Some universities are even looking at other measures, such as four-day work weeks, to cut costs.

Of course parents and students are feeling the effects, too. As a result of cuts, those students who do get into their desired program may face the prospect of larger classes and fewer course offerings, which can impede their progress to graduation. And there is no question that students will be paying more for the privilege, as tuition rates around the country have grown (in some cases by double digit percentages) in response to a decline in state support. Some institutions have been forced to implement mid-year tuition increases. It would be difficult to argue that such changes have had a positive effect on the quality of education or our students.

Other universities have moved beyond paring down and tinkering around the edges to taking steps that structurally reshape their offerings, including the elimination of entire schools which many had previously assumed were fundamental to their mission and identity.

Meanwhile, the University of Oregon has asked legislators to essentially let it become a private institution, substituting future annual appropriations for the issuance of bonds to fund a one-time payment that would be invested in the university endowment. Such action is virtually unprecedented, and shows just how unreliable state funding has become for many institutions.

In Kansas, which has traditionally supported higher education with healthy state appropriations, there has been a steady decline in state support, and for the first time our resident students are paying a higher percentage of the cost of their education than the state. And while I recognize that many other public universities passed this point long ago, it is an important milestone marking the transition from state-funded universities to what some call "state-assisted."

Private institutions are not immune from the effects of the recession either, as endowment returns saw huge declines during the recent stock market decline. Endowments suffered a nearly 19 percent loss in FY 2009, with drops of nearly 30 percent not uncommon. Two years ago a colleague at a premier private research university told me that her university had lost about 30 percent of its income that year.

Though the stock market appears to be rebounding, endowments continue to climb out of a deep hole and have not returned to pre-2008 levels. Prolonged economic uncertainty has donors nervous about their own financial well-being, making them less willing to donate.

In this time when loss of endowment or the decline of state funding increases pressure on tuition, and families may be less able to pay college costs, students may also have fewer opportunities for financial aid because of an increase in demand. States that offered guaranteed scholarship plans to in-state students are facing shortfalls. For example, Georgia's famed HOPE scholarship plan is facing a half a billion dollar shortfall over the next two years.

Given the economic realities facing our students, is it at all surprising that they are trending toward degree programs that they believe will offer an immediate payoff upon graduation?

Changes in What Students Study: The Decline of the Humanities Major

There have been many erudite – and some heated – discussions about the reasons for the decline of the humanities major.

We might agree with Patricia Cohen (2009) who argues that humanities must justify their existence. Or we might concur with Stanley Fish (2008) that the humanities must be appreciated for themselves, and do not need to be justified by reference to an exterior purpose or application. Or our views might jibe with those of Jim Leach (2009), who argues that there is an enormous cost to foreign policy when we ignore the humanities, which offer expertise in history, language, and cultural understanding – areas that are critical to international problem solving.

Whatever one's perspective on the role and value of the humanities, the current economic situation is likely to hasten the decline in humanities majors unless we find better ways to "market" the edge that a humanities major can provide.

Although the change has been gradual, its accumulated effect is quite dramatic and could easily have structural implications for our universities. In the past two decades the number of humanities majors – English, foreign languages, literature, and history – has declined by some 50 percent.

Obviously, there are consequences to the decline in undergraduate enrollments in the humanities. There are implications for the number of faculty we have in these fields, for the number of graduate students we can reasonably train, and for those graduates' prospects for obtaining faculty positions. This year the Modern Language Association reported about a 27 percent one-year decline in the number of jobs in English and in foreign languages, following a similar decline in the previous year (MLA, 2010).

This decline presents a challenge for the entire university. William Chace, former Emory University president, observed that English departments are now regarded by those who manage the university treasury as more of a liability than an asset (Chace, 2009). We find ourselves facing a number of questions: to what extent do we preserve the same size and structure of humanities programs that we offer to undergraduates? How will we structure the size of the humanities faculty? To what extent will the strength of the humanities "voice," which is so key to a liberal arts education, be sustained at our universities?

The Corollary: "When the Going gets Tough, the Tough take Accounting." (Brooks, 2010)

While the number of humanities majors has declined in recent years, the number of business majors has increased slightly more than 50 percent over the same period (Chace, 2009). The number of economics majors has also increased. When the job market worsens, many students figure they can't indulge in an English or history major, even if it is their favorite subject. They believe that they have to study something that will lead directly to a job.

In a study modeling the effects of expected salary on the choice of a major by undergraduates at Duke University, (Arcidiacono, Hotz, & Kang 2010) showed that if expected earnings were equal across all majors, then the students choosing humanities and social science majors would increase by 17 percent and 10 percent respectively, while those choosing economics majors would fall by 16 percent. (Note: Duke does not offer an undergraduate major in business). It would appear that at present we are educating a large number of students for careers that they would rather not pursue.

Policymakers often weigh student demand and student enrollment in making decisions about resource allocation. It is reasonable to assume that just as humanities enrollments and faculty sizes are declining, there will be increasing

numbers of faculty members in areas such as business and economics, and an attendant increase in their influence on university policies and decision-making.

But the question still remains: How does this shift change the nature of what we do at a university? We have set ourselves apart from other institutions of higher learning by offering a more comprehensive education. If we lose that, we lose one of the distinguishing hallmarks of a university education.

Beyond the effects on universities, what does a shift away from the humanities do to our students and, by extension, to society and civilization? John Hofmeister (2010), a former vice president at Shell Oil Company, recently argued that there cannot be an adequate solution to the world's great problems – whether energy or poverty or war – without consideration of the cultural, religious, and environmental issues relevant to these problems.

Whatever the ultimate answers to those questions, there is no doubt that shifts in what students study are creating opportunities for institutions that in the past were not seen as competing with research universities for students. These include community colleges and for-profit schools.

Changes in Where Students Study: The Rise of Community Colleges and For-Profit Colleges

Regional universities, and particularly community colleges, have the benefit of providing post-secondary education at a lower cost – a potent advantage in the current economic climate.

Make no mistake: community colleges themselves have made significant gains in the quality and diversity of the degree programs that they offer. For example, the University of Kansas is just down the road from Johnson County Community College, an excellent institution that serves about the same number of students as we do at Kansas.

Yet there ultimately is a difference between the sort of education that you can receive at a community college and the education that is available at a research university. Some of that difference comes from the areas that the Reinvention Center has been working on, such as the rich opportunities for research experience and global awareness. But that difference may not always be evident. We need to do a better job of making the difference compelling to students and parents, whose first inclination may be to look solely at the cost, rather than also considering the benefits.

And although many community college students do not spend their entire academic careers at a community college, and instead take part in a "2-plus-2" program, that still amounts to a 50 percent reduction in the credit hours that those students will earn at a research university.

What things are lost, and what other things are gained by having students start at the university halfway through their academic careers? Are the students less likely to be active at the university during their careers, as well as when they become alumni? Are they less likely to become donors to the university?

Ultimately, it is important to ask this question: when is it educationally desirable for a student to begin college at a community college versus a research university or other four-year institution? For example, Bowen, et al. (2009) found that for high-achieving students, starting at a community college seems to present a barrier to successful college completion. Because of the increasingly important role of community colleges in higher education, however, it is important for research universities to work with them to ensure the smooth and successful transfer of students.

While we see increased competition from institutions that are able to play up their low-cost advantage relative to our tuition prices, we are also seeing competition from the other end of the spectrum: for-profit institutions that very often have tuition costs that are quite high.

It was easier to ignore for-profits ten to fifteen years ago, but the industry has seen a significant expansion in recent years. The Government Accountability Office released a report in October 2010 showing that enrollment at for-profit institutions rose by 83 percent from 2003 to 2008, increasing from 1 million to 1.8 million students. During that same period, all other higher education institutions saw only a nine percent increase.

Many of these students are individuals for whom a traditional four-year university is either not of interest or – because of their circumstances – not an option. But some of these students may very well be deliberately choosing a for-profit school over a university, and I would not be surprised if we saw still more direct competition for students in the future.

The percentage of minority enrollment in for-profits (about 47 percent in 2008) greatly exceeds the percentage of underrepresented minorities undergraduates in four-year colleges, about 27 percent (IPEDS, 2009; National Academies, 2010).

The University of Phoenix now leads all institutions in the number of bachelor's degrees awarded to African-Americans (Blumenstyk, 2010). The trend for African-Americans is so striking that Tom Joyner of the Tom Joyner Morning Show has developed a foundation to help historically black colleges and universities (HBCUs) develop online courses to compete with for-profit colleges, and at the same time try to offer some of support system ("the history and heritage") that would traditionally be found at an HBCU.

Disproportionate enrollment of minority students in for-profit colleges shows that they are apparently filling a need that other institutions are not. It also raises the specter that the kind of college education that increasing percentages of minority students receive will differ from the traditional college experience. Moreover, as minority students become the majority in the next few decades, there will be a strong pattern of matriculation at for-profit institutions.

Even if we do not think we are not competing with for-profits for students, there is an area in which we are definitely in competition: federal financial aid.

There is a finite amount of federal financial aid available to college and university students, and for-profit institutions are receiving a disproportionate share of that pie. The same GAO report referenced earlier revealed that while for-profits had only 9 percent of total enrollment in 2008, they received 23 percent of federal student aid dollars. That share is growing: for-profits had a 210 percent increase in federal financial aid dollars from 2003 to 2008, while all other institutions had only a 69 percent increase.

The for-profit industry will point out that their tuition is much higher and that more of their students are low-income, hence the need for greater federal financial aid. But as our students seek ways to finance their education, we must be aware that students at for-profit institutions share the same pot of financial aid money.

Changes in How Students Study: New Technology On Campus – and Off

Changes brought by technology are altering the ways that we deliver education in the classroom, while at the same time expanding our ability to do so outside the classroom. Most undergraduates today are unlikely to remember life without the Internet as a constant presence. They expect more integrated use of technology to enhance the classroom experience, or even to replace it.

Let me acknowledge that there are many variants of technology-mediated learning or online education. They are not equivalent, nor are they meant to be. Some involve online presentation of traditional teaching approaches; for example, the University of Kansas School of Medicine podcasts all first- and second-year lectures. Ninety percent of students use the podcasts in some way, and thirty percent of them use them exclusively.

Studies at the University of Kansas have shown that students who rely solely on the podcasts do just as well as those who attend lectures, except for the subset who enter with the lowest MCAT scores. That group tends to do better when they attend lectures in person.

This sort of evidence, and the experience of the thousands of faculty and administrators who oversee online degree programs, lends support to the view that you do not have to be in a classroom or even on campus to receive the benefits of higher education.

Other approaches, such as the Online Learning Initiative (OLI) at Carnegie Mellon University, attempt to teach students in hybrid courses. These feature some in-class time, but also include extensive interactive computer learning, designed to capitalize on the cognitive processes involved in learning. Here too, the finding is one of comparable learning and retention in comparison with more traditional classroom methods. However, students in the hybrid course did have a higher rate of course completion and required less time to complete the course than those in traditional sections. The OLI approach seems best for courses (such as statistics and science courses with structured, sequential content). Though they promise economies, the cost of developing and evaluating such courses has been enormous, beyond the resources of most departments. Yet, through sharing, such courses can become more economical.

A number of prominent universities (George Washington University, Boston University, the University of Southern California, and the University of Florida, among others) are working with online companies to compete with for-profit institutions in the online market, thereby blurring the distinction between for-profit and university offerings (Parry, 2010).

Northeastern University in Boston offers an MBA program, which has been outsourced to a private company. Thus, the private company is offering the degree under the aegis of the university, and the university's name will appear on the degree. The company which offers the degree, Embanet, reportedly spends millions of dollars in developing degrees, can offer them through numerous universities with slight accommodations for each one, and receives a substantial portion of the tuition, in some cases as much as 85 percent.

From the point of view of efficiency (and perhaps quality) this approach seems quite reasonable. Yet this new breed of online collaboration challenges the notion of what constitutes a university's curriculum, and blurs the lines between college and corporation – or perhaps, it better blends college and corporation.

There are at least two key issues here. The first is that we need to determine the best use of electronically mediated tools to enhance our curricula, regardless of whether the advances come from universities or from private companies.

The second issue is this: there are hard questions to be considered when universities offer under their auspices courses and degrees which are developed by others. Whose degree is it anyway? For example, what will the wholesale embrace of industry-produced degrees mean about institutional identity and about faculty roles and responsibilities? I can envision an environment in which universities become retailers for educational products and services that we did not create, but on which we place our brand, a model reminiscent of Sears' marketing of their Kenmore brand of appliances, which were made by other manufacturers. The increasing availability of such educational products – in combination with the loss of traditional resources and our need to attend to the bottom line – will increasingly drive our decisions (Bok, 2003).

Conclusion

We sail amongst the shoals of shifting financial resources, advancing technology, increased options for the delivery of higher education, and changing demographics.   We also find ourselves in a time when there are increasing challenges to the pre-eminence of the U. S. higher education system. To be successful in this time of strong and dangerous crosscurrents, we need to be deliberate.   But we also need to avoid being bound by inertia or the sense that we have the academic freedom to do things in the same way that we have done them in the past.

The research university must become more entrepreneurial. At the same time, we must not lose sight of what sets us apart from other institutions of higher learning.

It is a basic principle of economics that differentiation allows us to provide specialized capabilities and excellence that a uniform approach cannot achieve. In the context of higher education, it is unreasonable to expect that all students will be educated at research universities, and it would similarly not be appropriate to put all students through an education focused solely on getting a job in a particular field, especially since careers change multiple times on average during one's life. Community colleges, for-profits, regional universities, liberal arts colleges, and research universities must all play a role in achieving President Obama's goal of increasing the number of adults with post-secondary degrees.

If we can recognize and even celebrate the differences among higher education institutions, we can more effectively take full advantage of the tremendous opportunities that research universities can provide for our undergraduate and graduate students.

What this means is that we need to give a great deal of thought to the kind of student and the kind of experiences that are best matched at a research university. The rich connections among disciplines, which hold the key to any productive examination of the issues we face, expose our students to an important culture of thinking. That thinking is the key to the culture of innovation and entrepreneurship that drives our society and economy. It is important that students from all ethnic/racial and economic backgrounds, and not just those who can afford private institutions, have access to this type of education. That's one reason for the importance of public support of research universities.

We should be preparing students to use research/scholarship to address global problems and confront uncertainties with the confidence that they can find answers and establish new certainties.

We need to explain clearly to students and to the larger society the advantages of studying at a research university, and be prepared to adapt ourselves to ensure that we are offering the best education and conducting relevant, high-quality research. In short, much of our success will depend upon the extent to which we can continue to reinvent ourselves.

Thank you for your kind attention and best of luck as you each chart your institution's course in this new world.

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Proceedings

"The Creative Campus: A Guiding Framework for Catalyzing Non-Routine Engagement in Higher Education"

Speakers:

Steven Tepper, Associate Director of the Curb Center for Art, Enterprise, and Public Policy, Vanderbilt University

Elizabeth Long Lingo, Assistant Director of the Curb Center for Art, Enterprise & Public Policy; Director of the Curb Program in Creative Enterprise and Public Leadership, Vanderbilt University

Steven Tepper

What we want to talk about today is the *moment* of the creative campus that we think we are presently in the middle of. [Tepper plays recorded theme from *Chariots of Fire*.] And from there, we're going to talk about research on creativity that we think informs this particular moment, and then some of the possibilities.

I'm playing this music for you for two reasons: first, it puts you in a triumphant spirit, so you're likely to conclude this speech by saying, "Wasn't that a triumph?" (The sad thing is, students today would not know what that song is from. There's no cultural reference.) And the other is to prepare you for a marathon, because we have a lot of slides, and it's going to be a lot to digest.

So, if you'll bear with me, what is creativity? Here's how we're defining a creative person: a creative person is someone who approaches problems in a non-routine way, successfully communicates the value of their solutions, and then can effectively mobilize resources, including others, to realize their ideas in some appropriate form.

When I was leaving yesterday morning, I asked my six-year-old, Sam, what he thought creativity was, and this was his answer: *creativity is not listening*. Which I think is true! Or maybe better yet, selective listening. We have to listen to some things, but we have to decide not to listen to others in order to be truly creative.

What is changing right now to produce this particular moment in time? One big change is derived through the creative economy. This is not new to you. It has been popularized by Richard Florida, whose argument is that if you look at different classes of workers, this creative class is the one that's growing the fastest. These are people who are essentially working with intellectual property in one way or another, across the software industries to the video games to media design. There is evidence that the copyright industries are one of the larger parts of our economy: in fact if you look at exports, the copyright industries make up a greater proportion of exports than chemicals, allied products, motor vehicles and aircraft, the agricultural sector, and the electronic sector, so this is a big part of our economy.

John Hawkins from the U.K. says that the British and American and Japanese actually spend more on entertaining themselves than on clothing or health care. This was 10 years ago, and of course healthcare has exploded, so I think I need to find a new quote; I imagine that health care has eclipsed entertainment. "The world is flat," is Tom Friedman's argument: even technical skills can be sent offshore. Hospitals are beginning to experiment with sending their radiology charts to India to be read for one-third the price. A radiology technical degree is a good degree, but it may not be the degree in the 21st century that's going to stay here, or that kind of work may not be here in the US.

Daniel Pink and others are talking about other kinds of skills our graduates need to have. Pink talks about the MFA as the new MBA, and he describes these high-concept, high-tech skills, the ability of our students to craft compelling narratives, to be able to design things that can capture attention in this very noisy media culture, and argues that the MFA actually is a degree that's becoming more popular. Those of you who are deans of schools of the arts, you know that your enrollments have kept pace, and are stronger than ever. I have some evidence for that, which I'll show you in just a second. And of course, folks who are hiring our graduates are recognizing that creativity is increasingly a defining property that they need to succeed in their work. This is a recent IBM poll of 1,600 CEOs, and creativity is the topmost skill that they say they are looking for in graduates. So: the rise of the creative economy.

The other thing that coincides with these economic changes is a huge shift in the way our students think and learn, and the kind of talents that they bring with them to campus. They are media-driven, media-savvy, they like to get under the hood and fix things themselves, they like to repurpose things, remix things, recombine things. In some ways, they are much more interesting than we are. They want to live in interesting places, and they want to go to school in interesting places. They want their campuses to reflect this creative ethos. So in a survey of graduates that the *Wall Street Journal* did a few years ago, they found that three-quarters of graduates said that they were moving to a place that they wanted to live in, and *then* they were going to find a job. So what motivates them is to live in an interesting place, and then they will figure it out. This is so different from two decades ago, where students would have lined up a job, and then they would have gone wherever that job is.

And there is the rise of the creative ethos, the aestheticization of everyday life. Design has become so important in our everyday life. I'll use the example of a toaster at Target that is so well-designed and beautiful, for a reasonable price. We are filling our houses and our lives with these well-designed products, we're expecting this. IKEA actually claims that one in ten British citizens are now conceived in one of their beds, and that on a Sunday more people are shopping at IKEA stores than are going to church.

Here is more evidence of the rise of this creative ethos: all of you know of the freshman UCLA survey. I just find it so interesting to track this stuff over time. Look at what's happened over the ten years between 1990 and 2002 (1990 is the orange bar [*on a PowerPoint display*], 2002 is the yellow bar). There are lots of things that students find less important now than they used to: participating in community action; being knowledgeable about politics; promoting racial understanding has taken a big hit; cleaning up the environment has taken a huge hit. But all of the things that relate to creative work – creating artistic work, writing original work, being accomplished in the performing arts – have all gone in the opposite direction. They're still small compared to making a lot of money, or raising a family, that's okay, but they are trending in the direction that we would expect given this rise in the creative ethos. 44% more high school seniors say they plan to study the arts today than a decade ago. This is actually evidence of these increasing enrollments in the visual and performing arts that I mentioned. 79,000 visual and performing arts degrees in 1998. That's gone up to 120,000. That's a huge increase.

A colleague at Northwestern who looks at what students do online found that an amazing number of our students are actually creatively producing art and other forms of creative outlets online. These numbers are really high. I've been tracking arts participation and attendance at arts events over the last 30 years, and we see really small numbers, like 8% of Americans have gone to a classical music concert in the last year. 26%, 27% of our students have made their own music, and posted it online. So on the one hand, attendance figures seem to be going down; but when it comes to creative practice, there's a real renaissance in the kind of activity students are doing. 21.8% are writing poetry or fiction and posting that stuff online. We're not going to have a conversation about whether it's any good; the students think it's good, and that's important in its own right.

I've been doing a study across nine campuses, supported by the Teagle Foundation, with my colleague, Richard Pitt. Many of your campuses are involved in the study, which looks at the double major. This is one of the biggest trends in the curriculum over the last decade, and it's totally unintentional. We have neither encouraged it nor discouraged it, but at many schools, upwards of 50% of the students are now double majors. One of our questions was, does this have any

creative payoff, because the majors are in very different domains of knowledge. According to creativity scholars, that should suggest some creative benefit. My colleague, Richard Pitt, says it won't, because they are just getting more focused into areas, and they don't have enough time to take electives. I say it *should* produce creativity, but I think he's actually right.

We're learning some other interesting things from this study. 84% of those students –we had about 3,000 students take the survey across nine campuses— thought that thinking creatively was "very important" or "important" to them in their college time. Compare that to 6% who say solving quantitative problems is important to them. 92% say that having a career that allows them to be creative is very important to them. These are the numbers that are shocking to me. So all of our students want to be creative, they come to college to be creative, they plan lives that are creative. And this is what they tell us is happening in the classroom: Only 29% report that coursework allows them to express their own creativity; 33% report that classes are intellectually playful; 30% say they can take their assignments in a different direction. Almost none of them report that their institutions provide them with any resources to make any connections across domains.

Another project that we're doing is trying to map creativity on the Vanderbilt campus. What's interesting about this is that it resonates with the slide before. If they are not finding creativity in their classes, where are they finding it? So the first thing we ask them is just to check all the words that they associate with creativity, and we found some interesting things. *[Shows a chart.]* You might notice that "the arts," or "artistic," or "artsy" is a tiny little dot. The size of these spheres indicates how often this was nominated as a word that links to creativity, and the connection between them and network between these concepts is how often one person who said one concept also said another, that creates a tie between them. So when they think about creativity, they're often thinking about inventiveness, expressiveness, being pathbreaking, but they're not necessarily thinking about creativity in the way some of our traditional disciplines might think about it.

We also asked them where they thought creativity happens, which organizations on campus, and again this will be different across all campuses, and it would be interesting to compare to one another. They're finding creativity is happening in alternative spring break, it's happening in *The Slant*, which is the alternative newspaper on campus, Fashion for a Cause, a social-cause oriented organization. Again, these are things that we wouldn't have suspected if we hadn't gone into the field and actually asked students. And these are the locations, the actual physical locations where they think creativity happens. This is overlaid against our campus map which you can see in the background, and again bigger circles represent more nominations. The biggest one is just this open space called Alumni Lawn, where nothing is planned, they just go and they take over the space and do whatever they want with it. It's just an outdoor yard. It's our quad. The beautiful student center that we built five years ago, and spent a lot of money on, didn't even show up on their map of creativity.

We also asked them to tell us when they *felt* creative, and we did some complicated statistical analysis to group students into different clusters, and here's what we found. I won't go through all of these, except to say that we found that creativity was more often connected with sociability. So it wasn't necessarily showing up in our studios and our laboratories. Where our students felt the most creative, for some of them, was when they were engaged in conversation. So this last one, gregarious creativity, a lot of students said, "When I'm able to make my classmates laugh, or hold their attention, that's when I'm feeling most creative." Or, "When I'm planning an event for my sorority or fraternity, and having to organize people around a task, that's when I feel creative." So our students are experiencing creativity in lots of places where we had not planned for it to happen, and they are not necessarily experiencing it where we had planned for it to happen.

Here's the question that I think we need to ask ourselves, and this is a theme for the whole conference. If we have this world, this creative economy that's demanding certain kind of skills, dispositions, and talents, and we have these students who are engaged and creative, and they're actually doing the kinds of things that our world is demanding of them, and then they come to us for four years, and we ask them to leave all that stuff at the door – when they come in to our classrooms, we're not asking them to draw on all these talents, to deepen them, to organize discipline

around these things – right? We're setting them on a different path, but then they have to go out in a 21st century economy, and be creative again. So what value are we creating? And the students are asking themselves that question, and the parents are asking themselves that question as well.

This also comes from our Teagle survey. I added a question to the end of the survey – I wanted to see how many students thought of their education as a commodity. It turns out that a quarter of them actually think they should get refunds if they don't like their classes. Yesterday, I was talking to my colleague in sociology, Prof. Jen Alina, and they were talking about how she had banned technology from the classroom. Actually, she had created a technology ghetto: she said, "If you want to use your computer during the class, you have to sit in the back of the room together." So all the computer users moved to the back of the room and basically didn't feel like they were part of the class. And when they were discussing how this worked out, one of the students was a little bit annoyed by it, and he said, you know, "Shouldn't I be able to make that decision, because I basically consider my professors as employees. Right? You're working for me, I'm paying the bill."

Well, that's really not where we want students to be thinking about value. And so we have to think about what is the value of face-to-face four-year education. I often ask this question when I'm walking behind a campus tour. It's unbelievable what students say in these tours. I mean, they just lie. They just lie! And you know that all the values are organized around amenities, or around – in our case, students tell incoming students and parents that our campus has five-hundred-year-old trees. There's no way in the middle of Tennessee that a tree lives that long. They're promoting these things that are supposed to make students feel like they're getting their money's worth.

I consider that the "convenient university," or the "commodified university." I think this is what we're up against, because the more our university gets defined in these types of value terms, the harder it makes it for us to compete against the universities that actually can provide fairly inexpensive education in a much more convenient fashion. And I think these numbers are really striking, and I'm not saying this is a bad trend. I think University of Phoenix is serving a lot of students, but they're not serving *our* students, and they're not necessarily serving them in the values that we embrace. Over the last decade, more than 100 traditional four-year colleges have closed, while the number of corporate universities has ballooned from 400 to 2000. That's really remarkable.

So we have the rise of the creative economy; media-driven, media-savvy, highly expressive students; and along with this, the hopeful side, is that we do have a growing interest among higher education leaders in creativity and the arts. I'm going to talk about some examples that are happening, and they're happening on your own campuses.

The idea of the creative campus first got public legs in an American Assembly meeting in 2004 where university presidents, deans, provosts, and arts leaders gathered for three days to talk about their creative campus. One of the things that came out of this meeting, one of the impeti of the meeting, was this idea that universities are the Medicis of the 21st century when it comes to the arts. If you took all our stages, all of our faculty, all of our collections, our museums, our performance spaces, that universities are by far investing more in the arts than any place else – more than foundations, more than government – and that university leaders have to take that responsibility very seriously as stewards of our cultural ecology. I was an advisor to that meeting, and I thought that it was an important point to make, but I thought it wasn't enough. To call a creative campus an "arts campus" was really misusing the term creativity; creativity is much broader than just the arts. The arts are a major player in the creative campus, but they're not the only player. So I wrote this article really challenging the universities to think about whether they were in fact creative places to teach and learn. And are we perhaps creative in spite of ourselves? Since that time there's been a lot of stuff happening.

This just got published a month ago by Holden Thorp at the University of North Carolina: *Engines of Innovation*. The chapters in this book talk about entrepreneurship in science, social entrepreneurship, they talk about interdisciplinarity, and how you make better connections across centers, they talk about changing the campus culture for entrepreneurship. This is what they write: "We believe this moment in history makes unlocking the innovative potential at our universities a national imperative, and an entrepreneurial mindset is key to achieving this objective." At University of Texas, $1.5 million for a chair in entertainment studies, that's okay, it's not as interesting to me as the fact that this money is also supporting

student creativity fund (those of you at Texas can tell me if this is correct or not). Duke University, this is just one piece that I pulled out, but I think of the grant that you got to think about visual studies, visual literacy – that the 21st century requires not only understanding of how to write, but also how to see the world, because so much information is communicated visually now.

When Tom Friedman re-issued his book, he added a chapter based on his interviews with then-President of Georgia Tech, Wayne Clough, about their experiment with changing the way they think about admissions, changing the way they think about music on campus. The President felt very strongly that students that were coming to Georgia Tech who had had these other hobbies, these other interests, these other talents, who played in a band, who sang, composed music, were actually better engineers. And they did a bunch of interesting things, changed how they recruited; I think this is remarkable. Now, more than 50% of entering freshmen have played a musical instrument. They bought up all the musical instruments from the 1996 Atlanta Olympics and they created a whole bunch of new bands and ensembles.

There are other efforts, which I can't go through all of. What's interesting is that most of this is happening in the last five years. This really is a groundswell of activity. I was at Boise State recently. *Innovate at Boise State*. They have something called The Gang, where their football coach, Boise State football, number four in the country, gets together with a professor from the business school, a humanities professor, and the Sheriff of Boise, and it's called The Gang, and they talk about creativity, because all of them are interested in advancing creativity in their own domains. It's a really interesting group.

So what do we know about creativity? Science actually tells us a lot. This is not just a squishy concept. For 30 years, cognitive scientists and psychologists and sociologists have been learning about and understanding creativity. Can it be measured? Let's do a little experiment. Take out a piece of paper if you have one, and I'll give you one minute to write down everything that you can do with a pencil. Just everything you can do with a pencil. … Okay, time is up. Let's just shout some things out. What can you do with a pencil? [audience members shout out; Tepper repeats.] Poke your eye out with a pencil. Poke someone. Okay so we got the poke concept; what else do we have? You can conduct an orchestra with a pencil. Yeah? Put it behind your ear for what purpose? Okay. What else can you do with it? *-Save my place in a book*. So use it to mark office space. Yes? *-Use it as firewood*. Good. Calculator. Calculate things with it. Measuring stick. Scratch an itch. Dental floss. Hair tie. This was great!

Let's think about what we just did. We have actually cut across a couple of different categories of use for the pencil, right? Poking the pencil – let's say we create a category called "Pencil as Weapon." You can poke with the pencil, you can stab someone with a pencil, you can think of other ways to injure people with pencils. Another one was organized around body management. So we use a pencil to pick our teeth, to put our hair up, there was another one under body management – to scratch! Another example was using the pencil as a tool for something else. Conducting a symphony; I'm sure others of you had other uses of the pencil as a tool, *-writing with it*. Writing with it! Use the pencil as writing instrument. This is about creativity. We had using the pencil – no one put this down, but a lot of people put using the pencil as a toy, something to play with. As something to count. *-Chew*. So now we're going into bodily management. Stress. Physical, emotional. Okay, we can debate those categories after this.

This is a very standard creativity test, and it actually has a lot of validity. It measures three things. Who thinks they came up with the most number of things in that minute? What's the most number of things on that piece of paper? Anybody get five things down? Anyone get 10? Anybody get 15? Okay, 12. Okay, so 12 is probably about the upper limit. I won't ask how many people only had one.

The next thing I'll ask is, how many of you wrote down things in multiple categories, and how many categories? We just named five or six categories. Some people can come up with 15 things in a minute, but it's all "I can use a pencil to write my name, I can use a pencil to draw a picture, I can use a pencil to draw a map," so they're all about using the "pencil as a tool" category. Other people come up with hair product, writing utensil, weapon, toy, musical instrument, and they cut across many categories.

And then the third thing is whether you came up with anything that nobody else mentioned. Now, we didn't get a chance to go through everybody's suggestions, but if you came up with something that no one else came up with – who thinks they came up with something nobody else came up with. In the back? Okay, did anybody else have "a pencil to hold flies with?" [audience member:] *I had spear a bug*. –Spear a bug! Sorry. Anybody else want to try? Stir coffee? Anybody say stir coffee? Yes. Drumstick? Chopsticks. Chopsticks. Anybody – play with a kitten? Yup, play with a kitten. Okay last one, in the back. Make a bridge for ants. So we have stabbing insects and helping insects. Interesting. Last one. Okay, a reflective surface for the graphite. Okay, you win. No one else had that one.

So those are three things. The first thing measures fluency, which is the ability to generate ideas very fast, and we know that is useful in several contexts, but not all contexts. The second thing measures flexibility. How flexible is your mind to think across categories? And the last thing measures originality: how capable are you of coming up with something that's truly non-routine, something that's truly different from the way anybody else in the room might be thinking? And you can actually just count those things up, so if you want to do that in a dinner party to embarrass your guests, see who's the most creative, you just count those things up. Fluency – you count how many things they came up with; flexibility, how many categories, and then you get an extra five points if you're the only one who came up with something.

The point is that there are ways to measure creativity. This is only one, and it doesn't measure every aspect of creativity. Robert Sternberg, who is now at Oklahoma State as Provost, formerly a dean at Tufts, has been working on his Rainbow Project, and has actually found that this battery of questions that he asks is a better predictor of student success than grade-point average or SATs. Habits of practice: scientists have found that creative skills are actually not just innate, this is not just about *eureka* moments, but these are actually things that you have to practice. You have to learn. Rex Jung from University of New Mexico concludes that are competencies that can be learned in a purposeful manner. You can actually recruit your brain to these things. And just an example from my own classes, I'm often disappointed by how poorly prepared students are to ask good questions. So in a bit of frustration, I said okay, stop. Enough of this *Ferris Bueller's Day Off* experience. Anyone? Anyone? Anyone? Anyone? They don't have anything to offer. So I said let's just brainstorm, here. If you are just sitting there and someone's presenting information to you, what are the tools that you have in your brain to help you ask a creative question. And here's the list they came up with.

- You could start off with a "what if" in your brain. No matter what they're saying, think of it in terms of a "what if" question.

- Is this similar to or different from something else?

- Is the thing you're saying, would it work in all conditions, or would it only work in the condition you talked about?

- Has it always worked this way, or has it changed?

- And of course in sociology, you might as well ask, what do you think Marx would say about this?

Once I did this, the class got unbelievably animated, and it was a successful tool for the rest of the semester.

There's some fascinating brain research as well, that's showing that creativity happens in a certain part of the brain, and it happens co-related to other things that happen in the brain, in that same area of the brain. Kevin Dunbar at Toronto has done some fabulous studies. It turns out that performing arts activities create certain kinds of activities in the frontal lobe, which is also where creativity happens, so he's made that association. Reasoning by analogy – they're getting rid of the analogies from the GRE, I was told today – but it turns out that analogical reasoning is really good for stimulating the same part of brain as working on creative tasks. And if you're able to make semantic connections across very different domains, the brain really goes crazy. It loves that. The frontal lobe is on fire.

There is Gruber's work on creative people, and the notion of networks of enterprise – I only say this because it's so in contradiction to how we actually organize our curriculum— his argument is that creative people have to have multiple

projects going on at any one time, and these are really deep projects. When they get to a dead end on one, they move over to another, and then they'll come back to the other later, and so they need to have the time with their ideas to be able to revisit them, to be able to make connections across them. We don't set up our curricula that way, right? We have like a shotgun approach: the students take in these different classes, and don't get to return to them. Once the semester's over it's over. We are not working as networks of enterprise for students. We are not giving them the chance to make those kinds of deep connections, return to their work, revisit it, and find those creative insights.

In Elizabeth's work, she's studied something called "nexus workers." This is the ability to actually put together creative projects, and it turns out that there is set of competencies that successful nexus workers have, and it's how to manage people and expertise around creative work. We can share that knowledge with other students. Visualization, creativity, and memory. It turns out when we visualize things, we remember them better. You may have heard on NPR that there's a study of doodling. I'm a horrible doodler. I doodle all the time, and they're not good doodles. But it turns out if you play someone a very long boring message on their phone, and then you ask them to recall the details of that message – you know, the message may have been about someone went to pick up their kid, they were late, and they get the car fixed, and this is what is wrong with the car, and they had to pick up their mother, and then they had to pick up the cake, because it was this person's birthday – and then to one set of people, you say, "Okay, listen to this message, and draw while you're listening." And to the others, you say "Don't draw." Don't give them a pen, don't give them a pad. "Just remember what you hear." The people who were drawing and doodling while they were listening recalled much more of the information in greater detail.

David Perkins, a cognitive scientist, has also said that training your brain to look and notice through visual art is really good for general intelligence. This is not the argument about 'art makes you smarter than math,' or 'art or music makes you better at spatial reasoning.' This is just a, "This is what visual arts does." It helps your brain track things in a deep and meaningful way that leads to higher levels of intelligence.

I'm going to pass the baton to Elizabeth, who is going to give you some more detail about what we're doing at Vanderbilt, and also some examples of places across the country that we hope will inspire you to think about your own possibilities on your campuses.

Elizabeth Long Lingo

About a year and a half ago, Steven and I were presented with an amazing opportunity to ignite, illuminate, and nurture creativity on the Vanderbilt campus. We started brainstorming ideas, and imagined: "Every student will graduate with a creative portfolio. Every faculty member will be introducing some kind of media or creative outcome in class, so students will be able to harness their creative potential. Every time you walk across campus some spontaneous encounter with the non-routine will happen, breaking people out of their conversations." And then we thought, "Whoa! How on earth are we going to accomplish that? Where do we start?" We decided that we would start with people we called *catalysts*, creative agents who were already committed, and true believers in the creative idea. We had about 25 faculty members, maybe 25 to 30 students, and an additional number of staff members who had totally bought into that creative campus idea, and were ready to do this work in a marathon, not only getting us slides, but also pursuing this over the long run.

The first thing we did was gather together colleagues from an array of disciplines who, in conversation, had been really enthusiastic about this effort. People from film, from anthropology, music, composition, physics and astronomy, neuroscience, communications studies; we brought them together, and the first thing we did was try to wrestle with "What do we mean by creativity?" And you can just imagine that within the first two sessions we were at near fisticuffs by what we meant by creativity! Is it play? What's the role of discipline? Can you have discipline and play at the same time? Is it creativity for creativity's sake? What about creativity for applied reasons? For pragmatics? In

general we were civil but we are still dealing with all these underlying tensions based on different people's perspectives on what creativity meant. And what does it mean in undergraduate learning?

Luckily, one of our students showed us a film that gave us a way in, and when we played it for faculty members, it really helped us develop the idea that it can be *and*. It can be playful, it can be pragmatic, it can be based on deep discipline, *and* it can be a playful, fun interchange.

[Elizabeth shows a short film produced by Volkswagen, in which a staircase positioned next to an escalator in an underground mass transit station is turned into a functioning piano keyboard. Most commuters choose the stairs instead of the escalator, and some are shown playing on it. The captions indicate that Volkswagen's "Fun Theory" is that fun can be used to modify behavior for the better.]

This example is so lovely because it shows the true discipline that was needed. The people need to understand the tones of the scale, they need to get the engineering right to configure those stairs, they did the initial social science research to look at how many people were going up and down, and then they made it in a playful way that had people engaged, something very common in a very different way. There were multiple people involved; and then just the observing of it, and the noticing of it maybe challenged people's perceptions on what everyday things can be. So this also helped us bridge and say, look – we need to get beyond these different definitions of creativity, and define it in terms of the common creative process and practice that helps make those kinds of events and those kinds of projects happen.

When we talk about the creative process in terms of the arc of activities and interactions involved in bringing novel or non-routine ideas from conception to implementation, so it's not just about that creative spark, the individual person coming up with their ideas, or even trying to generate the ideas, but then it's also trying to get people involved and engaged. So we played this video, and people understood what we were trying to talk about. That's the power of these kinds of visual images, they provide the expressive agility that we need. And they also need to be able to manage power negotiations. Creativity and innovation often entail a change effort. We might be challenging some of the *status quo*, so we want students to be able to understand that entire arc, from idea generation to actual implementation.

And so we have this bold ambition of trying to make change at Vanderbilt. We want to focus on our catalysts, the people who want to make a change, who are interested in creativity, who are already buying into this, and we decided to take a concentric circle approach. The first thing that we're doing is focusing on our Curb Scholars. We've developed an extracurricular Scholars Program in Creative Enterprise and Public Leadership. I'll talk a little bit more about Creative Enterprise and Public Leadership, and what that means, in just a second. And then we have an academic program, a minor in Creative Enterprise and Public Leadership, with the idea that we have a select group of scholars; and then we'll build out, and offer our courses to a larger group of students, and then we'll move the concentric circle out yet one further ring, and develop programs and technologies and support structure for people working across campus, and hopefully interact with the broader student population on campus.

The Curb Programs in Creative Enterprise and Public Leadership include both the Scholars Program and our minor. They were funded by Mike Curb, who is the founder of the largest independent record label in the world. He was also Lieutenant Governor of California. So the term, "creative enterprise and public leadership," actually was inspired by his life.

Our goals are creativity, enterprise, and also public leadership, serving for the public good, for the public interest. And as we talk about creative enterprise and public leadership, as we try to manifest it in our programs, we've come up with four areas that we're seeking to develop in our students. One, an aptitude to invent and imagine. That's the start. Then, the expressive ability to communicate an innovation's advantage. How do you mobilize resources? You need to be able to engage, you need to be able to tell stories. You need to be able to convey your ideas in compelling ways and get people involved. And then, the dexterity to develop and implement those innovations within your respective fields, and then the ability to critically examine products, practices and policies for their impact on the public good. And so public leadership not only is government service, or understanding how larger structures impact creative enterprise and creative practice,

but really reaching out and saying, how can we harness our creativity? How can students, faculty, and staff harness their creativity for the larger good? And also being able critically to discern the ecosystems, and the policies, and the structures that impact what you're doing, and whether or not your innovation is going to be a success, and productive for whatever community you're trying to help.

We have a wonderful opportunity in our Scholars Program. We have a select cohort of students – we bring in six every year. We're in our second year, and we have developed a four-year arc based on this creative process, from imagining ideas all the way to implementing them. We meet with them weekly. The idea is to try to develop these habits of creative practice. Let me just show you some: [*shows slides*] we brought in Second City to do an improvisation workshop. We have the students work with a Marc Jacobs fashion designer that we brought in from New York City to do a Project Runway with found-wear. The woman who's second on the left in the white, she has an outfit with Chinese takeout boxes and with a skirt that's made out of inner tubes. Liz Lerman's Critical Response Process, how do you give and receive feedback, especially around critical feedback? We worked with a photographer to work with students on, *how do you notice and observe?* They went around and took pictures of the non-routine, the aesthetic on campus. All of these programs are around trying to develop the students' habits of creative practice.

We also have an ongoing series of creative leadership salons. We want students to engage with creative leaders. We want them to understand – what are the design decisions that they make, some of the trade-offs, how do they negotiate for creative elbow room? This is Mr. Jalopy. Mr. Jalopy is one of the leaders of the Maker Movement. He's about being able to get under the hood and repair and renew and transform everyday goods. And you see him here – he has a movable movie theater, it's a moveable drive-in. He's also the maker of the world's largest iPod. We had him work with the students.

We also want students to solve problems on the fly. There's a lot of emphasis on creative problem-solving. A lot of that is very structured, and you're taking your time to do it, but so much of what we're trying to get our students to be able to be fluid and facile, be reactive and agile to deal with problems on the fly, and be able to handle it with grace, whether it's trying to figure out how to swap out parts across bicycles that they're trying to refurbish and renovate, or whether you're in the middle of filming a film and all of a sudden your camera goes down, what do you do? Those are the skills that students of creative enterprise need.

We also feel that a very important creative practice is to be able to translate ideas. Part of the salons is to expose students to this array of careers and ideas across the creative spectrum. We also took them to the Idea Festival in Louisville, Kentucky. This is a phenomenal opportunity for students. I can't recommend it enough. We brought the students and they got to see 30 to 40 speakers in the course of a few days, and we asked them to translate what they learned in a two- minute presentation, and that was the only constraint I gave them. I said, take away what you did, translate it into your own experience. And they hated that, they hated the ambiguity that I presented to them. I wasn't telling them to write an essay, or do a blog, or take photos. I just said however you want to translate it, two minutes. And after they fussed around for a little bit, they actually came out with some wonderful, wonderful translations. Two of them teamed together to do an acoustic rap song about the Idea Festival; this one woman developed a beautiful collage book of quotations, one student developed a graphic novel. So part of it was finding their voice and finding their unique translation of the ideas that they were presented with.

In the Curb Scholars program, we have workshops, we have salons, we have this creative practice they develop over the arc of four years. We also have a strong commitment to public leadership. We have developed some case studies that they've worked on: they worked with Thistle Farms, which works with abused women to develop products, to do a case study on how to develop strategic marketing. There was the sale of the Vanderbilt radio station, how do they prevent that from happening, or what are the policy issues around that? In one of their summers they go up to Washington DC, where they actually get to look at the policymaking and the creative ecosystems that they'll ultimately be leaders in. Part of the creative enterprise-public leadership, and why we have the public leadership piece, is that once they graduate, we want them to be leaders. They'll be *de facto* decision-

makers who will be shaping the cultural and creative vitality of their communities, their organizations, and we want them to get a sense of, what are the secondary and tertiary implications of their decisions and the work that they do? Being in Washington is a wonderful way for them to see how everyday decisions are impacting people's lives.

And then, finally, all the students do their own senior legacy projects. In all of our programs, the students do a translation that's unique to their interests. One of our students, Maria, has a unique multiple major where she's a bassoonist and she's a human organization development major, and so she's finding a way for the Freshman Commons program to bring the students and Music City together and engage in conversation around that. That's never been done before on the Vanderbilt campus.

The second thing is our minor in Creative Enterprise and Public Leadership. The minor is expanding again. So our scholars – we're investing in all of their energy. We meet with them weekly, we have them for four years watching them blossom, watching them grow, seeding them as catalysts all across campus. The minor is designed to open up our sphere of impact even yet a little bit further. So the minor has courses relating to the ability to invent and to imagine, to be able to express, to be able to navigate. I'm developing a course called Negotiating Creativity and Change; the class on public leadership, but what's interesting is that we are designing it –specifically to Steven's point around double majors – we're specifically designing it as a minor that has to complement their major discipline. They have to do a capstone project that takes the theories and methods of creativity and innovation and public leadership, and apply it to their home discipline. Whether it's a question about how sociological methods can be improved to address issues of poverty, or how can engineering students take on a problem in the community, we want that translation and integration. That's very important to us.

We have our Curb Scholars program, we have our minor, and then we have our larger creative campus initiative. We have four pillars for our creativity initiative. The first, we were trying to figure out, what are the key things that we're trying to inculcate and foster on campus? One is this idea of creative lives. We want to illuminate everyday, extraordinary creative lives on campus, with the value that it raises awareness of all the creative action that's going on. We are not the owners of creativity on our campus, we're really trying to bring up what everyone else is doing, and also trying to shed light on the behind-the-scenes creative process and practice that's going on all throughout campus.

We were inspired by one of our colleagues, an astronomer who is working with minority students to try to develop a way to get more minority students to take on science PhD programs and become scientists. And he's found that the best way to do that is to have them develop a creativity narrative around being a scientist: each student develops his or her own narrative as both a creative person and a scientist. He does this to encourage them to get in and apply to these programs. Inspired by that, we are pursuing this effort to have every student at Vanderbilt through the Freshman Commons programs and through the Vanderbilt career services, to have them all write their creative narrative. We have the chance to look at all of our students. When we select our scholars, we look at the pool of applicants applying to Vanderbilt, so we have these stunning students, creative, passionate, entrepreneurial, committed to public service, and then you ask them to try to write their creative narrative, and it's so difficult, because they're so used to just writing all their idiosyncratic achievements and courses and events. So this ability to be a storyteller and to convey themselves as creative problem solvers is invaluable, both for shedding light on how they might navigate through the Vanderbilt experience, but then also when they try to go on the job market, they can present themselves as a creative person rather than just offer a series of idiosyncratic activities.

In addition to this effort on creative lives, we have "serendipitous encounters." The idea with serendipitous encounters is that as you're walking around campus, we want to help people break out of the routine. So you're just bumbling along, as we always do, but what if you saw the ROTC guys coming down scaling the wall and instead of just scaling down they were throwing roses? What if there's a huge pile of Legos in the middle of campus? I don't know if any of you have been to South by Southwest, the Music-Film Festival, but they have this massive pile that would go up to the ceiling here, and every time you walk by people are engaged, and they're building on each other's work. Or a pile of sand? We had

a photo of this guy at Texas who saw this pile of sand, and decided to build a sand castle. Imagine if we could help people break out, start to question their assumptions, maybe help foster their noticing the every day in a different way.

Problem solving is another main area of our program. We have encounters, we have creative lives, we have problem solving, and this is really the pragmatic side of our creative campus, where we're charged with trying to apply that creativity for the larger good, and to solve problems. We have so many people on campus who are bright and who are ready to take on things we want to bring together, but who really don't have great mechanisms for that.

We were inspired by Michigan's work-play competition. They were trying to explore getting new designs for their north campus, and what they were able to do is bring together, they put out this call for designs and interdisciplinary teams came up and redesigned it, and this is just a fantastic mechanism. You can go on their website and check out all the different designs they came up with. In terms of harnessing expertise, one of the things that we thought would be really wonderful was to develop a creative course SWAT Team. So we want to challenge all our professors and our faculty to have classes that are engaging creatively, that are engaging students in alternative ways, but do they have time? Did they have the energy to do that? So we thought, what if we have a course, and we can get the students and partner them with community artists or graphic designers or engineers, and they could come in and work with the professors to redesign the class or redesign a different aspect of their course. This could be a possibility that would work wonderfully on your campus.

We also thought that having a problem solving/opportunity exchange would be a wonderful idea. Instead of all of our institutions saying, "we've been there for a while, we've started to take inefficiencies for granted, we just have to work around it," what if we had a mechanism to kind of get everyone charged up? That doesn't have to be the way it has to be! We can engage them in different ways if we get those things raised up, and then we can match them with people who can fix them. This was inspired by an iPhone Apps course. There was a call for problems. For example, Vandy Vans are vans that drive around to help students after hours and keep them safe, but nobody knew where they were. The students would wait on the corner and feel unsafe just being there. What they ended up doing was, the apps people invented an app that worked with GPS, so now the students know exactly where the Vandy Vans are. You can go online on your iPhone and find out where they are. That's a wonderful example of harnessing the creative expertise of your university to solve everyday problems.

So we have encounters, we have creative lives, we have problem solving, and the fourth area is creative conversations. These are non-routine conversations that – you know, we have these conversations and they typically follow a routine script. But what if you wanted to get it so you are actually generating something new out of it, or you had multiple interpretations of a common theme? Breaking out of the existing way that we view things and think about things. We were thinking about our cocktail conversations and our faculty meetings and our meetings with students that we always have, and we always end up talking about roughly the same thing, maybe sports or maybe this or that. So we ended up developing a speed dating approach, where the students and the faculty actually exchanged in a speed dating format. We started with an improv workshop and then the faculty and the staff and the students were forced to come up with ways they could work together, or problems or opportunities that could be addressed.

Our goal is to try to develop a toolkit of evergreen technologies that could be used both by our catalysts for change and for creativity on campus, but then also could be used more broadly around campus, which could be adapted and exported to other universities. This idea of different workshops, an improv workshop, a question-asking workshop, innovation grants, different competitions, generative exhibits, theme semesters, open houses, residential halls. Overall, we're trying to build this program so we can start the conversation with you about how these things can be adapted at your universities as well.

"Nothing in Education Makes Sense Except in the Light of Evolution"

Speaker:

David Sloan Wilson, SUNY Distinguished Professor of Biology and Anthropology, Binghamton University

I want to make four points in this talk. The first is a mundane point that evolution integrates the many disciplines that comprise the biological sciences. We know this. This is business as usual. My second point is that it can do the same for all human-related subjects. That's not so conventional. My third point is that it can integrate undergraduate education across the curriculum, in addition to research and scholarship. And fourth, the possibility that evolutionary training can increase general thinking skills and academic performance. In other words, as strange as it might seem, learning about evolution can just plain make you smarter. And that's the best argument for teaching evolution that I can think of. So if I can establish these four points, I will have accomplished my mission.

Well, let's start with good old Charles Darwin, and this is a famous, famous passage. It's the last paragraph of the final edition of *On the Origin of Species by Means of Natural Selection*, in which he says: "It is interesting to contemplate a tangled bank, ... and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us." Now what did Darwin mean by this? It meant that his theory consisted of amazingly few simple principles: minimally, the simple concept that all organisms vary; that those differences make a difference in terms of survival and reproduction; and because they're heritable, the offspring generation is different from the parent generation in the direction of being better adapted to its environment. How amazing is it, that this theory can be stated in a single minute, as I have just done? And yet you can take those basic ideas and extend them almost endlessly to different applications.

With these simple ideas, Darwin was able to study basically all aspects of all species; he was able to study the historical relationship among species – that's phylogeny, the great tree of life; the adaptive design, how each species is adapted to its particular environment; and the absence of adaptive design, as Stephen J. Gould never tired of telling us. There's more to evolution and adaptation, and Darwin was aware of that, because everything that evolves, evolves from pre-existing traits; that many, many adaptations resemble contrivances – Rube Goldberg devices – rather than something that an engineer would build. This could be extended through time to explain the fossil record, and in space to explain the geographical distribution of species, which provided a way to understand development. Thus, all aspects of all species could be understood in terms of this single theoretical framework.

So when it comes to transcending disciplinary boundaries – a widely appreciated goal of modern higher education – that was the primary import of Darwin's theory from the study of the biological world, and I think it's just amazing to think back and to see how Darwin proposed it, with just the theory in rudimentary form, and so much less information than we have today (although it was still a lot of information that he had to integrate). It amazes me that the entire import of Darwin's theory was this ability to take existing knowledge and to integrate it, to put it together, and to serve as a guidepost, a set of guidelines for gathering new information. And that is the process that continues to this day, the process which enabled the great geneticist Theodosius Dobzhansky to make the statement that has formed the basis of my title. "Nothing in biology makes sense except in the light of evolution," said Dobzhansky, something that is quoted as a mantra by my colleagues again and again and again. I find it interesting that he wrote that in an essay in a magazine for biology teachers. So that brings us close to our mission for today. And the best way that I can convey what this statement means is to actually relate my own experience as a college student, because when Dobzhansky wrote those words, I was a graduate student at Michigan State University.

So let me just tell you a few stories about how I became a scientist. I'm not from a scientific background at all; my dad's a novelist, and so I come from an artistic, humanities background, but I love nature and so I took an ecology course in college, and because the instructor was an evolutionary ecologist, I learned about evolution as a sophomore in college. As a class project, I started to study vertical migration in zooplankton. Zooplankton are wonderful, minute creatures that live in the open water, and I discovered that they migrate. They go down into the depths in the day, and they come up to the surface at night, and I started to think about why they might do that. And it was evolution that helped me to do that. Why would they do such a thing; how would that help them to survive and reproduce? There were numerous theories they were being tested at that time, one of which, a very straightforward theory, was predation: that in order to avoid predation they had to go down into the depths, and then they could resurface at night.

So that became my entry, and I started working in the laboratory of Conrad Istock, an ecologist and evolutionary biologist at the University of Rochester, and from there it was a very short step to study feeding in zooplankton. That's the same creature but a very different behavior. Nevertheless, we can ask the question that any organism is feeding, how should it feed? Is it just gathering food at random, or are they perhaps being selective in order to maximize their energy gain per unit time? This was the time when optimal foraging theory came into vogue. And so, thanks to evolution, I was able to switch topics even though I was studying the same creature.

In my first year of graduate school I took a tropical biology course. God bless those tropical biology courses. I hope that they still are strong and remain supported. The Organization for Tropical Studies deserves to be richly supported. And in that tropical biology course I encountered this wonderful creature, the antlion. This is the larval form of the insect, and it makes its living by digging a pit in the sand and lying beneath, and then trapping insects that fall within. So now I was studying the same behavior – feeding – in a completely different creature, and yet it was perfectly straightforward to be doing that, because all of these creatures and how they behave, how they're structured morphologically, they were all part of the same "tangled bank."

At that point, because I was working with basic principles that transcended any species or topic, I was able to become a theorist and write mathematical papers such as this: this one asks the question – at that time, it was an idea that one way that species coexist is by being different body sizes. They would eat different things. And mathematically, I was able to show that that's true in some cases but not others. I have to tell you that as a college student, I had taken only one mathematics course, freshman calculus, and it almost killed me. I got a C-. I was lucky to get a C-. So I had no reason to learn mathematics at that time. And yet now I had a strong reason to learn mathematics. I purchased *Calculus for Dummies*, and it went on from there. And today I'm a well-known theoretical biologist.

I also became interested as a graduate student in the subject of group selection, a completely different topic. One of the theories of vertical migration was kind of a collective form of parental care, so that the adults left the food-rich zone in the daytime in order that the offspring could feed. And so the idea of collective parental care, whether parental care was an individual thing that you only do for your offspring, or whether it can be done at the population level, became something that I became interested in. It was very controversial at the time. And so I was able to switch topics once again, and to consider one of the great evolutionary puzzles – of altruism and selfishness, individual-level adaptations and group-level adaptations – as a general subject that might apply to all species, including humans.

All of this while I was still an undergraduate and a graduate student. And since then, it's been my privilege to have the entire tangled bank as my stage. I've studied all these things plus more. Believe me, I'm not boasting, or if I am boasting, I'm boasting about the theory. This was business as usual for an evolutionary biologist, and that is my point. So, I have come to the end of my first point here, that *evolutionary theory integrates the many disciplines that comprise biological sciences*. My point, I would like to say, is simple, but profound. The integration across disciplines and the unity of knowledge that is the ideal of higher education, that we speak about all the time as the way that we want knowledge in general and higher education to be, is already business as usual for evolutionary biologists. So we have something to learn from the way evolutionary biology is structured.

And now we can ask the question, can this way of thinking be applied to humans, and to higher education? Can we have this kind of integration that already exists -- can we extend it beyond the biological sciences? And here we encounter a puzzle, because Darwin included humans as part of the tangled bank from the very beginning. At the same time that he was studying orchids and barnacles, he was studying human morality and the expression of emotions, all as part of the same tangled bank. And it was obvious at the time – of course that's one of the things that made evolution so controversial and so fascinating to everyone – that if true, this theory was going to revolutionize our understanding of humanity. So all of this was known and in a sense studied from the very beginning. And yet, by the early 20th century, evolutionary thinking applying evolution had become largely restricted to the biological sciences, and avoided for most human-related subjects. Not for genetics and not for physical anthropology, but the closer a discipline gets to behavior – human behavior and human culture – then the more we avoid framing it in terms of evolutionary theory.

So, why? My first answer is, it's complex, and I only have an hour. It really is complex. All social histories are complex, and I don't want to minimize its complexity, but I do want to draw out two points. The first, familiar to all of us, is that early on, evolutionary thinking became associated with social policies that in essence attempted to justify inequality. This became known as Social Darwinism. And if you read the history of this (especially, for example, Janet Brown's wonderful two-volume biography of Darwin), you can really see that this was so much in the bone of Victorian culture: everyone's thinking at that time, from any perspective really, was going to be, in a sense, a creature of a very hierarchical British class society and colonial society, in which it would seem that if you're going to tell an evolutionary story, it would be a simple linear scale with the savages here and the Europeans here, and so on and so forth. And so evolution was applied to human affairs in a way which was so wrong for many people that it caused them to distance themselves from evolution.

Now the second point is, I think, just as important, but not so obvious. And that is that so many people today (including many people in this room) have this sort of polarized way of thinking, in which biology and evolution and genes and genetic determinism are over here, and learning and cultural diversity, open-ended learning and cultural processes are over here – as if the latter lies outside the orbit of evolution. That's why it's possible for people in entire disciplines to proceed without explicitly framing their ideas in terms of evolution. It's the idea that if we're just dealing with learning and culture in the sort of open-ended part of human nature, somehow we don't need to consult evolutionary concepts. As a result, on the one hand, we have evolutionary science growing sophisticated within the biological sciences, and integrating it, as I've said; and then we have all the disciplines comprising the human sciences and the humanities. Of course they've all grown sophisticated in their own way, but largely without reference to evolution. Or to each other. And so the implicit assumption, as I said, is that evolution can explain our physical bodies and a few basic urges such as to eat and have sex, but has nothing to say about our rich behavioral and cultural diversity. Implicitly, most of my colleagues in human-related areas are very open-minded about evolution. They're not in denial of evolution. But implicitly what they're saying is: "What I think about and study is consistent with evolution, but does not require much knowledge about evolution." That is the implicit assumption throughout academia outside the biological sciences.

This leads, among other things, to the fragmentation of knowledge. Without being connected to a common theoretical framework, each discipline goes its own separate way. I keep toying with different metaphors for this. In *Evolution for Everyone*, I said that it's not the ivory tower, it's the ivory archipelago: many islands of thought with little communication between the islands. I think "ivory tower of Babel" essentially says the same thing. This is widely recognized as a problem, but one which stubbornly resists a solution.

And so, like Sleeping Beauty, the study of evolution in terms of human affairs took a long nap, and only awakened during the late 1980s and 1990s. The publication of Edward O. Wilson's *Sociobiology* in 1975 is a good place marker for this change.   Just two years after Dobzhansky uttered his statement that "nothing in biology makes sense except in the light of evolution," Wilson publishes *Sociobiology*. The whole theme of *Sociobiology* was to say that there can be a single theory of social behavior that applies to all creatures, from ants to primates. It was celebrated as a triumph – except for the last chapter on humans, which created an uproar. So that's a great marker, which tells us that in 1975 that separation of biology from the human-related disciplines was still in place, and still being heavily defended. And so it wasn't until the late 1980s and early 1990s that terms such as "evolutionary psychology" were coming into use. So only then were people starting to rethink entire disciplines from an evolutionary perspective. And if that's not exciting, what is?

If you fast forward to 2010, there is an explosion of research and scholarship on all things human from an evolutionary perspective. So, you name it, it is being studied from an evolutionary perspective. It is a very exciting time to be an intellectual.

Once again – I'm obviously covering a vast terrain here, and I hope we have the opportunity to dip in on specific topics – but the best way that I can convey this in a short space is once again to relate my own personal experience of how someone who thought he was going to be a zooplankton ecologist (of all things) started including humans in the tangled bank, just as Darwin did. And again, not just me, but many of my colleagues as well. So, cooperation and cheating – something I'd started to study in zooplankton of all creatures, in theoretical terms, in terms of group selection – of course this is part of the human condition. Benefiting one's group or benefiting oneself is one of the great themes of our species. Individual differences: which kind of baby were you? [Wilson shows the audience a slide; laughter] Or which kind of baby is your child? Why is it that we're so different from each other? And do you know that animals are different from each other too, that animals have personalities, not just mammals, but also even insects have huge individual differences? Why is it that there's diversity within a species in addition to diversity between species? Why does it begin so early, at the same time being amenable to lifetime experiences?

Gossip. Here's a topic that everyone knows about! We can't help but know about it, because we're humans, and gossip is just something we do. We do it so naturally, we don't even think about studying it. It's an understudied subject. And it turns out to be very sophisticated endeavor, gossip is, and very moral in its own way. It's really a very important part of human social regulation that's expressed as it evolved to be expressed: in the context of small social groups. So gossip becomes a fascinating topic to study from an evolutionary perspective. We've done very interesting research on this.

Physical attractiveness. Here's a photo I grabbed off the Web. (Wilson shows a slide to the audience.) It's a bunch of friends, they obviously like each other. If I were to ask you to rate the physical attractiveness of this group, you could give them some number. How about if I were to ask them? And it turns out, when you do this kind of research, that how physically attractive you regard someone is very highly influenced by nonphysical traits, such as how much you like them, what kind of social partner they are, and what kind of relationship you have with them. What is attractiveness from an evolutionary perspective? Why are we drawn to some things and repelled by others? What are the factors that go into that – not just our social partners but our physical habitat? These end up being deeply evolutionary questions.

Individual and group decision-making. Working in groups of course is an enormous theme in education at all levels, but does it work well? Or does it work well some of the time and in some contexts but not in others? Are there certain ingredients that are required for it to work well? Decision-making is a form of cooperation and it's a form of social behavior, and so the general theoretical principles about cooperation – when it works and when it doesn't – are very important for making group decisions that can go well.

Obesity – another health issue – is one of the most terrible problems that we are confronted with. Now, what is happening with our bodies interacting with the modern environment? Why is there this kind of a geographical variation, even within the United States? This is something which is a deeply evolutionary question, and raises among other things the concept of mismatch – a very elementary concept, that organisms are only adapted to their past environments. If I took a lizard that evolved in the rain forest and put it in the desert, all bets are off about its survival and reproduction. And in many respects we are like that lizard that now lives in a different environment. All sorts of adaptations which make sense against the background of our past environment – not just our past genetic environment, but our past cultural environment – are going haywire today. And unless we understand that complex relationship, and what we can do about it, then were going to have serious problems (like obesity) that we don't even recognize at the moment. I think that many of our cultural and communication problems are like obesity, in terms of the mismatch between our evolved psychology, or working in groups, that's going haywire today.

And so that brings us to cultural evolution as a product of genetic evolution, and a process of evolution in its own right. It's thinking of culture this way that brings culture and learning and the open-ended side of human nature inside the orbit of evolution. And so if you're a social constructivist, or a postmodernist, you're not wrong. You just

have to be a sophisticated evolutionist in order to understand what it means, what social constructivism means. What would social construction be, but cultural evolution? We should be thinking about our open-ended capacity for behavioral and cultural change as like the immune system, and I've written on this also. We could continue that conversation.

The arts are a manifestation of current culture. I think one of the wonderful things that approaching humanity from an evolutionary perspective does is to reveal that all of the activities associated with the arts are not superfluous, but are part of the vital organs of culture. And so this actually becomes a way to make the humanities and the arts central to the study of what it means to be our species. You've heard the saying, "No music, no life." That's right, actually. That's how important music and other activities that we associate with the humanities are for our cultures, and as a cultural species we really cannot live without them.

Religion is another manifestation of culture, and I have spent a lot of my time studying very seriously religion from an evolutionary perspective. To make a long story short, the entire toolkit that evolutionary biologists use to study the biological world can be used to study the amazing and fascinating world of religion. It's that which brought me into contact with Bill Green and his work in religious studies. It's hinted at here in this wonderful stained glass window. (Wilson shows the audience a slide.) Does anyone know where this is from? It's at St. John's University in Collegeville, Minnesota, the site of the oldest Benedictine monastery in North America. This is a modern 1930s era stained glass window which has that beautiful honeycomb motif, and religious believers often compare their communities to single bodies and beehives. I'm going to say that they're right. The same theory that explains higher levels of biological organization such as multicellular organisms and social insect colonies explains why religions and other forms of meaning-systems basically organize human life, and cause human communities to be like bodies and beehives.

Finally, as Bill briefly pointed out in his introduction, what I've been doing for the last five or so years is really taking these ideas and putting them to use in the real world. This is my city of Binghamton, New York, and this is the GIS map in which you see these hills and valleys — these are hills and valleys of the quality of the neighborhood. How "good" or "bad" are the neighborhoods? Small-scale heterogeneity in pro-sociality, basically. And so the same ideas about altruism and cooperation, groups and individuals, can be put to use — basically — to increase the quality of life on scales both small and large.

And so I'm concluding the second part of my talk here, and I want to emphasize that this is not fringe science, not future science. It's already arrived. We've already discussed how evolution became stigmatized with respect to human affairs early in the 20th century. Now you often hear the reaction to terms such as evolutionary psychology often stigmatized as "pop science" or "bad science", but I think that any objective analysis shows that this is research that's being reported daily in the top peer-reviewed journals. Here's an example: only a couple weeks ago in *Nature* there was a very comprehensive article relating the cultural evolution of social complexity in Polynesia to linguistic trees that are constructed using phylogenetic methods — which is a long-standing anthropological question. The same methods that are used for biological phylogenies can be used for linguistic phylogenies, and can be used to test hypotheses for the evolution and the devolution — the decline — of social complexities. This is a thoroughly evolutionary approach to this particular topic. So a growing community of research across all disciplines is functioning in the same "tangled bank" mode as evolutionary biologists.

What this sets up — getting now to our main topic of college education — is extreme disequilibrium. What's been happening over the past ten or fifteen years of the level of research and scholarship is not yet reflected in higher education. You all can consult your own experience, but in my experience at virtually all institutions of higher education — from community colleges to major research universities — if you're not a biology major, you're not going to learn much about evolution. You can get your BA, your BS, or your PhD outside the biological sciences without getting any training to speak of in evolution. And academic culture is surprisingly conservative — this among people who regard themselves as freethinkers. Unless something is done, then this kind of thing is likely to persist for decades.

And so, as somebody who is doing this kind of work including humans in the tangled bank for my own research — and having a great time with my worldwide network of associates — in 2002 I decided: wouldn't it be interesting to get something like this going, to have this reflected in the culture at my own university? And so we started EvoS in 2003. Our second program was established at SUNY-New Paltz in 2007; we got National Science Foundation funding to expand

our programs and to create a consortium in 2008; and now, as Bill said, we have groups at over forty institutions at various stages of development. The University of Alabama is our most recent institution to have a full-fledged program, and the University of Lisbon in Portugal is going to the first university outside the United States to have an EvoS program.

The objective of this program is to teach evolution to all students as early as possible within their academic careers, from the very beginning to apply evolution to all human related subjects in addition to the rest of life. I think that the greatest tactical error in teaching evolution is to shy away from human-related subjects. Of course that's what's going to interest students the most, and that has proven to be the case. And then you enable students to continue their evolutionary training throughout their academic careers. The way we do this is very simple, very low-tech if you will. We need to teach an "Evolution for Everyone" course, available to all majors with no prerequisites. We need to offer a multi-course curriculum that can be taken in parallel with any major – that immediately makes a campus-wide program – and then we offer a campus-wide seminar series (an academic seminar series) that has an associated course for undergraduate students, which I will describe in just a minute. What this does is expose undergraduates to graduate-style education. Another thing we all know in this audience is the apartheid between undergraduate and graduate education. Yes, undergraduates are encouraged to do research. But most undergraduates see professors and graduate students in the context of formal courses, whereas graduate education is based not on formal courses, but on creative research, on reading the primary literature, and so on. It's possible to meld these two worlds.

Evolution is famously described as "a tinkerer that builds new things out of existing parts," and that is explicitly the way I thought about EvoS when I built it at Binghamton University. Binghamton is a midsize university and a fine university, but it has many fewer parts than many of our universities. Over the years we had built up a faculty in the biological sciences – we have a strong biological anthropology group – and we had a sprinkling of faculty in the other disciplines that were already doing research and teaching their courses from an evolutionary perspective. And so we could actually put together a program merely by taking those courses which at that time were invisible to the average undergraduate student, and creating a curriculum program in which these are made available to students from all departments. At Binghamton there was already an emphasis on integrated curricula, so the concept of integrating the discipline was already a priority at my university. That's not always the case, but that made it easy for us, because existing administrative structures were already in place. And so we were able to put together our evolutionary studies program just on the basis of intramural funding: pocket change, basically. It was hugely popular among the students, and although it started as an undergraduate curriculum it had a very important additional effect of providing a vehicle for faculty training. Because, after all, most faculty outside the biological sciences have not received any evolutionary training during their own higher education. And so there must be a way for them to become trained, and once they become involved, that becomes a very powerful vehicle for collaborative research. So at Binghamton we're now also a center for incubating collaborative research, and that's functioning very well.

So the basic evolution course for non-majors increases acceptance. I've written about this: *Evolution for Everyone* is basically the book version of the course as I originally taught it, although it's been developed a lot since then. What we've shown by assessing the course very carefully is that it increases acceptance of, interest in, and knowledge about evolution across all categories of students . So, this course works equally well across a range of categories: whether you're a science major or non-major; regardless of your prior training in evolution; whether you're a religious believer or non-believer (strangely enough); whether you're a liberal or a conservative.

We've developed the course to be a real science machine: actually doing science, even in a lecture format. We involve the students as participants in the experiments, and then we also involve them in analyzing the experiments, so they learn quite a bit about the scientific method as we go along. We're actually averaging one or two scientific publications year from teaching this course. So it's actually become a data-generating device involving the students in the process. And now we've designed it to be taught in a coordinated fashion across campuses.

Now let me say a little bit about the EvoS seminar series, because it's something that is very simple, which could be implemented at any college or university, and yet which is very powerful from the standpoint of undergraduate education. This is a campus-wide seminar series. We bring in approximately ten speakers every semester, who

basically illustrate this "tangled bank" approach. So we cover all topics, biological and human, from an evolutionary perspective. Each speaker is co-hosted by the most relevant department, so this becomes a vehicle to expose our faculty colleagues, so they can hear about the evolutionary perspective from someone respected within their own discipline. And it's funded by the same sources that fund any seminar program. So the university did not have to come up with any additional money for this; we simply competed for seminar funds using the normal sources, and because this is such an attractive idea, and one which is so much shared among departments, we get funding every year from standard sources.

What's really great about this seminar series is the course for undergraduate students that's built around it. This is a two-credit course, and it's very simple to do; it must be taken twice as part of the requirement to earn this EvoS certificate. For every speaker – ten times a semester – the students read articles from the primary literature, write a commentary, attend the seminar, and then we have an extended discussion over food and drink, so it's a nice social event in addition to being an intellectual event. So this is an extended discussion in which the students interact directly with the speaker, who is the best and brightest from anywhere in the world on their particular topic. You know how, typically, when you go to a departmental seminar, there's twenty people in the room, you go out to dinner with a few colleagues, and that's the end of it? Our speakers come to campus and speak in a room with over one hundred people in the audience, then they go to this event in which there might be sixty or seventy, mostly undergraduate students, in addition to faculty and graduate students showing up for that particular speaker. And our speakers almost invariably say, "I cannot believe the level of sophistication of these undergraduate students, who are asking me these thesis-size questions. It's amazing."   This illustrates the concept of the university as a single intellectual community.

Here is a sampler of topics from a semester a number of years ago: a talk about moral psychology; another about cancer's evolution within the body; a third talk on experimental economics; another on *The Rise and Fall of Empires*, Peter Turchin's wonderful work on history from an evolutionary perspective; and finally a talk on Barbara Ehrenreich's *Dancing in the Streets*, her book about public revelry through the centuries, which poses questions such as: Why is it that we celebrate? Why do we have this need to party? What's that about? Is that just something superfluous, or is that something very deep about human nature?

So just imagine that you're a student, and in the course of getting your EvoS certificate, you've gone to at least twenty of these seminars. And in each case you've read the primary literature, you've written something about it, you've heard the talk, and you've had the opportunity to participate in a discussion. You've also been able to observe your fellow members of the academic community – faculty members, undergraduates more experienced than you, and undergraduates less experienced than you. This illustrates the value of mixed-age education, and you've done that some twenty times, in addition to whatever formal coursework you're taking. No wonder that our students end up being very sophisticated about this.

I've covered three of my four points, and now I'm down to my last one, about this idea that evolutionary training might just make you smarter. I have received many comments about the EvoS program like this one: "After I got turned onto evolution, I started pulling A's." And we're currently in the process of testing this hypothesis in two ways. We now have several hundred EvoS alumni who've been through the EvoS program, and we can look at their academic records and compare them to a similar set of non-EvoS students – kids in the same majors, in the same incoming year, with similar incoming SATs, etc. – and examine whether evolutionary training actually increases your academic performance. Also, in collaboration with a cognitive psychologist in Binghamton's psychology department, a member of the EvoS Program – this is an example of collaborative research that's incubated – we're now doing controlled experiments using EvoS versus non-EvoS students on cognitive thinking skills, writing skills, and writing samples which have been evaluated for thinking skills.

Now this research is in progress, so I'm not going to report results, but what I do want to do is to discuss the rationale: why would we expect evolutionary training to increase general thinking skills and academic performance? I think the reason is this: evolutionary training inherently involves applying a few basic principles to a diversity of subjects. That is what distinguishes it. It is therefore inherently a domain-general form. At the professional level, the reason someone such as myself – trained as a zooplankton ecologist – can make a contribution to a discipline such as religion is because I am thinking in this domain-general process, and putting things together at the highest level of scientific and scholarly discourse. And so the same kind of thinking which is functioning at the professional level, think of how that's functioning at the level of undergraduate students encountering all the different subjects that they're encountering in their courses.

I think that you can see that this can allow students, instead of learning a bunch of disparate facts, to put them together and relate them to each other in a way that causes them to retain them, and say intelligent things about them, more than they might have might have done otherwise.

I want to end, again at an anecdotal level, by talking about a single person. Omar Eldakar recently received his PhD under my direction. (He knows I'm talking about him, and has approved of everything I'm saying about him.) He's a resident of the Binghamton area. He flunked the first four grades of elementary school; his first grade teacher actually suspected that he couldn't understand English. He entered Binghamton University on an athletic scholarship, and he had mediocre grades until he got turned on to evolution. His grades shot up, he got his doctorate in 2008, and now he's a post-doc at the University of Arizona and publishing this fascinating research on both humans and nonhumans in Science, Proceedings of the National Academies of Sciences, and other journals. I actually asked Omar yesterday, if he would just state for me in his own words, what evolutionary training did for him. And so, with apologies for being anecdotal – next year I hope that I can provide the numbers – but in some ways, I think it's even more interesting to hear from an individual, what did evolutionary training do for this person. So here is Omar in his own words:

> I have learned Darwin's theory of natural selection numerous times, from grade school through my undergraduate education. However, only when I was really taught it not just as a process, but as a new way of thinking, did everything seem to click. By "click," I mean a transition from a GPA of 2.67 in my semesters before taking the EvoS course, to a GPA of 3.70 afterwards. [This is the kind of thing that we'll be able to document with large numbers.] I was about to see the world through a different lens, able to ask why things occur in a powerful, yet incredibly simple framework behind it. From a very young age, we always constantly ask "why this?," and "why that?," yet we often get stuck with explanations of how this, and how that. It's amazing to know that the answer can be so simple, as that certain traits that confer an advantage over others will increase in prevalence over time. For example, such a basic question as why cheaters are most likely to enforce cooperation …

Here I need to add just a little bit of detail. We were doing research, when Omar was an undergraduate student, about cooperation and selfishness, and also individual differences in the propensity to punish cheaters or not. Okay, so there are two individual differences: are you a cooperator or a cheater; and do you punish cheaters or not? And one thing we discovered empirically, paradoxically, was that there is a correlation between cheaters punishing other cheaters. That seems morally hypocritical, right? I cheat, but I'm going to punish other cheaters. And to Omar, in part because he's kind of a street person, actually that made sense. That if you're a cheater, you want to get rid of other cheaters just as much as an altruist might. And so he started to develop this concept of selfish punishment, which he helped us turn into a theoretical model. It has human applications, and non-human applications in – believe it or not – water striders (water bugs). And so this is the kind of thing that I'm talking about.

> So, for example such a basic question as why cheaters are most likely to enforce cooperation; i.e., "Why is hypocrisy so rampant?" began as a curiosity, and later blossomed into a major topic of my graduate studies. This simple reasoning provides insights into corporate theft, cheating in sports, the Mafia, hierarchies, why police are paid, and the behavior of social insects, without having to be an expert in any of those fields. In the end, evolutionary thinking allows us to become an expert in why, and this kind of expertise is unlimited in its application.

And so I hope I have delivered, or at least intrigued you about, my four points. Let me end with this wonderful image, and Darwin's wonderful tangled bank passage. Thank you very much.

"In Search of Creative Solutions: What, in an Age of Diminishing Resources, Does it Mean for a University to be Mission-Centered and Market-Smart?"

Speaker:

Robert Zemsky, Chair, The Learning Alliance for Higher Education

What we forget is just how long we have been at this reform moment *in higher education*. If you want to see the real seeds of it, you need to go back to the 1980s. And in fact, the 1980s were very rich with a series of events that were not really connected, but events which became linked. Probably the best known of all of those key events is still *A Nation at Risk: The Imperative for Educational Reform* (1983). Now, we in higher education love to talk about *A Nation at Risk*, because we tell everybody it has nothing to do with us. That just means we didn't read *A Nation at Risk*. It had everything to do with us; it told us we were doing no better in our job than those in K-12 education. Somewhere along the line the spin doctors in higher education put out the story that it was about *them*, not *us*. But you might want to go back and read *A Nation at Risk*, and you'll see that it was all said back then.

Also in the 1980s, the Association of American Colleges (now AACU) enlisted Fred Rudolph of Williams College and others to produce one of the great reports about higher education, *Integrity in the College Curriculum*. Of course, the answer was "no integrity," but you'd have to read the report to see that. It is an extraordinary report because of its conclusion that there was no longer any coherence or cohesion to the undergraduate curriculum. It talks about a "smorgasbord" of curriculum offerings, and the great line that I always remember says, "It's a curriculum in which anything goes."

Now the AAC got really nervous when this came out; it was not what they thought it was going to be, so they came to us at the Institute for Research in Higher Education at the University of Pennsylvania and said, "Could you verify what Rudolph and company said?" And I said, "What do you mean?" and they said, "Well, they said all this "disconnected" stuff in the curriculum, could you verify that that's the case?" And I thought about it a little while – I thought about it with my colleague Susan Shaman in particular – and I said, "Well, I tell you what: you have a lot of money, and a lot of institutions willing to give us their full transcript data. We can take it on."

It's an interesting story. We spent a million dollars on this project. That was a lot of money then – even now it's a lot of money, not quite as much now as then – and we had the complete transcripts from more than eighty institutions, including Harvard. (Now those of you from Harvard know that you're not great at sharing, so it was something of a coup to have data from Harvard.)

It's a very complex task to "machine" that much data. Statistically, it's not difficult, and we had some very simple ideas. So, if there was an ordered sequence to the curriculum, two things should happen. You would have to take course "A" before you could take course "B." We could go into the transcripts and see if that had happened. And we started with this simple idea that if 90% of the students in B had taken A, we could conclude that A was a prerequisite to B. But it turned out that we couldn't do that. We had to drop that standard down to 75% to get any prerequisites.

The other thing that we could do is say, "There is this argument that there are these beginning courses, middle courses, and advanced courses, and *Integrity in the College Curriculum* says that's not what happens." And sure enough, that's not what happens. We were able to go in and show that there were as many freshmen and sophomores in most classes as there were seniors. Because you could see in these transcripts that there was no connectivity; there was no ordered

sequence. In some ways, we didn't make a big deal out of it, but we could have argued that *Integrity* put a nice coating on what was really an unexpected result.

Then in the 80s we began publishing *Policy Perspectives*, and we had a great run at it. I always like to visit Washington, DC, because the first day that the first issue of *Policy Perspectives* was issued, the *Washington Post* (which at that point was not an outlet for Kaplan, Inc.) ran a lead editorial about this brand-new journal that had no traction.

For other reasons, that *same* day we met with the presidents of the Association of American Colleges – fifty to sixty of the "cardinals" of higher education, plus University of Chicago President Hannah Holborn Gray – and that was diversity for the AAC – and we presented all this. To dead silence, of course. And we said that there were three basic issues facing higher education in the mid-80s: access, quality, and cost.

What else happened in the '80s was – toward the end of the 80s – Henry Rosovsky gave his farewell address as Dean of the faculty of Arts and Sciences at Harvard. It's one of those oddities of academia: apparently he forgot that the minutes to those things get published, so what he thought was a private communication between him and his colleagues actually got published. I've quoted it more than once – I quote it again in the book – and Henry is never happy when I quote it, but it is such an amazing communication, that speech.

He looks out there (that isn't in the transcript, but I can picture this, because I know Henry), and he says, "You know what? You have broken the social contract, you faculty." This is the 80s, and what he's talking about is that the faculty are mostly out there doing their own thing, mostly not on the Harvard campus.

And in the middle of it he tells a story of meeting his colleague, who is rushing in to his 10:00 class, and says to Henry – a mistake, apparently – "Henry, I took the red-eye to get here," and Henry apparently says, "What the hell were you doing on the red-eye, you were supposed to be here all along."

Now Rosovsky doesn't say this in the address, but what you read there is that he is telling his colleagues: *You have become independent contractors. You're not dependent on each other, you're not really dependent on us, except that you like the brand and you like the money. You are independent contractors.*

And if you read *Integrity in the College Curriculum*, what that was saying is, if you have a bunch of independent contractors delivering your curriculum – not just delivering it, but designing it, owning it, protecting it – it's going to look like it did: a lot of very granular, independent experiences. And then if you come and do the statistics on the transcripts, as we did, that's what you're going to see: all this granularity.

Now this is twenty-five years ago I'm talking about. I'm not talking about ten years ago, I'm not talking about even fifteen. Twenty-five years ago, this was known about higher education. So I come to come to write the last chapter in *Making Reform Work*, and I literally – this is a true story – I say, "Well, the three big things are participation, learning, and cost." And I had a colleague read the draft, and *he* said, "Bob, this has all too familiar a ring. Did you not go back and read your own *Policy Perspectives* of twenty-five years ago?" And I did go back and change the text, because that's what I'd said all along.

Look, gang, this is the same agenda that we've been on for far too long. It's an agenda that, if you're still at the starting point twenty-five years later, then you have to begin to draw some conclusions that aren't necessarily warm and fuzzy, or flattering, but I think that are necessary. Now the first conclusion you might draw from this story that I'm telling is that the money bet – you know, that's what you do in Las Vegas, you don't need to know the full odds, you just need to know the marginal odds – the money bet is that we're not going to change. That we will continue to have interesting experiments – and we have lots of interesting experiments – and we will continue to try new things, and we do that all the time, but that we will not change the basic nature of the organization – what we do most of the time.

I'm always reminded of the importance of the money bet, because I once shared a platform with Robert Reich. And to be perfectly honest, I did not know that he was, as he describes himself, "height challenged." This was a very large audience that one of the big accounting firms had put together. This was one of those "Come to Florida, we'll get somebody to shout at you, but go play golf in the afternoon" conferences. So Reich and I were the people shouting, and it didn't matter what I said, because this is what Robert Reich said that morning.

The conference was sometime after 1987. Remember in 1987, three things happened: the Bay Bridge in San Francisco collapsed, *U.S. News and World Report* issued its first college rankings, and the stock market dropped by 500 points on a single Monday – all this roughly at the same time. Now 500 points then was about 2,000 to 3,000 points now, just a huge drop. And it turns out, Reich says, he was appearing on the *Today Show* that day of the big drop, and they asked him – this is in the morning, and the markets haven't opened yet, and they asked him, "Do you think one of these days, the market is going to have to have an adjustment?" And as Reich tells the story, he said, "I think it could happen this morning, as a matter of fact." And, he says, "For the next three months, my phone didn't stop ringing. I had every speaking engagement you could possibly imagine, because they want to hear from the genius who knew in the morning that the market was going to take a big drop." He said, "You know what they never asked me?" No? They never asked him, "Have you ever predicted that before?" And he said, "You know what I would've told them? 'Yes, every morning for the last three and a half years, I've said, some morning, most likely this one, the markets can drop.'"

The moral of the story is this: every once in a while, when you make these predictions that keep not coming true, they can come true.

So I'm still going tell you that the money bet is that we're not going to change. That we will absorb some changes, but that we will go on. We'll even, like a kidney stone, pass this current economic crisis. "This too shall pass."

But, just maybe, this may be the moment when to predict change is to make the right prediction. We might look at the signs – the tell-tales, if you're a sailor – that say out there: "The breeze is quickening, and in fact it could get quite stormy."

The most obvious one is this recession. And this recession, not because it's a recession.   We've had recessions just as bad before, and we're very fond of calling this "the Great Recession" -- we had recessions in the 70s that looked like this.

What is really different for us in higher education is that this time we have all these public institutions dependent on public appropriations that just aren't there. There are two groups of people in this room. (In fact, there are really three). I don't know where you belong, which one you belong to. But there are people in private research universities who like to pretend they're under strain, but if they're really honest with themselves, they say, "What strain?" There are – and there won't be many of you here, given the mission of the Reinvention Center – but there are people in research-oriented liberal arts colleges, who really are beginning to worry if they have an economic model that's going to survive.

But mainly it's the public institutions that say, "The world is fundamentally different. Something has happened. We've got furloughs, we've got layoffs, we've got three years with no salary increases, and – by the way – I can't come to your meeting because we have a freeze on all out-of-state travel." The recession is not just taking resources away from those institutions; it is also impacting them by sending them more students, so that they are sitting there having to teach more with less, with this independent contractor model that isn't exactly working for a "teach more with less" world. And then, if you think about it, not only are they going to have to teach more with less, but the extra students they are going to teach are even less prepared than the students they are teaching now. That is, by all definitions, "a perfect storm," and something is likely to happen. So just the fact that you can't pretend the money's coming back anymore, you all. You're all going to have to think about, you're going to have to readjust what you're doing. That's just one of the big tell-tales that's out there.

The second big tell-tale is what the chapter on "Were Learning to Matter" is really all about, and that is, we are learning things about learning that just change the way – or ought to change the way -- we do things in the classroom. I don't know James Zull. I'm sure I've increased his book sales five-fold, but what I am talking about is his book, *The Art of*

Changing the Brain. He is not a neuroscientist; he is a biologist. He has had one of the greatest tasks of all time, teaching pre-med students at Case Western Reserve, because that's what they do at Case Western, and the biology department teaches them all. And he got interested in what the neurologists and his neuroscientist friends were talking about.

So he writes on the art of changing the brain. I recommend it highly to all of you; read him, not me. Because what the neurosciences are teaching us is that *learning is not metaphorical or conceptual. It is physical*. That is such a profound insight. This subject we talked about metaphorically for so long actually has a very real physical dimension. And he tells lots of stories in that book about how you can apply this insight, but the most interesting one to me was, you know what most of us do, we faculty? When we start a course – as an independent contractor who doesn't want to be bothered with what other independent contractors have said before – we always tell our classes, "You know, I don't care what you think you know, just forget it. I'm going to tell you how it really works." And some of you recognize that's what you do, in one way or another.

What the neuroscientist says is, "Don't do that! That's not how memory works. You actually have to de-learn by talking about what you know." So he says to use the simplest teaching tool: *Go ask your classes to tell you what they know*. Don't start with what you know, because you're going to have to work with it.

What's coming out of the neurosciences is moving at galloping speed. I got told – people now bring me these things because they know I'm interested in it – so I got told a week ago, I guess, of a set of Harvard experiments where they're doing brain scans where they show images to various students, about where the images actually trigger responses in the various parts of the brain. And it was a very interesting experiment, as you might imagine. Because they want to get funded, they were taking pictures of African-Americans and showing them to whites to watch which areas of the brain lit up, but they also took pictures of whites and showed them to African-Americans, and as an afterthought, they actually took pictures of African-Americans and showed them to African-Americans. And you could *see* the responses in the brain; you didn't have to imagine it. You didn't have to go and run a regression analysis or factor analysis; you could see it. That's going to change. So that a tell-tale that's out there.

Another tell-tale is the for-profits. Now, there are two kinds of for-profits: there are the bottom feeders, and then there are the sort of interesting for-profits – who occasionally feed on the bottom too – but that's not mainly what they do. What Kaplan and Phoenix and DeVry, Argosy and Strayer and Capella – what they're doing is really interesting, and it's a whole different model. And that's not their business, to give us the lie. We always say the only way to do it is the way we do it. But they are out there doing it differently, and they're now doing it with such significant numbers of students – and those students seem to be succeeding, or at least choosing them – that we simply can't say, "There's only one way to do it, it's our way."

So not only is there the competitive piece of the for-profits. It's just actually different. Some of you may know that at Penn we run an executive doctorate program. This is for upper-level administrators without a doctoral degree who think they need to be called "Doctor," in order to become a college president. It's a very remunerative process, I will tell you that. But because we have far fewer slots than we have qualified applicants, we made a decision with the faculty group about four years ago that we would recruit people out of the for-profit world to be students in our program. And it's fascinating. They have changed the conversation.

One of the great books out there – which most of you don't know about but which you really should – is Peter Cappelli's *Talent on Demand: Managing Talent in an Age of Uncertainty*, which is really about the contingent workforce in the business world. It's not about higher education, but it's about how the labor market has changed. Well, none of my traditional students knew the Cappelli book, but all my non-traditional students knew about it. They do talent management. They have labor ratios that are so different from ours – they try to get how much of the revenue goes to cover the teaching down to 40 to 45%. They consider it successful if they're at 60%. We just take it for granted that 85% of the money we spend will get spent on us, or other people, or the support staff.   You know, that's a whole different model. They put money in the front end of the course. Real money -- a million, two

million dollars to start a course. We start new courses by giving the faculty member one quarter off. They put real money out there. Why? Because *they own the course*. They have independent contractors delivering the curriculum, but they do not have independent contractors owning the curriculum. And that is a *very* different model.

Another thing – which means less to research universities but means everything to the comprehensives – is that they really are networks. So every outlet – and it's much better to talk about the Phoenix outlets, although they don't like it, they like to talk about campus, because that's our lingo – but they really are outlets on a node. And I talk about this in the book. It's an interchangeable node, and it means that what you get in one outlet is, you can move to the next outlet. That's called transferability, and it's seamless. It is truly seamless. So when we say, "Well, no, you can't possibly have a transfer system that works," well, they have one that works! And it works well, actually.

They have also made a discovery that we in the traditional world are coming slowly to discover, and that is, once again, we're on the march into a future where a high school degree is not sufficient, and a college degree is no longer sufficient, and the new world is going to be all about a professional finish to higher education. In the world of professional Masters' -- professional Masters' are increasing overall about 3 to 4% per year. But the for-profits -- four years ago, the for-profits had 2% of the professional Masters' granted in America. The last time they did the data, which is really 2009, it had 8%. That is a curve that's just out of sight, and that's because they target their audience. That's the other thing the for-profits do, they target. And that makes a difference. So that's another tell-tale that's out there.

And then, there is a growing recognition, I think – or I hope, I guess is the way of putting it – that we are not going to make any progress on this until we start talking about the curriculum, and what we as faculty do. Joni Finney and I have an article that appeared last May in *Crosstalk* that says, "You know what the biggest challenges to higher education are? You graduate too few people who start, and you cost too much money." If you're a president, you spend your life defending against those two propositions. And what I found myself doing about six months ago – I was trying to think through what this is about – I found myself writing what I would come to call the 'Clintonesque statement.' No, I didn't write, "It's the economy, stupid," but I did type – I literally felt myself typing – "It's the curriculum, stupid," and for the last six months, I have just been overwhelmed about how obvious that insight is.

Just up the road from here in DC is Towson University, a very good comprehensive university in Maryland. I went to talk to the Provost at Towson – we're trying to interest her institution in being part of one of our big projects – and I had said that I thought I had the answer to under-enrolled classes (we were going to change the curriculum) and she sits me down and she says, "Bob, you're wrong." I do not like it when the conversation begins, "Bob, you're wrong." Nonetheless, she was right. But what she said to me was just amazing. She said, "You know, Bob, we don't have under-enrolled courses. We have over-enrolled students."

What she meant was that at Towson, more than a third of her graduates – that is, the people who survive – graduate with 145 or more credits in a 120-credit curriculum. Don't worry about all the money that the students extra-spend. Just take a look at what the state of Maryland spends to create the classroom spaces for that.

I was at the City College of New York yesterday. (They are a part of the same project.) And the average—not a third, but the average – number of credits on transcripts of students getting a B.A. from CCNY is 140. This is a sure sign that something has gone wrong.

Three weeks ago I was at the University of Wisconsin - Oshkosh (and this was a great disappointment, my kids grew up in Oshkosh B'goshes all their lives, and now that my daughter has got kids of her own, she says, "Dad I want to go see the factory, just for the fun of it," and I had to tell her they don't make Oshkoshes in Oshkosh anymore). But it's an interesting university – they get a third of their students from a ring of community and technical colleges, and these students arrive angry. And why do they arrive angry? Because nothing that they did at their previous schools transfers. They get the units on the credit, but they do not get the boxes checked in the General Education requirements, and none of the boxes checked in the prerequisite for major. So I'm facilitating a roundtable, which I've done all my life, and I say, "What's going on here? What do the Gen Ed requirements look like?" And the person next to me, who was responsible for me being there – she's there to kick me in case I get into trouble, I suspect – but nevertheless, she hands me the sheet

of paper that is laying out the Gen Ed requirements, and you have to be my age to really appreciate this, but what it looked like was a bad FORTRAN flowchart. And so I say to them, "How did it get like this?" And they know this is the result of not one, but two failed attempts to change the General Ed requirements. And each time they've started they had to patch something together at the end. And what the issue was there— and now I know elsewhere as well – what the Gen Ed requirement really is, is a temporary peace treaty in a turf war, and it has nothing to with what the students are learning or what they need. It has everything to do with preserving appointment opportunities in the departments. And I've told this story now – we've only had the story about three weeks, it happened about three weeks ago – I've told over and over again, and watching your reactions, you know what I'm talking about. And it's very simple. I said, "Well, I can solve that problem for you. Just agree that you'll have a new Gen Ed requirement – or not Gen Ed requirement, but a Gen Ed environment, learning sequences.. we don't need requirements, we need learning after all – and guarantee every department that's got ten slots in the current system, that they will get ten slots in the new, but they will have to send those faculty into a common design pattern, to actually design the learning sequences. We cannot go on, or, you can't go on, I guess I said, with a system in which your Gen Ed is simply a menu of courses that the faculty want to teach, and somehow minimally meet your own notion of what a Gen Ed requirement is. And then they too began talking like Henry Rosovsky, which was sort of nice: "We've got to stop being independent contractors," they said.

It was the same conversation I heard two weeks earlier at Northern Arizona University. In fact, when the faculty there started the conversation, I thought they were just making fun of me by telling me what I wanted to hear, and I kept saying, "You don't know what you're talking about," and eventually they said, "Shut up, Bob, we know exactly what we're talking about. We have to return to collective action, or none of this is going to work."

So let me lay out in the last few minutes that I have here how we would know that learning was starting to matter. How would we know that this wasn't just another reseeding? Well, some of you may know Lloyd Thacker, who's out there with the Education Conservancy, who says that all this starts with the admissions process. And I think he's right. And it isn't just that we compete. It's that when people come onto our campuses, they don't want learning. You know, this is an insight I developed actually twenty-five years ago. In *The Structure of College Choice* – the first of the big market analyses that I did, in conjunction with Penny O'Dell – we said, "Look, we can give you the whole structure, and we never even need to know what the curriculum looks like, because it doesn't matter."

I have a colleague, Ann Duffield, who took affront at that. She said, "Well, I think learning matters; it matters to me." Meaning, to Ann. And I said, "Well, how come?" And she says – and I know her children, they were smaller then, they're grown now – "Well, Gareth, you know, is learning disadvantaged." He was. He's now an advanced student in psychology. So this is a good news story, (Don't worry, I'm not going anywhere I shouldn't.) But what she pointed out to me then was that, as this child was going through school, she knew how that child learned, and what that child needed. And you know people – I'm talking about some of you, and you know that – you form very effective networks if you have learning disadvantaged children, and you share stories. So what she was getting at was that, even though her children weren't ready for college yet, she was getting the stories from the parents of what happened when learning-disadvantaged children sought college admission, and she said we know what learning means, even if nobody else does.

And then I began talking to admissions people, and they said, "Oh, yes, when we get one of those on our tour, we sort of take them aside. They're going to ask all kinds of different questions, because they know how their kids learn." Just imagine how different our world would be if in fact parents knew how their children learned, and what they needed. And that there was a real discussion – not amongst us to start with, other than that we're parents – but among them.

Now there's an old saying in business: "You get the consumers you deserve;" or, "consumers get the businesses they deserve." We need to encourage a different language about learning in the parent community.   Thacker says it's about values. I have no idea what that means, but it is about how people learn. And they will learn differently,

but not that differently. The other thing you get out of the Zull book is this: all this talk about learning, those infinite numbers of learning styles – apparently that's not true. There are four or five styles; it's not infinite at all. But they're different. So that would be one tell-tale.

A second tell-tale, if learning really were to matter, is that we would actually have real curriculum change across this enterprise, such that we no longer offer smorgasbords. It's that simple, and it's really, really tough, because there are two groups of people who just love the smorgasbord: the students like it, and the faculty like it. And it is not working. Some of you teach regularly. Remember that frustrating moment when you know the class is supposed to know something because they been in this previous class and you discover—you're launched forth, and you have all these blank looks at you like, "What are you talking about?" It isn't working at the students' side because they're not connecting their learning experiences. There is lots of evidence about that. So that everything becomes a singular task to either excel in (probably at your institutions) or survive during (at most institutions), but they aren't connected.

My argument (in collaboration with Joni Finney) is that we can move a long way towards this by introducing pathways as opposed to course options, so that a student essentially would know what was going to happen to them for the next two or three years if they took this pathway. Not only would the student know, the institution would know, and it *would* be able to arrange its assets accordingly. It's no wonder we can't control costs. We are constantly in this endless business of supplying a cafeteria line that has no limits to it whatsoever, and so there's huge wastage. There's either wastage in terms of under enrolled classes, or there's wastage in the sense that we've got overenrolled students. But there's mainly wastage in terms of learning opportunity.

Now some of you know that I also push the three-year degree. I started actually pushing the three-year degree because I was looking – and I'm pretty clear about this in the book – I was just looking for something that would shake people up enough. My disruptive event. I decided I did pretty well, that that would be a great disruptive event, if we all really had to do three-year degrees, a three-year curriculum. You don't have to do it in three years, but the standard would be for three years, and we would then have to redesign almost everything, and then something like the Reinvention Center would have a major calling, because that's what this is about. So that's the second thing that has to change.

And the first or the third thing is that we've got to end the model of the independent contractor. And I don't want anybody to misunderstand who I am. I am one of the great independent contractors of all time. I talk about *my* students and I talk about *my* course and I talk about *my* research and mostly I talk about *my* money. That's what we do. That's what this culture is about now. It's a possessiveness, because we are self-contained, we're sealed off. And you can't tell somebody to end that. They have to come to the conclusion that we can't accomplish what we need to accomplish without ending that. There's no rhetorical way that I can explain to a faculty that you have to stop being independent contractors. They're going to look me in the face and say, "What's the problem Bob? I don't understand." But if you're at Northern Arizona or you're at CCNY or you're at Oshkosh, or you're at several of these institutions in California, you know that you have to produce an environment that's different, and you need the faculty to be different. And what I say repeatedly – and I spend a lot of time now in front of boards, because public boards think they're going to mandate this, and I get really weak-kneed when I'm standing there, because I don't want to be guilty – I say, "You know, you can't do anything. The only people who can do what you are talking about are the faculty." But what I know is *that* an awful lot of faculty want to sit this one out. They want to wait for the money to come back, or wait till they retire, or wait for me to go away.

My revenge is in the new manuscript I've started: the chapter on faculty is tentatively called, "A Camp Just North of Armageddon." But that's the challenge. I can't embarrass them. What Miller thought he could do was embarrass them into change. Well, we're impervious to that. But we are problem solvers. That's what makes us academics: we are problem-solvers. And these problems I've laid out for you cannot be solved by independent contractors. They can only be solved either by the for-profit model, which is a corporate model, or by the model that I hope we will adopt, which is a true collective model, where we gauge our collective activity.

Proceedings

Science and Technology

Evaluations of the STEM fields—Science, Technology, Engineering and Math— have come to permeate discussions about the quality of education in the United States. The K-12 system is perceived as being unable to provide the kind of rigorous foundation in these subjects that would undergird success at the college level. Alarming evidence suggests that insufficient numbers of first-year college students are attracted to these disciplines, and that many undergraduates who enroll in the STEM fields change to other majors before graduation. The private sector absorbs many of the college graduates who earn degrees in the STEM disciplines, resulting in only a modest number of students who go on to pursue graduate work. The vicious circle in the STEM fields continues in graduate school, as studies show that many of these graduate students fail to earn the terminal degree.

Research universities can play a key role in turning this vicious cycle into a virtuous one. Reinvention Center campuses are clearly eager to reshape their curricula in ways that will better support success in all STEM endeavors.

In response to the national dialogue about these issues, the 2010 Reinvention Center meetings offered sessions under the categories "S is for Science" and "E is for Engineering."

S is for Science

Two sessions focused on undergraduate science curricula: one on astronomy, a fairly traditional field of study, and the other on a newer endeavor, global health. While at first glance little seemed to link these presentations other than their science connection, each session offered innovative approaches likely to strengthen student engagement in these fields.

In his presentation, "Skynet: Opening the Heavens to Everyone Everywhere," Daniel Reichart, Director of the Skynet Robotic Telescope Network at the University of North Carolina at Chapel Hill, described the ways that student constituencies, K-12 teachers, and the public at large can have first- hand experiences with leading edge scientific research.

Funded primarily by the National Science Foundation and by the American Recovery and Reinvestment Act, Skynet is a growing collection of fully-automated or robotic scientific telescopes under the control of software developed by the University of North Carolina. Spanning three (and soon four) continents, Skynet is an easy-to-use, Web-based resource shared between participating colleges, universities, and individuals. Originally conceived to observe cosmic explosions called gamma-ray bursts (GRBs), Skynet has now taken nearly three million astronomical images for hundreds of professional astronomers, thousands of high school and post- secondary school students, and tens of thousands of middle- and elementary school students and members of the general public. Attendees at Reichart's presentation gained a sense of the Skynet experience when they witnessed as a participant in Virginia manipulate telescopes in Chile from her laptop computer.

Skynet's global, remote capabilities will not only significantly impact UNC-Chapel Hill's ability to study GRBs and other transient and time-variable phenomena, but will also similarly impact effect research and research training carried out by its broader user community. Furthermore, these efforts will significantly grow this community, opening Skynet to the user communities of the Whole Earth Telescopes and the National Radio Astronomy Observatory (NRAO). The ability to experience the thrill of scientific discovery from remote locations will, it is hoped, stimulate students at all levels to further explore astronomy.

Whereas many students come to college with some prior exposure to astronomy, the field of global health is a new discipline which is rarely incorporated into high school curricula. Nonetheless, global health is an increasingly popular and clearly much-needed area of scholarly inquiry and engagement on research university campuses.

In "Global Health: A New Model for Cross-Disciplinary Scholarship," Heather Wipfli of the University of Southern California (USC) described the multi-pronged efforts that she and her colleagues are pursuing to capture and sustain student interest. Just as Skynet has a dimension available for high school teachers and students, bringing students to the on-campus science center, USC's Global Health Initiative provides a pathway for high school students, inviting them to participate in a two-week residential program. These summer courses for high school students are interactive, engaging, and challenging, allowing students to explore new areas of study or build on their high school coursework. In addition to the academic experience, students explore the USC campus, attend social activities and participate in excursions throughout Los Angeles. Residential students are afforded a unique preview of college life, living in the same residence halls and eating in the same dining facilities as USC undergraduates.

USC's Institute for Global Health serves as a locus for education and training programs, with the campus currently offering three degree tracks specific to global health, and many minors and programs dedicated to complementary issues. Global Health Initiative faculty have developed several auxiliary programs that will enhance the appeal of the program for undergraduate students. Meaningful opportunities are provided that allow students to take what they are learning in the classroom and the laboratories and put it to real work in developing countries: undergraduate, graduate, and pre-doctoral students can apply for immersion grants that will support their projects in countries in the developing world. Thus, high school students participating in the Global Health Initiative are given a taste of college life, and college students are given a glimpse of the working world of the 21st century researchers.

E is for Engineering

In many ways, undergraduate students who major in the engineering fields are academically isolated from their peers at research universities. Until quite recently, most engineering majors had to succeed in a number of college and science and math courses prior to actually taking an engineering course. The curricula of engineering colleges are often highly prescribed, leaving engineering students with little time to take advantage of elective courses and co-curricular activities such as Study Abroad and non-engineering internship placements.

Faculty from three engineering schools described their efforts to attract students to their discipline and to provide them with a rich and rigorous grounding in engineering.

To increase the attractiveness of engineering to high school students and to better foster degree completion for enrolled undergraduates, faculty at the A. James Clark School of Engineering at the University of Maryland revamped their entire undergraduate program. The faculty presenters – William L. Fourney, Kevin M. Calabro, Darryll Pines, and Paige Smith – reviewed their reasoning for the changes as well as the new features of the Clark School of Engineering's curricula.

As has been the case in other science disciplines, outreach to high school students with a goal of encouraging them to envision themselves as college students in a STEM field is now seen as a viable undertaking for research faculty.

The Keystone Program is the College's first- and second-year program that focuses on engaging, retaining, and graduating a larger number of engineers by providing first- and second-year students with access to the best teaching faculty, a challenging curriculum, and support to help these students adjust to the academic rigors of engineering. Each program engages students by providing engineering and pre-engineering students with

experiential and hands-on learning activities. Of particular interest was ENES 100, the course required of all Clark first-year students.

ENES 100 is a project-based course that requires students to work in teams to develop a complex and multidisciplinary product. Students must apply engineering principles, computer software tools, and technical communication skills to meet all of the product performance and project reporting requirements. The current implementation requires students to design, build, and test an autonomous hovercraft. Students in all sections receive the same set of product specifications on the first day of class. The current project is extremely challenging and requires the successful design and integration of structural, levitation, propulsion, power, sensors and controls sub-systems.

As is still true for many engineering colleges, the percentage of women who graduate remains disappointingly low. The hands-on components of the revised engineering curricula appears to be quite attractive to women students. Also, female Clark undergraduates can opt to participate in a Women in Engineering Living and Learning Community.

In "iFoundry: An Alliance for Promoting Innovation in Engineering Education," Professor Ilesanmi Adesida, Dean of the College of Engineering at University of Illinois at Champaign-Urbana, and President Richard Miller of the Franklin W. Olin College of Engineering in Needham, MA described a curriculum incubator effort that involves faculty from their respective universities.

Initiated at Illinois, iFoundry is committed to the following principles: (1) principled, effective, and piloted change; (2) respect for faculty governance; (3) the honoring and support of student aspirations, choice, and engagement; (4) active corporate, alumni, and supporter involvement and consultation; and (5) open, viral dissemination and gathering of feedback on iFoundry transformative efforts.

The program was piloted with the incoming 2009 freshmen class. The success of the 2009 iFoundry freshmen pilot lead to a Fall 2010 roll-out of the experience to a larger number of students. Specifically, the Illinois Engineering Freshmen Experience (iEFX) is being offered to freshmen admitted in 2010.

iFoundry is also actively creating new courses at the University of Illinois to put in place experiences in the sophomore year in 2010. Chief among these are two courses being piloted in Spring 2010 for launch the following year, "Foundations of Business and Entrepreneurship" and "User-Oriented Collaborative Design" were developed at the Franklin W. Olin College of Engineering in Massachusetts. iFoundry faculty are working with their Olin colleagues to carry those courses over to Illinois in a manner that scales to a large public university.

The presentations on STEM education at the 2010 Reinvention Center meetings revealed the extent to which research university faculty and administrators are committed to addressing the world's needs for an intellectually versatile generation of scientific leaders. By partnering with one another, deploying resources from funding agencies and the private sector, and reaching out to the K-12 community, academic leaders are expanding their reach.

Performing Arts

The teaching and learning that occurs in the so-called "three Ls" – lecture halls, libraries, and laboratories -- has traditionally dominated discussions about undergraduate curricula in research universities. With innovation and creativity as central components of the 2010 conference theme, the organizers were keen to incorporate the teaching of the performing arts into this year's offerings. Anchored by Stephen Tepper and Elizabeth Long Lingo's plenary address, "The Creative Campus: A Guiding Framework for Catalyzing Non-Routine Engagement in Higher Education," the conference featured five break-out sessions focused on the performing arts track.

Eager to offer a variety of institutional perspectives, the conference leaders selected presenters with a range of academic positions on their campuses. The break-out sessions were led by: a teaching faculty member without administrative responsibilities; a faculty member responsible for running a campus arts initiative; a humanities institute director; a dean; and a performing arts director.

In "Meeting Place for the Disciplines," Caleen Jennings, professor of theatre and co-chair of the Department of Performing Arts at American University, reminded the assembled faculty and administrators of **the** fundamental tool used for theatrical performance: the human body. In the course of her 90-minute session, the eternal basics of performance were modeled, enacted, and debriefed. Insisting on full physical engagement on the part of the attendees, Jennings coaxed the group out of their chairs and encouraged them to experiment with their voices, faces, and limbs. Although the portal for this session was theatrical performance, its intended impact was much broader. Jennings summarized her intentions in these words: "My thinking was that if we, as administrative leaders, can experience it [performance], we can challenge our faculties to do so. Only by inspiring and daring our faculty can we have the chutzpah to ask our students to take risks. I believe to my core that when we step into a character's skin, put on that character's shoes, and speak through that character's experience, we are transformed."

In his presentation, "New Technologies/New Pedagogies," John McGowan, Director of the Institute for the Arts and Humanities at University of North Carolina-Chapel Hill, shifted the focus to the creation of informed and engaged audiences for performance. Faculty at Chapel Hill have developed courses in which students are given structured "scavenger hunt" assignments that teach them how to find information without using Google. They also learn how to recognize sources of information and evaluate their trustworthiness. One such course has freshman attend the concerts, plays, and performances brought to campus by the Carolina Performing Arts Series. Students research the performers ahead of time (without the benefit of Google) and then use what they have learned to write program notes, reviews of performances, profiles of the artists, and standard academic essays. McGowan believes that organizing classes in such a way is one key method of engaging a new generation of students who are online much more frequently than in the library stacks, and who are not inclined to passively receive information in the traditional manner. His presentation ended with both a discussion of models of student research for the humanities and arts (which McGowan believes pose specific problems), and a consideration of how to get faculty buy-in for such dramatic changes in teaching styles and the organization of undergraduate courses.

The ability to transcend the boundaries inherent in college campus structures was paramount in the three breakout sessions that showcased best practices from three universities. On these campuses, senior leadership conveyed clearly their support for widespread artistic opportunities for all of their stakeholders. While the traditional academic

departments continued to offer high-quality art courses for their enrolled students, generous physical, financial, and human resources were deployed in order to saturate the campus with other artistic opportunities.

Susie Farr, Executive Director of the Clarice Smith Performing Arts Center (CSPAC) at the University of Maryland, spoke about the innovative approach taken there since the opening of the Center in 2001. The CSPAC website describes itself as "the epicenter of a vibrant collaborative performing arts community." Unlike most university performing arts centers in the United States, the University of Maryland's center has made collaboration a basic operating tenet from the outset, by means of partnerships with the School of Music and the University of Maryland School of Theatre, Dance and Performance Studies. It also provides a "home for artists (student, faculty, visiting), where growth and development are supported;" Artists in Residence are linked both to an academic department and to the Smith Center.

Farr's presentation outlined some of the contextual factors and practical decisions that have helped make CSPAC successful. First, the mere presence of a new and innovative performing space on the Maryland campus gave added impetus to the efforts to implement a collaborative approach to the performing arts on campus. Second, the Center provides most of the production support services for the academic units at no cost to their budgets. Third, CSPAC staff regularly engage the faculty on which visiting artists should be brought to campus, and how they can best engage the artists with the students and their curricula. Lastly, the Center continues to enjoy generous financial support from several funding streams – not only traditional student fees, but significant state appropriations as well as ongoing funds from a sizeable endowment.

Jonathan Berger of Stanford University documented the steps and missteps encountered by the faculty who designed and implemented that campus's signature Stanford Institute for Creativity and the Arts (SICA) project. Stanford faculty members from several traditional academic departments developed multiple co-curricular and extra-curricular programs to enable their students to both create art on their campus and to explore art off-campus. Berger readily acknowledged the potential for conflicting priorities in a situation where a separate and generously funded entity (such as SICA) required the cooperation and good will of academic departments in which resources might be quite scarce. Nonetheless, Professor Berger wholeheartedly agreed with the SICA faculty leaders' conclusion: "Imagination, originality, and risk taking should not be by-products of a university education. They should be at its core."

Reflecting on his decision to invest his university's resources in the arts, University of Southern California President C. L. Max Nikias noted: "The arts and humanities are our teachers, helping us discern what it is to be truly human and to live together in human society. They illumine our way." Ambitious to have all of its undergraduate students literate and conversant in the arts, USC launched its Visions and Voices program in 2006. Each year the program has grown and now mounts dozens of free lectures, plays, concerts, readings, and panels each year. Visions and Voices events are designed to contain a reflective component during which audience engagement is solicited and encouraged. Grant funding is available so that students and faculty can propose events they would like to create and share on- and off-campus. Madeline Puzo, Dean of the USC School of Theatre, praised the foresight and courageous thinking of President Nikias while acknowledging the occasional tensions that can arise between traditional departments and campus initiatives.

Stephen Tepper and Elizabeth Long Lingo's plenary address called to our attention the increasing demand for creativity on college campuses, both from the students' perspective and that of the world outside the university, and described their efforts to seek and promote creativity both in and out of the performing arts disciplines. Jennings reminded us that we carry the performing arts with us in our own persons, urging mindfulness to the constant opportunities for performing arts on a personal scale. McGowan emphasized the importance of appreciating the arts through thoughtful engagement with the artists through research, and demonstrated new approaches to research methodology. Representatives from the University of Maryland, Stanford University, and University of Southern California described their university's investments in the arts with new programs, facilities, and approaches to integrating performing arts programs with the campus as a whole.

Learning Inside and Outside the Classroom

For more and more members of research university faculties, the subjects we teach, the assignments we expect from our students, the spaces we teach in, and the tools we use for teaching are remarkably different from those employed by the college professors who initially inspired us. Professors of the past were satisfied with a lecture hall complete with podium, board and chalk, and perhaps some device for showing films or slides. We trekked to the library to look for books and journals; our students go looking for power outlets. Our limited exposure to global topics and issues came through books and lectures, the occasional international exchange student, or a highly proscribed, language-immersion oriented junior year abroad; our students opt for international experiences of varying lengths, focused on subjects from aquaculture to bioengineering to global health. The presentations offered under the rubric of "Learning Inside and Outside the University" documented several ways in which today's faculty members are driving the development of exciting topics and platforms for learning.

Where is this Class?

In "New Models for Learning In and Out of the Classroom," Lynne O'Brien of Duke University focused on several aspects of the increasingly unstable boundaries between the classroom and the world outside of it. O'Brien identified the drivers for these changes as the initiatives related to globalization, interdisciplinarity, and knowledge in service to society which Duke and so many other research universities are currently advancing. After describing examples of each, O'Brien challenged the audience to ponder these questions: Are these "extra" experiences, or are they the heart of the learning experience? How will growing the amount of time students spend in these non-classroom experiences change what happens in classes and courses?

O'Brien's presentation concluded with recommendations that research universities should consider in the future, including these: (1) offer opportunities to explore new technologies and new teaching strategies in a supportive environment; (2) encourage openness; and (3) foster a climate of experimentation and flexibility.

Service learning is an example of a relatively new dimension of undergraduate academic student experience. However, many students, as well as their universities, have high expectations for meaningful and rigorous activities, which almost always take place outside the confines of the campus. In "Use of Web 2.0 Technology Applications for Service Learning Experiences," Susan T. Parlier and Jo Ann R. Coe Regan of the University of South Carolina examined specific examples of teaching and learning strategies -- such as using Adobe Connect for small group discussion, polling, guest speakers, student presentations, and other Web 2.0 technology applications that facilitate the development of appropriate communication and leadership skills. While service learning opportunities effectively position students in nonacademic settings, using state of the art communications tools allows for a consistent contact between the student, his peers, and the instructor.

For well over a decade, issues of "sustainability" have excited faculty members and students alike. In "Sustainability and Student Learning," Geoffrey Chase of San Diego State University provided a brief history of the efforts to expand university curricula to include sustainability topics. Chase made a compelling case that students are best served when faculty members signal the importance of sustainability approaches within the contexts of their standard curricula. Thus students enrolled in Art Studio classes should not only learn about the most environmentally sound ways of rendering their aesthetic impulses, but also the best ways to dispose of or repurpose leftover tools

and materials. Viewed from this perspective, many courses and majors can contribute to a student's awareness of environmental or green concerns. Professor Chase also made the case that faculty would be wise to use the physical plants of their own universities as laboratories in which their students' best efforts in the realm of recycling and the development of energy efficient systems could be put to work.

Is There a Book for this Class?

Two speakers offered presentations on the ways in which faculty are using their students' interest in film and video to improve the calibre of their offerings. In "Digital Pedagogy and the Rise of the Fifth Estate," Virginia Kuhn described and demonstrated the potential inherent in filmic texts. Her argument is based on the premise that films can be used to capture multiple genres of materials so that students can read, watch, and listen to the content that will best advance the course's learning objectives. Students can move easily from prose to images as they work their way through information that would have traditionally been presented in the form of a hard copy text book. Just as video footage becomes one source for learning in the course, Kuhn said that students are also able to construct their own digital arguments, thereby submitting filmic assignments to the faculty member who has used a filmic textbook for their course.

In "The Classroom and the World – Experiments in Visual Storytelling Across Borders," Sanjeev Chatterjee from the University of Miami proposed that faculty connect one of our oldest pedagogical strategies – storytelling – with the new technologies that allow for highly creative and visual depiction of narratives.

His goals are not confined by the boundaries of a specific class with an assigned project that will be evaluated solely by a professor. By encapsulating difficult and distant environmental and social challenges into a structurally dialogue-free simple film, Chatterjee argues that research university students can participate in genuinely meaningful activities that will improve the standard of living for many of the world's most deprived populations. Topics include poverty, climate change, and public health. For Chatterjee, the University of Miami is emblematic of the modern research university: a place that serves as a base of operations for students and a venue for receiving the basic educational tools, which they then can pass on to the world at large.

The presentations in the "Learning Inside and Outside the Classroom" sessions demonstrated that students are best prepared to contribute to society if their university experience exposes them to the kinds of problems that they will have to grapple with in the settings where they will have to solve them, and demonstrated ways in which new technologies and approaches support students' abilities to do so.

Assessment

Research universities have always been committed to the assessment of student work for quality, improvement, and overall intellectual growth. From general education requirements to core and elective courses in majors and minors, research university faculty structure curricula and build standards in the hope of producing these positive results. In recent years, many of these universities have increasingly turned their attention to assessment, becoming more deliberative and focused, particularly in evaluating programs and sharing best practices.

At the 2010 Reinvention Center conference, four panels focused on two main themes of assessment: (1) the design of writing assignments geared to support student learning ("writing to learn") in various programs, and (2) assessment of programs and student learning outcomes.

Writing to Learn

Two sessions at the conference centered on the role that "writing-to-learn" (WTL) can play in strengthening undergraduate learning and engagement in science, technology, engineering, and mathematics (STEM) disciplines. The sessions, designed for STEM faculty, were offered as part of an NSF-funded project directed by Robert Thompson and Julie Reynolds of Duke University, working closely with Reinvention Center Director Emerita Wendy Katkin and the Reinvention Center WTL Working Group.

Conceived as a workshop, the two writing-to-learn sessions had three interrelated goals: (1) to advance current knowledge and discourse on the role of WTL in undergraduate STEM education – particularly within the research university context – and demonstrate how meaningful writing exercises can enhance STEM teaching and student learning and engagement; (2) to educate and empower faculty to use writing as a pedagogical tool to improve and measure student learning; and (3) to set forth a systematic approach to pedagogy in which best practices are based on solid empirical evidence.

The morning session, "Writing-to-Learn: A Tool for Strengthening and Assessing Undergraduate Learning and Engagement," provided an overview of the power of writing as a pedagogical and assessment tool in teaching STEM disciplines. The session featured three presentations.

In the first session Robert Thompson, Professor of Psychology and Neuroscience at Duke University and Senior Consultant on Assessment for the Reinvention Center, opened with a consideration of the role of WTL in undergraduate education. Thompson not only noted the longstanding use of writing in undergraduate education to increase learning of the content and concepts in academic disciplines, but also traced the initiation and implementation of the NSF-supported project on WTL in the STEM disciplines that was the impetus for this workshop. Thompson concluded by explaining that the first session would serve as a foundation for the afternoon session, in which the preliminary findings from the research literature review would be shared with workshop participants and the implications of promising pedagogical practices and implementation challenges would be explored.

In the second presentation, "An Overview of What We Know about Writing in STEM," Christopher Thaiss, Director of the University Writing Program at the University of California-Davis, contextualized the current state of WTL

knowledge and practice in STEM disciplines, which can be divided into three categories of research and teaching practice: (1) defining "writing to learn;" (2) designing teaching practices to enact these definitions; and (3) measuring student growth and classroom effectiveness. Thaiss urged the use of various assessment methods that are common in educational and social science research but less common in STEM research. In the spirit of the WTL-in-STEM project, he urged university representatives both to strive for methods appropriate for measuring validity in their teaching environments and to look for ways to collaborate in research with colleagues across departments and institutions.

In the third presentation, "Moving Beyond Paper Texts," Greg Bothun, Professor of Astrophysics at the University of Oregon, emphasized the need to adopt an expanded view of "writing" to take advantage of new technologies that create opportunities for document sharing and multimedia presentations, with the goals of innovation, collaboration, and greater student engagement. Bothun argued that if a writing project includes a "design" element (e.g. an illustrated brochure), students' engagement will be significantly higher than if they were merely processing words. He pointed to WordPress as an emerging collaborative platform that incorporates elements of design into the final outcome, and urged universities to start running WordPress servers. By far the greatest engagement tool he has found is to use video as the final product. Bothun urges faculty to consider collaborative video assignments (best done in small, upper division classes) as a robust substitute for the traditional term paper.

The afternoon session of the workshop, "Using Writing to Improve and Measure Learning in STEM Courses," had two components: (1) a presentation summarizing the current state of WTL practices in undergraduate STEM education (including descriptions of promising practices and consideration of barriers that hinder implementation), followed by (2) parallel small-group deliberations in which STEM faculty focused on the application of WTL approaches in either introductory, advanced or capstone courses. The emphasis in both the presentation and group discussions was on devising WTL exercises that build on normal practices and support the specific course's learning goals

The presentation provided a foundation for the deliberations as speaker Julie Reynolds, Associate Director of Undergraduate Studies and Assistant Professor of the Practice in Biology at Duke University, spelled out what constitutes effective WTL practice and offered guidance on how to construct writing exercises that: (1) address distinctive learning goals; (2) are authentic and meaningful; and (3) teach critical thinking skills.

In small group breakout sessions, participants considered various WTL approaches that they either had learned about or experimented with in their own classes, and probed challenges that members of the group had encountered in using them. Several common themes emerged across groups. A major theme was participants' lack of knowledge of current research and promising practices, and the absence of good resources to guide them. Although a high percentage had already begun or considered themselves ready to implement WTL exercises (75% in introductory courses and 82% in advanced or capstone courses) prior to the workshop, only a small minority were familiar with WTL theory or research findings relating to WTL. In a follow-up survey, participants were remarkably united in advocating for more rigorous studies that address the complexities.

Assessment of Student Learning Outcomes

The third and fourth sessions focused, respectively, on assessment of general education (GE) curricula and on electronic portfolios, a popular method of assessment. Assessment of GE has become an important criterion of university accountability in the past decade among regional accrediting bodies, state councils of higher education, and institutional budget committees. The Reinvention Center Assessment Network created a GE Assessment Task Force in 2008, and the task force members chose the 2010 Conference as the appropriate forum for discussion of aims and methods of GE assessment among the member institutions. Both sessions featured demonstration of websites created to allow member institutions to upload their own assessment content.

In "Assessing General Education: Contributing, Collaborating and Creating a Rich On-Line Resource," three panelists – Matt Serra of Duke University, Kara Penfield of the University of Miami, and Christopher Thaiss of UC-Davis – presented ongoing examples of GE assessment foci and strategies. To frame the model examples of their three institutions and provide structured inquiry for the small group discussions to follow, panelist Thaiss presented the following heuristic:

- Goals of Assessment (both macro and micro);
- Stakeholders (does each stakeholder demand a different goal for assessment?)
- Challenges/Roadblocks (what factors make reaching your goals especially difficult?)
- Methods (e.g., portfolios, external tests, surveys, focus groups/interviews, retention/graduation/grades/demographic data)

Matt Serra described the ongoing assessment of the language requirement at Duke. "Macro" goals involve determining the validity of the current language requirement, as well as whether students are attaining the goals associated with the requirement. "Micro" goals include informing instructors and programs regarding the impact of current teaching practices on attainment of student learning outcomes and informing administration and related programs of the impact of participation in these programs on student learning in the languages. Serra identified several stakeholders, ranging from the students themselves to the public at large. Given the number of participants in the language programs at Duke, the logistics of the study were one of the main challenges, along with student and faculty buy-in to the project. Serra also detailed the mixed-method methodology utilized in the study. Both cross-sectional and longitudinal designs were used and phased in over time. Also, both direct (a standardized instrument, the Global Perspectives Inventory and an Oral Proficiency Interview) and an indirect measure (self-report survey) were used. At the time of the conference one book chapter had been published detailing the assessment efforts at the four-year mark, and a manuscript was in the works for submission in the Fall of 2011.

Kara Penfield described the plan for multi-modal GE assessment across all nine undergraduate colleges at the University of Miami, identifying the "Macro" goals of informing university-wide continuous improvement efforts and complying with accrediting body standards (in Miami's case, the Southern Association of Colleges and Schools). "Micro" goals include understanding the effect of programs (academic and non-academic) on student growth and experience, and informing change at the school/college, department, program, course and instructor levels. Penfield also identified a range of stakeholders in the process and described the varying levels of buy-in or support in the GE assessment process that each has demonstrated. Penfield identified the following as challenges: (1) the sheer number and diversity of schools and colleges; (2) resource issues necessitating the creative restructuring and development of inter-departmental relationships; and (3) limitations in current and/or existing assessment tools and instruments. In terms of methods, Penfield reported using a variety of standardized tests, scoring rubrics, and a wide range of program assessment plans, emphasizing that any results must be reported in forms that are most useful to the varying constituents.

Christopher Thaiss described the long-running reiterative assessment of student writing competency that commenced in 1999 at his former institution, George Mason University. "Macro" goals were to define and measure "writing competency" of undergraduate students and to improve curriculum. "Micro" goals were to identify and validate disciplinary distinctions and to create further opportunities for faculty development, particularly in furthering the aims of George Mason's nationally-recognized writing-across-the-curriculum (WAC) program. He identified students, faculty and departments, the University President and Board of Visitors, the Virginia State Council of Higher Education, and the WAC and writing studies research communities as stakeholders in assessment. Challenges included training faculty in fifty different disciplines. Thaiss described a successful methodology that included training of departments to develop rubrics and assess student writing samples. Applied over several years, this discipline-centered model produced results that met state requirements, gave faculty data to improve curriculum, and contributed to research in the field of writing studies.

Serra then demonstrated the Web-based WordPress website that he had designed and to which some members of the GE Assessment Task Force had earlier contributed. Participants in the session were given access to the site and invited to contribute to this new resource with information and discussions about their own programs.

Finally, Serra, Penfield and Thaiss each led small groups in discussion of further examples, successes, and challenges at the participants' own institutions, using the same heuristic employed in their three institutional models. Again, participants were urged to contribute their ideas to the WordPress site.

The fourth and final session on assessment consisted of a panel entitled "eportfolios, Rubrics, and Tools: Contributing, Collaborating, and Creating a Rich On-line Resource." The panel, moderated by Judith Ouimet of Indiana University, featured Julie Reynolds of Duke University and Gail Ring of Clemson University.

The purposes of this session were twofold: (1) to present GoogleDocs and GoogleSites as tools used for collaboration for the ePortfolio, Rubric & Tools working group; and (2) to build a common site for ePortfolio resources, tools and rubrics. The panel members not only identified two strong examples (see https://sites.google.com/a/g.clemson.edu/reinventioncenter/) of the ways in which their campuses have implemented GoogleDocs and GoogleSites, but also urged working group members to gather resources to populate the site.

The presentation included an introduction to the goals of the working group (i.e., the need for an online space to share resources) and a presentation of examples and resources in the online site. Participants were shown how these tools are used to facilitate communication and collaboration among group members working at a distance, and were encouraged to implement the tools in similar ways among their own group members. Those attending were eager to learn how to implement and support a large-scale project such as this one. They were also curious about how to assess ePortfolios for a university of 14,000 undergraduates. Gail Ring of Clemson showed student ePortfolios, CUePort (Clemson's tagging and assessment system), and answered questions about the program.

Participants were also queried about current uses of Google Apps on their campuses and asked to brainstorm in roundtable discussions about how this new online resource might be useful to them, how the databases should be organized, and what additional resources should be added to the site.

Attendees at the assessment sessions left with good models for their own institutions and opportunities for further input and guidance through the online assessment resources, which the presenters will continue to work together to facilitate.

Presenter Biographies

Ilesanmi Adesida is the Donald Biggar Willett Professor of Engineering and the Dean, College of Engineering, University of Illinois at Urbana-Champaign. His field of academic research is nanotechnology with special emphasis on high speed devices used in communications. Dr. Adesida is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), the American Association for the Advancement of Science (AAAS), the American Vacuum Society, and the Optical Society of America. He is a member of the National Academy of Engineering, the Minerals, Metals and Materials Society, Nigerian Academy of Engineering, the Materials Research Society, and the Society for Engineering Education. In 1996, he won the Best Paper Award at the Micro- and Nano-Engineering Conference. At Illinois, he received the Oakley-Kunde Award for Excellence in Undergraduate Education, and he has been appointed a University Scholar and an Associate Member of the Center for Advanced Study. He has held posts as director of the Center for Nanoscale Science and Technology, director of the Micro and Nanotechnology Laboratory, professor of materials science and engineering, professor of electrical and computer engineering, professor of the Beckman Institute of Advanced Science and Technology and research professor of the Coordinated Science Laboratory at the University of Illinois. Dr. Adesida earned his bachelor's, master's, and doctoral degrees in electrical engineering from the University of California, Berkeley.

Jonathan Berger is the Denning Family Provostial Professor in Music at Stanford University. Professor Berger's work melds composition with research in computational music theory including music perception and cognition, auditory display, and audio signal processing. Professor Berger's recent commissions include a work for soprano Dawn Upshaw for this year's Spoleto Festival, where he is Composer in Residence. Together with Bryan Wolf, Professor Berger is co-director of the Stanford Institute for Creativity and the Arts (SICA) and the University's Arts Initiative.

Greg Bothun received a Ph.D. in Astrophysics in 1981 from the University of Washington. He is an inaugural member of ISI's Highly Cited Researchers in Space Sciences in the period of 1980-2000. He was a Phi Beta Kappa Visiting Scholar in 2001/2002 and was scientific Editor of the Astrophysical Journal from 1996-2002. He has been using Instructional Technology as a major portion of curriculum delivery in the classroom since 1993 and has been offering courses via Distance Education since 1997. He teaches classes in astronomy, atmospheric science, physics, science and culture, energy policy, and environmental data methods. Via various external funding sources he has developed a full suite of interactive classroom tools that allow for instructor developed content, simulations and exercises to be pushed out to individual student laptops for analysis and manipulation and then those results are published back to a global canvas in the classroom.

Kevin Calabro is a Keystone Instructor in the Clark School of Engineering at the University of Maryland, College Park. Professor Calabro teaches and provides administrative support and leadership for the Clark School's Introduction to Engineering Design (ENES 100) course. This is the only course in the College taken by all engineering students in all disciplines and requires students to work as teams to design, fabricate, and test an autonomous hovercraft capable of meeting a very challenging set of product specifications. In addition to teaching many first and second-year Keystone courses to incoming engineering students, Professor Calabro also teaches an upper level seminar on Engineering Education.

Geoffrey Chase who has been the Dean of Undergraduate Studies at San Diego State University since 2002, attended Ohio Wesleyan University, where he received a B.A. in English. He also holds an M.A.T. from Miami University (Ohio) and an M.A. in English from Boston College. After receiving his Ph.D. in American literature from

the University of Wisconsin-Madison, he taught for 11 years in the School of Interdisciplinary Studies at Miami University in Ohio. While at Miami, he served as a Fulbright Scholar in Turku, Finland (1990-1991). Dr. Chase joined Northern Arizona University in 1992 as the Director of English Composition. While at Northern Arizona University (NAU), Dr. Chase also served as English Department Chair, Dean of Liberal Studies, and as the Associate Provost for Undergraduate Studies. At NAU, he revamped the composition curriculum to give it an environmental focus and became a leader of the Ponderosa Project, a faculty development project aimed at helping faculty from throughout the university integrate issues of environmental sustainability into their courses. The Ponderosa Project has become a model faculty development project that has been introduced to faculty on more than 120 campuses. In 2004 he co-edited, with Peggy Barlett, *Sustainability on Campus: Stories and Strategies for Change* (MIT Press). He currently serves as Board Chair for the Association for the Advancement of Sustainability in Higher Education (AASHE). He has also served on the Executive Committee for the American Conference of Academic Deans (ACAD), as Co-Chair for the Proposal Review Committee for the Western Association of Schools and Colleges (WASC), and as team chair for accreditation teams. Dr. Chase lectures widely on sustainability in higher education and, with Peggy Barlett, offers workshops on institutional change, curriculum, and sustainability.

Sanjeev Chatterjee is Vice Dean, Professor, and Executive Director of Knight Center for International Media at the University of Miami. Professor Chatterjee earned his M.A. in English Literature from Delhi University and his M.F.A. in Television Production from Brooklyn College. He has taught classes in studio and field production, media and society, writing, and documentary production. Professor Chatterjee's earlier documentary work explored issues of identity among people in the Indian diaspora. His films on the topic are "Bittersweet" (1995) about Asian Indians in the United States; "Pure Chutney" (1998) about people of Indian origin in Trinidad; and "Dirty Laundry" (2005) about people of Indian origin living in South Africa. "Pure Chutney" won second place at the Film South Asia competition in Katmandu in 1999. In addition, he produced, co-directed and wrote "One Water," a global motion picture project about potable water. Professor Chatterjee was commissioned by The National Geographic Channel to produce television reports about environment and culture in India for its prime time magazine show "National Geographic Today." The topics of these reports range from deforestation and habitat fragmentation to the survival of folk and classical dance in India. Professor Chatterjee's awards for his work include the Best of Festival King Award at the Broadcast Education Association's Media Arts Festival. He is also the recipient of an Excellence in Teaching Award at the University of Miami.

Susie Farr is the Executive Director of the Clarice Smith Performing Arts Center located on the campus of the University of Maryland, College Park. Professor Farr became executive director in 1999, two years prior to the Center's official opening to the public in September of 2001. She has been responsible for establishing the strategic direction of the Clarice Smith Center and the stewardship of the Center as a place for learning, exploration, and growth in the performing arts. During her tenure, Professor Farr has been strongly committed to creating ongoing and meaningful collaboration with the performing arts and academic units housed within the Center (School of Music, Department of Theatre, Department of Dance, Michelle Smith Performing Arts Library) to ensure integration of the Center's programming with the educational mission of the campus. Under her leadership the Center has established itself as a national innovator among university performing arts centers.

William L. Fourney is currently Keystone Professor and Associate Dean of Engineering at the University of Maryland. He holds a joint appointment in the Mechanical Engineering Department and the Aerospace Engineering Department. He received his B.S. in Aerospace Engineering and his M.S. in Theoretical and Applied Mechanics from

West Virginia University. His Ph.D. in Theoretical and Applied Mechanics was received from the University of Illinois in 1966. His areas of research interest are in experimental mechanics and fracture mechanics - primarily from a dynamic aspect. He has published approximately 220 articles describing the results of his research in dynamic fracture and crack arrest including approximately 50 reports to the sponsors of his research. His research has been sponsored by NSF, AFOSR, ONR, NRC, DOE, NSWC, ARL, Oak Ridge National Labs, Los Alamos National Labs, and the US Bureau of Mines. He has served as a consultant for Gillett Research Labs, Versar, Allegheny Ballistics Lab, Harry Diamond Labs, Los Alamos National Labs, and SAIC. He is active in the Society for Experimental Mechanics (SEM) and the International Society for Explosives Engineering (ISEE). In SEM he has been elected to fellow grade membership. Within ASTM he served as Chairman of the Crack Arrest Technical Committee. Within ISRM he was President of the Commission of Fragmentation by Blasting and is North American Editor of FRAGBLAST (International Journal on Fragmentation and Blasting). He is also a member of the American Society for Testing Materials (ASTM), the American Society for Mechanical Engineers (ASME), the American Society for Engineering Education (ASEE), the American Society for Aeronautics and Astronautics AIAA), and the American Helicopter Society (AHS).

Bernadette Gray-Little assumed the post of 17th chancellor of the University of Kansas in August 2009. Dr. Gray-Little previously was executive vice chancellor and provost from 2006 to 2009 at the University of North Carolina Chapel Hill. A professor of psychology, Dr. Gray-Little rose to the post of UNC's chief academic officer after successive administrative appointments, including dean of the College of Arts and Sciences, executive associate provost, senior associate dean for undergraduate education for the college, and chair of the Department of Psychology. In these roles, she earned a reputation as a superb fundraiser, a relationship builder, a strong advocate for faculty and for research, and a champion for the highest quality educational experience for students. A native of eastern North Carolina, Dr. Gray-Little received her bachelor's degree from Marywood College in Scranton, Pennsylvania, and her master's and doctoral degrees in psychology from Saint Louis University. Her postdoctoral research in cross-cultural psychology was funded by a fellowship from the Fulbright Foundation for study in Denmark. She has also been a Social Science Research Council Fellow and a recipient of a Ford Foundation Senior Scholar Fellowship through the National Research Council.

William Scott Green is Senior Vice Provost and Dean of Undergraduate Education at the University of Miami. Dr. Green has overall responsibility for enhancing the quality of the undergraduate experience and strengthening the integration of university-wide undergraduate curricular and co-curricular initiatives. Dr. Green earned an A.B. in religion at Dartmouth College and a Ph.D. in religion from Brown University. He has held fellowships from the National Endowment of the Humanities, the American Council of Learned Societies, and the Andrew Mellon Foundation. Dr. Green currently holds an appointment as professor of religious studies and senior fellow in the University of Miami's Sue and Leonard Miller Center for Contemporary Judaic Studies. In addition, Dr. Green is among a group of American educators working to expand entrepreneurship from schools of business into university-wide education. He served as a member and then as chair of the Kauffman Foundation Panel on Entrepreneurship Curriculum in Higher Education. He has participated in panels on entrepreneurship education at various American universities and in Peru, Denmark, India, Brazil, and China. He serves as Executive Officer of the Reinvention Center.

Donna B. Hamilton is Associate Provost for Academic Affairs, Dean for Undergraduate Studies and Professor of English at the University of Maryland at College Park. During 2003-2004, she served as Interim Associate Provost and Dean; in July 2004, she was named Associate Provost and Dean. Her responsibilities include oversight of the

Honors College, College Park Scholars, Letters and Sciences; Orientation, Asian American Studies, LGBT Studies, the Center for Teaching Excellence, Army and Air Force ROTC, and TRIO programs. She has responsibility for implementing Maryland's new General Education program, set to begin in Fall 2012. She oversees enrollment management, learning outcomes assessment, transfer student initiatives, academic advising policy, limited enrollment program policy. She recently led the development of the Marquee Courses in Science and Technology, a group of innovative science and technology courses for non-science majors. She was Associate Dean in the College of Arts and Humanities, 1990-1996; and Director of English Undergraduate Studies, 1998-2003. A specialist in sixteenth-century English literature, Dr. Hamilton has published articles and chapters in books on sixteenth and seventeenth century literature and is also the author of *Virgil and The Tempest: The Politics of Imitation* (1990); *Shakespeare and the Politics of Protestant England* (1992); and *Anthony Munday and the Catholics*, 1560-1633 (2005). She has taught undergraduate and graduate courses throughout her career. Dr. Hamilton is a member of the Reinvention Center's Executive Board.

David Hanson is Professor of Chemistry and SUNY Distinguished Service Professor at Stony Brook University. Dr. Hanson graduated from Dartmouth College and received a Ph.D. in Physical Chemistry from the California Institute of Technology. He then worked with Nobel Laureate R.L. Mössbauer at the Technical University in Munich before joining the Chemistry Department at Stony Brook. Professor Hanson is an active researcher and scholar with over 150 publications. He was awarded the prestigious Alfred P. Sloan Research Fellowship and the NATO Senior Fellowship in Science. He pioneered studies of excitons and energy transfer in molecular solids, electric field effects in molecular spectra, and the molecular dynamics associated with core-electron excitation and core-hole decay in molecules and solids. Dr. Hanson has served as Director of Graduate Studies, Director of Undergraduate Studies, Associate Department Chair, and Department Chair. He also was the inaugural Director of Stony Brook's new Learning Communities Program. To help faculty change the way they teach from a style identified as "the sage on the stage," to one characterized as "the guide on the side," Professor Hanson has created innovative curriculum materials that they can use, written an *Instructor's Guide to Process-Oriented Guided-Inquiry Learning* that describes the research base and how to implement the pedagogy, and conducted over 90 workshops and faculty development seminars nationwide.

Caleen Sinnette Jennings is Professor of Theatre and Co-Chair of the Department of Performing Arts at American University. In 2003 she received American University's Scholar-Teacher of the Year Award. She directs for the main stage season and teaches such courses as acting, directing, voice & speech, acting Shakespeare and theatre history, in addition to four different courses in the general education program. She is a faculty member of the Folger Shakespeare Library's Teaching Shakespeare Institute. Dramatic Publishing Company has published her plays: *Elsewhere in Elsinore: The Unseen Women of Hamlet, Classyass, Inns & Outs, Playing Juliet/Casting Othello, Free Like Br'er Rabbit, Sunday Dinner, A Lunch Line* and *Same But Different.* She received a $10,000 grant from Kennedy Center's Fund for New American Plays and the Heideman Award from the Actor's Theatre of Louisville. She is a two-time Helen Hayes Award nominee.

Wendy Katkin is the Founding Director of the Reinvention Center (2000) and served as its Director through 2009. She holds a BA from Queens College, where she majored in English, an MS in Psychology from the University at Buffalo (UB), and a Ph.D. in English also from UB. Her first academic position at Canisius College in Buffalo was followed by ten years of teaching and administrative work at UB. Before launching the Reinvention Center, she served as the Associate Provost for Educational Initiatives and Associate Dean of Arts and Sciences at SUNY

Stony Brook. In her capacity as Associate Dean, she founded, and for five years directed, Stony Brook's nationally-recognized Women in Science and Engineering project (WISE), designed to engage high-ability high school and college women in the excitement and challenge of science and math. As Associate Provost, she initiated many of the University's undergraduate research programs which were critical to Stony Brook receiving an NSF Recognition Award for the Integration of Research and Education (1997), and a TIAA-CREF Theodore M. Hesburgh Certificate of Excellence for Faculty Development to Enhance Undergraduate Teaching and Learning (1999). Dr. Katkin has written on issues relating to undergraduate education and to women in science, and is co-editor of a book, *Beyond Pluralism: Essays on the Definition* of *Groups and Group Identities in American History,* (with Ned Landsman and Andrea Tyree; University of Illinois Press, 1998). Her publications include "Reinventing Undergraduate Education: Three Years After the Boyer Report" *in Undergraduate Research: Models for Learning through Inquiry* (Jossey-Bass, 2003)*;* "The Integration of Research and Education: A Case Study in Reinventing Undergraduate Education at a Research University" *in Reinvigorating the Undergraduate Experience through Research and Inquiry-Based Learning* (Council of Undergraduate Research, 2003), and "Building Connections in Research Universities," published in *Math & Bio 2010; Linking Undergraduate Disciplines* (the Mathematical Association of America, 2004). In recent years, she has served as a consultant on a wide range of issues relating to undergraduate education, particularly within the research university context.

Jeffrey Kovac was educated at Reed College (B.A, 1970, Chemistry) and Yale University (M.Phil, 1972 and Ph.D., 1974, Theoretical Chemistry). After two years as a postdoc at MIT he joined the faculty of the University of Tennessee where he is currently Professor of Chemistry and Director of Undergraduate Studies. Since 1994 he has also been Director of the Tennessee Governor's Schools for the Sciences and Engineering. In 2008 he became Director of the Tennessee State Science Olympiad Tournament. His scholarly interests include statistical mechanics, equilibrium and non-equilibrium thermodynamics, computer simulation, history and philosophy of science, scientific ethics, chemical education, and most recently the history and philosophy of pacifism. He is the author of more than 100 publications including three books: *Writing Across the Chemistry Curriculum: An Instructor's Handbook*, co-authored with Donna W. Sherwood (Prentice Hall 2000), *The Ethical Chemist: Professionalism and Ethics in Science* (Pearson Prentice Hall 2004) and *Refusing War, Affirming Peace: A History of Civilian Public Service Camp #21 at Cascade Locks* (Oregon State University Press, Fall 2009). His honors and awards include election to Phi Beta Kappa, the Woodrow Wilson Fellowship, and election as a Fellow of the American Association for the Advancement of Science.

Virginia Kuhn joined the University of Southern California in 2005 after successfully defending one of the first born digital dissertations in the country, challenging archiving and copyright conventions. Her dissertation, *Ways of Composing: Visual Literacy in the Digital Age,* was created in TK3, an electronic book platform that is the precursor to the USC-based open source program, Sophie. Professor Kuhn serves as the Associate Director of the Institute for Multimedia Literacy (IML), an organized research unit within the School of Cinematic Arts, and directs the IML's Honors in Multimedia Scholarship program. She develops and teaches classes in the Honors program, as well as in the recently launched minor in Digital Studies. She has collaborated on several projects with the National Center for Supercomputing Applications, in an effort to bring the power of high performance computing to bear on the humanities. Professor Kuhn's research interests include digital rhetoric, visual literacy, and critical multiculturalism. Her work can be found in online journals such as *Kairos, ebr* (electronic book review) and *Academic Commons,* as well as in print. Before joining USC, Professor Kuhn taught in departments of Film, English, and Cultural Studies and she spent three years as a writing program administrator at the University of Wisconsin-Milwaukee.

Presenter Biographies

Elizabeth Long Lingo is Assistant Director of the Curb Center for Art, Enterprise, & Public Policy at Vanderbilt University and Director of the Curb Center in Creative Enterprise and Public Leadership at Vanderbilt. Dr. Lingo's research and teaching focus on how collective creativity can be harnessed to transform organizations, communities, and society. She is particularly interested in the creative process that threads through art, science, design, and entrepreneurial ventures, and the leadership challenge of managing creative projects and networks of expertise. She is currently putting her research into practice by directing Vanderbilt's Creative Campus Initiative. Dr. Lingo holds a Ph.D. in Organizational Behavior from Harvard University and Harvard Business School; a master's in sociology from Harvard University; and a finance degree from the University of Massachusetts, Amherst. Her recent publications include: "Nexus Work: Brokerage on Creative Projects" with Siobhan O'Mahony (Administrative Science Quarterly, 2010); "The Creative Foil" (Qualitative Organizational Research, 2009); and 2008 National Performing Arts Convention: "Assessing the Field's Capacity for Collective Action."

John McGowan is the Ruel W. Tyson Jr. Distinguished Professor of Humanities at the University of North Carolina Chapel Hill and Director of UNC's Institute for the Arts and Humanities. He completed his undergraduate degree at Georgetown University and earned his Ph.D. in English from the State University of New York at Buffalo. Dr. McGowan has served as director of the Royster Society of Fellows in The Graduate School, associate director of the Institute for the Arts and Humanities, and founding member of the University Program in Cultural Studies. He has written five books, covering topics from Victorian literature to theories of postmodernism. Most recently, his work has centered on questions of what democracy can and should mean under contemporary cultural and political conditions. In that context, he has written a book on the political theorist Hannah Arendt and another on the values, principles and commitments of American Liberalism from James Madison to the present. In addition, Dr. McGowan has co-edited two books, including the massive Norton Anthology of Literary Theory and Criticism, a 2,200-page tome that covers 2,500 years.

Lisa McNair is Assistant Professor of Engineering Education at Virginia Tech and co-Director of the Virginia Tech Engineering Communication Center. She has a Ph.D. in Linguistics from the University of Chicago. She is involved in several projects that explore issues of learning, practicing, and teaching interdisciplinarity in university and industry settings. Her research, which spans many contexts, and encompasses verbal, visual, and written communication, focuses on communication, interdisciplinary collaboration, and institutional structures that encourage transformational learning, and integrating engineering, the social sciences, and the humanities. Her teaching emphasizes the roles of engineers as communicators and educators, the foundations and evolution of the engineering education discipline, and assessing communication in engineering.

Richard Miller was appointed the President, Professor, and first employee of the Franklin W. Olin College of Engineering in 1999. He served as Dean of the College of Engineering at the University of Iowa from 1992-1999, and spent the previous 17 years on the engineering faculties at the University of Southern California and the University of California, Santa Barbara. Dr. Miller's research interests are in applied mechanics and he is the author or co-author of about 100 reviewed journal articles and other technical publications. The recipient of five teaching awards at two universities, he is a past chair of the Engineering Advisory Committee at NSF, past chair of the AITU, a member of the Visiting Committee at the School of Engineering and Applied Sciences at Harvard University, and has been a consultant to the World Bank on the establishment of new academic institutions, among other activities. A native Californian, Dr. Miller earned his B.S. degree in Aerospace Engineering from the University of California, Davis,

where he received the 2002 Distinguished Engineering Alumnus Award. He earned his M.S. degree in Mechanical Engineering from the Massachusetts Institute of Technology and his Ph.D. in Applied Mechanics from the California Institute of Technology.

Tamara J. Moore is the co-director of the University of Minnesota's STEM Education Center and an assistant professor of mathematics and engineering education in the Department of Curriculum and Instruction. Her research is centered on the integration of STEM concepts in K-12 and higher education mathematics and engineering classrooms. Her research agenda focuses on models and modeling as a curricular approach and working with educators to shift their expectations and instructional practice to facilitate effective STEM integration.

Claudia Neuhauser is Vice Chancellor for Academic Affairs, Howard Hughes Medical Institute and Distinguished McKnight University Professor at the University of Minnesota Rochester. Dr. Neuhauser holds a Ph.D. from Cornell University. She is Director of the Center for Learning Innovation at the University of Minnesota Rochester and responsible for the development of an innovative new undergraduate degree in the Health Sciences. She is the Director of the Integrative Graduate Education and Research Traineeship Program (IGERT) on Non-Equilibrium Dynamics across Space and Time: A Common Approach for Engineers, Earth Scientists, and Ecologists. This training grant brings together scholars of ecology, civil engineering, and the earth sciences to study the interplay between landscape changes and ecosystem processes across a wide range of spatial and temporal scales and across interfaces, such as agroecoregion or urban boundaries, with an emphasis on non-equilibrium dynamics. An applied mathematician, Dr. Neuhauser's research interests are in two areas of biology: ecology and population genetics. In ecology, she studies the role of space in community dynamics, and in population genetics, how selection affects genealogies. Dr. Neuhauser is the author of numerous articles and developed a textbook *Calculus for Biology and Medicine* (Prentice Hall 2004) from her teaching of an undergraduate calculus course for biology majors. She is a member of the Reinvention Center's Executive Board.

Lynne O'Brien is Director of Academic Technology and Instructional Services for Perkins Library at Duke University. She works with faculty, librarians, campus IT planners, and academic technology groups around the country to develop strategic programs to support the use of technology in teaching and research initiatives. Dr. O'Brien and her staff have been key players in the campus-wide Duke Digital Initiative, which promotes faculty and student use of digital media in teaching. She recently led the Duke Libraries' strategic planning process. Dr. O'Brien came to Duke from Brown University where she was a faculty member and manager of instructional computing services. She has organized conferences on academic computing, taught courses in educational software design, planned technology-enhanced classrooms, reviewed proposals for the National Institutes of Health, and served on accreditation teams for the New England Association of Schools and Colleges. Dr. O'Brien holds a Ph.D. in Education from the University of Delaware.

Judith Ouimet is Assistant Vice Provost for Undergraduate Education at Indiana University, bringing her expertise in survey research, design, and analysis. Dr. Ouimet's focus is general education assessment and student engagement, primarily in post-secondary education—both public and private four-year institutions and community colleges. As Assessment Coordinator at the University of Nevada, Reno, she coordinated the University's Core Curriculum assessment program. Dr. Ouimet served as Associate Director and Project Manager for the Community College Survey of Student Engagement (CCSSE) where she developed the survey instrument, Community College Student Report (CCSR) that has been used by over 680 community colleges nationally. She has assisted in creating

and validating numerous national surveys using both qualitative and quantitative research methodologies and has partnered to create a classroom-level survey of student engagement called "CLASSE." Dr. Ouimet has served on numerous Southern Association of Colleges & Schools accreditation site visits as the Quality Enhancement Plan (QEP) lead evaluator. Dr. Ouimet holds three degrees from The University of Texas at Austin (B.B.A. in International Business, M.Ed. Student Personnel Administration, and Ph.D. in Educational Administration with a concentration in measurement and evaluation).

Bobbi Owen is Senior Associate Dean for Undergraduate Education and Michael R. McVaugh Distinguished Professor of Dramatic Art at the University of North Carolina at Chapel Hill. Professor Owen received her B.S. and M.F.A. from the University of Wisconsin and joined the faculty at Chapel Hill in 1974. She has held a variety of administrative positions including Director of the Honors Program, Director of Undergraduate Studies for the Department of Dramatic Art, and Head of the Graduate Costume Design Program. In her position as Senior Associate Dean for Undergraduate Education in the College of Arts and Sciences she oversees a range of academic programs, scholarships, and services for undergraduate students that are central to implementing the new general education requirements that are part of the university's Quality Enhancement Plan. Professor Owen is an expert theatrical designer, responsible for costume design for dozens of regional productions including several every year for PlayMakers Repertory Company. She has written hundreds of articles and seven books about theatrical designers, most recently *Late & Great: American Designers 1960-2010* [United States Institute for Theatre Technology (USITT) 2010], and the exhibition catalog for the United States entry in the 2007 Prague Quadrennial, Design USA (USITT, 2007). Professor Owen is vice president for communications for the USITT and chair of its publication committee. She is also a member of the publications committee of the International Organization of Scenographers, Technicians, and Architects of the Theatre. She has taught undergraduate and graduate courses, honors classes, and first year seminars. She is chair of the Executive Board of the Reinvention Center.

Marie C. Paretti is an Associate Professor of Engineering Education at Virginia Tech, where she is co-director of the Virginia Tech Engineering Communications Center and Director of the MSE/ESM Engineering Communications Program. Her research and teaching interests include communication and collaboration in engineering curricula, gender and identity in engineering, and design education. Her research is funded by several grants from the National Science Foundation, including an NSF CAREER award to study teaching expertise in engineering capstone courses.

Susan T. Parlier joined the College of Social Work faculty in fall 2007. She is an instructor and interim BSW and Undergraduate Social Work Minor Coordinator. Susan received her MSW from Virginia Commonwealth University and MAR from Lutheran Theological Southern Seminary. She is completing her Ph.D. from University of South Carolina. She teaches across the BSW and MSW curriculum: practice with individuals, groups, communities, and organizations, policy, and diversity. Her research interests are social work education, student development, and working women coping with the stress of material hardship and food security, and international social work. Susan has over thirty years of direct social practice. For 15 years, she was Executive Director of a local not-for-profit agency. She remains actively involved in service with her community, state, nation, and international organizations.

Kara Penfield is the Director of Academic Assessment in the Office of Planning, Institutional Research, and Assessment at the University of Miami. She earned her Ph.D. in School Psychology at the University of Florida. Dr. Penfield has extensive experience in using assessment to drive continuous improvement efforts in corporate,

community mental health, K-12, and higher education settings. Within the field of education, she has focused on using data at the aggregate and disaggregate levels to inform change in education through data-driven (1) delivery of instruction to students, (2) delivery of professional development to instructors and administrators, and (3) allocation of resources within institutions. At the University of Miami Dr. Penfield plays a key role in the assessment of General Education Competencies of undergraduates and Program Assessment (i.e., Institutional Effectiveness) for all academic and non-academic units across the institution.

Darryll Pines became Dean of the Clark School on January 5, 2009. He came to the University of Maryland in 1995 as an assistant professor in the Clark School and has served as chair of the Department of Aerospace Engineering since 2006. Under his leadership, the department was ranked 8th overall among U.S. universities, and 5th among public schools in the U.S. News and World Report graduate school rankings. In addition, during his tenure as chair, the department has ranked in the top five in Aviation Week and Space Technology's workforce undergraduate and graduate student placement study. The undergraduate program was ranked 9th during that time. Dr. Pines has been Director of the Sloan Scholars Program since 1996 and Director of the GEM Program since 1999, and he also served as Chair of the Engineering Council, Director of the NASA CUIP Program, and Director of the SAMPEX flight experiment. Last year, he served on the university's Strategic Planning Steering Committee.

Madeline Puzo has been Dean of the University of Southern California School of Theatre since 2002. Under her leadership, the School has inaugurated three new graduate degrees, revised and expanded its undergraduate programs, and has doubled its faculty. Before coming to USC she was a creative producer for some of the country's leading regional theatres, including the Ahmanson Theatre and the Mark Taper Forum in Los Angeles and the Guthrie Theater in Minneapolis. Dean Puzo has commissioned and/or produced work by such noted theatre artists as Bill T. Jones, JoAnne Akalaitis, Spalding Gray, Joe Chaikin, Philip Glass, Femi Osofisan, Girish Karnad, Bart Sher, and Robert Woodruff. She has produced such diverse plays as *House Arrest: An Introgression*, Acts I & II by Anna Deavere Smith; Shakespeare's *Measure for Measure* and *A Midsummer Night's Dream*, directed by Sir Peter Hall; and David Henry Hwang's new version of Rodgers and Hammerstein's *Flower Drum Song*. Her adaptation of Truman Capote's *A Christmas Memory* was presented by the Mark Taper Forum for ten consecutive years and toured Eastern Europe. She has won nine Los Angeles Drama Critics Circle Awards. Dean Puzo served as co-director for the theatre portion of the 1984 Olympic International Arts Festival, was the producer of Los Angeles' first Non-Traditional Casting Symposium and has been a consultant for the National Endowment of the Arts, the Pew Charitable Trust, Theatre Communications Group, the Rockefeller and Lila Wallace-Reader's Digest Foundations, and has written for *American Theatre* magazine.

Jo Ann R. Coe Regan, M.S.W., Ph.D., is currently the Director of Distance Education and a Clinical Associate Professor at the University of South Carolina College of Social Work. She is currently involved in the development of a new undergraduate social work program focused on service learning and the integration of technology and Web 2.0 applications in teaching and learning. She has been involved in the planning, teaching, administration, and evaluation of social work distance education programs and online courses for the last 15 years at the University of Hawaii, California State University-Long Beach, and the University of Texas at Arlington. She also teaches human service courses offered entirely over the Internet for Walden University, a virtual university. She has been involved in faculty development workshops and trainings for educators involved in distance education and online learning. Her research and publications have focused on distance education, online teaching and learning, and the use of technology for programs with children and youth.

Presenter Biographies

Daniel Reichart earned B.S. degrees in Astronomy & Astrophysics, Physics, and Mathematics and a minor in History from Pennsylvania State University in 1996, and M.S. and Ph.D. degrees in Astronomy & Astrophysics from the University of Chicago in 1998 and 2000. Dr. Reichart won a Hubble Postdoctoral Fellowship, which he took to the California Institute of Technology in Pasadena. Since 2002 he has been at the University of North Carolina at Chapel Hill. Dr. Reichart's dissertation research on distant, cosmic explosions called gamma-ray bursts was ranked by Science Magazine as one of the top ten discoveries in science in 1999, and in 2003 earned him the Robert J. Trumpler Award for top astrophysics dissertation research in North America. In 2005, he and his students at the University of North Carolina discovered the most distant explosion in the universe yet known, a gamma-ray burst that occurred 12.8 billion years ago, when the universe was only 6% its current age. Their findings were published in the journal *Nature*. He and his students are currently building six robotic telescopes on a remote mountaintop in the Chilean Andes, and are helping others to build similar telescopes across the United States. When not observing gamma-ray bursts, the telescopes are available to students and educators of all levels from their home and school computers. Dr. Reichart is the recipient of the Carl Sagan Award for Excellence in Teaching, the Nathan Sugarman Award for Excellence in Research, the Donn MacMinn Award for Service beyond the Walls of the University, and Ernest F. Fullam Award of Dudley Observatory. He has published over 60 scientific papers, 114 observing reports, and has written popular articles for *Sky & Telescope* and *Mercury* magazines. He has raised over two million dollars for his research, and regularly reviews grant proposals for the National Science Foundation and NASA.

Julie Reynolds is Director of the Certificate in Teaching College Biology, Assistant Professor of the Practice, and Associate Director of Undergraduate Studies in the biology department at Duke University. She earned her Ph.D. in Integrative Biology from the University of California at Berkeley after earning a M.S. in ecological economics from University of California, Davis and a B.A. in environmental policy analysis from Pomona College. In 2002, she was one of the first scientists hired to teach in the award-winning Thompson Writing Program at Duke. As a member of the biology faculty, she teaches writing-intensive science courses, including graduate courses in professional scientific writing and a course for undergraduate thesis writers. In addition to teaching, Dr. Reynolds has an active research program focused on pedagogies that promote science literacy. Dr. Reynolds was chosen to participate in the American Society for Microbiology's 2009 Biology Scholars Research Residency Program, and was also elected to be Chair of the Ecological Society of America's education section.

Gail Ring received her Ph.D. in Instructional Technology from the School of Teaching and Learning at the University of Florida. She is the Director of the Electronic Portfolio Program at Clemson University. Dr. Ring has consulted with universities and school districts across the U.S. on the implementation of electronic portfolios in teacher education. She has worked with electronic portfolios in an academic setting for over ten years. Over the years Dr. Ring has taught a variety of graduate and undergraduate courses in instructional technology and has implemented and managed large-scale electronic portfolio projects and faculty development activities in two major universities. Dr. Ring's research interests involve the study of innovation diffusion in an academic setting, specifically as it relates to the use of digital portfolios in a K-20 environment and the use of simulations in middle school science.

Arlene Russell is a Senior Lecturer at UCLA in both the Department of Chemistry and Biochemistry and in the Department of Education. She is the project director of the Calibrated Peer Review™ (CPR) program. Since 1999, she has led more than 50 CPR workshops for over 700 faculty from community colleges through research universities and has implemented CPR in her own classes varying in size from 14 AP high school students to 320 UCLA freshmen.

She has been involved in national assessment activities for 25 years as chair of the *California Chemistry Diagnostic Test* committee, which develops and validates a national test for placement of students in entry–level college chemistry courses. She is the director of the Lower Division Undergraduate Laboratory Program and teaches the range of general chemistry courses in this area. At the graduate level she teaches technical writing and a seminar in Issues in Teaching in Higher Education for science and engineering graduate students and post-docs who are planning on academic careers. She is Chair-Elect of the Division of Chemical Education of the American Chemical Society. Her work in science education has been recognized by awards from the New York Film and Television Association for excellence in science videotape production; the Smithsonian Institution for her educational innovation using technology, the Chemistry Manufacturing Association for her outstanding college chemistry teaching, and the UCLA Brian Copenhaver Award for Innovation for Teaching with Technology for the development and implementation of CPR.

Leslie Schiff is a Professor in the Department of Microbiology at the University of Minnesota. She serves as Director for Undergraduate Studies in Microbiology and teaches a writing-intensive virology course to upper-level undergraduates. Schiff has won University and national awards for her teaching, including the Carski Award from the American Society for Microbiology, the University of Minnesota Morse-Alumni Distinguished Teaching Award, and the University of Minnesota Center for Interdisciplinary Study of Writing Award for Excellence in the Teaching of Writing. Schiff holds an NIH research grant to support her work on mammalian reoviruses, but she remains passionate about science education and the importance of writing in the discipline. She worked with colleagues at the University of Minnesota to attract a Bush Foundation grant to transform undergraduate education through the development of a writing-enriched curriculum in which faculty define both the characteristics of their disciplinary writing and the disciplinary writing abilities with which their students should graduate. Schiff currently serves as the faculty liaison for the College of Biological Sciences writing-enriched curriculum project. At the University level, she recently chaired the council that reviewed and revised the campus wide liberal-education requirements. Finally, Schiff currently serves as principal investigator on an NSF-REU summer program that focuses on scientific communication at the same time as it provides research experiences to undergraduates from around the country.

Matthew Serra is responsible for all phases of the assessment of academic initiatives and grants related to the college and the university as well as assessment of general education student learning outcomes for the college. Since 2002 Dr. Serra has served as the lead evaluator on three four year Howard Hughes Medical Institute grants focused on undergraduate education. In addition to his responsibility for assessment at the college level, he provides consultation and grant writing services to other faculty and programmatic initiatives of importance to the teaching and learning objectives of the College. Dr. Serra serves as convener of the Trinity College Assessment Working Group and works with departments and programs on issues related to program review and assessment of student learning outcomes. He is also in charge of the assessment of Duke's current Quality Enhancement Plan. Dr. Serra participated in the standards setting procedure for the Collegiate Learning Assessment instrument developed by the Council for Aid to Education. Dr. Serra has served as an onsite review committee member (Lead QEP reviewer) for the Southern Association of Colleges and Schools; Commission on Colleges. Dr. Serra is a member of the General Education Assessment Group for the Reinvention Center and serves on its Steering Committee. Dr. Serra has an appointment as Adjunct Assistant Professor of Psychology in the Department of Psychology and Neuroscience at Duke University. Dr. Serra received his Ph.D. in Cognitive Psychology at Purdue University in 1993. Dr. Serra has presented and published research in the areas of human memory for serial order information, interference and inhibitory mechanisms in memory as well as meta-comprehension and evaluation and assessment.

Presenter Biographies

Paige Smith has served as the Director of the Women in Engineering (WIE) Program in the A. James Clark School of Engineering at the University of Maryland since September 2001. WIE provides a comprehensive set of academic year and summer outreach programs for students in 4th-12th grades. Retention programs include a living and learning community, peer mentoring, and fellowships in research and teaching. Dr. Smith is also the Director of the Mid-Atlantic Girls Collaborative (MAGiC), a regional collaborative of the NSF funded National Girls Collaborative Project. MAGiC connects girl-serving and supporting individuals and organizations in Maryland, Virginia, and Washington, D.C. that are committed to increasing the number of young women pursuing science, technology, engineering and math (STEM) careers. Dr. Smith has 18 years of experience recruiting and retaining diverse populations in engineering. She earned her B.S. in Engineering Science and Mechanics (1992) and her M.S. (1998) and Ph.D. (2004) in Industrial and Systems Engineering from Virginia Tech.

Steven Tepper is Associate Director of the Curb Center for Art, Enterprise, and Public Policy and assistant professor in the department of sociology at Vanderbilt. Prior to joining Vanderbilt, Dr. Tepper served as deputy director of the Princeton University Center for Arts and Cultural Policy Studies. Dr. Tepper's research and teaching focuses on creativity in education and work; conflict over art and culture; and cultural participation. He is author of *Not Here, Not Now, Not That! Protest Over Art and Media in America* (University of Chicago, 2011) and co-editor and contributing author of the book *Engaging Art: The Next Great Transformation of America's Cultural Life* (Routledge 2007). Dr. Tepper is a leading writer and speaker on U.S. cultural policy and his work has fostered national discussions around topics of cultural engagement, everyday creativity, and the transformative possibilities of a 21st century creative campus. Dr. Tepper holds a bachelor's degree from the University of North Carolina at Chapel Hill; a master's in public policy from Harvard University's John F. Kennedy School of Government; and a Ph.D. in sociology from Princeton University.

Christopher Thaiss is the Clark Kerr Presidential Chair, Professor and Director of the University Writing Program, University of California, Davis. Until 2006, Dr. Thaiss was Professor of English at George Mason University, where he directed the composition and writing-across-the-curriculum (WAC) programs and served as chair of the English Department. Dr. Thaiss coordinates the International Network of WAC Programs (INWAC). He frequently consults on writing and conducts workshops on teaching and program development for schools and colleges. Recent books include *Engaged Writers and Dynamic Disciplines: Research on the Academic Writing Life* (with Terry Myers Zawacki; Boynton/Cook, 2006) and *WAC for the New Millennium: Strategies for Continuing Writing-across-the-Curriculum Programs* (with Susan McLeod, Eric Miraglia, and Margot Soven; National Council of Teachers of English, 2001). Dr. Thaiss' current projects include working with a team of international scholars to "map" writing in the disciplines worldwide. In 2005, he received the University's David King Award for career contributions to teaching excellence.

Robert Thompson holds a B.A. from LaSalle College and a Ph.D. in Clinical Psychology from the University of North Dakota. Dr. Thompson also holds appointments in the Department of Psychiatry and Behavioral Sciences and the Department of Pediatrics at Duke University. Before joining the faculty at Duke, he held positions at Georgetown University Medical Center and Catholic University of America. His research interests address how biological and psychosocial processes act together in development. He has authored over 100 scientific publications, including the book *Adaptation to Chronic Childhood Illness* (with Kathryn Gustafson; American Psychology Association, 1996). Dr. Thompson served as President of the Association of Medical School Professors of Psychology and received the Association's Distinguished Researcher Award in 1993. He also received the Distinguished Service Award of the Society of Pediatric Psychology in 1997. Dr. Thompson has been on the editorial board for several scientific journals,

and served as associate editor for the *Journal of Pediatric Psychology*. He previously served as Dean of Trinity College of Arts & Sciences and Vice Provost for Undergraduate Education at Duke University.

Patricia A. Turner is the Vice Provost of Undergraduate Studies at the University of California-Davis, and Executive Director of the Reinvention Center, a post she assumed in September 2010. Dr. Turner received her Ph.D. from the University of California-Berkeley and taught at the University of Massachusetts-Boston before joining the faculty at University of California, Davis. Dr. Turner has served as director of the American Studies program African and African-American Studies at UC Davis. She recently completed her fourth book, *Crafted Lives: Stories and Studies of African-American Quilters* (University of Mississippi Press, 2009). Her earlier books include *Whispers on the Color Line: Rumor and Race in America* (with Gary Alan Fine), University of California Press, 2001, *Ceramic Uncles and Celluloid Mammies: Black Images and Their Influence on Culture* (originally published by Anchor Books 1994, reissued by University of Virginia Press, 2002), and *I Heard It Through the Grapevine: Rumor in African-American Culture* (University of California Press, 1993). Dr. Turner has served as a consulting scholar on several documentary film projects. She has been interviewed for commentary related to folklore and popular culture in many prominent publications and on television and radio interviews.

Daniel MacLean Wagner is Professor and Director of the newly created School of Theatre, Dance, and Performance Studies at the University of Maryland. An accomplished lighting designer, Professor Wagner has been a member of the Theatre faculty at Maryland for twenty years, and previously served as Chair of the Department of Theatre (2001-10), and Acting Chair of the Department of Dance (2007-10). He has guided the merger of Theatre and Dance at Maryland through passionate advocacy for the vitality and diversity of both disciplines. The new School of Theatre, Dance, and Performance Studies aims to foster collaborative pedagogical and performance initiatives through partnerships of cross-disciplinary faculty, students, and curricular programs. Regular engagements of acclaimed artists-in-residence supplement the faculty in both disciplines, who are nationally and internationally known artists and scholars. The School offers the B.A. in Dance, B.A. in Theatre, M.F.A. in Dance, M.F.A. in Design, M.F.A. in Performance, and M.A./Ph.D. in Theatre and Performance Studies.

David Ward served as President of the American Council on Education (ACE) from 2001 to May 1, 2008. Under his leadership, ACE developed a strategic plan that has strengthened the Council's role as the major coordinating agent for higher education. As president of ACE, he was deeply engaged in the development of the responses of higher education to initiatives of the Secretary of Education as well as to congressional actions, including the reauthorization of the HE Act. He is a member of the Council of the United Nations University and the Irish Universities Quality Board and served on the Commission on the Future of Higher Education, convened by Secretary of Education Margaret Spellings. Before assuming the presidency of the ACE, he served as Provost and then Chancellor of the University of Wisconsin-Madison, where he led the development and implementation of a strategic plan that improved the quality of undergraduate education; added to campus research facilities; enhanced the connections among the university, the city, the business community and the state; and creatively combined public and private support for the institution. An urban geographer, Dr. Ward's research focuses on nineteenth century English and American cities and industrialization. Among his many publications are *Cities and Immigrants: A Geography of Change in Nineteenth Century America* (Oxford University Press, 1971) and *A Landscape of Modernity: Essays on New York City, 1900-1940* (with Olivier Zunz; Oxford, 1992). He has held visiting appointments at University College London; The Australian National University, Canberra; Hebrew University, Jerusalem; and at his undergraduate alma mater, the University of Leeds. Dr. Ward served as president of the Association of American Geographers in 1989

and was elected to the America Academy of Arts and Sciences in 1999. Dr. Ward received his B.A. and M.A. from the University of Leeds and his Ph.D. from the University of Wisconsin-Madison. He is a member of the Executive Board of the Reinvention Center.

David Sloan Wilson is SUNY Distinguished Professor of Biology and Anthropology at Binghamton University. He applies evolutionary theory to all aspects of humanity in addition to the rest of life, both in his own research and as director of programs that apply evolution to higher education (EvoS), public policy (The Evolution Institute), community-based research (The Binghamton Neighborhood Project) and Religion (the Evolutionary Religious Studies). His books include *Darwin's Cathedral: Evolution, Religion, and the Nature of Society* (Chicago, 2002) and *Evolution for Everyone: How Darwin's Theory Can Change the Way We Think About Our Lives* (Bantam, 2007). His next book is titled *Evolving the City: An Evolutionist Contemplates Changing the World—One City at a Time* (Little, Brown).

Heather Wipfli is an Assistant Professor in the Departments of Preventative Medicine and International Relations at the University of Southern California and the Associate Director for the USC Institute for Global Health. Dr. Wipfli holds a Ph.D. in International Studies from the Graduate Institute of International Studies at the University of Geneva. Her research focuses on international cooperation and governance approaches to improve health, specifically in regards to global chronic disease control including tobacco use, obesity, and exposure to air pollution. Prior to joining USC, Dr. Wipfli directed research and training for the Institute for Global Tobacco Control at the Johns Hopkins Bloomberg School of Public Health and worked on the development of the Framework Convention on Tobacco Control as a technical officer at the World Health Organization headquarters in Geneva. As Associate Director of the USC Institute for Global Health, Dr. Wipfli works with the university's diverse faculty on global health research, is responsible for consolidating and sharing information about global health projects and events throughout campus, and develops global health curriculum for USC's undergraduate and graduate programs in global health.

Robert Zemsky is the Chair of the Learning Alliance for Higher Education and Professor in the Graduate School of Education at the University of Pennsylvania. In *The Chronicle for Higher Education* Dr. Zemsky described himself as someone "old and round enough to be mistaken for a pooh-bah." Over a forty year career he has pioneered the use of market analyses for higher education, served as the University of Pennsylvania's chief planning officer and as the founding director of Penn's Institute for Research on Higher Education, as the Convener of the Pew Higher Education Roundtable, as Chair of The Learning Alliance, and as a member of the U.S. Secretary of Education's Commission On The Future Of Higher Education (better known as the Spellings Commission). More recently he has focused on what globalism might mean for higher education, on what technology has not accomplished, and on how to make learning more important in the higher education marketplace. His new book, *Making Reform Work: The Case for Transforming American Higher Education*, focuses on how the reform of higher education will likely depend on one or more dislodging events. Dr. Zemsky earned his B.A. from Whittier College in 1962 and a Ph.D. in History from Yale University in 1966. In 1998 he received a Doctor of Humane Letters (Hon.) from Towson University and in 2008 a Doctor of Humane Letters (Hon.) from Franklin and Marshall College. In 2008 he retired from the Board of Trustees of Franklin and Marshall College after 25 years of service. That same year he was elected to the Board of Trustees of Whittier College, his alma mater.

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To become a member, please contact the Reinvention Center:
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Telephone: 305-284-3998
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Contact:
Dr. Patricia A. Turner, *Executive Director*
The Reinvention Center
University of Miami, P.O. Box 248033, Coral Gables, FL 33124
Telephone: 305-284-3998
Fax: 305-284-6917
Email: reinvention@miami.edu
Web: www.reinventioncenter.miami.edu

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