

***REE Working Session – Life Sciences Entrepreneurship:
The best ways to integrate life science and engineering entrepreneurship education***

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Ken Morse (MIT): The first thing we are going to do is get everyone to contribute by explaining what they want to get out of this session and telling us their biggest headache...what's keeping them awake at night.

Dick Dorf (UC Davis): How can we drive the life sciences into the our business creation/entrepreneurship program? We have had much success with general technology, but we haven't been successful with the life sciences. We'd like to know how we can do a better job.

Dave (Life Sciences Director at Ernst & Young): We have a long history of supporting the life sciences field from the very early days of Genentech, Chiron and others. I am much more experienced with working on the company side, helping with presentations to investors, aiding start-up firms to secure first rounds of financing, etc. I'm not as knowledgeable on the academic side. I want to learn more about what goes on in fanning that spark of innovation that creates the new companies that I then try to help.

Ken Morse (MIT): We all want to help to create more deal flows for you.

Neil Armstrong (UT Austin): We have close ties with the natural sciences colleges. I want to know what are the opportunities for working with others.

Anonymous: We've had pretty good success cooperating with engineering, but much more limited success with penetrating the life sciences areas. There seems to be resistance from our Life Science professors to more organized efforts for us to get involved. More specifically, the problem that we are running into is that the administrators of these departments are afraid that we are going to turn both their doctoral students and their faculty into entrepreneurs. Their fear is that we are going to leave them with nothing.

Ken Morse (MIT): Are you saying the life science departments basically see us as abolitionists and are afraid that we're going to get rid of their slavery system?

Judi Dohn (Technology Ventures Corporation): There is very strong support in engineering, but less so in other colleges. Fortunately, the provost comes from a life sciences background so that helps.

Marybeth Camerer (Johns Hopkins University): Our entrepreneurship group is well connected with the biomedical and mechanical design engineering groups. We get involved with the student's senior projects. We get them to look at what their product costs would be and how they would manufacture their products. We haven't been able to do that yet with life sciences. Life sciences are located in the Arts & Sciences college and the two groups are like bickering siblings. They can't get along. We are doing a better job in medical devices. Working with the biomedical design group was a natural place to start, but to really sustain some growth, we need to do something with the life sciences. Therefore, I'm here to get ideas of how to break the road blocks.

Norris Kreuger (INRA/Boise State): We are largely focused on environmental technology. The local politicians kept telling us that all this emphasis on "technology" would insult the potato farmers. So we have put our focus on agricultural technologies. There is tremendous drive there and it turns out that the scientists in this area were way ahead of us. The most advanced stuff that is going on in our region is in the area of agriculture. Therefore there are lots of opportunities to really jumpstart what is already there.

Anonymous: We already have a close tie to a successful biotech entrepreneur who is leading the charge. He is really championing our cause. But it is a small effort and we would like to build on it. Therefore we are looking for ideas.

Appie van de Liefvoort (U of Missouri): I'm here to learn how to get resources.

Jean Micol (EPFL): I want to know what is different, if anything, about successful entrepreneurship in the life sciences as opposed to say IT and software technology.

Ken Morse (MIT): One of the differences is the egos of medical people. Another is the product life cycle is much longer. It takes 5-7 years of research just get to where you can think about a product, then another 5-7 years to get to market. Also the amount of money involved in bringing a product to market is orders of magnitude greater.

Jean Micol (EPFL): Once you've said that, that's it.

Ken Morse (MIT): Another problem we face, is that we don't have enough CEOs to run the companies—in part because there haven't been enough failures yet, which create "seasoned" entrepreneurs," and the products are still in the pipeline.

Peter Reid (The Center for Scientific Enterprise): I don't have problems, but I do have irritations. At CSEL, various heads are adamant that there are differences between those who are involved in life sciences engineering and those who are not. We offer very focused courses at the undergraduate level. These courses are very entrepreneurial in nature and cover all aspects of the commercialization process. We even have the heads of one or two departments behind us, but we can't get students to attend the courses.

Ken Morse (MIT): Is the reason because in this industry or field, starting—as compared to licensing to—a company to commercialize a technology may not be as well recognized?

Peter Reid (The Center for Scientific Enterprise): We only talk about writing a business plan at the end of the course. We exhaust other options, such as licensing the technology, first. If what works best is starting a company, only then do we offer a follow-on course that focuses on writing a business plan.

Abigail Barrow (UCSD): I want to benchmark what we are doing against what others are doing.

Steven Currall (Rice University): We've had lots of involvement with bio-engineering, but not much at all with biotechnology. We have two medical schools right beside the university and although they are not under Rice's jurisdiction we would like to interface with these different institutions and connect to entrepreneurial students.

Wendell Dunn III (University of Auckland Business School): I'm in the process of transitioning between two different disparate systems. I am looking for resource substitutions that I can make. Our medical school is more interested in entrepreneurship than some of the individuals in the business school. That's wonderful, but now I need to come up with creative ways to fund them.

Arthur Boni (Carnegie Mellon University): I am an engineer by training, and a serial entrepreneur. Now I am teaching MBA and undergraduate students. Carnegie Mellon just introduced the Track system. It's a joint venture with a lot of other colleges and centers. Students can spend five years at Carnegie Mellon and get both an MBA as well as degree in another area.

Ken Morse (MIT): You are building a bridge that enables disparate groups to talk to one another.

Arthur Boni (Carnegie Mellon University): The Track program occurs at the individual level. It educates one student, but we also have students working on teams that span multiple departments.

Frank Rothaermel (Georgia Institute of Technology): I want to learn about early stage ventures.

Alan Carsrud (Florida International University): We started our efforts with the biomedical department. Biology is now knocking on our door. Now want to integrate other departments as well. Our situation is similar to Rice University's. We don't have a medical school, but the University of Miami's medical school is next door. They had a bad experience with an incubator program at their own university so in some ways we have a better relationship with their medical school than their own university. I want to know how I can become their substitute business school.

Ken Harrington (Washington University): I want to focus on the organizational environment. How can we better connect with community, how can we grease the wheels?

Ken Morse (MIT): It sounds like you need a few more biotech success stories to help you out. (General agreement about the need for more success stories)

Michael Fountain (University of South Florida): I'm running a center that was created to be interdisciplinary. It is designed to bring together arts, humanities. I'm also heading up the National Consortium for Life Sciences. The members are mostly from Carnegie 1 Research Institutions. Our objective is to identify ways to further promote the commercialization of life sciences.

Ken Morse (MIT): Consortia are always a challenge; consortia of academics are even more difficult. What was the motivation?

Michael Fountain (University of South Florida): The consortium is an outgrowth of Kauffman. We wanted to learn how we could bring together disparate areas. How do we collaborate across departments and institutions?

Ken Morse (MIT): You are saying that one of the key success criteria is venture creation, is that right? *Michael Fountain (University of South Florida):* Yes.

Individual from front row: Apart from the device area are we misleading young researchers? Should we be encouraging them to enter an area where most of them won't succeed?

Ken Morse (MIT): In other words the situation is similar to blowing the whistle in WWI and telling your troops in the trenches to just go "over the top" and everything will be all right, when in fact most of them will be killed?

Alan Carsrud (Florida International University): We [the state of Florida] are in the process of trying to bring the Scripps Research Institute to Palm Springs. Do we know what they will bring? I'm not going to say "no" to it. The support system that has made the Scripps Institute a success in California does not exist in Florida. There is no proximate hospital, the research universities aren't close by. The center would be isolated. It's going to be hard gain all the synergies that were achieved in California.

Ken Morse (MIT): Do you have a better idea?

Abigail Barrow (UCSD): This is what Pheonix is trying to do in hopes that it will spur a cluster.

Anonymous, front row: Having different people from different areas is good for creativity and innovation. The college environment is better for new ideas. We are very interested in learning

more about the social and human sciences and how we can get these people working with us. I would like to hear about others experiences and learn more about how our program can be interesting for human life sciences people.

Gary Hansen (UCSB): At Washington University the group that reached out the most to the business school was bioengineering. But for those in the business school it was easiest to interact with computer sciences. Life sciences was more difficult. It was hard to wrap a project around a course.

Andrew Isaacs (UC Berkeley): Typical for Berkeley, we were very creative. Simultaneously, we tried 20 different methods. Then we have to figure out what happens when five or so of those work. We have three biotech courses that are joint between life sciences and Haas School of Business. We have a new bioengineering department that is joint with UCSF. Both the courses and the department are oversubscribed. We have incorporated bioengineering, which is joint between Berkeley and UCSF into the Management of Technology Program. More generally quite a few of the courses at Haas have a biotech component to them. Currently we have just over 50 courses that look at technology management in some form. About half of them have some sort of biotech components. But there is nothing that looks like a cluster or coherent structure. I'm sure we'll go back and see how it evolved into something, but for now its just a couple dozen flowers blooming.

Ken Morse (MIT): We have 7-9 different centers at MIT engaged in some aspect of entrepreneurship or technology commercialization. We don't have a heavy hand that has taken over everything. This is a good thing. The other thing that Berkeley has is their Oral History Program.

John Bourne (Olin College): While I have this group together I wanted to let you know that we have students who are looking for places to go in biotech. Are there any places to accept students for a while, we'd be happy to send them? These are students at the undergraduate level and at the end we will take them back. We will exchange students as well. We are thinking along the lines of a semester or so. In particular, some students are interested in going abroad for a year.

Ken Morse (MIT): You are not the first person to bring up students. Most of the innovations in biotech at MIT are driven from the students. Is anyone else here listening to students? Students are our product.

SLIDE ONE – Changes to Building a BioTech Cluster

- Silos are necessary: a high degree of specialization is needed, yet...
- Biotech is also interdisciplinary, and

- Gestation time for new technologies to emerge from the lab, support spin-offs, and eventually get transformed into products is lengthy: 15-20+ years.

Ken Morse (MIT): The idea of silos is necessary. Interdisciplinary collaboration is necessary, not just in biotech. The former head of the Whitehead Institute had a PhD in mathematics. But you cannot have specialization without isolation. I think that the next wave will be interdisciplinary. Ken [Harrington] should point out that Washington University sequenced 40 percent of the human genome, they don't talk about it. At MIT we talk about it.

SLIDE THREE – “Optimal” Conditions for BioClusters

- Stringent Ordinances, which won't change
- Sturdy, Terrible Buildings...ready for conversion
- Smart People
- High Tech-Friendly Atmosphere
- Snowball Effect: “where the gloves are”
- Active Efforts in Community Leadership

Ken Morse (MIT): Everyone knew that the stringent ordinances wouldn't change. They were bad and tough, but there was also confidence that they won't change so the business individuals decided that they could live with the ordinances. There are also a huge installed base of former warehouses ready to be converted. They are fabulous to convert into biotech labs and pilot plants. Finally the people in the area understood biotechnology, they knew what the technology was.

SLIDE FOUR – Picture w/ caption “Curtis Davis & Co. (later Lever Bros.) had its soap factory on the large expanse of land which now includes Draper Laboratories.

SLIDE FIVE – Rome Wasn't Built in a Day...

- ...neither was the Kendall Square Biotech Cluster – building Kendall Square required sustained effort.
 - 1940s, 1950s: Molecular Biology breakthroughs at MIT
 - 1960s: MIT converts SoapWorks into Technology Square
 - 1960s, 1970s: Breakthroughs in recombinant DNA technology
 - 1977: Harvard-MIT Division of Health Sciences & Technology
 - 1982: Whitehead Institute founded in Cambridge, MA

- 1983: Biogen opens its manufacturing facility in Cambridge, MA
- 1986: Genzyme moves to Cambridge, MA
- 1991: Merck partners with MIT Sloan's Pharma Program
- 2000: McGovern Institute for Brain Research founded at MIT
- 2002: Novartis moves its international research center to MIT's Technology Square
- 2003: Broad Institute founded in Cambridge, MA

Ken Morse (MIT): We did the joint venture with Harvard medical in 1977. That joint venture has been having a major impact in the last few years. We competed hard against a number of other cities in order to get the Whitehead Institute. At the time it was controversial. They were afraid that the center would divert us from pure research. We also worked hard to get Merck to do significant multi-year research with MIT. Same for the other institutes and partnerships, we fought for these.

SLIDE SIX – Picture w/ caption “Ken Morse, Joe Tulimeri, Prof. Eric Lander, and President Charles Vest admire the map of the biotech cluster in Kendall Square during the Second Annual Celebration of Biotechnology (8/2003). Over 600 people attended, including over 150 CEOs and Board Members.

SLIDE SEVEN – Picture of map [handed out paper copy]

Ken Morse (MIT): What we do at MIT, when we don't know what else to do, is we throw a party to celebrate success and build community. Everyone one of these dots [on the map pictured] is a biotech company in the Kendall Square areas. Students can take classes in the MIT buildings and then they can walk to their internships.

SLIDE EIGHT – Kendall Square Metrics (1/2)

- There are currently 92 Biotech companies located in and around Kendall Square, compared with 55 just two years ago.
- The MIT \$50K Competition has produced 11 winners and runner-ups in the last five years, including:
 - Ancora Pharmaceuticals (2002, finalist)
 - Crosslink Medical (2002, finalist)
 - Angstrom Medica (2001, winner)
 - Iptyx (2001, finalist)
 - SiteSpecific Pharmaceutis (2001, finalist)
 - SmartCure (2001, finalist)
 - EyeGen (2000, winner)
 - MolecularWare (1999, winner)
 - Virtmed (1998, finalist)

- Actuality Systems (1997, winner)

SLIDE NINE – Kendall Square Metrics

- Kendall Square companies accounted for two-thirds of the \$1.8B spent on R&D in 2000 by MA companies.
- 13 of the Kendall Square companies accounted for \$1.2B R&D in 2000
- 21 of the Kendall Square companies were either founded by MIT alumni or faculty or have MIT-licensed technology; their revenues were \$2.5B in 2001.

Ken Morse (MIT): These two slides give some statistics on the companies in Kendall Square. Since 1998 almost all the winners of the annual business plan competitions have been biotech. Judges were made up from people at Ernst & Young and VCs in the region. Biotech business plans consistently wound up at the top.

SLIDE TEN – Entrepreneurial Attitudes for Bringing University IP to Market

- “It never works well with big companies. They focus their energy on showing why the new technology won’t work. I always prefer to start a new company: it will deliver total focus, energy, passion, and commitment.” – Professor Robert Langer, Langer Lab. Kenneth J. Germeshausen Professor of Chemical and Biomedical Engineering. Keynote Speaker, MIT Venture Capital Conference (07 December 2002).

Ken Morse (MIT): Langer tells his students that the only way to commercialize technology is to start new companies.

Norris Krueger (INRA/Boise State): It’s similar to the students saying “this is what we ought to be doing.” Students can be used as a breakthrough to get over the bad blood. When I went to [government agency] they kept looking at me and saying you are not a college professor. This was because I didn’t come asking for something. Instead, I asked how can we help. When they find out that I am asking on behalf of students they are willing to help out. If you do just one specific thing well it changes the whole attitude. Two of our students are testifying to the state legislature this fall, because the legislature cannot say “no” to students.

Alan Carsrud (Florida International University): At UCLA, we couldn’t get UCLA, CalTech and UCSD in the same room together to talk. But in Florida we have four universities working together on a virtual biotech incubator. I say that these collaborations are like trying to herds of cats. How do we manage to do it? How can we convince the parties to put down their egos? I call up the dean of another university and he doesn’t understand why we need to talk.

Cooperation is going to get us a lot further. Unfortunately silos exist not only between departments, but between universities as well.

Robert Hisrich (Case Western Reserve University): I found it lot easier to work from the outside instead of within. Masters programs are a lot more to receptive to these ideas. We are now working on masters programs in science entrepreneurship. By getting outside of the business school we were free from many of the traditional constraints. We offer fewer, more focused courses on traditional business subjects and do so in conjunction with science requirements.

Anonymous: We just received a new NSF grant for biomedical science. We've had success in the process of product development. We're curious it can work for biopharmaceutical. Can it work for molecular biology? (Lower hurdle rate = more innovation)

Peter Reid (The Centre for Scientific Enterprise): It's easy to do things not for credit. After a while, demand will drive the development of for-credit projects. Faculty cannot ignore the demand. We began with a formal business plan competition. That translated into courses. The faculty saw the demand and needed to respond. Start small, and with a low threshold and make sure it's not regulated. Then you don't need to apologize when it gets big enough.

Anonymous: We have a series non-credit opportunities that are specifically focused on life science students and life science opportunities. We encourage them to enter business plans in business competitions. But, we still haven't won over key decision makers. We were even blocked at the faculty and doctoral level. There was a doctoral student who won the business plan and when he tried to launch his product into a company he was threatened with dismissal from doctoral program.

Dave (Life Sciences Director at Ernst & Young): There needs to be a paradigm change/shift in the colleges. Students in business schools are taught to look at enterprise and venture formation. But the most innovative discoveries are not in business; they are in science and in engineering. Also, at the university level they would rather license out to an existing corporation instead of licensing the discoveries back to the inventors.

Back of room: We have developed an organization whose mission is to bring biotechnology into the K-12 space. Kids can then turn around and teach their parents that they should not have a perception of biotechnology as a threat. Instead they should see biotechnology as delivering benefits.

Anonymous, front row: I think that we should focus on low technology. It will help us who are on the engineering side to understand what a day is like for a life science professional. It is easier to offer help if the idea is simple to understand and it has a shorter product development cycle. Understanding biotechnology/life sciences first in simple situations/technologies is the best way to begin to understand one another.

Robert Hisrich (Case Western Reserve University): Getting a small number of faculty members to champion your cause is incredibly beneficial. Once our dean signed onto the idea things became much easier. [Bob's paper summarizing some of this thoughts on the topic was distributed at this point]

Anonymous: One of our deans was involved with starting a company himself. That really helps: he's a believer and a role model.

Gary Hansen (UCSB): Can we use distant learning or other technologies to help us think beyond the local cluster concept. Can you find complimentary technologies even if it means going beyond your immediate environment? There are some things going on in the future that will help to make distant collaboration easier.

Ken Morse (MIT): Spontaneous creative communication is difficult unless people are in the same room.

Alan Carsrud (Florida International University): It is great to have donors who indicate that they will write the cheque only if the two deans [or other relevant parties] talk, and only then distribute the funds based on milestones.

Ken Morse (MIT): The venture capital model to university gifts.

Ken Morse (MIT): I want to close by saying that at MIT I believe not having a medical school has been a benefit instead of a hindrance. It frees us to work with people who make the most sense for us to work with. It also helps that MGH is within walking distance.

[Most everyone stayed late, after being called to lunch, exchanging cards and making plans to keep the dialogue going. It was a stimulating session.]