



**Saturday, 10 May 2003**

**Science, Perceptions, and Society**

***Peter McCann***

***Bill Thomlinson***

***Bruce Waygood***

*The three panelists were asked to consider the following questions:*

- *What are the major challenges in science-orientated partnerships between university groups and private sector or government?*
- *How do attitudes and perceptions in society-at-large influence future science-orientated research partnerships?*
- *What role will society-at-large have in shaping the future of these partnerships?*

**Peter McCann:** I'd like to thank the organizers for allowing me to speak here today. Bryan was kind of enough to refer to me as an expert, but I'm not. To set the tone, a statement from Stanford University argues that community-university partnerships are about maximizing opportunities to fund research appropriate to the institution, such as agricultural science and medical science at the University of Saskatchewan, and to promote commercialization of any technology that is subsequently developed. Technology transfer can occur through licensing discoveries, which is a sort of conventional interpretation, by training highly qualified people who take knowledge with them (post docs and so on), consulting work, which is very common here in Saskatchewan, and publication in academic journals and other print media.

Each of the parties seem to treat technology transfer in different ways. The university looks to generate or create revenue or endowments and so on—to fill the cup, in other words—to secure government funding, to enhance its reputation, to develop research projects, and to attract and retain faculty. Industry looks for partnership, for transfer, to get superior projects to get ahead in the marketplace and increase profits. Scientists / principal investigators look for personal satisfaction, reputation gain and peer admiration, and so on. Venture capitalists looking for dealings to capitalize on will look to fund one hundred and fifty different opportunities in the course of the year to develop commercial products and services and make a profit, a lot of which will fall back to the university.

We talk about the argument of public benefit and public good as not necessarily being the same thing. Sometimes a goal is best achieved by partnership with private industry. For example, if a drug discovery is made at the University of Saskatchewan, it will take at least five to seven years to get that product to market (probably longer) and the minimum cost will be three hundred million dollars, probably closer to five hundred million dollars. By the time it makes it to market, it will have gone through the final stages of research medical trials, a truly rigorous process. Sometimes government agencies can do this as well, such as developing new crops that benefit farmers. And, of course, the traditional way that university and technology work to transfer products is bundling through organizations, such as the University of Saskatchewan Technology Transfer.

So, while structured university partnerships can lead to economic benefits and can also lead to social benefits, there is a growing requirement for research to be commercialized or at least be commercializable. Genome Canada requires that there be a commercialization plan submitted with every application for grants. Granting agencies want to see matching grants from industry funds—a 50/50 match. They look to invest five hundred and seventy million dollars into enormous research in Canada—not a small amount of money. I often get asked for letters of support from scientists who are putting forward proposals and methods of commercializing their research products.

And, of course, there is the pressure to patent. It is often difficult to balance these pressures with the university's many roles—quality of education, basic research, expressions for public good, free flow of ideas, and publication. The concept of open science is difficult when you're taking industry money and looking to patent, to have complete open science, and, of course, the pressure of all research scientists, especially at the university, to publish.

By 2010, Canada will be among the top five countries in the world in terms of our own research and development performance. That's not an easy thing to do, but university-derived new knowledge and intellectual capital is an essential component in the transition from a manufacturing-based economy to a knowledge-based economy.

So what do we look for in this university-industry partnership? Believe me, the road to successful partnership is never smooth; it is always full of bumps and bangs along the way. But they do work. First of all, a united vision of a valuable goal achieved together is necessary. Common vision, common goals, and common respect are essential. Respect goes two ways—be it from industry, government agencies, or from university research. There has to be trust and transparency and willingness to share right from the beginning. It is taking and sharing risks and it needs to be an honest game of sharing. Mutual respect and regular close interaction—at least talking to the university researchers—is key. Government and industry need to meet monthly, to talk to each other in the lab, to look at each other across the table so that all expectations are clearly documented and using flexibility and teamwork to make it work. These are not easy things to do because, essentially, what we are doing is working with a bunch of preconceptions on both sides. So, to bring these people together as a team is not easy.

And, of course, there is plenty of opportunity to fail. Technology transfer leaves many universities uncomfortable. It is very cumbersome and hard to operate and hard to live with. And, of course, you do need to be willing to bend the rules to make the thing work, as long as it's within the parameters of achieving the common goal. The rules-bound systems, which tend to dominate existing governments and universities, are very problematic in this area. It always takes longer than you would think and costs twice as much.

There are numerous unintended impacts of university-industry partnerships. For example, there is directed research versus serendipitous research, and freedom of action by the scientist versus a remotely controlled research agenda. There is also the concentration of high impact science and neglected “orphan” science. Often an “orphan” product is not right in the context of the partnership.

However, industry partnerships with university departments add value, as well as join the expertise. Attitudes and perceptions influence partnerships, as well. Some regard industry as dominating the university’s direction, as a sellout to industry. Industry funding has been said to generate tainted data. There is also a perception that the public is not well served by such research.

Society’s role is one of the questions that we were asked to address. Frankly, I pondered that for some time, and I’m not too sure whether society at large, in a sense of the man in the street, really has a role in this. The other part of my mandate, by the way, is to devote one-third of the budget on public awareness building, bringing information in an unbiased way to the public, and we’ve been at this for years. We’ve had about twelve thousand people go out and demonstrate our services, we have newsletters and brochures, and it is very hard to get the public to understand some of these issues that are involved in a way that they can take a real and meaningful role in the discussion. It’s desirable—please don’t misunderstand me—but getting the ideas and issues across is not that easy. I like to personally get involved in concerns and have gone through the process and considerable expense to train a selective group from all walks of life to talk about the issues. We seek that discussion to project a consensus view of what shape society might take. Ultimately, it’s the market that is going to decide what’s going to happen in the marketplace.

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So what factors have brought us to this point? We have government cutbacks, as you well know, in research funding cutbacks and in university funding. And so industry money fills the vacuum. Research continues by private funding. Researchers, in my experience, will always find some sort of money, and industry money provided for research works very well. It just takes the incentive to make it work.

I would like to just mention just a few Saskatchewan success stories that have come out of the University here. One is Saskatoon Colostrum, Inc., whose owner is a professor of veterinary medicine. She is an animal health specialist who was working in her garage collecting colostrum, which is the mother’s first water and milk. It is full of all the nutrients that confer resistance to the early days of life. But none of us produce it specifically (for cattle, in this case). We put a couple hundred thousand dollars into the operation to help her get it out of her basement. Now she has a plant here in Saskatoon with markets in the U.S., Japan, and Germany. She is now looking toward human health.

We have been involved with another company called MCN Bioproducts, Inc. A professor came into my office about two years ago with a test tube saying, “Look at this, it’s fantastic stuff.” It was actually very high quality protein material that came out of canola, and its purpose was to replace fishmeal in fish feed formulations. This is one of the fastest growing areas of growth food parts in the world, but there are a limited number of fish. So we need substitutes, and canola is a good substitute. Again, we invested two hundred thousand dollars, while the company raised another two million. So, now we are in the process of raising fifteen million for full-scale commercial operations of a major canola crushing plant, which means a big value-addition to the canola industry and gives the farmer a greater chance of survival.

So the University of Saskatchewan, which is obviously the leading agriculture university for research, has a seminal influence on the development of the Saskatoon agbiotech cluster. We have eight major areas of strength in research and development, but I will just discuss agriculture here. There is approximately \$120 million of agricultural research coming out of the city of Saskatoon (not all in Saskatoon, as it’s also in conjunction with other universities, such as McGill, the Universities of Calgary and Alberta, and so on). In the area of vaccines, the Vaccine Infection Disease Organization has a twenty-seven and a half million dollar grant to pursue research into infections and vaccinations. They’re also interested in reducing infections in cattle to make beef safer.

Specialist research centres also aim to develop crops, develop better animals, and use better feeds. We also have the Saskatchewan Research Council, which looks at agriculture technologies. The Vaccine Infection Disease Organization is building a new building and putting up part of twenty seven million dollar project. We have, of course, the Western Canada Veterinarian Medicine School, which is the Western centre for veterinary medicine on campus.

Innovation Place is the key to all of this. Innovation Place is directly contiguous with the University and built on University land with a long-term lease. It has a public policy mandate to create jobs, support local initiatives, and operate profitably using commercial public structures and working through partnerships. The total cost of Innovation Place through the investment in Government of Saskatchewan in micro technology is around seven hundred million dollars. Innovation Place aims at creating an environment of collaboration that contributes to the growth and financial success of its tenant. It’s a positive symbol for the community. Whenever you arrive at our airport and ask for Innovation Place, you get a lecture on biotechnology from pretty much every taxi driver in Saskatoon. It also helps that the community shares knowledge. Tenants support each other, and closeness is absolutely key to the success of such a working environment. We now have twenty 2200 people working there, with revenue of \$248 million. This is a very successful outcome from a university-government partnership.

Also on the campus, we have Agriculture Canada, a very large research institution of 350 people. That is also a part of the infrastructure.

Thank you very much for your time. I went over a little bit, but I'd be happy to take part in the discussion later on. Thank you very much.

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**Bill Tomlinson:** It certainly is a pleasure to be here. Yesterday, or a couple days ago, at breakfast, I told Peter McKinnon, the President of the University, that I will be here for about five years—that is the term that I have in front of me—and some time in that five years I promised to talk about something that I am an expert on, but there is certainly nothing today that I have reflected on to talk about. I've not dealt with such issues directly, but that is why this is a refreshing challenge to me, and I will pass along some of my thoughts.

The Canadian Light Source is a national facility, not a university facility. It is quite fortunate to be on the campus of University of Saskatchewan because it is a strong base for us to draw from. The research potential, the personnel, and the resources all contribute to a progressive university. We produce light, we produce ultra violet light, infrared light—that's what we do. We produce that for up to about two thousand researchers each year who will visit in the next couple of years. We hope to have it at two thousand individuals a year marching through to carry out their small science. That term—small science—is bench talk for basic science, not social science; the large part is the machine.

And our mission is very clear—it is to serve academia and industry. Our challenge is to keep them balanced. I don't want that balance to get distorted in favour of commercialization. I want it to be a largely open academic environment. It will be so, even if the 25% or so of some of our facilities will be utilized by industry. In fact, my experience in the synchrotron world is that most of that also depends on scientific literature. We want the same thing, then, but relative to what we're talking about today, our mission to support industry and commercialization, I find that appropriate. The national resources are brought to bear on problems with a product or problems, in general, using our tool.

The government part is what we're supposed to address, as opposed to Peter's explicit, or almost explicit, attention to commercialization, to small start-up companies. So, for the economic base, once you bring government into it, I don't think we can separate the social science side of research and partnerships from what we'll call the natural sciences—for example, the use of x-rays in medical technologies. And in thinking about today, and what the problems might be, my mind keeps going to how we are between academia and industry, whether we sit on this campus between what's called academic world and Innovation Place. That's sort of a characteristic of our mission.

So, when I started looking ahead, I couldn't separate the commercialization from the social part of it, and I don't want to. Because when I look across this country and look at its huge innovation agenda, it is very important to me to make that agenda work in society, as well as industry. I am a great believer that if you generate spin-off companies, if you generate income, that feeds back into all aspects of academic life, as well as all aspects of personnel life. So my thoughts kept going back to the problems that we have.

First of all, there are problems in terms of creating a partnership with anyone and that knowledge base. You've got to know your problem. Once you know the problem on

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one side, and you know, you've got some people on the other side that can solve it, maybe they're from the university community, which is what we are discussing. You've got a problem out there defined by government or defined by some industry or some corporation. Now you can begin to develop the partnerships, which doesn't mean fee for service. A lot of what we will be doing at the Canadian Light Source will be fee for service. We have the tool, people will pay us to do some experiments for them. That is not a partnership.

A partnership is when you might have a government body or community organization that may have some problem to address.

We have heard a lot about Aboriginal problems, how problems have problems, and so forth. Can we, as scientists, address those problems? If so, it has to be a genuine partnership or that partnership, in my mind, is doomed to failure. That doesn't mean that we don't do it. That doesn't mean we don't try. But I'm not an expert on this. I missed a lot of the discussion this week, so probably everything I'm going to say you will be able to tell me it's wrong. From an individual perspective, though, I see failure in partnerships because, as those initial questions posed, where does society fit it at home? I can tell you that part of the problem is that the core interaction of scientists with their tools is based on a problem in the industry or in the community. But you immediately—and this kept coming up to my mind over and over again—the real challenge comes into two layers. One is economic impact and the other is social-ethical impact.

We've heard Peter use the word "trust" and so forth. Can you trust the results of a scientific study? If you trust it as an organization, as a corporation, or as a government body, now can you implement it? Do you have the societal will to implement the findings?

Peter mentioned the fishing industry back east. We knew twenty or thirty years ago that it was going to collapse. Scientific studies and partnership studies with the government and with other organizations told us 20 or 30 years ago that we were doomed unless we did something. Society failed to do something and now the consequences are

dramatic. So you've got this problem in front of you and you'll see it in the social aspect of this world. We all can understand some of the root causes of poverty in our community by examining carefully defined scientific university studies driven in terms of their character and the people and the knowledge. Most of them are never implemented because they run into economic problems or resistance to change within society. This doesn't mean that we don't try. We have a lot of examples to the positive. We have to accept that when we enter into a partnership the pay-off may be very difficult to implement. Conflicts of culture are constant.

Conflict occurs between the culture of the university professor, where university personnel need to have a career and need to be academic, and the industry culture where you need short-term profit. Academics need to publish and that can hurt. Until society as a whole has a better appreciation of that interplay, it is valuable for university academics to be out there in the community, out there in industry, using their knowledge to society's benefit. Until we make that leap, I think that a lot of partnerships will never develop and will be doomed. At the Canadian Light Source, I run into these types of problems—"Well, how fast can you get results?" "Well, it's going to cost and so forth." And so on.

So I'll just stop there and summarize my thoughts—one person's thoughts sitting in a position of responsibility, where I have to deal with the balance between academics and industrial pressures and governmental pressure for results. Industry Canada, for example, put in a lot of money in Canadian Light Source and they expect economic return. Is it measurable, is it quantifiable? My answer to that is yes and no. Results would be quantifiable. I can tell you how many new professors we hire, how many new jobs are created. I can also tell you that that may not be the most important part of that input to Saskatoon and Saskatchewan. It may be the sign of things, a better life, a better profile for this city and university. It's about attracting some industries that you don't quite count on your fingers.

So, how does society at large influence these partnerships? Until we have the will to implement the outcome of the partnerships, we're not going to make a lot of progress. And unless the private sector partnerships, using publicly invested money for example, are expected to make a payback to society, we're not going to make a lot of progress in a lot of these types of partnerships either.

So it's that willingness of government to support the outcome of partnerships, which, to me, is going to be the driver in the years to come at my facility, the university, and all government levels, for regulatory issues have to be based on scientific knowledge in many cases. So, thank you very much.

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**Bruce Waygood:** When the organizers asked me to speak—and this, I believe, is the last talk of the conference—and I saw that we were going to be after Stephen Lewis, I

said to the organizer, who lives in the same household as me, “If we have twenty people in the room at the end of this we’ll be lucky.” And I think we actually have a couple more than twenty, so I thank you all for being here, because it’s a tough act to follow talks like Stephen’s, and I understand why people are off talking about that. Yesterday, I chaired a session after Judy Rebick spoke, and I felt nervous because we had four white males at the table and it’s much the same situation here. Some of the people who have been at the rest of the conference may not realize the implication of that. And the other thing that I would like to point out, as there will be discussion about this whole community partnership theme, is that there are actually three city councillors in the room right now and I think that I just want to bring that up before I start talking.

I think about the three questions, and while I’m not going to address them as separate questions, they really are a part of the current discussion that is going on within the university about issues surrounding contract research and certainly what is perceived as a new and perhaps troubling influence of commercial interest and academic policies. This is a discussion that is going on within academia, within government, within society, and it’s really about the extent of control by governments and industry of university research and artistic endeavour. It really crosses the whole spectrum. This discussion is both healthy and necessary. But industrial and commercial involvement in universities isn’t new, and for many in the academic community the alarm that some feel, which has been expressed by some speakers and participants at this meeting, is not supported by the experience of many.

Too often the context of the discussion, and certainly here at this university, has been that the contracts are inherently bad. Those who enter into them have somehow compromised their honesty, and that industry is forcing the university to make investments in particular areas. The first thing I would like to say is that contracts are not inherently bad, and here at the University of Saskatchewan, and, as far as I know, most university contracts, they must respect fundamental university values. The right to publish is required. The funder may require review rights, which may delay publication up to six months, but often less. This review period may allow the funder, university, and researcher to apply to patent. This review period may be a requirement, particularly around the use of government health data, to ensure that privacy issues have been honoured, or to respect a growing call from communities to ensure that the publication is respectful of their aspirations, cultural values, and sensitivities.

The other important requirements are the training of graduate students and post-doctoral research. Contracts must be carefully exercised, such as their ability to publish and defend their work, which is essential for degree requirements, and that their future career development is not damaged. Industrial contracts between companies with this University and many other universities are, in fact, a small portion of the total research funding. Most of the contracts here are actually with the provincial government, and many are with agricultural groups that Peter talked about. These are fundamental to the people of Saskatchewan.

Secondly, the idea that university research needs to come out of their ivory tower—another topic that was addressed here—and work with community clearly has been a popular theme at this meeting. There is also the idea of community should be inclusive of all elements of our society, a point quietly made by William Coderre yesterday. Agriculturist researchers need to work with producer groups, with small start-up companies, with big multinationals if they are not in the ivory tower. It is a positive achievement if an academic will also work on contracts, for example, with municipal governments to help improve local water supplies, the need for which is integral to the fundamental safety and health of communities.

And, yes, there is a lot more to do in this area, especially in our northern and rural communities, as well as in public policy in this area. Physicians participate in drug trials funded by big pharmaceutical companies because they believe that it will lead to better patient care. Many take a component of this funding that is earmarked for their salaries in such contracts and subsequently use it for funding their separate curiosity-driven research. This area of pharmaceutical research, from my perspective, is one in which vigilance is needed because the financial reward is huge and obviously the benefits that can occur are significant.

The third point is that government influence is causing universities to change. The place of universities in society has, in my view, changed fundamentally, and society has different expectations of universities than it had fifty years ago. Universities have undergone radical changes since the end of the Second World War and, most specifically, from the date that Sputnik orbited the world. Many people comment that they remember where they were the day that JFK was assassinated, but Sputnik had a much greater and long-lasting effect on our society. I remember exactly where I was—shopping with my mother in England for my school uniform. I remember buying the *Evening News*, going to a coffee shop as a family, sitting down, and reading every word of it, and spending an hour discussing it. It was incredibly important. What has happened is that universities have since changed from sleepy provincial institutions in which the very bright and privileged pursued intellectual inquiry, and, from time to time, stumbled upon interesting observations, which industry was able to use. Up to the early 1960's, only a few percent of high school graduates went to university. Today, universities are considered essential training grounds. I use that word training deliberately, for our knowledge-based economy is driving an increasing share of new economic activity. Universities have moved from being pleasant intellectual and important training ground into being mainstreamed. They cost a lot, and the funders, government in particular, want more say.

We live in a democratic society, and as individuals and even as groups we do not always get the government that we want. And even when we do, we can be disappointed.

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I want to stand as a proxy for government, but while they do push the economic drive model, they have consistently, in respect to the role that I have assumed in the last few years, pushed for university-based administration and research to pay more attention to the needs of communities. For many in the university community, the opportunities that are made possible due to being mainstream represent marvelous intellectual opportunities, and, for the most part, the demands of funders are not unreasonable.

But it is a human endeavour, and sometimes things go wrong, as happens in all human activity. Thus, healthy and sparring discussion and reporting must continue to be supportive. The infamous Nancy Oliverie case in Toronto is an example of what can go wrong. What is not in the headlines is that similar types of controversial research have more often produced useful publishable results and beneficial outcomes.

I was trained as a microbiologist, as was Peter, sitting next to me. I started my research on a biochemical problem, and over the years I have become a microbiologist, biotechnologist, and even a structural biologist. Both biochemistry and microbiology, which are all disciplines that trace their origins to the end of the nineteenth century, reflect that evolution in the university. Textbooks in both disciplines often point to single individuals whose experimental approaches fostered the emergent sciences' vaccines and antibiotics. Louis Pasteur created a process, a public health measure that has saved millions of lives and has helped remove diseases like tuberculosis from our everyday experience. Louis Pasteur was funded by the wine producers in France who needed to control spoilage. This was a direct industrial contract with the university that had an amazing and not anticipated outcome, but has benefited both the wine industry and all of us.

This says that, to illustrate a number of points, industrial contracts have existed even back in the sleepy days of universities and, in fact, for many university scientists and other academics that was the only source of funding until governments introduced grant councils in various forms. Second, there is a logic that a greater public good can come from these activities. And third, we cannot predict what and when that might occur. It is often difficult to identify what will produce a social good.

At least two major tensions exist in and around the identification by society that the universities are the engines of the economy. The first is that investments are being made in universities by governments and are often directed in an uneven manner to the sciences. This was perceived as more likely to generate economic activity initiatives, such as the Canadian Foundation of Innovation, Canada Research Chairs Program, and to increase Tricouncil funding in the recent introduction of the budget . We've been justified on the requirement that has increased Canada's economic position through investment and research, most of which is science-based. Many in the humanities, fine arts, and social sciences are distressed by the emphasis of these initiatives because they are changing how universities make funding priority decisions. However, quality of life

issues have very significant economic impacts—better health policy, better life style practices, better education practices and policies, and cultural richness, etc. All have major implications with respect to the quality of our existence. These points need to be made repeatedly.

The second major tension involves the output of research and its implications for society. Much of the science that happened at the universities that had commercial uses in the first half of the twentieth-century involved physics and chemistry. Scientists helped develop radar and atomic energy. But in 1953, the world of DNA began, and now we have a huge research community that is investigating life and making discoveries with huge promises. But even our excitement is balanced with uncertainty and moral challenges. These are all mixed up in great economic potential and possibilities of great public good.

The ability to patent life forms has at last become a larger society discussion. The first patent, I believe, happened back in the early 1970's. Many scientists forged the concept, but neither the public nor government showed much interest in what was a struggle between financial interests and underpaid scientists. We lost this battle. A whole generation of life scientists had simply gone on and enjoyed the intellectual opportunities and all the wonderful discoveries in this area.

Two things have occurred. First, scientists, in their own enthusiasm, I think, promised too much. Remember Nixon's war on cancer? It wasn't like going to the moon. We knew where the moon was, there was only one, and, for the most part, the physics of the endeavour were understood. Cancer is different in its manifestations. We're still trying to understand the basic biology that leads to the many events that cause cancer. Remember the excitement when researchers from Toronto cloned an event by discovering genes for cystic fibrosis and muscular dystrophy? We had more information, but, really, no new knowledge of the difficulties that we faced. It is likely that we are going to develop curative therapy, but so far it appears that we haven't figured out how to do it.

Many university hospital researchers are working on these fundamental problems, funded primarily by government and charitable donations. Industry watches for potential opportunities, as Peter pointed out. In Western society, we have a massive system to ensure safe development of new drugs and medical procedures. Society has insisted that this be done safely and has created an incredibly expensive system that only the big pharmaceutical companies can, in fact, carry out in most cases. I don't think that that kind of development is, in fact, a function of the universities.

Do we want more involvement from society in directing and regulating research? I would urge caution. The mechanisms that have been established are often constraining. For example, the well-intentioned review requirements are being taken too far in the minds of some, but there is a potential to influence public opinion and insipidness in many areas of research. That's not to say that we don't have problems, such as reliance

on generating external funds for many research institutes. I would like to define that separately from universities that have public funding. As such, they often do not communicate their findings with other scientists in a way that encourages information transfer. They have introduced an atmosphere of secrecy and confidentiality that, I think, inhibits the exchange of ideas because of their implications of commercial activity. These are issues, I think, that need to be visited and discussed.

The common feature of external input into university-based research, whether it is government, society, industry, or community, is the control of the output and the freedom to communicate freely. And I think this is more of a concern than the fact that a funder has influence on the research opportunity. It is almost impossible to conceive how funded research will ever be free of the priorities of the funder. We, the universities, must protect the freedom of expression and communication that comes from that research because that is the central feature of academic freedom. Thank you.

**Q:** My question has to do with the whole aspect of the interdisciplinary factor in the changing culture of the university itself, and also recognition of the importance of culture. I was wondering what experience you had, in general, with the effects of interdisciplinary work and also with understanding different cultures coming together and communicating culture between those groups.

**BW:** One of the first things that happened when I took on this job two years ago was a response to a CIHR initiative and for an ACADRE program with Aboriginal people's health, and to say that that was a learning experience of trying to pull together incredibly diverse groups of individuals and interests would be to understate the problem. It requires patience and is going to require patience on behalf of the funders because it's going to take longer to get to results. There's a tremendous amount of dialogue that has to go on between the different groups so that they can understand each other. And I think that there are speakers at this conference who have talked about having to listen to each other and to really go through and try to get each other to understand where each other are coming from. There is a different approach to how you do things and there are different values that are placed upon the type of research. There is a huge discussion that is going on in the universities, particularly dealing with Aboriginal groups. The idea that you have to leave something of value within the community creates a whole different aspect of how you do this multi-disciplinary research. It's not easy. That's the one thing that you must come away with from this—it is not easy and it requires a determination on behalf of everyone involved. It's going to require flexibility on behalf of the institutions. It's going to require determination on behalf of the funders, and it's going to take a lot of good will between the people who try to participate in this, because you deal with people who come to the table with very different ideas about how things should be done and why they come to the table. They want to get from here to there and

coming together is just the first part. How you actually get from here to there takes a while to figure out. I hope that answers your question.

**Q:** Yeah, it touches on it. I wonder, in order to do that, if there also needs to be more of an emphasis that I haven't noticed on the whole aspect of culture, of educating people who are involved in science so that they have the social skills and cultural knowledge to make those kinds of connections.

**BW:** That is a whole different kettle of fish. Scientists have been trained very badly at being like this and that's how they become successful. And I think that one of the initiatives that we've had at this University is a college of biotechnology, and one of the important parts of that was to make sure that in those degree requirements the whole issue of dealing with cultural issues, with community issues, are all incorporated into the degree program. So there is, at least in that initiative, an attempt to deal with some of the issues. But do we do it commonly throughout science and education? Generally not. I think there is more of a feeling, certainly at the graduate level, that there needs to be more attention to this sort of aspect.

**Q:** I know that this has been a long day and I appreciate the time that you have taken to hang in there with us. Just a comment on the last comment. I agree that there are tensions there. For example, for the last few years I've seen some natural science departments at the University of Saskatchewan under much greater pressure, and I believe that it is happening elsewhere in Canada. It's squeezing out the so-called distribution credits that are from things like social sciences and humanities. So it's a consequence of some of those things. There are tensions that are involved in that environment, as well.

My question is for Bill Thomlinson. You mentioned that you almost have a plea—if only we implemented solutions suggested by analysis. Problems would be solved and, maybe I'm sort of taking it to extremes, but what I've seen of social scientists—I think you've seen this again and again—that control and behaviour by shaping our environment has proved to be a failure. Success, as well as failure. As someone who has trained in urban studies, for example, I've read about the failures that have existed from our urban design by raising university neighborhoods and replacing high density towers in the many larger cities in the United States, even in our cities in Canada. These have been a dismal failure, even though analysis at the time determined that that was the way to go. Another classic example is requiring food for everyone and solving our hunger problems, and clearly there are major problems associated with hunger. Revaluation hasn't solved hunger, so I wonder if you might want to comment a little bit more about what you meant by partnership challenges and as to how we might solve our problems.

**BT:** You touched on sort of the core of what came to me while thinking about this. As I said, I'm no expert and I don't think about these things very much. But as a product of society and a product of a liberal education, I appreciate it. It's partly why I am successful in science, because I am a product and am very indebted to a liberal education. I didn't

say, “What you have to do is Ö” I said, “If you enter into a partnership and you carry out a true study you open yourself for successes as well as failures.” I can provide a good example of a dismal failure. I moved to Long Island, New York in 1973. Long Island is a small village on the south shores, a beautiful village, until a hurricane destroyed most of the tourism industry. A social science-based experiment was to build a bunch of houses and take the black minority, an under-represented population economically, as well as socially, and move them in there. It was going to be a wonderful project for Long Island to take care a lot of the racial tension. But by the time I got there in 1973—this was created in the mid 60’s—it was a complete failure. The houses were falling apart, they were being burned to the ground by absentee landlords to get insurance money. It was a dismal failure. Based on these stories, what I’m trying to imply, is not that the results of the study are absolutely correct. You know, in all sciences, and natural sciences as well, you can study the hell out of a problem and be sure that you’re right but, in fact, be completely wrong. What I meant was that if you undertake a partnership, you need to have the will to implement it and end it if, in fact, it proves unworkable. Go with a partnership only if you believe it is something that you should do. That was what I was implying. Otherwise, don’t start a waste of time.

There is another issue. It’s much easier for me to take a sample of rock salt and put it in an extra being and study its physical structure, temperature, or whatever. But to go out here in the city, as Peter and other councillors have done, dealing with work, with social problems, because, you know, there is a population of twenty thousand people in an environment with fifty thousand opinions. That is what should happen.

**Peter McCann**, president of Ag-West Biotech Inc, has an extensive business background in agri-science-based companies. He is a strong proponent of Saskatoon’s biotech cluster and encourages companies to relocate, expand, or start up in Saskatoon. A long-time member of Saskatoon City Council, Peter also serves as a Director of various groups including the Biotechnology Human Resource Council (BHRC), the Canadian Agri-food Marketing Council (CAMC), and the Saskatoon Regional Economic Development Authority (SREDA).

**Bill Thomlinson** is Director of the Canadian Light Source Synchrotron facility in Saskatoon, Saskatchewan. He is the former Head of the Medical Research Group at the European Synchrotron Radiation Facility (ESRF) in Grenoble, France. Prior to joining the ESRF, he was from 1979 through 1998 a member of the scientific staff and management group at the National Synchrotron Light Source, Brookhaven National Laboratory, in Upton, New York, ultimately serving as Associate Chair for Environment, Safety and Health.

**Bruce Waygood** is the current University Co-ordinator of Health Research and professor of biochemistry at the University of Saskatchewan. He informs health researchers at both Saskatchewan universities of funding opportunities, encourages applications and promotes collaborations among researchers from a broad range of health-related areas. Waygood has also served on numerous university committees and has been active in Saskatoon community affairs.