

Session 1

Education and R&D in University

## Commercializing University Technology : A Tale of Two Organizations

Robert Ronstadt  
Boston University  
2003.7.23.

**Dr. Yaniv:** I am Dr. Zvi Yaniv. Our first speaker will be Dr. Ronstadt, my friend and colleague. Dr. Ronstadt will talk about commercializing university technology because Dr. Ronstadt was very strongly involved with technology commercialization at the University of Texas, leading the IC<sup>2</sup> Institute. He is currently at Boston University. He leads a newly created technology commercialization institute, and we will learn of his experiences in both institutions. Please, Bob.

**Dr. Ronstadt:** Thank you very much, Zvi. It is a pleasure to be here. I appreciate the opportunity to speak about this particular topic. It is an important one: university-centric technology commercialization. It is actually about more than even commercialization; it is really about revising the economics of university education. This may take a few years, it may take a decade, it may take several decades, it may take our lifetimes, but I believe that it will happen.

### University-Centric Technology Commercialization

#### A Tale of Two “Level Three” Organizations

Dr. Robert Ronstadt  
Vice President of Technology Commercialization at Boston  
University  
Ronstadt@bu.edu

The title of my talk is “A Tale of Two Level-Three Organizations.” What does that imply? It implies, obviously, that there is probably a level one and a level two organization, and what I would like for you to

do is to ask yourselves, what do you think a level one organization is, and what do you think a level two and a level three organization is for accelerating technology commercialization? These are new kinds of entities that have emerged and they are part of a growing theory of entrepreneurial commercialization, facilitation and acceleration.

What I am going to do is talk about two entities where I have been very involved with those organizations. One is in Austin, Texas; the other is in Boston, Massachusetts. Both organizations are part of major universities; both organizations are approximately 26 to 28 years old, so they share a similar kind of timeline in their development. We have got the Yankees up in Boston, and we have got the Rebels, the Texans, down here in Austin. So we will see how they compare.



## Agenda

- A. Introduction: Two Key Questions
- B. IC<sup>2</sup> at University of Texas at Austin
- C. Technology Commercialization Institute at Boston University
- D. Prior Success & Failures
- E. Core Activities For The Future

What I would like to do is really cover a number of general issues associated with technology commercialization emanating from universities and lay out the terrain, if you will, so that some of my other colleagues who are following me today can get more into the specifics, whether it be intellectual property or nanotechnology, and various other aspects of what is happening in terms of university commercialization.

### A.

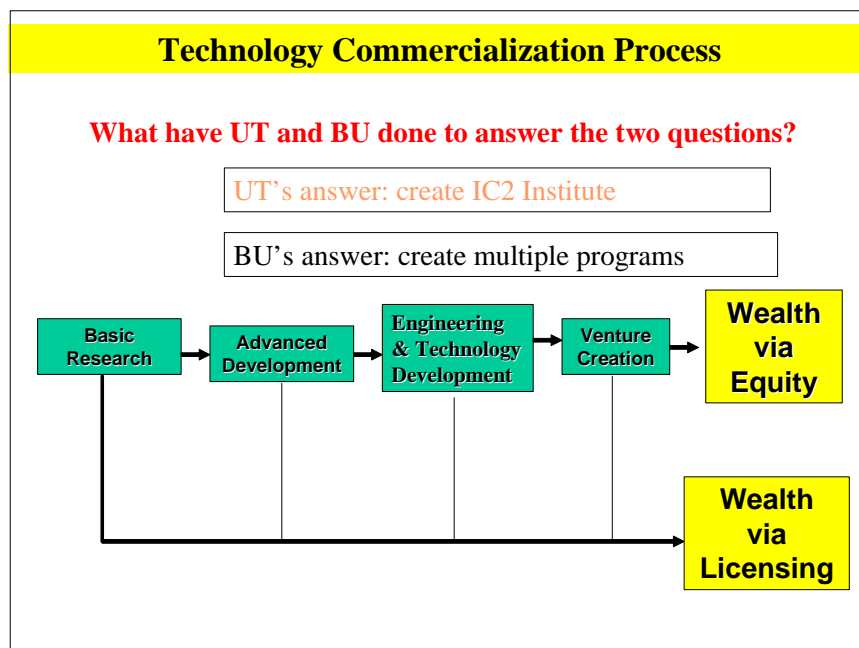
#### The two questions are how to...

1. Make university-centric technology commercialization more effective?
2. Accelerate university-centric technology commercialization?

Now we are going to cover a number of things. I am going to start off with what I think are two very

critical questions, two basic questions. Then we are going to look in some detail, not a lot (we do not have too much time), at an organization at the University of Texas (UT) in Austin called IC<sup>2</sup> – and I will tell you what that means in a minute. It is, again, a very novel kind of organization. Then we are going to shift and take a look at a newer organization at Boston University (BU). While that organization, the Technology Commercialization Institute, is new, in fact the programs that it is taking over are 27, 28 years old. So there is quite a history there. Then we are going to look at them a little bit – in the interest of time, I am going to combine these last two sections – in terms of successful core activities, or what I think are successful core activities for the future.

The two questions, very straightforward it seems to me, are: first, how do you make university-centric technology commercialization more effective? By that I mean, are we doing the right thing? Are we asking the right questions? Are we in fact commercializing the right kind of technology? Second is how to accelerate university-centric technology commercialization because you have a fundamental problem. This is new stuff for US universities certainly, but also, I think, for universities around the world. We all know that there is generally a gap in time in the way universities move and operate. It is much slower than the way the market operates. For years I ran a software company and I can tell you the rate at which we had to move in terms of being in business. Running a software company is quite different than, often, the pace at which universities operate in terms of developing technology, whether it is at the research bench, all the way through creating new ventures.



So those to me are two critical questions in terms of the commercialization process. This is a very simplistic representation in green here of this process, from basic research, advanced development,

engineering technology development, venture creation. We could picture this in eight or ten different ways, with more detail and a lot of other interesting things, but the key thing here it seems to me is that we are trying to produce wealth, initially financial wealth, through equity leading to social wealth as well. By equity we mean venture formation, but you also have the opportunity to create wealth by licensing technology.

The University of Texas in 1977 got involved in this very early – I will explain why – to create this organization called IC<sup>2</sup>. BU’s answer was to create even a couple of years earlier multiple different programs. So they approached this very differently and that is part of the interest.

Two Profiles UT & BU	
<ul style="list-style-type: none"> <li>• 50,000 students</li> <li>• 3,000 faculty</li> <li>• \$350 million Research</li> <li>• \$1 million Licensing</li> <li>• No University Hospital</li> <li>• IT strength</li> <li>• State Institution</li> <li>• IC<sup>2</sup> &amp; Kozmetsky</li> </ul>	<ul style="list-style-type: none"> <li>• 30,000 students</li> <li>• 3,000 faculty</li> <li>• \$300 million Research</li> <li>• \$1.6 million Licensing</li> <li>• 2 Hospitals: BMC</li> <li>• Life Science strength</li> <li>• Private Institution</li> <li>• John Silber</li> </ul>

A little bit about the two universities, just so you will have a sense, because some of you are probably familiar with those universities but a number of you may not be. They are both very large. 50,000 students. The University of Texas, depending on what year you look, is the largest university in the United States. But BU, you may not realize, has nearly 30,000 students. It is the fourth largest private university in the United States. They are both very substantial and they both have about the same amount of faculty – about 3,000 faculty – and Boston University has built that faculty up over the last 15 or 20 years considerably.

The research spending is not that different, although the amount of research on an annual basis at UT – at the US\$350-million level – has been in place for longer and a lot of it is somewhat more focused than BU. Why that is the case, I will get to in a minute. But Boston University still has about US\$300 million in research.

Out of that, neither one of them are performing very well in terms of licensing – taking that research and converting it into licensing income. If you think of UT, or you could talk about BU the same way, US\$350 million over ten years – you are talking about US\$3 billion – and out of that, only producing US\$1 million in licensing income. By contrast, MIT for instance produces maybe US\$30-40 million a year. There are certain other universities that produce much more, but mainly in a lot of those instances it is because of one very fortunate breakthrough, and if you subtract that, then the performance of licensing has not been satisfactory. Many, many universities – even MIT – are not content with their performance.

At UT in Austin, key differences here: no university hospital, a lot of the activity focused around information technology, a state institution. By contrast at BU: a couple of hospitals, strong life science focus, a private institution. How did this all get started (in terms of at UT, the creation of IC<sup>2</sup> Institute; or at BU, all these programs in the 1970s)? They had champions. At the University of Texas, it was a gentleman by the name of George Kozmetsky who had the foresight and vision to create IC<sup>2</sup> Institute. At BU, it was an individual who became the president of Boston University, probably the most entrepreneurial academic in the country in terms of being an academic entrepreneur. Dr. Silber in 30 years really transformed Boston University.



- IC2 INSTITUTE
  - A unique institution for regional development

## What Is IC2 Institute? History, People, Programs

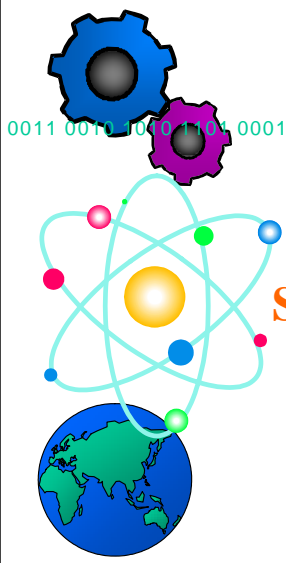
- 26 years old
- \$5 million
- 40 people
- 230 IC<sup>2</sup> Fellows
- Research Conferences
- Visiting Scholars, etc.
- Incubators...TCCs
  - ATI, AMI
- Masters Program
- Training Programs

2

Let us start with IC<sup>2</sup> Institute. This is a unique organization. This particular facility is about 20,000 or so square feet devoted to education, very innovative education and leading-edge research associated with entrepreneurship in the early 70s and then it moved into technology commercialization. What is particularly well known right down here at the bottom floor is a global classroom, very innovative education that I will talk about in a few minutes.

### MCC Building & Austin Technology Incubator on 3<sup>rd</sup> Floor






**IC<sup>2</sup> Institute at  
The University of Texas at Austin**

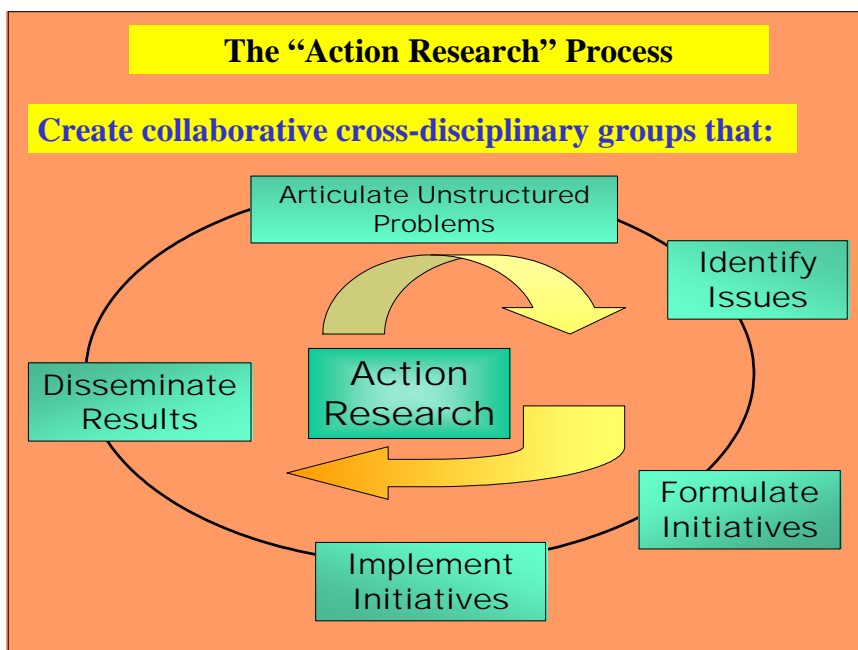
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**Master of Science  
in  
Science and Technology  
Commercialization**

## Biggest Contributions of IC2



1. Theory of Collaboration & Regional Development
2. Action Research



The key message here is that this particular institute, when it was created, was not strictly focused on technology commercialization. It was particularly focused on regional development. Its charter was to transform Austin and make it a high-tech area.

It was very effective at doing that. As some of you may know, it took 50-60 years for Silicon Valley to emerge and even longer for Boston’s Route 128. In Austin, this transformation occurred in about little under 20 years. I could talk for about three hours about why this happened; there are probably about 17 or

18 reasons that we could go into, but this particular institute was one of the reasons. One of the factors that made it very effective was, quite frankly, its size. This is an institute that is very substantial. It has an annual budget, depending on when you looked at it, of anywhere from 4.5 million to 6 million; about 40 people – again, depending on when you looked at it, sometimes a little less, sometimes a little more; during research conferences, they would put on visiting scholars; we ran incubators – I will get into and show you a major incubator (ATI is the Austin Technology Incubator); we had an in-house Master's program and a number of training programs.

But the real secret weapon, if you will, of this particular institute was 230 IC<sup>2</sup> fellows who were outstanding academicians, scientists, CEOs and government officials around the world. For most of it, it is history. There were probably about 80 to 180 of these fellows in the last seven or eight years of its existence; it increased to about 230 fellows. These people played a very important role in developing the policies around the creation of our incubator and developing the ideas associated with our Master's program. When an incubator was created in 1989 (it was created at this MCC Building, which is a rather famous building in Austin), it had the entire third floor, about 50,000 square feet, and it was one of the more successful incubators. I think this is important: it was completely subsidized. Essentially the business model associated with this incubator was that the university gave IC<sup>2</sup> and the Austin Technology Incubator free space. They turned around and rented it to companies and used that money to then pay the professionals who worked with the companies to accelerate them through the commercialization process.

I think it is also important to say that since this was started in 1989 (it has been running now for 14 years), it has never produced what we would call a homerun. It has produced a number of very successful ventures that have been acquired, there were four or five companies that have gone public, but I would have to say that from the Institute's perspective and the University's perspective, it never really produced anything significant for the University of Texas. It produced very significant things for some venture capitalists, for some companies that acquired these new ventures. It was very successful from the city's standpoint in terms of the taxes that were generated. But the University never really made very much out of this, and so it is in the process because of that of being downsized to a certain extent. They are down to about 20,000-25,000 square feet and it has been a problem sustaining that.

The other major program that bears mentioning was a customized Master's degree in technology commercialization. This was the only one. This is not a Master's degree in the management of technology. It is technology commercialization where we would have executive students, people 30-50 years old with industry experience, come in and work with real technologies. We would get a couple of hundred technologies from the national labs, from the university, from the corporations, and each student team would work on real technologies to see if there was market potential, if the technology itself was worth pursuing, and eventually what kind of business opportunity could be identified and developed.

The rationale is what is important, why this program was created. It was created because we came to the conclusion that no one is trained to do technology commercialization. MBAs are not taught how to do it. Engineers are not taught how to do it. What we basically said at IC<sup>2</sup> was that we really need to create a new cadre of people who are trained specifically in commercializing new technology.

The biggest contributions of IC<sup>2</sup> – I am going to skip over this because it does not relate specifically to education. But basically there were two things that were important about IC<sup>2</sup>. One was its collaborative approach, and this was mentioned in the introduction. What is important here is that IC<sup>2</sup> in the early 70s and early 80s was getting government people together with industry people, with academicians, and working jointly on collaborative projects and doing what we call action research. Those slides are in your packet so you can see them and go over them. If you are interested in talking more about them I can talk with you more later on, but for the purpose of this discussion I would like to move on.

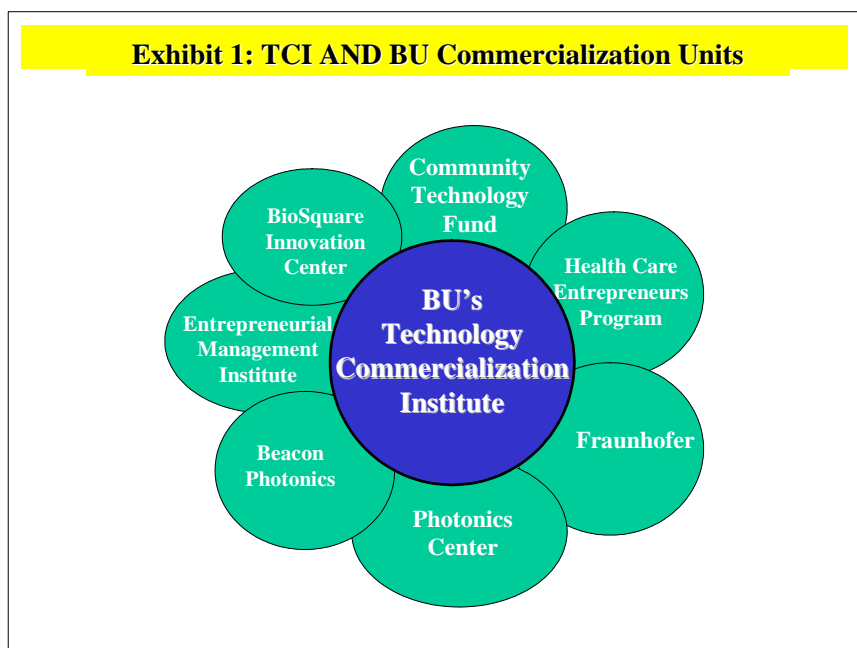
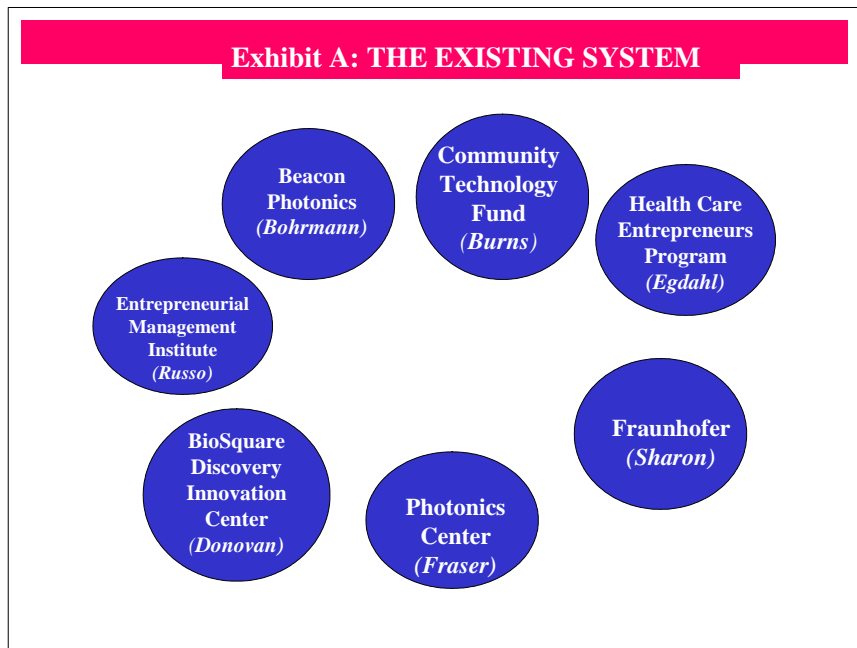
### C. Boston University



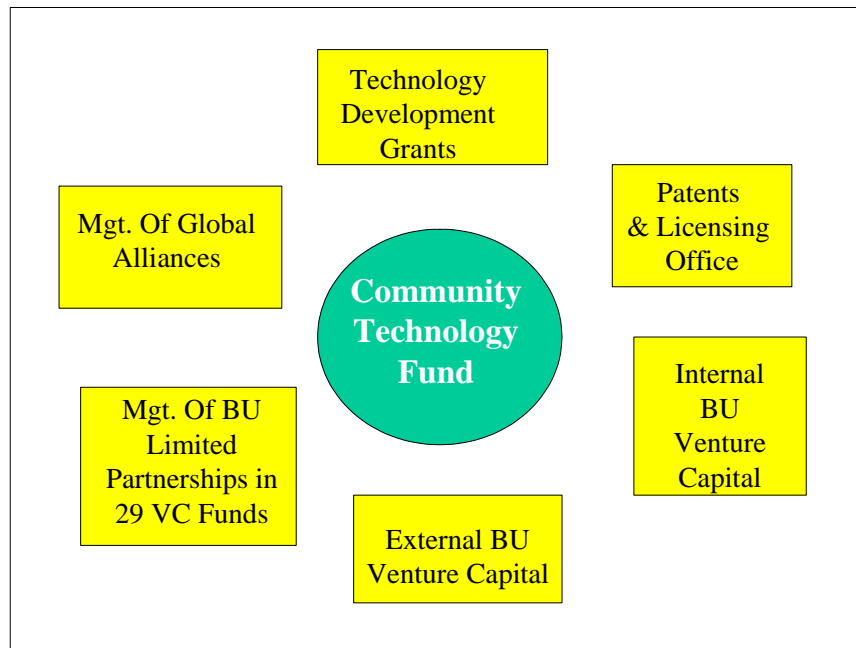
Boston University – quite a bit different in terms of the setting. Of course you know it is Route 128. Boston and Silicon Valley are kind of the two areas that have led the high-tech charge. One of the things that was very different about Boston University as opposed to the University of Texas is that Boston University has a lot of competition. Right across the river you have MIT and up the river you have Harvard University. So they had quite a different situation, very competitive in a friendly way. I guess we would call it cooptition, where the universities now coordinate. In fact Harvard and MIT are coordinating with Boston on a major new activity down here in this area that is called BioSquare. It is actually where a couple of BU's hospitals are. The point is, there is competition here.

**Boston University: Two Campuses plus the competition**

In Austin, the University of Texas is it. There is not a lot of competition, so there is more of a history of a very slow, bureaucratic approach to things, whereas the environment here for Boston University – particularly the environment that John Silber faced 30 years ago – was one where if you wanted to be a first-tier university, you had to be aggressive and you had to do some things. So they were very aggressive. There is a lot of medical activity around here, and in fact Boston University has two campuses – one right along the Charles River. Another one is about 30 buildings, a major medical complex down here, and part of this is called BioSquare, but it is a much bigger medical center with a medical school, dental school, a number of other activities, two hospitals, etc.



What happened is over the years, the university created a whole bunch of programs, and I am not going to have time to go into all of these, but there are seven entities here and together they really contain about 15 different programs. What I am going to do is talk about two or three very quickly. What has happened is because we had these separate seven entities, we collapsed them down to a certain extent by creating a new umbrella organization called the Technology Commercialization Institute. All of the directors of these programs will now report to me, and the University not only created this institute but created a position, a Vice Presidency of Technology Commercialization. That in itself is unusual, and we can go into that later.



I would like to just look at two or three of these – one is the Community Technology Fund, because it is the oldest. It started in 1975 and it created a fund, a venture capital fund. It was the first university-based venture capital fund in the United States. It started with about 10 million, it grew that to over 60 million. With the dot-com explosion, the value of that fund has collapsed down a bit. But it is still about 30 million.

Today this focuses on external ventures, as opposed to another fund that focuses on BU ventures that are started. You have also got heavy investments now in limited partnerships in 25 venture capital funds – over US\$100 million invested. Boston University is well covered in terms of investing in high-growth, high-impact ventures, whether they are starting on its campus or in the area. The Community Technology Fund was also in charge of managing global alliances. It had another fund that was not for new ventures but for developing technology. This is where what we call the real “Valley of Death” often exists, where it is hard, and where you have technology and people think it is promising but they need another US\$50,000 or US\$75,000 to proof of concept or proof of practice, and that is what these grants do. This Community Technology Fund also ran the licensing office, and that has grown and has about a half dozen people. We are expecting some big things from them.

## PHOTONICS CENTER MISSION



**The Photonics Center  
at Boston University**

*"The Future of Light"™*

- Create and accelerate photonics enabled businesses in partnership with industry, investors and entrepreneurs
- Operate a "full service" incubator to support our companies
- To be the "Hub" of photonics activity for the industry
- Educate the future leaders of the industry

There is a major photonic center. This is the second biggest program and it is probably about 250,000 square feet, nine floors. It has done a reasonably good job in terms of incubating some new ventures and certainly in terms of drawing attention to the university as a site or a hub for photonics activity. It has created an outstanding job in terms of developing these portfolio companies. Despite the fact, I have to say that they have raised a lot of venture capital and created some jobs, but no big hits yet. This came online in 1997, so they are going through the pipeline and it is going to take a while for them to have some major successes, it seems to me. Actually they are up to 19 labs now and US\$30 million in equipment. You can read these – there are a whole variety of labs.

### Portfolio Companies

- |                                 |                          |
|---------------------------------|--------------------------|
| • <b>US Genomics</b>            | Rapid Gene Sequencing    |
| • <b>iProvica</b>               | Long Term Care Products  |
| • <b>Mosaic</b>                 | Blood Monitoring         |
| • <b>Solx</b>                   | Glaucoma Laser Treatment |
| • <b>Ambergen</b>               | Drug Discovery Tools     |
| • <b>PhotoSecure</b>            | Anti-counterfeit Dyes    |
| • <b>PhotoDetection Systems</b> | PET Detector             |
| • <b>Verrillon (IntelCore)</b>  | Specialty Optical fiber  |
| • <b>Airity</b>                 | Telecommunications       |
| • <b>A123</b>                   | Batteries                |
| • <b>FiberGrade</b>             | Telecommunications       |
| • <b>BioScale</b>               | Pathogen detection       |
| • <b>Verilink</b>               | Telecommunications       |

**These companies have raised more than \$156 million in venture capital and created more than 200 new jobs.**

### LABS AND EQUIPMENT

**17 Labs (>\$30 M in Equipment)**

- Scanning IR Near-Field Microscopy
- Femtosecond Laser Facility
- Photochemical Processes
- Photonics Systems Engineering
- Quantum Optics
- Precision Optics
- Optoelectronic Materials
- Precision Measurements
- Optoelectronic Processing Facility
- Magnetic and Optical Devices
- Laser Measurement/Fiber Optic Sensors
- Near-Field Scanning Optical Microscopy
- Picosecond Spectroscopy
- Photonics CAD Lab
- Lightwave Technology
- Test & Measurement
- Photonics Integration



## BioSquare

**Boston's only research park devoted exclusively to the Life Science sector**



BioSquare is the medical area. This particular development is about eight or nine buildings, 2.5 million square feet. Down this end is the BioSquare Discovery and Innovation Center wet labs. This is a picture of one with hooded kinds of capability that is leased out to budding biotech companies. One of the big advantages of these companies is that they have access to all kinds of other facilities that you can see here: Genomic Microwave Resources, all kinds of things that are available.

## BioSquare Sample Floorplan

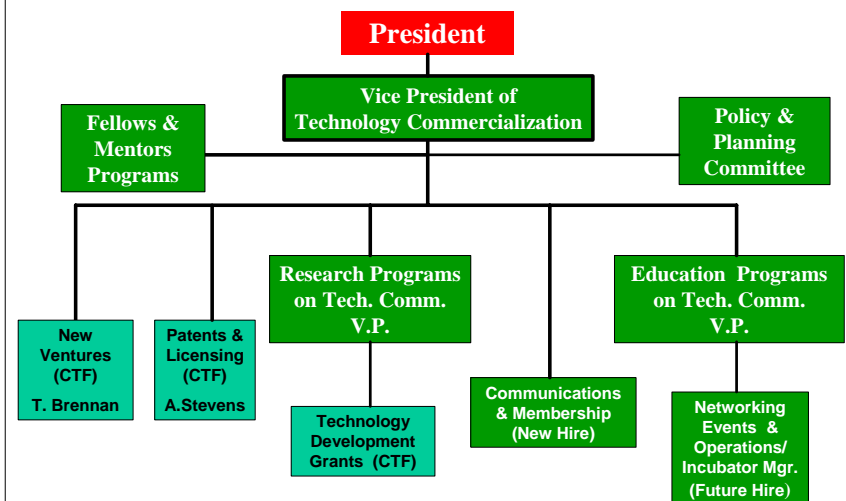


## Tenants of BioSquare Have Access to Outstanding Biomedical Core Facilities

- 
- **Laboratory Animal Research and Transgenic facilities**
- **Biocontainment Facilities**
- **Genomics Microarray Resource**
- **Cardiovascular Proteomics Core Laboratory**
- **NMR Spectroscopy Core**
- **Mass Spectrometry Resource Center**
- **Macromolecular X-Ray Crystallography Core**

Now what about the future? The future is really built around this Technology Commercialization Institute, and what it is adding is what was really missing at Boston University but existed at the University of Texas at IC<sup>2</sup>, and that is primarily research programs and education programs, fellows and mentors – that is going to all be added.

## The Technology Commercialization Institute

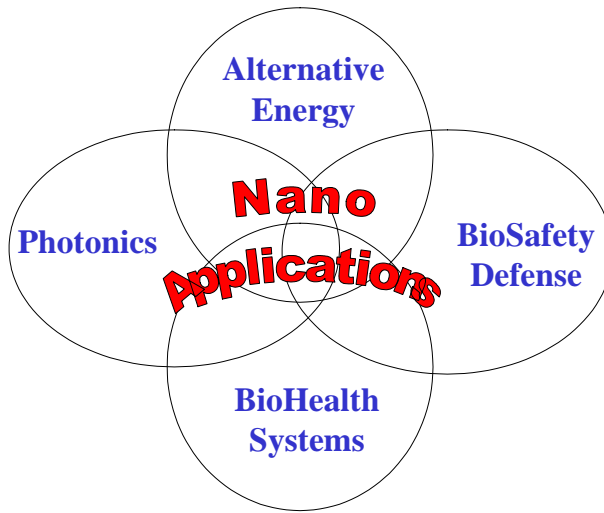


## D. Core Activities

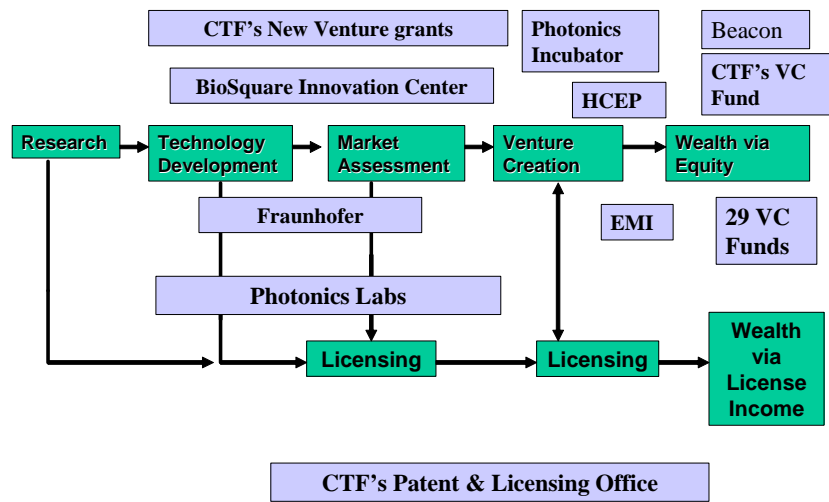
1. Focus the pipeline
2. Build critical mass for full service
3. Innovate to eliminate the bottlenecks
4. Innovate to match technologies, ventures, and capital to market needs.
5. Innovate to galvanize people around compelling problems.

Coming down the home stretch. We have some success factors here. It seems to me, what we need to do is focus on these things. You could call these core activities but you could call them success activities actually. I think they are critical success tasks for having successful technology commercialization. Number one is focus the pipeline, not fill the pipeline. By focus the pipeline, basically, what I am talking about is figuring out what are the technology areas you really need to focus on. Build critical mass for full service; innovate to eliminate the bottlenecks; innovate the mesh technologies, ventures and capital markets and needs; and innovate to galvanize people around compelling problems. What do I mean by each of those? Well, look. Focus the pipeline. Where is BU's focus going to be? Well if you go around, I have been studying what has existed there for the last six months, and we have a strong bio-health systems group. Obviously we probably have a strong photonics group. There are half a dozen professors working specifically just on fuel cells and a bio-safety defense group that is emerging that may result in a major level-four bio-safety laboratory. What is interesting is that you have nano applications going all across this.

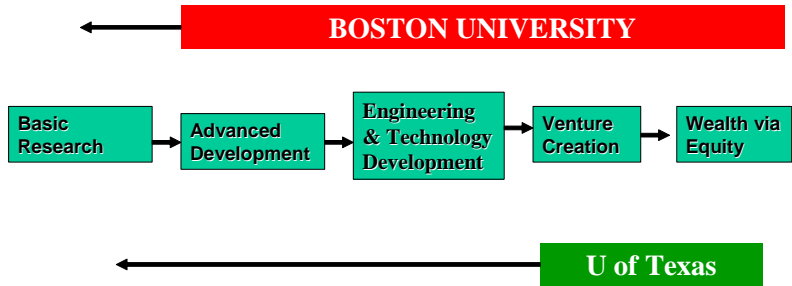
**1. Focus the pipeline: BU's Technology Focus?**



**2. & 3 Bottlenecks & Full Service : B.U.'s Specific Purpose Accelerators**

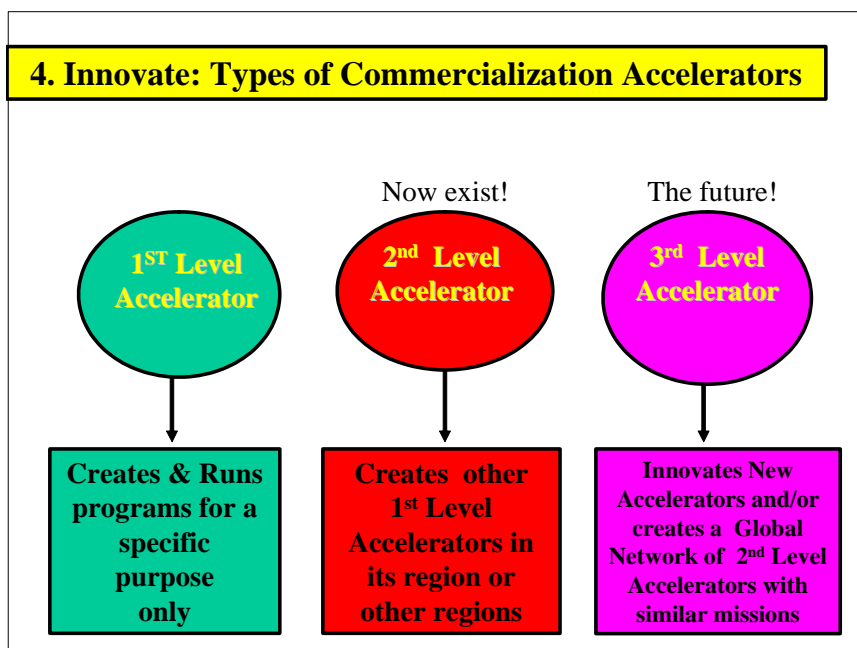
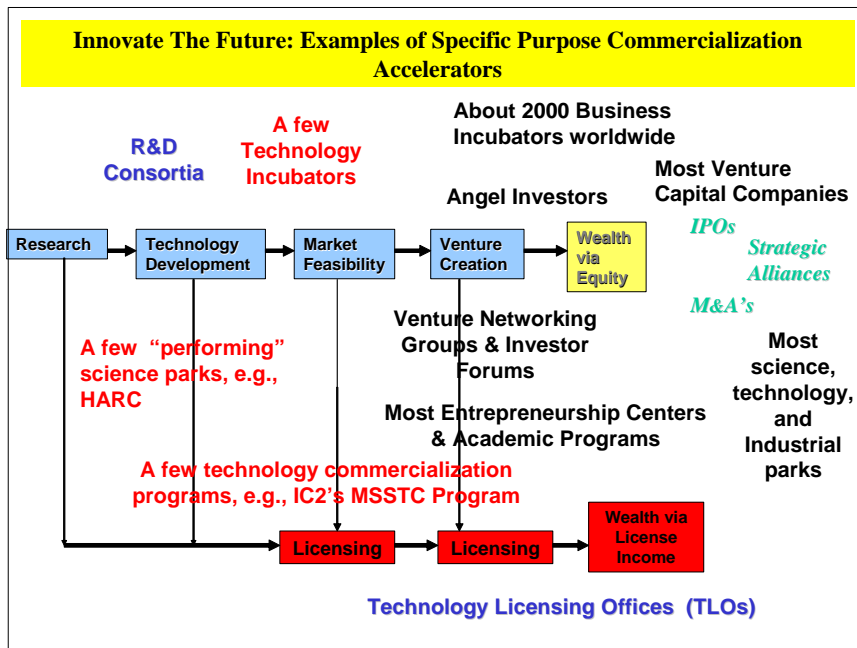


**4. Match to Market: Where are BU and UT positioned in terms of commercialization?**



**UT vs BU**

UT	vs	BU
<ul style="list-style-type: none"> <li>• Research on T.C.</li> <li>• Education on T.C</li> <li>• Limited Outreach</li> <li>• No independent capital</li> <li>• Bureaucratic, NIH Syndrome</li> <li>• Science oriented</li> </ul>		<ul style="list-style-type: none"> <li>• No Research</li> <li>• No Education</li> <li>• Outreach: Stronger and deeper</li> <li>• Capital Funds</li> <li>• Top Driven, Entrepreneurial</li> <li>• Applications Oriented</li> </ul>



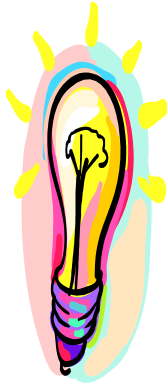
What I have been talking about with the Technology Commercialization Institute and IC<sup>2</sup> are in fact level-three kinds of organizations. When you look at BU, it has really created programs that cover the entire spectrum of technology commercialization. Most universities have not done that. If you look at the positioning, you see Boston University has covered a broader spectrum or covered that entire process. But both universities have good things. The University of Texas at IC<sup>2</sup> Institute, Research and Education – BU did not have any of that, but a much stronger outreach activity.

So it really differs. If you look at the history of institutions that have been created to facilitate technology, they all have a specific purpose. Whether it is a venture capital firm, venture networking groups, incubators, licensing offices – very specialized purpose. We call these level-one entities. What we are seeing are entities that now innovate new accelerators and create global networks. These are third-level accelerators. What I have been describing with IC<sup>2</sup> and with the new Technology Commercialization Institute at Boston University is a level-three kind of incubator or accelerator, and those are the kinds of organizations that are going to have to be created if you want to make sure you are doing the right thing in terms of commercialization and accelerating it as fast as possible.

**5. Galvanize: The Future “Haiku”  
by Thom The World Poet**

man stands by Ben White –  
holding sign – ‘employed. happy.’  
traffic snarls. confused.

## 5. Galvanize



1. **Internal: Tuition Remission**
2. **External: Job Creation**

Before they kick me out of here, I better stop and open it up for some questions.

**Mr. Asada:** Allow me to ask in Japanese two points. One, where is the independence of universities, especially in the case of Boston University? Where does the independent initiative lie within the University? The second question is about the Commercialization Technology Fund, an interesting fund. How is it managed? Technology licensing, ventures and joint research? They are all put into a comprehensive fund in your case, but we do not have anything like that in Japan. So can you give me a more elaborative explanation of this fund?

**Dr. Ronstadt:** First of all, the initiative at Boston University came from the top administration and the trustees of the university. I think it is unusual to have an administration that is very entrepreneurial within an academic institution. In fact, that is what you had at Boston University, first embodied in terms of its president, but it needs to establish a culture where other administrators within the university – not the faculty, the administrators within the university – act in a very entrepreneurial way. They have had, in terms of the other question that you asked, in terms of the management of the venture capital funds – you have essentially very talented people who are venture capital professionals who have been in fact hired to run these funds. They are centered very much the way professional venture capitalists are centered and motivated.