

ACCELERATING TECHNOLOGY TRANSFER AND COMMERCIALIZATION

IP Commercialization and Research Spinouts Conference

Boston, Massachusetts

November 4, 2004

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Good morning, and thank you for the invitation to join today's important conversation around technology commercialization. I'm pleased to be able to share with you some of our thinking on this subject and related initiatives we're pursuing at the Kauffman Foundation.

We all have an interest in seeing that innovations are more efficiently brought to the marketplace. Universities want to more swiftly commercialize discoveries from their labs . . . Business and industry want to capitalize on the products and services that result from breakthrough research . . . VCs want to pluck the most promising investment opportunities . . . and we at Kauffman want to see that entrepreneurship is cultivated to the greatest extent possible.

But today, we find ourselves at an unprecedented juncture. The need to identify solutions that will allow the U.S. and global economies a more abundant flow of discoveries into the marketplace has never been more critical. There is little doubt that ours is increasingly a knowledge economy in which intellectual property is the dominant force, the capital that will continue to drive economic growth. Our ability to remove the barriers that inhibit the transformation of knowledge into products and services that improve the way we live, work, and play will greatly determine the long-term prosperity of our nation.

During the last two centuries, traditional economics recognized only two factors of production: labor and capital. Education, knowledge, and intellectual capital were believed to be outside of the system. Stanford economist Paul Romer's New Growth theory recognizes the tremendous role and impact of ideas. It shows that economic growth doesn't arise just from adding more labor to more capital. Rather growth is derived from new and better ideas expressed as technological progress. Romer believes that technology—and the knowledge on which it's based—is an intrinsic part of the economic system, and that knowledge has, indeed, become the third factor of production in leading economies.

In fact, the balance between knowledge and other resources has tipped so far on the side of knowledge that it may have become the most relevant factor in determining the

standard of living—far more than labor and capital. Of course it's not the raw knowledge alone that will chart our future. Rather it is what we are able to do with that knowledge.

America is known as a knowledge leader, a hotbed of discovery and innovation, and the world's bellwether for entrepreneurship. Ours are the minds constantly churning new ideas . . . ferreting out superior ways of producing or delivering goods and services . . . discovering new technologies that positively influence health outcomes, improve quality of life, and make our economy stronger.

The ability to harness new technologies, spur innovations and, in turn, grow companies and jobs, is the lifeblood of entrepreneurship.

We know well that university-based research plays a central role in the innovation process. Basic research that leads to fundamental discoveries provides the underpinning of more applied technologies. University researchers are active in both areas of scientific inquiry and, since the Bayh-Dole Act of 1980, have been commercializing technologies at an increasing pace.

And we know how integral entrepreneurs are to this process. The ability to harness new technologies, spur innovations and, in turn, grow companies and jobs, is the lifeblood of entrepreneurship. Entrepreneurs are responsible for many of the breakthrough products and technologies that drive our national prosperity—the airplane, the automobile, computers, and telecommunications to name a few.

An entrepreneur himself, our founder Ewing Marion Kauffman understood better than anyone the renewal of democratic capitalism that occurs the moment new businesses are started. When he established his foundation twelve years ago, he decided to commit his philanthropic resources to the very process by which he made his money: entrepreneurship. And while, historically, all of the major foundations in this country were founded by entrepreneurs—Gates, Ford, Carnegie, Rockefeller—ours is the only one truly dedicated to the advancement of entrepreneurship.

The Kauffman Foundation's interest in propagating new knowledge and facilitating entrepreneurs' ability to commercialize it led us to begin studying the technology transfer process at universities early last year.

On the surface, the system appears to be humming along quite nicely. University research has spun out new high-impact companies such as Genetech and Cisco

Systems. In places like Silicon Valley, Boston, and Vancouver, it has fueled major growth industries. Federal- and corporate-sponsored research has increased at schools across the United States. Indeed, with the growing debate over the influence of commercialism at universities, many fear that our campuses are becoming research factories for private industry.

Yet, closer scrutiny offers a sobering realization. Preliminary research shows that, residing in universities are a significant number of innovations either mired in the depths of bureaucracy or paralyzed by a lack of applied skills and resources, slowly struggling their way to the commercial forefront. Worse, many never make it at all. The reality is a great deal of promising research consistently fails to be developed and brought to market for practical use. This includes research in the life sciences that could lead to vital new drugs and medical therapies. It includes research in computing and engineering that could lead to useful new products and job-creating new firms. In short, despite the appearance of widespread commercialism, we are actually failing to reap the full fruits of our investment. In a global economy where researchers around the world are gaining on American universities, more must be done to rapidly and efficiently move technology from the halls of academia to the front lines of U.S. commerce.

The main problem lies in a technology transfer system that was created years ago to encourage commercialization, but has since developed symptoms that greatly inhibit its ability to do so.

Bayh-Dole, through passing responsibility for ownership to universities, has had powerful effects. In return for identifying and patenting promising innovations made with federal funds, universities receive exclusive licenses and the income that goes along with them. The intent, or course, was to drive more innovations into the marketplace by delegating responsibility and providing broad-based incentives for success. And to a certain degree, it has worked. On one hand, innovation flow via patenting and licensing has increased dramatically, along with increases in federal research dollars. Some universities have enjoyed windfalls from single licensing deals: Stanford and the University of California, San Francisco earned millions from patents related to recombinant DNA; Carnegie Mellon built a new academic building with proceeds from the Lycos Internet-search patents. To manage this new “business,” close to 300 universities and nonprofit research institutions in the United States have started technology transfer offices since 1980.

While universities have been given the opportunity and obligation for commercialization, we are not seeing the full potential of this federally funded research. Instead, a much clearer result has been the ramp-up of university technology transfer offices with the expectation that the office, in and of itself, is a sufficient resource to meet the

government's mandate to commercialize. The assumption being, "If we build it, they will commercialize."

But results are spotty and uneven, and there is evidence that numerous opportunities are being missed. There are a few who seem to do it well, but the current measurement for success is flawed, focusing solely on the big "home runs," which are fairly isolated occurrences.

We know that only a small number of universities receive the lion's share of licensing income. And a recent survey of engineering and science professors at eleven major universities found that only 30 percent of research faculty account for the great bulk of patenting and licensing.

Their success, however, cannot merely be explained by the 80/20 rule, whereby a handful of good players produce the winning results. One can find curious and troubling gaps in university output across the spectrum. There are elite universities that rank in the nation's top ten for research funding, but far lower in patenting and licensing. There are many small- to medium-sized universities that have well-regarded research faculty who, themselves, receive significant funding, but very few, or no, commercial activities result.

Admittedly, technology transfer as defined today is a complex business, for which many universities are poorly trained and equipped. Good ideas must first be identified and evaluated. Often university researchers lack the opportunity recognition skills necessary to judge the commercial potential within their own research. In addition, most basic research requires significant testing and development before it's market-ready. Raw ideas and discoveries gain their real value after many permutations, thorough analysis, and eventual translation into practical applications. But the ideas are what hold the real key to the nation's wealth.

New Growth theory considers ideas to be non-rivalrous, that is, they seek to be a public good. Once an idea is discovered and in the public realm, there is zero marginal cost to sharing it with more users. By definition, a non-rival idea can be copied and communicated, so its value increases in proportion to the size of the market in which it can be used. In other words, it's scalable. At the highest level are the ideas that not only translate into products or services, but that, themselves, support the production and transmission of other ideas, what Romer calls Meta-Ideas. But the skill sets necessary for recognizing this tremendous potential are highly specialized and to a great extent missing in the university tech transfer setting.

As many of you know, particularly the VCs in the audience, evaluating and taking a chance on licensing a raw innovation can be risky. The better developed the

innovation—the more tangible the application—the better the chances for investment. And this process of recognizing the potential marketability of ideas and readying them for practical use is a huge task. Rarely can a university muster the resources to support the work of proactively identifying, evaluating, and developing all of its promising discoveries. Yet in the present system, that is exactly what each of 280 or so institutions is expected to do.

Add to that the pressures universities often face to be economic development engines for their regions—profit centers whose primary goal is jump-starting new local companies and the job creation that goes with it—and the

result can be just the opposite: a constricting of innovation flow. Also, faculty members who believe basic research is being threatened by the pressures of commercialism may be less inclined to come forward with promising ideas. And on both sides, there is a tendency to overly narrow the focus, which perpetuates the cycle of missed opportunities. Universities often concentrate their tech transfer resources on just a few innovations having the greatest potential payback. Similarly, VCs tend to focus on a few proven university relationships rather than casting a wider net that would likely uncover new and even more profitable discoveries.

All told, it's an environment that was, in theory, created to empower innovation flow to the market, but instead is under-supported, commercial-unfriendly, and in fact sets up universities, industry, and the capital community to be extremely limited in their success.

The Foundation is seeking solutions on several fronts. We're working with universities and others to identify current replicable best practices in technology transfer; there is little systematic knowledge in several key areas. We're also exploring how to improve technology transfer at universities with small- to medium-sized budgets and very limited resources.

In addition, we're piloting a new system designed to maximize innovation and deal flow, rather than merely maximize dollar flow per licensing deal, as is the case with the current system. Our goal is to enable the technology transfer offices to automate much of their transaction work so that they can spend more time developing opportunity recognition and marketing skills. We believe a part of this is opening up the system and creating a two-way thoroughfare: one in which faculty have the time and are trained to look outwardly at the possibilities, and at the same time private-sector parties who may be

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interested in faculty's work are able to look inside the universities and mine the multitude of latent ideas and discoveries—one of which just may be the missing link needed for an emerging technology.

It's interesting to note that, for the most part, among the champions, there are no conclusive patterns that would be telling of the reasons for their success. However, there seems to be a common thread among the half dozen or so schools that do it well. Those university faculty located in a "cluster" of commercialization engage in a high level of industry consulting and collaboration. Because of their propinquity to a vast network of friends and colleagues who are entrepreneurs, venture capitalists, and other experts, their opportunity recognition skills are more keenly developed. That, coupled with a technology transfer office that is appropriately resourced to manage the incoming traffic, has good analytical skills, and fosters collaborative external relationships, provides a positive stream of commercialization for the

university. Schools that are isolated from industry tend to have fewer industry relationships and, therefore, provide less robust input to the tech transfer office, causing it to be inwardly rather than outwardly focused.

What this tells us is, not only are industry-university relationships positive for innovation, but collaborations with other experts bode well for the process, too. For those who do not have the necessary established social networks, we must help create them.

Today, we must begin creating the social networks that will allow us to leverage knowledge from those who know. Our success in advancing the technology transfer process depends on it.

It is said that there are really several types of knowledge. For example, "know-what," or mere knowledge of facts, has today become far less relevant and useful. "Know-how" refers to skills and the ability to do things on a practical level. Perhaps of most significance is "know-who," which refers to the world of social relations or networks and is knowledge of "who knows what" and "who can do what." Albert-Laszlo Barabasi, Notre Dame physicist and the nation's expert in the science of networks, believes that the power of networks, including social ones, governs our ability to succeed in virtually every aspect of science, business, and beyond.

Knowing key people may, indeed, be of greater importance to innovation than knowing scientific principles.

VCs are the first to recognize the human capital factor in the value and expertise they bring to entrepreneurs in advancing their enterprises. Similarly, successful entrepreneurs who understand relationships and proven methodologies have valuable skills they can bring to bear on the process.

Determining how to bring the “know who” parties together—many of whom are in this room—and apply the collective “know what” to build the skills of the innovation creators is our challenge. In other words, before we can transfer technology, we must effectively transfer knowledge from “those who know.”

An interesting story last week in the *New York Times* illustrates this point and the fact that “those who know” may be found in somewhat unexpected places. Students from the University of Arizona’s business school competed in a business idea competition called “Fame or Flame.” Two students’ initial idea was considered a “flame,” and they had to go back to the drawing board. To help them, a professor gave them a catalog compiled by the university’s tech transfer office containing dozens of technologies developed in the university’s physics, engineering, and other science schools. The two students quickly identified a portable device developed by two medical school professors that allows you to peer into children’s eyes and photograph the retinas to detect Shaken Baby Syndrome. In short order the two had conducted market research, developed a business plan, and incorporated the company as Optica Inc., complete with a detailed exit strategy. Of course, these students were *trained* in entrepreneurship. They had the opportunity recognition skills—and the time—that likely many of our tech transfer faculty lack.

Similarly, our Kauffman Campuses program is currently funding eight universities, all of which are focused on graduating students with entrepreneurial skills no matter what their discipline. This, we hope, will serve our future generations of faculty well. But it does not help us address the here and now.

Today, we must begin creating the social networks that will allow us to leverage knowledge from those who know. Our success in advancing the technology transfer process depends on it. The unintended consequence of Bayh-Dole has been undue pressure placed on a single “office” to solve the commercialization puzzle; the solutions we seek must look beyond. Faculty, university administration, government, and industry must all come together to apply resources—human and financial—and share knowledge in the name of opening the floodgates for innovation.

According to New Growth economics, a country’s capacity to take advantage of the knowledge economy depends on how quickly it can become a “learning economy.” In a “learning economy,” it is believed that individuals, firms, and countries are able to

create wealth in proportion to their capacity to learn and share innovation. Part of the learning economy may well be our ability to create the social networks necessary for commercializing university research, learning from each other how to better recognize opportunities, evaluate them, and translate them into products and services that will transform society.

Thank you.

Carl J. Schramm, Ph.D. is president and chief executive officer of the Ewing Marion Kauffman Foundation. Before joining the Foundation in April 2002, Mr. Schramm was chairman of Greenspring Advisors, Inc., a Baltimore-based merchant banking firm he founded to support business development in health care and insurance. Previously, he founded HCIA, Inc. He also is a co-founder and vice-chairman of the board of Patient Choice Healthcare, Inc., in Minneapolis. From 1992 to 1996, Mr. Schramm served as executive vice president of Fortis, Inc., where he oversaw health-care operations and was president of Fortis HealthCare. He is a former CEO of the Health Insurance Association of America. He founded the Johns Hopkins Center for Hospital Finance and Management and from 1980 to 1987 served as the director of the center, where he was a professor. Mr. Schramm has a Ph.D. in Economics from the University of Wisconsin and a J.D. from Georgetown University.

The **Ewing Marion Kauffman Foundation** works with partners to encourage entrepreneurship across America and improve the educational achievement of children and youth. The Kauffman Foundation was established in the mid-1960s by the late entrepreneur and philanthropist Ewing Marion Kauffman. More information about the Kauffman Foundation is available at www.kauffman.org.

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