I would like to take this opportunity to thank this Legislative Committee for inviting me to share my experience on technology transfer. My name is Dr. Alan Moy, and I am an Associate Professor Medicine and Biomedical Engineering at the University of Iowa. I have had the good fortune of bringing over $3 million dollars of academic extramural funding to the state of Iowa. My research group has filed two patents through the University of Iowa Research Foundation in the past year. In January 2000 I founded CET Inc., which is based on spin-off technology created by my research group. My company is preparing an additional patent, and we are engaged in a research contract with Iowa State University to develop additional intellectual property in microfabrication. CET Inc.'s combines molecular biology and engineering and focuses on drug discovery. Our research team invented bioengineering technologies that have advantages over conventional tools like electron microscopy in evaluating important biological properties in cultured living cells. Compared to electron microscopy our technology measures biological properties in living cells at 1/100 the cost and space and it processes more samples and collects more information at a million times faster rate. We identified a novel gene therapy that potentially could be used as a generalized treatment against viral infections. Our ultimate goal is to develop a gene therapy that could be used to treat viral pneumonia in which presently there is no antiviral treatment for 70 percent of viral pneumonias.

I have 4 years of experience trying to commercialize our intellectual property. I have interacted with every administrative level at the University of Iowa that participates in technology transfer. I have interacted with the Pappajohn Entrepreneurial Centers; the Department of Economic Development; Legislative leaders like yourself to help craft legislation to support entrepeneurism; I have interacted with businessmen, investors and lawyers to learn about their point of view about business; I am familiar with the requirements of SBIR programs; and I participated in the Battelle discussions. My experience is comprehensive and similar to my entrepreneurial colleagues at the University of Iowa. My experience has given me insight into the Iowa environment for faculty entrepreneurs, and it has led me to question whether Iowa knows how to create biotech companies, and I have also concluded that Iowa's institutions must fundamentally change the way it manages economic development for biotechnology. Our institutions have systemic flaws. Like my colleagues, I have experienced frustration and disappointment. I will highlight in my testimony my experience; explain the holes in the system, and finally make recommendations.

When CET Inc incorporated in 2000, at a time when Bill Decker was not the interim Vice President of Research, we approached UI administrators for advice on the best mechanisms how we could provide commercial service in cellular engineering to customers by using my on-campus laboratory space. There was no available wet lab space then or now on the Oakdale campus, the industrial park at UI, for me to set up my company at an affordable cost. There was precedence for this model at other universities. CET was charged an overhead rate of 47 percent – the same rate it charges the federal government and almost twice the rate ISU charges small businesses. You can decide whether that is an attractive deal for an Iowa based-startup company. To make a long story short, after 1.5 years of UI giving CET indications that they would support the contract that they wrote, and after going to through several layers of bureaucracy, and costing me thousand of dollars of legal fees, the university ultimately refused to support this contract on the basis that on-campus research space should not be used for commercial services.

I have also encountered an apathetic culture in my Department, College and University towards faculty-directed entrepreneurism. The only way that UI will see a return on its investment is if I put sufficient energy and time into this venture. Yet, my College does little to protect my time to commercialize the intellectual property. I have to work on my company on my own time in the evenings and weekends. My Department currently requires that I provide 6 months of clinical service; increases my teaching and service on academic committees without increased financial compensation or rewards and without a raise in 3 years; and at salary that is below the 25 percentile for comparable faculty of the American Association of Medical Colleges. The amount of teaching, clinical and committee service that I provide already makes it difficult to perform my academic research, despite having NIH funding. Trying to maintain my laboratory and start a biotech company is to say the least a real challenge in this environment. In contrast, clinical faculty without research programs or scholarly or entrepreneurial expectations in my Department provide between 1 month more to 2 months less clinical service; receive up to 20 % higher salary; and receive greater subsidizations from the College of Medicine to protect faculty time to engage in administrative and teaching activities, while none of these activities generate revenue or comes close to the potential economic return to UI as the commercialization of intellectual property. The take home message is clear that tech transfer is not given any priority and is viewed irrelevant to the academic mission in the College of Medicine. Evaluations of research faculty performance and promotion are based on the amount of research grants and papers published, and without any consideration of tech transfer achievements.

There is a pervasive culture in the University shared among many but not all faculty and administrators that commercialization of research is not academically pure, is fraught with nothing but conflict of interests, and is simply to make a select group of faculty wealthy. There is an obsession at UI with conflict of interest, and it paralyzes many in making administrative decisions. It absolutely boggles the mind why UI would spend thousand of dollars on patent costs and risk leaving patents on the shelf rather than further developing it for societal good and create economic opportunity, which only comes back in the long run to help the university and Iowa's citizens. Since starting a biotech company is a high- risk venture (1/10 becomes successful) and the incentives and rewards are bias towards academic scholarship, and there are many barriers for entrepreneurs, faculty typically choose the safer option of concentrating their efforts in academic scholarly pursuits and not entrepreneurial ones. These are the reasons why few of my colleagues pursue startup biotech companies in Iowa, or if they do start a company, they recognize that they must give serious consideration to move the company outside of Iowa to have a chance of it growing.

I have found little assistance from the University of Iowa Research Foundation (UIRF) other than patenting an invention. UIRF does not provide seed money; help market technology; find investors or help find management. The burden of these responsibilities rests with me. Research foundations and license officers also have little understanding of what it takes to commercialize technology, and they don't recognize that the R/D is far more costly to bring a product to market than the R/D that created the patent.

There have been some improvements at UI. There is more positive dialogue within the University in great part by the efforts of VP Decker and President Skorton to try to reorganize

and plan new programs. Yet, these programs have yet to be implemented to directly benefit my colleagues or me at this time.

To be fair, UI receives less state appropriations than ISU to support economic development. If Iowans want more economic development output from UI, then the State has to put its money where its mouth is. By the same token, UI needs to do a better job of showing that economic development is a priority. UI has a campaign to raise 1 billion dollars. However, not one dime will be devoted to tech transfer. While there is a severe shortage of wet lab space at the Oakdale campus, a local biotech company left Iowa (supported by the CEBA program) and abandoned its brand new 10 million dollar 10,000 square feet laboratory and put it up for lease at $250,000/year. State legislators were informed of this opportunity last year but failed to assume the lease. Instead, UI COM assumed the lease and now uses it for academic research. Economic development in Iowa is like Oliver Twist standing last in line with an empty bowl and begging –Please, Sir may have some more!

I have found the Iowa Department of Economic Development (IDEC) completely unhelpful. My company has been turned down for seed money, including more recently by the Iowa Value Fund because my company is not creating enough jobs. One official told me that IDEC's mission is not to support research and development costs. He insisted that R/D is the responsibility of the Reagent Universities and investors. IDEC ignored my attempts to appear before investors at the Venture Iowa Network to try to raise [redacted] seed capital, but it was nice to see that Captain Jack got an opportunity to raise funding for a professional wrestling business in Iowa. In my judgment, IDEC is more concerned with giving grants and forgivable loans to outside companies like Wells Fargo, which will receive 10 million dollars to move to Iowa to create jobs. IDEC is more interested in making big public relation headlines, but does little to support entrepreneurs living in Iowa.

Another major problem for faculty entrepreneurs is lack of available and suitable management in biotechnology. I have received 4-5 resumes from managers over the past year. Only 1 had prior management experience in biotechnology. She lived out of state but had an interest to return to Iowa. However, CET did not have enough operating income to recruit her. These individuals know what their value is and it requires an executive salary plus stock options to recruit them, which is beyond a startup company's ability. Those that had managerial experience in other technology industries and lived in Iowa did not have realistic time horizons, experience and expectations of what it takes to develop biotechnology business and did not understand federal regulatory requirements in the biomedical industry.

The biggest problem that my company faces is a lack of seed money. Like other startup biotech companies in Eastern Iowa, my seed money has come from personal investment, from my academic research grants and from my family. Banks are unwilling to capitalize biotechnology because they don't understand the business and view it as too high risk. Angel investors in eastern Iowa do not have much experience in investing in biotechnology industries and are conservative investors. Local Angels want to see a management team, a scientific team, and a track record of revenue and industrial and customer endorsements. Some of these expectations are not realistic. These barriers are particularly challenging for biotechnology companies like

CET that are trying to develop therapeutic biologics and research tools, which require a significant amount of R/D to bring products and services to market.

I have received unsatisfactory support from the Pappajohn Entrepreneurial Centers. I have received business graduate students to help work on business plan development, market research and financial analysis. Yet, many of the students provided incomplete or unhelpful information or provided no work at all. My colleagues shared this same experience. Thus, I had to write my own business plan.

I have observed a less than impressive performance from government. My colleagues and I see the Iowa Value Fund largely as a spending bill – diluting resources to non-entrepreneurial areas such as supporting primary and secondary education, which already receives the highest fraction of state appropriations. This bill is choosing winners instead of systematically changing the entrepreneurial process. I was disappointed to see the Governor line item veto provisions in this bill for a statewide technology transfer agent that would coordinate and oversee tech transfer with state agencies and universities. I was disappointed to see the Governor proposed new taxes targeting engineering companies this year, which would negatively impact my company. I was disappointed to see Legislative committees entertain bills (SF3095) that create unfair requirements on faculty entrepreneurs to create spin-off companies. I have been surprised by discussions from Legislators and the Reagents considering closing the College of Engineering at UI to cut costs. However, this would force my colleagues and me to move our academic research programs and companies out of Iowa.

Despite these obstacles, CET Inc. is making progress. We are making progress on our R/D efforts. We are getting closer towards offering commercial services. We are making significant commercial and academic research breakthroughs. CET will be applying for options from UIRF for exclusive license for our filed patents this year, and we hope that an agreement can be worked out. We have applied for over 4 million dollars of federal grant support for technology development and for creating a training program in cellular engineering for doctorate students at UI and ISU to provide a highly educated work force in five areas of cellular and tissue engineering in Iowa. This program was a grassroots effort among over 30 faculty members from 4 separate colleges at ISU and UI to address a growing need in academia and industry. Our training program is unique in that we will promote economic development among our students and faculty.

I have outlined systematic problems in Iowa to develop a biotechnology economy. These problems have been well defined in the Batelle report, which I strongly urge all of you to review. Iowa has major challenges that it has to overcome if it wants to become a serious player in the biotechnology economy, and when I refer to biotechnology hereafter, I am restricting it to human biomedical industries and not agricultural industries because there are major differences between these two industries. Iowa is lagging behind many other states in the biotechnology economy, and it has failed to ~~make~~ create the ~~same~~ necessary investments and ~~cre~~ supportive environment. Creating a biotechnology economy in Iowa will take 10-20 years to develop. It will require long-term planning, commitment, and patience. While it remains uncertain whether Iowa can be a player in the biotechnology economy, there are a few rules that have been observed from the experience of other states that have accomplished this successfully. First, the vast majority of

biotechnology companies are created from local startups and not from companies that move in from out-of-state. Second, most local startup companies were founded by creative and talented faculty entrepreneurs from local universities and research institutions that formed successful businesses with the private sector that understood the biotechnology industry. Third, high tech companies are located where the founders and investors live. Fourth, whether we like it or not, the recruitment and retention of creative and inventive faculty is greatly influenced by the academic environment which allows faculty to see their creativity being commercialized. Thus, if Iowa wants to create a thriving and growing biotechnology industry, it is going to have to find ways to create incentives and encourage and support faculty to create companies in Iowa, and Iowa will need to do a better job of nurturing startup companies in a comprehensive fashion.

Among faculty entrepreneurs in my College, there is deep pessimism that Iowa will succeed in creating a robust biotechnology economy. In my Department, one faculty left Iowa to start a pharmaceutical company outside of Boston. Another colleague's startup company was offered a 0.5 million dollars from the Dept. of Economic Development to move his company to Pennsylvania. Another colleague is looking to move his academic research program and start a biotech company in Boston. Recruiters and industrial partners have asked me to consider moving my company out of Iowa. Few outside of Iowa view my business seriously because it's located in Iowa. There are 26 other states that are competing to develop biotechnology economies and most have more resources and infrastructure and are better poised to steal successful startup companies from Iowa. The only way Iowa can prevent or reduce this from happening is to create a nurturing relationship with startup companies from the beginning.

The solution to correct these problems is not rocket science. The solutions have been well documented in many reports like the Batelle report. I am not going to restate them, but I will emphasize those that I believe are critical.

1). There has to be strong cooperation and commitment between state, private and academic institutions to support economic development.

2). Startup companies need money and experienced business teams in the biotechnology fields. We need incubators that just don't provide lab space, but we need shared management teams. Every startup company can't afford to hire executives because of their limited availability and cost particularly in Iowa.

3). Faculty entrepreneurs need more seed money for R/D to commercialize intellectual property in biotechnology. Biotechnology carries far more risk than other technology businesses. Investors from the public and private sector are going to have to come to terms with this. If we as a State cannot manage or tolerate this risk, then Iowa shouldn't expect to become a player.

4). Public programs have to be very focused, and those resources should be positioned where it's going to have the most direct impact on creating high tech companies. Since 70 percent of our national economy is driven by small business, and Iowa has limited resources for economic development, then those public resources should only be marshaled to where it's going to have the greatest long-term impact on creating high technology industries. For these reasons, economic development programs should focus solely on entrepreneurism and not conduct a

litany of window dressing activities that have nothing to do with entrepreneurism. Until you perform entrepreneurism well, nothing else will happen. If Iowa wants a biotechnology industry, it's going to have to target faculty entrepreneurs. Faculty entrepreneurs need protected time, incentives, rewards, support and encouragement to create companies.

5). We need to solve the shortage of lab space. We need better comprehensive short-term and long-term solutions.

6). Most of all we need to change the culture of our institutions in how we encourage entrepreneurism. We need people who have the passion for business development, and they need the power and resources to change the culture of Iowa's institutions.

If Iowa's institutions do not fundamentally change its culture, Iowa will find itself at increasing threat. Legislators will continue to struggle with state appropriations. Cost of higher education for families will increase; jobs and high-technology businesses will leave the state; and our most creative citizens will take their public-supported education and leave the state in search of better economic opportunity. Academia, the private sector and government has no other choice but to work together to solve these problems or settle taking a trip that will ultimately lead to economic Armageddon.