Innovation, Biotechnology, and Regional Economic Development: Common Themes for Success

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Thank you for inviting me to discuss innovation in biotechnology at today's meeting. I especially want to thank Dr. Christine Vito and Elizabeth Selby Worley. The subjects of innovation, biotechnology, and regional economic development are becoming old friends. Since March 2003 I've been asked to talk about regional technology development, primarily in biotechnology, to a national forum on federal-regional partnerships for life science clusters; to a joint forum on biotechnology clusters between Sweden and the United States; to the Gordon Conference on global aspects of technology transfer in biotechnology; to the Association of University Research Parks about federal involvement in regional economic growth; and now to you about biotechnology, innovation, and integrating the efforts of the public and private sectors. I'm sure there have been others as well. Everyone is recognizing the need for innovation and the potential of biotechnology to revolutionize regional economies.

Since this is an after dinner speech, I want to keep my remarks general and at the conceptual level. Instead of getting into details, I want to focus on some of the common themes I've heard as I've considered these issues during my tenure in the Office of Science and Technology Policy. And I'd like to share some thoughts about how these themes may apply to Maine and to what you hope to do here.

One of the most significant themes I've heard across the country and around the world is the need to revitalize, and even reinvent, local economies; and associated with that, how rapid pace of change in economic development means regions must find some way to remain healthy and prosperous in a dynamic environment.

The U.S. was for many decades an agricultural economy, and then, over time, became one of the world's great manufacturing economies. Now it is transitioning to a new phase. In 1947, manufacturing industries accounted for 27 percent of U.S. GDP. But by 2001, manufacturing's share of GDP had declined to 14 percent. Manufacturing jobs have declined from 30 percent of full-time equivalent workers to under 15 percent in the same time frame, while jobs in the information and service sectors have increased.

Looking at what we need to do to produce jobs and keep our country prosperous, the President's Council of Advisors on Science and Technology has recently developed two reports on *sustaining our nation's innovation ecosystem*, because they see innovation – really, developing tools and techniques so advance that there essentially *is no competition* – as the way to secure our future. But that means change; continual change.

Rapid change, particularly since their manufacturing base was once seen as a stable and enduring part of the economic landscape, has left a lot of regional economies scrambling to adapt, or finding that external forces are shaping the region in ways that are unexpected and may not be desirable.

I am reminded of the way Richard Russo described the fictional Maine town *Empire Falls* in his 2002 Pulitzer Prize winning novel, which I understand has recently been filmed in Waterville. The novel explores the aftermath of the demise of the state's textile and logging industries. In an interview about the novel, the Russo said that he explored the topic because it seemed to be something that was happening all over the United States — people no longer have the stable jobs they assumed they would have all of their lives. How do you come to terms with what has been happening in the community when change comes that fast? He also mentioned that he saw in coastal Maine, where he lives, change coming too fast for some communities because the region's economy is now so based on tourism, and because it seems like there has been a lot of investment from out-of-state that has been going on unchecked by thoughtful regional planning or strategies to manage the change.

But, in regions all over the country, the people are learning to take stock of their advantages; attract investments; build healthy economies based on a few targeted, economic sectors; and manage change in ways that will ensure a prosperous future while maintaining a high quality of life. That's what I see you trying to do here in Maine with the biotechnology sector. Maine Biotech is an excellent resource for planning and organizing, you have state involvement in the Maine Technology Institute, you have business incubators, and you have the potential to tap into the International Northeast Biotech Corridor. I think you have many of the elements in place that you need to succeed.

The second major theme that I want to mention is the need to get the biotechnology industry, the educational system, the public sector, and the investors all working together on the same regional plan. This may sound like one of those "it goes without saying" points, but it's the place where economic development most often fails. It's not that each sector doesn't *want* to contribute, but they all have to be reading off the same page. I hope the need for getting the industry in touch with the university research community is clear not only for the intellectual capital but also for the workforce. And, there never seems to be a lack of appreciation from either for the value of federal investments in R&D—at least from where I sit (listening to requests for more funding). But, let me say that these elements are not enough for success.

When I was researching the Michigan Life Sciences Corridor, one of the U.S. success stories in regional biotechnology development, I read that they were still working on a particularly tough problem that was limiting their realization of their vision. According to a study conducted by Batelle for the Michigan Economic Development Corporation, there was a major disconnect between the local venture capital firms and the realities of start-up businesses in biotechnology. It wasn't that there wasn't money available for investments in new businesses, but the amounts available, and when it was available in the business life cycle, just didn't match the realities of the industry they wanted to attract.

For another example, one of the key elements in a strategy to lure more biotechnology start-ups to Northern Virginia was the transportation system. The difficult commute and crowded state of the Maryland road system was making it difficult to attract more life sciences start-ups to that

region, and also to attract workers. So, Virginia decided to try to offer all the same advantages *plus* a better quality of life. But, you have to really have the state and local governments on-board with the regional strategy to do that successfully.

At last March's forum on federal-regional partnerships for life sciences clusters, I listened to Mary Walshok from UC-San Diego talk about San Diego's success in reinventing its regional economy. She attributes much of that region's success to the ability to organize across disciplines and professional boundaries, involving economic developers, university presidents, CEO's of companies, real estate developers, local government leaders, and civic entrepreneurs—the full cross-section of the community. Tapping into the knowledge, resources, and networks of already successful regional leaders, instead of relying too much on paid development professionals who never get out of their offices, is the best way to make sure that assets and gaps are accurately assessed and all sectors are working together.

As I looked through *The Business Climate for Biotechnology in Maine*—the excellent report developed by Thomas Allen and Todd Gabe at the University of Maine—it struck me that they have done an excellent job at identifying places that could make an impact. It noticed that, when asked to rate the region's business climate across a number of factors, the biotechnology businesses they consulted found areas that is deemed "rather negative" about the business climate in Maine. Some things are difficult to change, but I thought there were a number of factors where the region could work together to make the environment a lot more attractive, *if* you can get everyone involved.

I should also mention that the element on that survey that got the most positive rating was "quality of life," which is critically important. With biotechnology being the huge global industry it is, areas with a terrific quality of life are going to have a big competitive advantage. In today's information technology environment, distance is much less of a factor for successful collaborations. For example, NIH has launched an initiative that fosters distributed collaborations in the biomedical sciences. BIRN, the Biomedical Informatics Research Network, involves 14 universities and 22 research groups around the country that participate in one or more of three test bed projects centered around brain imaging of human neurological disorders and associated animal models. One of the test bed projects is specifically on multi-scale mouse models of disease, and given the expertise at Jackson Labs in mouse genetics and pathology, it seems like collaboration in BIRN would be a good fit. The system is rapidly evolving to include data repositories associated with any laboratory research program. Bioinformatincs is a huge growth industry, and because of the potential of distributed collaborations you can take advantage of being in an area with great quality of life without losing out on economic opportunities. You will want to use that advantage to good purpose, and also make sure that you manage growth and regional change in a way that doesn't compromise this important factor.

The third common theme that I have heard, and think is critically important, is to fully engage the region's intellectual and human capital.

Again referring to what Mary Walshok claims for San Diego's success, she refers to what it means to a region to have all the vital ingredients in close communication. Businesses are built as much on the intangibles as on the tangibles, and chief among the intangibles are personal relationships and trust. The interrelationships in the region must be organic and involve long-term commitment to grow wealth.

You have to know where your regional intellectual and research strengths are and take advantage of them, and you have to build human capital to support the industry. That means not just universities, but community colleges, technical institutions, and the K-12 educational system have to be engaged. Regional networks have to develop that involve the local community and get them invested in the regional development. They have to be willing to use their collective national influence to bring attention and resources to the region.

Again referring to *The Business Climate for Biotechnology in Maine*, I saw the conclusion that the state's biotechnology businesses have, and I quote, "limited awareness of the science and technology resources available across the state. In almost every respect, the biotechnology businesses in Maine are more likely to engage in cooperative activities with partners from outside of the state than from within."

This is an area where I would really urge you to take a second look. Even though I extolled the ability of informatics to allow remote collaborations, you really need to balance this with the need to make development about mutual relationships, a regional partnership among all the players. Maine has some excellent intellectual and educational resources and I urge you to take advantage of them.

Both the University of Maine in Orono and the University of Southern Maine in Portland have excellent research programs and research capabilities, and have the capacity to expand and to focus more on the biotechnology industry's needs. Maine was one of the first Experimental Program to Stimulate Cooperative Research (EPSCoR) states, and has significant federal research funding from both NSF and NIH in areas that could support the biotechnology industry. This includes the 2003 award of a $6 million EPSCoR grant from NSF to the University of Maine to found the Institute for Molecular Biophysics. Three of Maine's leading research institutions—the Jackson Laboratory, Maine Medical Center Research Institute, and The University of Maine—combined their resources to form IMB. Another Maine EPSCoR grant is in biosensor technology research, to develop small, sensitive, and selective biosensor devices that can operate in real time and in extreme environments. And, an EPSCoR grant sponsored MaineTech 2003, a regional event promoting university research as an economic building tool.

Maine has some excellent private research laboratories. I've already mentioned the Jackson Laboratory, a unique biomedical institution that is truly a global resource. It is the world's largest mammalian genetic research facility that also serves as a center for training research scientists. The laboratory also brings scientists in regularly to learn about mouse genetics, as they did just last month with a conference devoted to accelerating drug discovery and development. There is also the Bigelow Laboratory for Ocean Sciences, the Foundation for Blood Research, the Maine Medical Center Research Institute, and the Mount Desert Island Biological Laboratory, all of which are influential, non-profit research laboratories that have much to contribute to the biotechnology sector.

You have an excellent state university system and community college system, and the Marine Maritime Academy, plus good private colleges, that all need to be engaged in the development of the necessary workforce, and invested in the outcome.

I can see that all the ingredients are here for a successful regional biotechnology industry, you just need to work at making the relationships work.

And finally, the last element I want to mention is being flexible and making use of what you have that is unique. As the PCAST report that I mentioned before concluded, it is innovation that drives the economy. You can only plan and manage so much. You have to be on the lookout for existing and new elements that have potential value, and figure out how to organize around dynamic growth and unexpected outcomes.

This gets back to the organic and integrated regional community model that I mentioned before—the relationships that are built and the ability to communicate across the varied interests are what make you able to adapt to change and be the first to seize opportunities.

One of my favorite quotes, from one of the people whose name gives me the most trouble pronouncing, is "*Discovery consists of seeing what everybody has seen and thinking what nobody has thought*." – Albert von Szent Gyorgyi. And, I might add, *acting on it before anyone else has the chance.*

Here in Maine you have so many natural advantages, and frankly, in looking at the Maine biotechnology industry I was puzzled that there is not more advantage taken of marine research, aquaculture, and other avenues that would exploit your unique natural resources and existing research capabilities. Maybe it's there, but I would still encourage you to keep your eyes open to what's new and unique in Maine. Look for the next wave rather than trying to copy some other region that's already been successful, since finding the next wave is our country's historical strength.

In conclusion, I'd like to recap the advantages the PCAST found in the U.S. high-tech economy, advantage that apply equally well to the regional economy of Maine. These include:

- The world's best R&D system (through universities, government, and industry);
- The best workforce talent and research universities;
- The most flexible and entrepreneurial business climate;
- The best government and rule of law (and associated Intellectual Property protections);
- The best infrastructure; and
- The world's largest market for high tech products.

Maine can capitalize on what other regions that have been highly successful in attracting major biotechnology companies have learned. While details vary, these regions followed several common "best practices." They understood the underlying characteristics of their innovation ecosystem, such as the importance of a skilled workforce and university research infrastructure; they viewed competing with other states for those companies as an economic development issue; they devised a plan, and relentlessly pursued it, engaging the whole community and providing a broad spectrum of incentives in order to achieve their goals; and they were prepared to take advantage of unique and unexpected opportunities.

Thank you.