HANSARD

NOVA SCOTIA HOUSE OF ASSEMBLY

COMMITTEE

ON

ECONOMIC DEVELOPMENT

Tuesday, February 12, 2013

COMMITTEE ROOM 1

Dalhousie University
Re: Economic & Cultural Impact of Dalhousie University

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ECONOMIC DEVELOPMENT COMMITTEE

Ms. Pam Birdsall (Chairman)
Ms. Vicki Conrad
Mr. Clarrie MacKinnon
Mr. Brian Skabar
Ms. Lenore Zann
Hon. Keith Colwell
Mr. Geoff MacLellan
Mr. Chuck Porter
Mr. Eddie Orrell

[Ms. Vicki Conrad was replaced by Mr. Howard Epstein.]
[Ms. Lenore Zann was replaced by Ms. Michele Raymond.]

WITNESSES

Dalhousie University

Ms. Martha Crago
Vice-President, Research

Mr. Stephen Hartlen
Assistant Vice-President, Industry Relations
& Executive Director, Industry Liaison and Innovation

In Attendance:

Ms. Jana Hodgson
Legislative Committee Clerk

HALIFAX, TUESDAY, FEBRUARY 12, 2013

STANDING COMMITTEE ON ECONOMIC DEVELOPMENT

9:00 A.M.

CHAIRMAN
Ms. Pam Birdsall

MR. CLARRIE MACKINNON (Chairman): Good morning and welcome. The fog and flu have either put people out of commission or some will be arriving late, so we will begin. We do have a quorum of five and we'll begin with introductions, please.

[The committee members and witnesses introduced themselves.]

MR. CHAIRMAN: We'll begin with a presentation.

MS. MARTHA CRAGO: Shall we just fire away? Okay. First of all, thank you very much for coming and showing this interest in the role that we think the universities, and Dalhousie in particular, can play for the province.

We've entitled this "Positioning Dalhousie in the New Economy." Basically I think the challenge we face in Nova Scotia is really one of a history with less than perfectly successful economic development. The issue is, how can we change that and how can the Nova Scotia Government play a role in that; how can the universities, particularly Dalhousie, contribute to that change; and how can we recognize the value of research and development in a new economy?

We hope that creating this new kind of new economy is seen as not optional for a province like this. It builds on a culture of innovation and entrepreneurship, and if I can say so, this is a province that had quite a history of innovation and entrepreneurship back in past years. It is also one that champions the kind of alignment of research across a variety of partners, so those partners in this province are the universities, the hospitals, the government and industry. In fact, we have partners from essentially all levels of government, particularly the federal labs that are here, and the way in which they can contribute and align themselves and partner with universities and local industries. We can develop linkages that basically build economy through innovation.

In terms of a new MOU that we're signing with the Nova Scotia Government, there is a commitment in it by the province and all of its universities to work on enhancing research and development as an important part of the role they play, provincially and basically in society.

We've worked hard to align our own priorities at a place like Dalhousie, with those of the province, so these are from the strategic research plan that is presently in existence, the kind of priorities you see. They have to do with health research; marine/environment research; clean technology through materials, particularly sustainable materials; and information science and technology. These line up with directions that I think the province finds important; we find it important to align ourselves with provincial priorities.

Our research funding strategy is basically to increase and support engagement with industry through a variety of funding programs that exist both provincially and federally and to align that with the provincial government priorities and to increase the kind of support we get from the Tri-council. One of the efforts is to use any kinds of money we can get from Nova Scotia to leverage larger sums of money that come from the Tri-council in Ottawa and to promote collaborative proposals, ones that engage us and are aligned with our priorities, those of the province, and aligns us with various institutions in the province.

Just in terms of Dalhousie and the kind of contributions it can make, it is the largest research enterprise in Atlantic Canada. I like to say we're in the largest city west of London, England - the first largest city west of London, England. We work collaboratively with the other Nova Scotia universities and with the community college. We account for about 80 per cent of all the research and development done in the province.

I think you can see on the next slide an indication of what that looks like graphically - the light blue line is Dalhousie, plus its newest addition, which is the Agricultural Campus. You can see that this is quite a bit different than some of the other universities in the province. If you see a line that stops in a certain year it is because this data comes from Info Source, which records the top 50 Canadian universities, so if a line stops or if a university doesn't appear, it is because that university is not within the top 50 that that particular source of information collects data on.

If you look at the next slide, you can see kind of how we're situated in Atlantic Canada. It is close, but not quite, that Dalhousie plus the Agricultural Campus is about twice as much as the other universities combined. So clearly it is bringing a lot to the table in terms of the funding that it has and the capacity to get that funding and use that funding in important ways.

One of the interesting things about Dalhousie - and frankly, not everybody can claim this in the country - per dollar of research funding, we have the largest scientific impact and that is measured in things like numbers of publications, numbers of people who cite the work of those publications by Dalhousie researchers and the impact level of the journals that those scientific publications appear in. We may not have the most money in

Canada - places like the University of Toronto will have more - but we have the largest impact per dollar, so in a good Scottish sense, we use well the money that we get.

We have about $145 million now in research funding. Our overall operating budget is about $184 million, so this is an important increment to the activities that we do with the university. That means we have about 1,000 researchers going across all the fields in the university; some of them are clinical scientists who also have appointments, of course, at the hospital.

We attract - more than 50 per cent of the students from Dalhousie come from outside of the province, so this is really one of the truly Canadian universities. There are very few like that; McGill is one of them, Dalhousie is one of the other ones. A number of our students are international students and this number is increasing quite rapidly over time. You can see that the graduate students make up about 20 per cent.

One of the things I wanted to show you was how different Nova Scotia is than some of the other provinces. These are figures for where R&D is done - who are the doers of research and development. In Nova Scotia the primary doers of research and development - almost three-quarters of it is done in universities. In the rest of Canada - and I came here from being in Quebec universities, which line up with this rest-of-Canada figure - we're used to two-thirds of the research and development being done in industry.

So just to contrast and give you a feeling why, we have a lot of small and medium enterprises here, and those enterprises don't always have a big research contingent. But the big multinational companies like Pratt & Whitney and companies like Merck Frosst that were located in a place like Montreal, they had the research capacity in-house to the industry. But this demonstrates to you the enormous importance of universities to Nova Scotia because they are the primary locus of research and development.

The next graph gives you a little impression of how we've been increasing our funding. A certain amount of that increase is really accounted for by what we call industry partnership programs that we're now competing well in and the contracts that our researchers sign with a number of local industries and with the government here to do research on their behalf - so a good record of trying to work to build the capacity of our local industries.

The next slide really shows you the value of highly qualified people, so who are these people in the university? These are, of course, the professors, but they are also in particular the graduate students and postdocs that work in our research laboratories and they bring a number of features to a province. They attract other people, they serve as magnets for other people, they start to work in industry and become receptors for science and development within the industries. So we've tried to spell out for you a variety of roles that they play, and they help to build industries.

The research funding environment really across the country is made up of three parts. The amount of money that industry has put in - a lot of the partnership programs, a federal Tri-council will, for instance, match money put in by an industry. Or to be precise, in the social sciences it will match money put in by a community, a school board, or an NGO. Then there's the provincial contribution. In this province that contribution comes to us largely through the NSRIT, which is the Nova Scotia Research Innovation Trust, and through the NSHRF, which is the Nova Scotia Health Research Foundation, and we're very grateful for the support they give.

To give you an idea of some of the kinds of things that we've been building - and these aren't the only ones, these are just some of the recent successes we wanted to share with you. We developed this Halifax Marine Research Institute and this basically became a vehicle for the value proposition for the Irving Shipbuilding contract and 10 per cent of the ranking of a proposal for that contract came from its value proposition. So we were proud to have been helpful in helping to structure that value proposition. I'll explain a little bit more about that institute in a moment.

We've also competed successfully for one of the last four networks of centres of excellence to be funded and this one has to do with Marine Environment Observation Prediction and Response, so predicting the kind of weather we just had, the kinds of responses communities will have to make when things like storm surges start to encroach upon those communities. Then we have the Canadian Center for Vaccinology, so a very important role in preventing illness, and the Clean Technology & Auto Partnership success we had, which is a Canada-wide program, and we went home with a fair chunk of the money that that program was putting forward.

We've also been supporting the province on trade missions and oftentimes opening doors to see what kind of research and development goes on and how that fits into an economic ecosystem in other countries and what goes on in universities.

In the marine sector this Halifax Marine Research Institute, what it has done is brought together all of the Nova Scotia universities with the University of New Brunswick and the University of P.E.I., so all the Maritime universities. Any researcher involved in marine-type research has been brought together with the five federal laboratories that are in town - laboratories of Defence, Environment Canada, Natural Resources Canada, DFO - Fisheries and Oceans - and the NRC. In addition, there were seven founding industry partners but this has increased because we are now hooked - the Halifax Marine Research Institute is now hooked to the Ocean Technology Council, so that's a wider spectrum of companies.

These are very promising companies in the Nova Scotia context. They do 95 per cent export, which is very rare for a Canadian company, something we should all be very proud of. A number of them are spinoffs from Dalhousie researchers and they tend to have a lot of expertise in sensing and monitoring of oceans, which is very important environmentally for us.

Then we have a commitment from the Nova Scotia Government that has helped to build that Halifax Marine Research Institute. It then goes forward and attempts to land other kinds of money and to develop other kinds of contracts and is busy doing that.

Just to give you a feeling of how this all works out financially, you take a reasonably modest contribution through the Nova Scotia Research and Innovation Trust here of about $3 million and you can see what it has leveraged from other sources, so we have an ocean tracking network that is connected to countries around the world, where those countries have put up over $120 million worth of work for research, whose data is all stored at Dalhousie and tracks the fish of the world, providing important information on how to preserve that biomass for the public's consumption and the health of the oceans. This is a picture of what we try to do, how we try to leverage local money to get much larger sums of money both internationally and nationally.

The next story is one that really has to do with a researcher at Dalhousie named Jeff Dahn but there are also companions in the faculty of engineering, namely a man named Stephen Corbin, who we just brought in from Waterloo, who competed very successfully in something called the Automotive Partnership Canada. So Jeff Dahn's work is to develop electric batteries, such that they can be used in cars and in pacemakers. He is partnered in this particular initiative with a very interesting set of partners: 3M that make the materials, Magna that will make the batteries, GM that will help put them in their cars, and Medtronic that will put them in pacemakers. He has this very interesting - and Nova Scotia Power, we use them for getting electricity on the grid. That's it, that's all.

I have a slide that has some acronyms for you, so you can tell what all these different things are that are referred to on the slides.

MR. CHAIRMAN: Thank you very much for a very informative presentation. I should have mentioned that I'm a last-minute chairman here. Pam Birdsall is a very capable chairman and she has come down with the flu and wasn't able to make it in this morning. She is the member for Lunenburg.

We will begin with 10-minute questioning from each of the MLAs. This chairman will be somewhat more relaxed in relation to time frame; if you go a little bit over, I won't be too concerned. Mr. MacLellan, you begin.

MR. GEOFF MACLELLAN: Thank you, Mr. Chairman, and thank you very much for the presentation. This is some information I think we've shared a few times, Stephen and I, so I certainly appreciate the effort and what you put forth for the economy. I have just two quick questions and maybe I can share our time with my colleague here.

The first one I have is with respect to commercialization of the research. I know it's a broad question. I remember a stat from probably two years ago that said - and this is a national stat - if you look at the top 20 sort of researching nations in the world, Canada is in the top three in terms of our investment and our efforts and sort of some of the results

we've had. However, we're probably not in the top 10 in terms of the commercialization of that research.

I know from sort of spending some time at Dal and as a professional at CBU, sometimes the commercialization is a priority and other times it becomes about the pure science of it. I guess when we look at public dollars and the private-sector research - the efforts that they put in terms of the funding they provide - obviously there's a mandate for that and it's not for the pure science of it, it's to advance their own technologies or their own products or what have you.

I guess the general question is, with the contributions you get from the private sector and certainly from the public coffers, how do you prioritize looking at things that are to be commercialized and has that changed over, say, the last decade? Are we more focused on those initiatives and those projects that are commercial-based or are we still kind of trying to find a balancing act between the science side and the commercial side?

MS. CRAGO: Okay, let me just talk about this in terms of - I'll start by talking about it in terms of applied research, because to get research commercialized, you have to do a kind of research that has more application to it. The increases federally to the research councils, the three big councils - they have gone primarily not into what we called discovery grants, or the more foundational basic science research, but in recent times any increase in funding has gone into what I would call generically partnership programs. So for the health areas, for the natural sciences and engineering, those partnership programs are with industry. This is an area where Dal is increasing the kinds of involvement that it has with those programs.

We have things like industrial research chairs where a company puts up half the money for a professor and a council puts up the other half of the money. We're starting to accumulate more of those industrial research chairs. When I came we had three; now we have eight. We're starting to compete more for the partnership kinds of money. So even something like this Networks of Centres of Excellence, this is something that you partner - you have industrial partners as a part of that group. The money is there, people are gravitating toward that, as a very interesting form of funding.

The other thing is there's an international ranking that's done by the Times Higher Education Supplement. This ranking is very interesting because they have a figure for what they call innovation; in other words, ranking universities according to how much money and involvement they have with industry and with commercializing research. Dalhousie, in the Canadian context of the top 15 universities, actually is right up there in the group of top five. My colleague at the University of Toronto actually badgers his people - they are saying, look at what Dalhousie is able to do, why can't we do the same thing? I think, in fact, that we have some very good examples of people doing applied and partnered research. The other thing I can tell you is, having spun off about one company a year for the last, let's say, four or five years, this year we're spinning off five, and this is due to the hard work of Stephen and his colleagues. So I'd say there's growing traction for that.

On the other hand, I want to always remind everybody of who won the Nobel Laureate about three years ago. It was three chemists: one quite elderly, who had done the foundational research; the next guy was roughly in his 60s and he had done the first application; and the next man in his 40s had done the thing that had the most commercial application. Without the work of the 80-year-old, the work of the 40-year-old never would have been possible. So we have to always find this balance between figuring out how the world works and then how to apply it.

MR. MACLELLAN: If I could just add one more . . .

MR. STEPHEN HARTLEN: If I could just add a quick comment, just a follow-up to that. When we talked in my office a while ago, I think, I explained the business model of what the Industry Liaison and Innovation office is all about. Traditionally most of these offices in Canada have been about tech transfer, which is finding something interesting within a university, put a patent on it, and then try to license it to somebody. That model traditionally hasn't worked very well anywhere in North America.

So what we've morphed more toward is industry engagement, which is going out and talking to the private sector, finding out what their issues are directly, and then trying to find some research capacity within the institution to actually match up and help them create new product services and processes that they can commercialize. Our traction on that has been much better than just trying to find something that we think is interesting and then going to try to license it to somebody.

If you look at the larger schools across North America, most of them have actually started to move toward that model, it just seems to make a lot more sense. We haven't turned off the technology transfer piece, we still do that, but we're putting more emphasis on going out directly and talking to the business community about what their issues are.

MR. MACLELLAN: The only other second question would be with respect to the marine sort of research and oceans. There are bits and pieces of information out there and it seems that most scientists who are connected to the oceans are excited about the prospects. If you sort of delve in you can see where the avenues are for some of that growth and some of the research and the investment. What specifically - if you have any, not to put you on the spot - but where are we going with the oceans in terms of where we can commercialize down the road?

MS. CRAGO: First of all I would say that the work that was done by Dal researchers, in part of what was called the Play Fairway Analysis Project, is what led to recent investments by BP and Shell, offshore. Now let's take a look at those investments, which are very important to us, and then the difference about the level of drilling we'll be doing. We'd be drilling off the shelf, extremely deep, where we don't have a lot of good information for the North American situation of that kind but we do have all of these interesting companies in Nova Scotia that develop exactly the kinds of devices that will

need to be used to make sure that any kind of resource extraction doesn't have a deleterious environmental impact.

So we actually have a very interesting thing on our hands and it's not dissimilar to what I saw on a recent trip to Brazil, which is Petrobras digs very deeply, as deep as we're digging and one of the only other countries in the world to dig that deeply, but at the same time they have a set of companies surrounding Petrobras' work that do a lot of monitoring and they have very tight regulatory frameworks around that to make sure that any resource extraction is matched by appropriate watch on the environmental impact. Actually, we have a possibility of seeing two things grow in partnership: the drilling, the resource extraction of oil; and the development of the companies that make sure that's done in the safest way possible, and that's a really interesting space to play in.

I would say also there has been really a very interesting development in some of our researchers who watch carefully this issue of climate change in the ocean and what that's doing to fish biomass. That story is much more complicated than I think researchers first felt. They are now seeing that with good conservation mechanism you can conserve the fishery, you can make sure that it doesn't disappear. It is important worldwide that we have people doing that kind of conservation. I think that there's a real partnership between people in the fishing industry and the researchers. For a fishing industry you don't want to see that biomass disappear any more than an environmental researcher wants to see it disappear. I think these kinds of links are really developing.

I think the other thing is people are interested in alternative sources of energy, like what the Bay of Fundy could offer, and I think we are now looking at an industrial research chair possibility in aquaculture. We're trying to look forward to the possible ways and really, the issues there are what's happening with climate change, what kinds of resources are there in the oceans and what kinds of risks are associated with that? The other large resources that people are starting to try to figure out more are what kinds of minerals are in the ocean floor? Again, what would exploiting those resources - what kind of environmental impact would one have to be watchful for?

MR. HARTLEN: The interesting thing that we have here in Nova Scotia in the private sector is that when you saw the pie chart of who does the R&D in the province, it's heavily skewed toward universities, heavily skewed toward Dalhousie. If you look at that group of ocean science and tech companies that we have in Nova Scotia, companies like Ultra and Satlantic, they're not like the rest of the SMEs in Nova Scotia. They actually invest heavily in R&D on their own, they do their own in-house R&D and they do contract research with universities like Dalhousie. That, in and of itself, indicates that they're more innovative, more productive; they're able to grow their companies. Really, for the economy of Nova Scotia, if we had more companies like that, operating in such a fashion in different sectors, we'd be in much better shape than we are today.

MR. CHAIRMAN: Thank you very much. I have a speakers list - Mr. Colwell and then Mr. Orrell.

HON. KEITH COLWELL: I thank you for coming in today, this is very important work you're doing. When I had my business, we worked very closely with TUNS. We were a small company but we did a lot of R&D and were supported and helped by TUNS tremendously as we went through the process. We did manage between us to develop some products which we did market all over the world and that was really good, very positive. I know it's very difficult to go from the science to the actual finished product that a company can relate to and market on the world market and is very expensive, extremely expensive. Even after the product is developed, just the marketing of it is a horrendous task.

What type of follow-up are you doing with companies now when you help them develop a product to that point? I know the science is very, very important because as you said earlier, if you don't have the science in place you can't come up with the end product down the road; it may be many years before that happens. People don't understand that but that's very important work all the way through.

MR. HARTLEN: As I mentioned earlier, we actively go out and engage the private sector, essentially looking for business. We at Dalhousie can take something only so far in terms of this technical development. There are other organizations in our innovation ecosystem around that are supposed to be plugged in to help companies take it to the next level.

Dal is pretty good on the technical side, and in some cases we have hooked companies up with the business school to help them maybe write a cursory business plan. But ideally, what we try to do is we work with the other partners' organizations, like Innovacorp and NSBI and ACOA, and we try to make those matches in terms of if a company doesn't know what programs might be available to them, we certainly are well educated and versed in what programs are available, federally and provincially in Nova Scotia. We try to make those matches, personally make introduction. As for taking it directly through to the market, that's not something we can do.

MR. COLWELL: I understand that and appreciate that. You shouldn't really be in that business anyway, but getting a product that will market and a company can make money on and then reinvest in Nova Scotia is very, very important. How much research and development work do you do in new products that go outside of Nova Scotia for commercialization?

MR. HARTLEN: That's a good question.

MS. CRAGO: I don't know the exact sum but what I can tell you is that for instance - I think maybe we'll explain about the IRBs. There is something called the industrial research benefit plan that the federal government has. Let's say Lockheed Martin is contracted to provide certain equipment to the Department of National Defence, they have to pay back a certain amount of money.

Let me just grab two figures out of the air. Let's say they did $100,000 worth of business - of course it's many, many times that - they would have to pay $10,000 back in R&D money. If they pay that money in Atlantic Canada, they get a multiplier effect. So instead of paying $10,000 they could pay $2,000 and it would equal $10,000 in the eyes of the federal government, in terms of their payback. We profit from this very, very nicely because for them to invest that money in Dal researchers and promote research that will help their companies means that they get a bigger payback, they've paid back more of what they owe the federal government.

We've just landed very large contracts with Boeing, with Lockheed Martin, so big multinationals like that. In terms of the vaccinology area, let's say, we have landed a lot of money from GlaxoSmithKline and Sanofi Pasteur, so we do quite a sizeable set of contract research related to big multinational companies of that variety. You see in the Jeff Dahn picture that he's working with Magna, with 3M, with GM, with Medtronic - he lined himself up with a set of companies. I can't give you the exact dollar figure on this, but some of our largest contract money is coming from outside the province and other pieces are coming from within the province.

The other piece I can tell you about is Nova Scotia has a very particular program called the voucher program, which is a small, little piece of money, but it has actually turned up some very useful small inventions for local companies. In fact, the Natural Sciences and Engineering Research Council used that program as a model for creating its own version of a voucher program, which happens to be called Engage, so engage with industry to develop a certain product.

So the voucher program is a very, very interesting model and Nova Scotia, frankly, should be very proud of having started it. We compete very successfully as a university for both the Nova Scotia voucher money and for the NSERC Engage money - so lots of small pieces to help a company develop a very particular product.

MR. COLWELL: Have you done any work with smaller businesses in Nova Scotia, perhaps having a day where you bring them in and show them the kind of work that you're doing that would be appropriate to them - though some of the things you're doing for the major national companies is a different thing, a lot different than you would do with a smaller Nova Scotia company. Would there be anything around that?

MR. HARTLEN: We often do things called industry mixers, industry connector events. We did three last year, I think, and there are plans to do three or four more this year. Essentially it is an NSERC-sponsored event so you would bring a group of companies in that all may have a certain flavour to them, so they could be ocean tech companies, they could be clean technology companies, and essentially it's sort of like a speed-dating kind of exercise. You would get 20 researchers who would spend two or three minutes each, just telling the business community what they do. Then essentially it's the reverse - you get the 20 or 30 companies, they stand up and spend two or three minutes telling the researchers what they do and what they're interested in and essentially make some connections. From

that we've been able to secure a fair amount of work from the private sector. And the next stage for that NSERC program is what Martha alluded to earlier, which is these vouchers.

The private sector can leverage their money fairly well. For 25 cents they can essentially get 75 cents from the federal government to do R&D with the university, in small amounts, but it's a step towards doing something bigger.

MR. COLWELL: That's very positive. A lot of times, a smaller business has a really difficult time taking their product to the next level technology-wise and if you come up with the right product, it's easy to sell it if you've got the right product and do some marketing. But it's that next stage - typically companies do not have the expertise at all to do that and really can't afford to do it. When you have these arrangements like that, what kind of success rate are you getting with that?

MR. HARTLEN: That's a good question. Typically what I would see in an event like that is if you had 20 researchers and 20 companies, you would probably make three, four or five matches after that meeting and that would be at the event, when they would discuss what they're going to do together. I don't know what the success rate is post that, but typically you'll have companies coming back more than once, and if they come back a couple of times, they start to understand it and then the propensity for them to actually make matches goes up. So it's a good event.

MS. CRAGO: So the voucher program, I think - what are there, 20-some of these vouchers that are given out? - we get three-quarters of them at Dalhousie, and for the Engage Grants we're one of the leading universities in the nation for getting these same kinds of federal voucher-type things. All of these are designed to improve a product in some manner. And then there's the IRAP program; we compete very well for IRAP funding. There are these varieties of sources of relatively small amounts of money that the company can get hold of and they look for the researcher - his office tries to match them up with the researcher who can help with the product development.

MR. COLWELL: I know for a long time that the universities had a terrible time trying to get the science that they had developed and the technology they developed into industries' hands to try to make a product that they could make some money off of and really add to our economy. How much have you improved that in the last few years? I know it's a very difficult thing to do, extremely difficult.

MS. CRAGO: I think these are exactly - the kinds of programs I just mentioned are all designed because the industry gets the money; they say what they want done with the product. We try to provide them with the researcher and the fact that we're so successful in getting these means that the industries are coming, searching for people. What I can't tell you right now is exactly what product they lead to and exactly what happened to that product. What I do know is there is a lot of people working together to develop the products, using these various programs that the governments, both provincially and federally, have put in place.

The Nova Scotia voucher program, I don't know exactly when it started but I think it was around the time I came, so roughly five years ago. The Engage program started about three years ago. These are roughly relatively new forms of funding to do exactly the kind of thing you're talking about.

MR. COLWELL: It might be useful to track and see what kind of innovative products come out of this. I think that would be something we need to hear about in Nova Scotia.

MS. CRAGO: Yes, I think that's a good idea.

MR. COLWELL: There are so many negative things with our economy all the time, and as you've indicated, we don't have a very good economy in Nova Scotia and if we're going to change that - and we've known that for 50 years but it doesn't seem to ever get together, the whole thing. Even though we're doing great work, a lot of companies out there are doing really good work; it just doesn't seem to click enough to really put it all together. From what you're saying, you're really making significant progress and that's fantastic.

MR. HARTLEN: Just a comment on that, in looking at all the information that is out there on our ecosystem and the economy, the one thing that we don't do well in Nova Scotia and generally in Atlantic Canada, is the private sector doesn't do a lot of investment in R&D. That's for a whole myriad of reasons - we don't have large companies here, we don't have head offices here. So the more that the university community in general can do to educate the private sector on the value of R&D and how we can partner with them in doing it and how we can leverage federal dollars to help you do more R&D so you can create more products, services and processes that you can export, I think the better. We take that task very seriously and we're working hard at it.

MR. CHAIRMAN: Thank you very much. Mr. Colwell, your 10-plus minutes have gone by. I will now call on Mr. Orrell and then Ms. Raymond and then Mr. Epstein.

MR. EDDIE ORRELL: Thank you very much for your presentation. I just want to switch gears a little bit to the funding aspect that you talked about earlier. We know the recent funding changes to the universities have gone down; you say your research and development budget has gone up. How does that funding to the universities change how you do your research and development or how you get your money to increase your research and development compared to a decrease in the funding to the university?

MS. CRAGO: Well, first of all, the research and development money is what I would call incremental to the operating budget. The operating budget is what we get from the province through the MOU. The research and development money is largely money we get outside of that envelope; we get that through the research councils. As I said, we get about $145 million through direct research funding; we get about $185 million through the MOU and the operating budget of the university. To say it's incremental is diminishing the

quantity of it. It's a very important piece but it does come from outside of that. That's what really funds the research, so if we want new research equipment, we don't go to the provincial government, we go to the federal government, to the Canada Foundation for Innovation or the research councils to get that kind of equipment money; the same thing for the fitting up of the laboratories.

MR. ORRELL: Maybe you can't answer this but it's something that - for every dollar that is invested in the research and development, what economic effect does it have on the outside? If we put $180 million in, what does that give us on the outside in the end?

MS. CRAGO: Well, when I say you put $185 million in, you are also educating 17,500 undergraduates with that. That money really pays for the classrooms, the education of the students. The research is paid for by the federal government in a lot of ways. What you're getting out of it is the kinds of things that are the productivity that we've been referring to, so that the overall funding of the university, I think we always have to be careful of what money is going for the education of students and what money is going for research. The research money largely comes outside of the MOU budget.

MR. HARTLEN: Just a follow-up to that; there was a study that Dalhousie commissioned a few years ago by Gardner Pinfold, and I can't talk to all the specifics of it but essentially it said that the economic impact of Dalhousie University on the Nova Scotia economy was about $1 billion.

MR. ORRELL: Do we, as a province, use the wealth of research that Dal provides effectively in what we do as a province, say in researching - we'll say the shipbuilding for example, Dalhousie has an engineering program - are we utilizing our programs enough that we're going to cash in on that program or can we do better at that, as a province?

MS. CRAGO: As a province - do you want to hazard a stab at this while I put my thoughts together on it?

MR. HARTLEN: Sure. The thing that we did around the value proposition was very interesting. Essentially we had a conversation with Irving and Industry Canada, or whoever told them, essentially said you know we did the value proposition the last time they built the frigates and the story that was told was essentially we would have the most cost-efficient, productive yard in North America, and that would be the yard in Saint John which is now a parking lot.

They came back this time and they said okay, so the value proposition question this time is what is your value proposition to the ocean science and tech community in Atlantic Canada and to the rest of the country? Irving, they build ships, so the ocean science and tech piece then was a bit of a foreign issue. So we worked with them to build a value proposition story and it will be implemented, but it was around ocean science and technology companies in Atlantic Canada. So going back again to those companies I mentioned earlier, that we have the strength in doing a lot of R&D, exporting their products

and services around the world. That was the value proposition that Irving signed up for to support the growth of that, so it's not necessarily in support of the shipbuilding contract itself but the spinoff benefit is to grow a science and technology community in Atlantic Canada and beyond.

Having said that, we do have an engineering school. The interesting thing about the Ships Start Here campaign essentially was that it painted a picture of the workforce being basically people with welding torches. That is somewhat true but it's not entirely accurate. The reality is that it is engineers, it is project managers, it is computer scientists; those are the folks who actually are going to have to be employed as well. So having 17,500 undergraduate students and 4,000 graduate students is a good, stable source of labour for the Irving shipyard, beyond the programs that the community college is working on with the welding and so on.

MR. ORRELL: What percentage of the people at the shipyard will take advantage of that program, like your engineering and your post-graduates and graduate programs; do you see a good chunk of your graduates going to that program? Will they be utilized effectively, I guess, or will they be . . .

MR. HARTLEN: It will depend; I mean it's an open job market. Those students will have to compete with others who are looking for jobs at the Irving shipyard, from other universities like McGill and Western and wherever else they come from.

I would suspect that being in our own backyard and being able to have conversations with the Irvings about what types of skill sets they are interested in having students graduate with, over a 20-year period in time, Dalhousie is more than willing to have those conversations . . .

MR. ORRELL: And will modify the programs to change that.

MR. HARTLEN: And we have had dialogue to that extent.

MR. ORRELL: Okay, if I could, one more question. You were talking about clean technology - is it just the automotive industry or has it been with others?

MR. HARTLEN: No, Dalhousie is exceptionally good and an area of clean technology around advanced materials is what we're kind of known for in Canada. We have an institute called the Institute for Research in Materials at Dalhousie. They work with companies like 3M and Boeing and others, so it's not just about the automobile industry - the automobile industry and Jeff Dahn specifically about ion lithium batteries, those are the batteries that Boeing is having problems with right now in their 787s. We also do a lot of research in materials - how you make carbon fibre lighter for airplanes, those sorts of things, so it's beyond that.

We've worked in the past with Seaforth Engineering around the structure, wind turbines, so it's broader than just the auto industry.

MS. CRAGO: Another local example is Composites Atlantic has worked with different people for the kinds of materials they're going to put in the products they produce.

MR. ORRELL: Okay, thank you.

MR. CHAIRMAN: You still have a little more time if you want to keep going.

MR. ORRELL: Okay, if I could. We're tracking 50 per cent of our population from outside Nova Scotia. What percentage of that is Atlantic and what percentage of that would be the rest of Canada, or would we know that?

MS. CRAGO: We would know it, but I don't know it off the top of my head. What I do know is that the Ontario group and the Alberta group are an increasing set of our enrolment. I would still guess that the majority of that is Atlantic, but this is a guess. I would need to look at the enrolment figures.

MR. ORRELL: Is there a reason there are more from outside Nova Scotia than there are inside Nova Scotia?

MS. CRAGO: I think it's basically a testimony to the drawing power of a university like Dalhousie and to the standards of . . .

MR. ORRELL: I would hope we'd have more provincial people going to Dalhousie and hopefully keeping them here when they're done, as compared to someone who may come from Ontario, get their education and go back to Ontario.

I guess I'm really interested in the international student aspect of it. The international students would be involved in what aspect of the education program? Would it be more - and I hate to generalize because I don't mean to do this - would it be more medical people or would it be more research people or would it be more just undergraduate programs? Would you know that?

MS. CRAGO: Well, I can give you a general idea of that. First of all, a lot of the international students are involved in engineering, in computer science, in management programs. I think the proportions are quite similar, undergraduate and graduate.

One of the things we have to bear in mind about Nova Scotia is we have this very sharply falling demographic for young people, so the number of high school graduates is going down. To be able to offer the richness of the programs that Dalhousie is able to offer, we need to bring students in from outside, otherwise we couldn't offer those broad programs to Nova Scotians.

MR. ORRELL: That's good for the province.

MS. CRAGO: It's good for the province and many of these people would like to stay in Nova Scotia. People fall in love with it.

MR. ORRELL: That was my next question. Is there a percentage that does stay?

MS. CRAGO: Well, if they can find jobs, they do, so one of the important things then is, of course, the creation of the jobs and the jobs for highly-qualified people. I don't have the data on the numbers that stay, that's the kind of thing we could get you from . . .

MR. ORRELL: Would it be a percentage - 10 per cent, 15 per cent, 20 per cent, or 50 per cent?

MS. CRAGO: I actually don't know this.

MR. ORRELL: We've seen in the past, in places like CBU in Cape Breton, students come in but they come in sponsored by their country, so when they get their education they go back. Some stay and some come in on their own, or their families have enough financial backing that the person can come and get their education. But the ones that are funded by their countries go back. So although we get the money in the education system when they're here, we don't get their expertise that we've trained them for.

MS. CRAGO: The only program that I know - and I know a fair amount about those international programs - the only program where the student is obliged to return is the students supported by the China Scholarship Council, and those are graduate students. We have a small number of those; I would say something in the order of 12 to 15 at Dalhousie. Otherwise, they're not obliged to and, of course, Canadian law is not such that if they don't go back we would make them go back.

I remember this experience when I was a graduate dean at McGill. People would say, well, this person didn't come back - in this case it was China - and you need to round them up and make them come back, and I said we don't actually do that in this country.

MR. CHAIRMAN: We can come back to you in the second round. Ms. Raymond.

MS. MICHELE RAYMOND: Thank you very much and I'm sorry to have arrived late, so please forgive me if I'm asking things which you've already talked about. Just reading through really quickly - I guess the first thing to say is it has been a real joy over, gosh, I can say nearly 50 years, to watch Dalhousie grow and diversify and fill up more and more of the city and make it a more and more - the university cluster in general, but Dalhousie being a large part of it.

I hadn't really realized how much of a role the federal government appears to be playing in this. I know I was recently at the Life Sciences Research Institute and listening

to some of the people with the CREATE program. I don't know whether you spoke about this but I was interested - I think at that point they said there were five institutions chosen across the country to be the host for this program. I think UBC was one.

MS. CRAGO: We were fourth in number of being able to attract funding for these. Many universities have them but only four of us have had one every single year. Dalhousie for its size is, in fact, overrepresented because the other universities in that four are UBC, McGill and Toronto - much bigger universities.

MS. RAYMOND: So, in fact, it is a year-by-year sort of thing?

MS. CRAGO: No, you get six years of funding, but you have to compete for it. We have five CREATE projects that are funded for six years, they've come on-board at different stages; we've gotten one a year for every year that we've applied for them and one year we got two. We are very well-heeled in CREATE programs, but there are other universities that have them, but we're fourth in the nation in CREATE programs. We are not fourth in the nation in either size or total funding, so we've been very successful. These are graduate programs that hook students in the natural sciences and engineering, with industry, have them do part of their research work with industry and can go internationally. Some of them are ending up with companies in Japan or other places in the world during their studies.

MS. RAYMOND: That's interesting because I had thought it was different institutions, so it is project based. You mentioned the industrial research benefits and the fact the federal government has said that there is this multiplier effect for Atlantic Canadian universities. How often would that multiplier be recalculated? Is this something that we can look at and say okay, Atlantic Canadian universities are going to benefit by being able to offer, in effect, less expensive research than other universities for a predictable length of time?

MR. HARTLEN: That's really a question for Industry Canada; they manage that program on behalf of the federal government.

MS. RAYMOND: Okay. So do you know that this multiplier effect will be stable for . . .

MS. CRAGO: We don't have any indication to the contrary is what I can say, but you know, governments can decide to do what they decide to do.

MR. HARTLEN: My understanding is - I don't know this as a fact, but - it's a rather complex formula. It depends upon how many universities are involved, what part of the country the universities are in, and it's somewhat of a negotiation between the proponent and Industry Canada, as to what kind of multiplier they can expect.

MS. RAYMOND: The proponent being the institution?

MR. HARTLEN: No, industry. It's like Sikorsky or a Lockheed Martin or a Boeing.

MS. RAYMOND: Oh, I see. Okay, so it's not necessarily regional, okay.

MS. CRAGO: It works out to be regional, but it's a little bit of a negotiated regional.

MS. RAYMOND: Okay. Do I have a couple more minutes?

MR. CHAIRMAN: Yes, certainly.

MS. RAYMOND: So it's a little bit negotiated, so again, it's a little . . .

MS. CRAGO: But I would say in general a region that is poorer is going to have a larger multiplier effect than a region that is more wealthy.

MS. RAYMOND: Okay, this also suggests that we develop a bit of an academic concentration in the area which is what we talk about. I've always said that education is a fluid resource, it comes here and sometimes it goes.

A couple of other things, maybe these are too specific but with the research and development money, is there a general policy about an obligation to do beta testing in the region as well? Once the product has left the R&D stage and gone into the testing phase, does the university have anything to do with whether or not it will finish its testing career?

MR. HARTLEN: It would really depend upon who the company was. Essentially, when you're doing research contracts with the private sector, they're fairly complicated contracts that would have obligations on behalf of the university and the private sector company. We would always, with our sales hats on, try to sell more than have something leave, but you can't necessarily dictate what would happen with that. If it's a local company, just by the fact that they're local, more often than not it's going to be done here, but if it's international or multinational, it depends.

MS. RAYMOND: Okay, but if you can have that in the scope you do?

MR. HARTLEN: If we can, we try to sell.

MS. RAYMOND: You do, okay. Another thing that I was kind of interested in - and we have more and more vocational school developments and so on, we have the Nova Scotia Community College that is very strong in this as well - I was interested in talking to some people at General Dynamics a couple of years ago and they were saying that they have a very active program in other parts of Canada, and in the United States as well, that they literally will partner with a high school, to have their sort of engineering high school students develop. They've not had any particular success with that in Nova Scotia at this

point; how actively they've pursued it, I'm not really sure. Would you see that as being a plus for the university community if there are high school-industry partnerships, or would that tend to detract from the eventual university undergraduate population?

MS. CRAGO: I can only guess that that kind of partnership would be about encouraging students to think about going into university programs that would develop the kinds of skills that a company like that would hire in. So anything that encourages students to think about furthering their education, looking at what are their job possibilities - all of that is highly desirable.

One thing I can say - and I think that Dalhousie has not advertised this or made this as clear to the world as it could, and we're talking about doing that - is Dalhousie is a very rich university in co-op programs. We have a very large number of students that either do some form of co-op, practicum or internship. We actually have a lot of on-the-job education that takes place across a wide variety of the programs of the university.

I think that students - it's a struggle these days for young people in terms of the employment rates not being as high as they can be. We're actually a university that's preparing students very well for employment settings. I think this is one of the things that Dalhousie needs to make the world realize about itself because everybody says, oh Waterloo, they do co-ops. Actually Dalhousie does a great deal and then in all of the health professions, the students do their internships and their practicums, as well, and learn on the job. So there are a large number of students at Dalhousie that have on-the-job education.

MS. RAYMOND: Actually this made me think, I know there's a lovely program - or I think it's a lovely program - which is the Imhotep program. I think it's done by volunteer students, Dalhousie students who go into schools with large African-Canadian populations and talk about the sciences and try to sort of encourage people. Are there other such initiatives where there's kind of the university working with students to encourage this experience?

MS. CRAGO: I know that our provost, who you know is a computer scientist, Carolyn Watters, has been very instrumental in - it's called WiTS, women in info, technology and science or something, and they do a lot of work encouraging women to go into the STEM disciplines, the science, technology, and mathematics disciplines.

MS. RAYMOND: So you haven't really had a chance yet to see how . . .

MS. CRAGO: I'm not sure what their figures are.

MS. RAYMOND: Yes, okay. I think the other questions I have are probably more related to the individual relationships between projects. Thank you so much, it's really wonderful to hear.

MS. CRAGO: Thank you for your questions.

MR. CHAIRMAN: Mr. Epstein.

MR. HOWARD EPSTEIN: Thank you for the presentation today, it was really excellent. The information you gave us was very helpful and very well laid out. I hadn't realized when we were doing our initial introductions that people were going to go around the table and take the pledge about their connections with Dalhousie so I guess I should catch up at this point and point out that I am also a graduate of Dalhousie Law School and I teach there part time. So I also have my Dalhousie connections.

I'll get to this in just a moment but let me assure you that however much we have been sorry to have gone through several difficult economic years in Nova Scotia, nonetheless this government continues to regard the higher education enterprise as one of the economic stars of the province, there's just no doubt about it. The enterprise is highly valued and admired, and we have every intention of continuing to support the universities and all other aspects of post-secondary education.

I've wondered if you've noticed this. On the Halifax peninsula, something that the three MLAs have in common is that all three of us have taught or do teach in the universities, and I think this is not an accident. Leonard Preyra was in the political science department at Saint Mary's, Maureen MacDonald in social work at Dalhousie, and myself in the Law School at Dalhousie. I think this is not an accident in the sense that it reflects not just a core Nova Scotian value, which is respect for education, but particularly here in metro it reflects what's probably the main business of the town. The same way you get people like Sterling Belliveau as a fisher elected in Shelburne, people who have ties to the universities get elected in metro and it's not surprising; it does reflect, I think, just how important the enterprise is.

I want to start by telling you a small story that you might not know as a prelude to a question. I was prompted to this by your comments about the recipients of the Nobel Prize in Chemistry. I wondered if you knew about Connie MacFarlane, and perhaps as a relative newcomer to Dalhousie you might not. When you were talking about oceans you talked about biomass, climate and aquaculture and minerals, you didn't actually mention seaweeds. Connie MacFarlane 40 years ago had a seaweed study lab, she was the sole researcher who worked on this. She had her lab set up in one of these little wooden houses that at that time was along University Avenue, before all the nice, new, modern, larger buildings had been put in place. I remember visiting her in her lab and being struck by what was a fairly lonely enterprise for her, but she was doing basic research into seaweeds.

Now, in Nova Scotia, we have enterprises like Acadian Seaplants, which is an enormously successful company that employs, I think, upwards of 30 people with doctorates, MBAs, Ph.D.s and they're going great guns in terms of the potential. A lot of this wouldn't have occurred except for some of the basic research of Connie MacFarlane and a few other people scattered around the world in outposts in Japan, and so on, where people were doing some basic research. This is kind of what I wondered now, a lot of our

discussion so far was all about applied research and it's certainly true that there's enormous interest in looking to the commercialization of research.

Mr. Hartlen correctly pointed out that not just in Nova Scotia, but in Canada generally, we don't have the very large, private enterprises that are able to fund great portions of their own research so the universities are relied upon to do both basic and then applied research. I'm wondering if you can comment on the interaction between basic and applied research at the university. Sometimes, I guess, we get the impression that basic research is somewhat swamped by the current emphasis in applied research. Can you comment a bit on this?

MS. CRAGO: I'd love to comment on this. First of all something occurred to me that hasn't occurred to me before, so I'll reflect on this from a personal level. In World War II, university researchers were called upon to make contributions that had to do with war efforts. Particular times will elicit particular needs, most of which will become applied-type needs. I know my own father, who was a university professor and researcher in World War II, turned some of his research to applied needs that he probably wouldn't have addressed in the same way if it hadn't been that there was a war and there were war efforts from the country he was living in.

We've gone through an economic time that's very complex, so I think a lot of attention has been paid both federally and provincially to what we can do to get our economy going as a nation and as a province. I think people's attention and the kind of funding, as I said, where the incremental increases in Ottawa have been to more of the partnered research, both socially and in ones that partner with industry, I think this kind of attention has got people - I think people in this particular climate find this important. I'm not sure it will always stay that way over time but I think the downturn of 2008 shook everybody and people said we've got to take this seriously and everybody has to make their contributions.

Now the relationship applied and - I did a lot of applied research in Aboriginal communities on children developing language.

MR. EPSTEIN: Psycholinguistics, is that your area?

MS. CRAGO: Yes. At one point I got interested in a particular little theoretical issue - very theoretical - and I wrote a grant and I got funded for it. I never thought it would have a single applied feature to it but I discovered that a little piece of the grammar in a variety of languages will indicate if a child has impairment, better than many of the other things like their vocabulary size, et cetera. This particular grammatical item now appears on almost every diagnostic test for children.

I never meant to be doing something applied when I looked at that particular little mental puzzle that I got interested in, but it has turned out to have great implications. It has

been used in a very practical way and commercialized by a number of my colleagues as test items in tests that they put together.

I think all of our researchers want to make an impact with their research and I think that if they fall upon, in discovery research, something that can have an application, they're eager to do that. But as I said, we have to have some of the foundational science to be able to figure out what one can make applications of.

I think that foundational science is an extremely important thing and I think people want to see impacts. I don't think you have researchers who say, I'm only about theory, I never want to see an impact of my work in a real-world setting. I think that most of them, if they can find something that's impactful, will attempt to move it in that direction. At the same time, they may personally be more interested in the theoretical aspect.

I think these things go hand in hand, I don't think you can really separate them, in fact. It's important that funding be maintained for both because what's going to be in the pipeline is the foundational research that we are going to discover today. That's what's going to be commercializable and brought to bear on industry going forward in the future, so you can't not furnish at that level of the pipeline, hoping to have something come out in the future.

MR. CHAIRMAN: We will have an opportunity for the second round but perhaps one last quick question.

MR. EPSTEIN: I wonder if you could tell us just a little bit about the framework in place with respect to identifying and then, I think, managing potential commercialization of research inside the universities. We heard examples in your presentation of particular projects that are very direct, but I'm wondering a bit about ownership of intellectual property rights. I'm wondering about whether there's a mechanism in place in which research inside the university is regularly reviewed for its potential for commercialization, things like that that may be a larger issue.

MS. CRAGO: I'll turn this in part to Stephen but I will say this: every university in Canada has a policy and there are university-by-university policies about intellectual property. Our particular policy is that the researcher owns 100 per cent of that intellectual property, unless they choose to work with our Industry Liaison office that Stephen runs and then they have 50 per cent and the university gets 50 per cent.

The United States has a country-wide law called the Bayh-Dole Act that says that all researchers get 50 per cent and all institutions get 50 per cent. We don't have a nationwide thing so this falls prey to our collective bargaining and other things like that. Dalhousie and Waterloo are the two universities in Canada that are in that top U15 group, where the researchers have 100 per cent ownership of the intellectual property if they so choose.

Many researchers are not great at how to commercialize their research because that's not what they were ever trained for, so if they keep 100 per cent and it doesn't go anywhere commercially, then they don't get anything. If they want to have some help with that, they have an office available to them but they will have to split the cost because we have to be able to maintain the office.

MR. CHAIRMAN: Thank you very much. I don't intend, as acting chairman, to take a round but I do have a question in relation to foreign students. We in this province are down in the public school system, 30,000 students over 10 years. We have to, in the feeding of our universities, look at foreign students.

When someone is working on a master's or a Ph.D. as a foreign student here, involved in research - so they spend perhaps six years here at Dalhousie - is there a program or is there an effort to keep some of the brains that we have in foreign students in this province?

MS. CRAGO: This is something that's interesting to me because I was - so if we just talk about the graduate students, I was a graduate dean in my own past and I found that our universities didn't do as good a job at career fairs for graduate students as they were doing for undergraduate students. We have started at Dalhousie, through the Faculty of Graduate Studies, with a number of career exposure opportunities. They consist not only of the career fair type thing - which is who are the students, which are the companies, and where might they work - but also with developing some of the more what we call soft skills, or professional skills that people would need to have in addition to their research capacity.

One of the things people don't understand is that 80 per cent of Ph.D.s in engineering do not work in a university when they finish their Ph.D. and 50 per cent of all Ph.D.s do not work in universities. These are people who get jobs in a variety of settings, including some of them becoming our ministers and other things in this province. So it isn't just an ivory tower where people are trained and stay there.

There has been an increasing effort - and I can say this knowing the graduate studies world and North America-wide - in the last 15 years we realized we're educating a different generation of graduate students, ones who will work outside the universities and who need a set of skills to do that. We need to provide them with the connector events to get acquainted with the various possibilities for employment.

I don't know the numbers per se - I know all the research numbers but I don't know all the student numbers, as you can see - but a provost can tell you what we do know about how many of these students that come here. What we do know is that most of them would like to stay. Almost all international graduate students in Canada - and they have a fabulous network for this - figure out a way to become Canadian citizens while they're here. The person we just hired back as the Canada Excellence Research Chair, Doug Wallace, came here from the U.K. He became a Canadian citizen while he was doing his Ph.D. so when

we hired him, it was really easy to get him back here because he already had Canadian citizenship.

Many of them do get citizenship, many of their children qualify as Canadian citizens. Even though they may go somewhere else, you sometimes see the children coming back. So there's every effort being made to try to keep people here. Again, it's a question of, do we have enough jobs for them?

MR. CHAIRMAN: I'd just like to make a comment. We heard about the great contributions made by Connie MacFarlane, but as a graduate of Master of Marine Management at Dalhousie, I would like to mention the name, the great leadership of Elisabeth Mann Borgese, who was internationally renowned in the law of the sea and so highly respected worldwide that she made such a tremendous impact and a name for Dalhousie internationally.

MS. CRAGO: She did, indeed. We have annually, on June 8th, UN World Oceans Day, the Mann Borgese Lecture at Dalhousie, in her memory.

MR. CHAIRMAN: Thank you very much. Mr. Colwell, five minutes.

MR. COLWELL: Thank you very much. I really respect the work that you do at Dalhousie. I know how difficult it is to commercialize products from the concept, to sort of the initial research that may be years and years before it gets to a product. The example you used, the one item you did in the report you did is a prime example of how important that research is.

I'm going to ask you for some information. I want to know how many Nova Scotia companies have taken products to market as a result of Dalhousie's R&D work - and I don't need those answers right now, you can send them back to the committee - over the past 10 years? I want to know the number of products developed to a commercial stage as a result of R&D work at Dalhousie and that would be any international companies you do, too, because that's very important?

MR. HARTLEN: Can you say that last one again?

MR. COLWELL: All products that have been developed, companies like the drug companies or the big international companies that would have products as a result of Dalhousie's work.

Also, how each one of these technical transfers has succeeded or failed in a marketplace - now, I don't want that information because once Dalhousie has transferred the technology it's not your fault whether it succeeds or fails, it's up to the businesses that do that. The reason I want the answer to that question is - of course, a large company may decide not to market the product for whatever reason afterward and that's fine, but I really want from the Nova Scotia companies because I think we're missing a link between what

you do and all of the other organizations you've talked about; they're there, there will be some funding, but there are some pretty basic management issues that have to be addressed with companies to make sure they're successful. It has nothing to do with your R&D work, I just want to see how that all blends together.

MR. HARTLEN: So that's more of an ecosystem question that you're trying to get at?

MR. COLWELL: Yes, exactly. The other thing I want to know is how the province can improve the transfer of technology from Dalhousie to Nova Scotia companies and Nova Scotia start-up companies. I think that's a very important question because the more we can get jobs created in Nova Scotia and because with the technology transfer - and I'm being real with this too - because you transfer technology to a large company, whether they work in Nova Scotia or not is immaterial. It's important if they do, but realistically they may not, but at least we've had the technology developed here and all of that economic impact here which is very, very important. I just want to know how the province could, in your view, help that transfer process to make sure the companies are more successful, the product gets to market easier, the transfer is easier, all of those things that go together to make that.

I know it's a very loaded question, a very difficult question to answer, but even if you can't answer it today, if you could send some information back to the committee on how, as politicians and as people who make decisions in Nova Scotia, we can help you do your job better and ultimately help the economy of the province better.

MS. CRAGO: I think you've done this in a really important order because it's the information that is the background that I think helps us figure out if we have gaps in the system. One of the things I think I can talk about here now, because I think some of you will hear about it more in the future, is working with the Nova Scotia Government. Dalhousie and other Nova Scotia universities are going to put on an economic summit in the latter part of April, about innovation, about what has made it work in various sectors, in various parts of the world in an attempt to identify if we have gaps in what we can call the economic ecosystem here, do we have something we need to be doing that would help to improve things when we look comparatively at what other people have been doing? Then we're going to look at it in various sectors that are more the resource sectors and say, how has innovation been bringing things like forestry, agriculture and oceans into new ways of doing business?

That question that you've asked is exactly what is at the heartland of the planning of this summit which is, have we got everything we need that would best encourage an economy through innovation in place in the province and what can we learn from other places about what they did to see what else we could put in place? My hope is that there will be some answers or some ideas that will come out of that summit that will also be able to address these questions. As you say, I think we're happy to see what kinds of evidence we have for you related to those questions.

MR. COLWELL: And I think it's a story that should be told, too, because even if you have five companies that have done very well in Nova Scotia the last 10 years, that's a real success story because I worked in all aspects of this thing, from actually working at Dalhousie University to Nova Scotia Research Foundation, at TUNS and working on product development. I can tell you - and you know - it's extremely difficult, extremely difficult. These are the success stories that we've got to talk about that may bring you more customers, as you might say, more people who want to work with you when they realize what kind of fine work you're doing. I think that's a story we've really got to tell, even if it is students coming in from outside the country, that's a success story too; it all adds to our economy and all improves.

If we're lucky enough to get them to stay in Nova Scotia and use those intelligent people to grow companies or help other companies here or work for the province or the federal government, any of those things, we all benefit from that.

MR. CHAIRMAN: Thank you. Certainly I gave you a couple of extra minutes there and we'll be prepared to come back to you, if need be.

MR. HARTLEN: Just a real quick follow-up to that. The question is timely, very relevant. The work that we're doing with the provincial government on the summit goes right to the heart of this. There's also another group out there called 4Front Atlantic that has been doing a lot of work on essentially the same topic. I'm involved with those folks as well; I chair one of the tables on productivity and innovation.

I think to your point, we have to get these success stories out, we have to get a dialogue going, and we have to figure out where the gaps are so that we can push the economy forward. I'm not exactly sure we're going to be able to perfectly answer these questions but we'll do our best.

MR. CHAIRMAN: Thank you. Mr. MacLellan.

MR. MACLELLAN: I just want to ask you for a quick comment, if I may, on a topic that's certainly on the minds of many Nova Scotians - it certainly affects people in a variety of ways, certainly the pocketbook - and that being renewable energies. Obviously it's an important topic for the research community; certainly the commercialization of some of those findings is critical as we kind of move forward with a renewable kind of energy source and sources in the province.

In a nutshell, where are we going with this? You've got tidal, wind, solar, geothermal, where there have been incredible events. I know that the Centre for Sustainability in Energy and the Environment at CBU has been set up and I know there's some collaboration with Dal. Just general, as a research community, provincially or from an Atlantic perspective, we always sort of tend to think there are scientists somewhere in a room figuring out this stuff for us. We know we're going to have tidal someday in the Bay

of Fundy and those types of things, but someone has to put the nuts and bolts together as to how we get there. So how are we getting there?

MS. CRAGO: Well, I think there's a variety of ways we're trying to get there. One of the things that's interesting about this is when you hire a university professor, you're hiring them for many, many years. They're often 28 years old and they stay with you until they're about 68 years old and what was a hot topic 40 years ago has changed, so you keep trying to do turnover in the crowd and hire people into areas that have emerged. A lot of the renewable energies are emerging areas, basically.

We do have people working on solar; they work on codings that can be put on solar receivers, so they are material researchers who are chemists, who try to figure out how it can attract more sunlight. We have FORCE; this not-for-profit that Nova Scotia has works on the tidal energy for the Bay of Fundy and there is a centre for that at Acadia. Our researchers work with the person, Anna Redden, who runs that centre, trying to concentrate on some of the things that would need to be developed - and these are a myriad.

One of our researchers, John Newhook at Dalhousie, has done a lot of work on how you structurally get bridges to stay in place and so on. Well, it turns out that when they put the first turbine in the Bay of Fundy, one of the hardest things was that it wasn't staying put on the bottom, so there needs to be work done to how you anchor this thing properly.

Then there's work being done figuring out what's going to happen modelling, computer modelling, to what happens to the tides. If you put 300 of these in the Bay of Fundy, there's actually some indication it may lower the tide. So we have to figure out what the overall, long-term impact would be.

Our people from the Ocean Tracking Network are setting receiver lines around these turbines to figure out what's happening to the wildlife as a result of the turbines. So this is not un-complex stuff. We do have people working on the materials for wind energy, so what are the materials that propellers would be made out of that would turn faster, that would create more energy? We have the battery people. People are coming at this from a variety of angles, but they're looking at wind, they're looking at tidal, to some degree wave energy and the storage of that energy is very important which is why the battery thing was important to Nova Scotia Power and the way in which you get all of this energy onto the grid. We have a variety of disciplines from chemistry, physics, oceanography, to electrical engineering, materials engineers looking at various aspects related to this.

So there is a set of researchers and there are connections, as I said, with Acadia, there are connections with CBU. One of the good things about the Halifax Marine Research Institute is it provides a connectivity between some of these instances and a number of these are marine-related renewable resources.

The other big one that is being looked at is biofuel from algae and this relates to the sea plants and algae are a sea plant. That was something that the NRC began looking at and

it is one of the flagship programs now. The NRCs have been transformed across Canada, they're rejigging their organization and they all have to be involved in a certain project and that project has to be able to make a Canadian company get over the edge and become internationally very competitive. Our NRC on Oxford Street is now linked to the NRC in Saskatchewan and it's all about biofuel from algae. We have very oily algae in our ocean.

MR. CHAIRMAN: Mr. Orrell.

MR. ORRELL: I just have one final - I think it's a fairly easy question. We know the value of a university education to a lot of different individuals in our province and where they've come and where they've gone. I know the research aspect is very important because of future technologies and stuff that we're going to need too. Should we be looking more intensely at funding differently for people who want to do research compared to just a straight university education or is that something that would be possible? I would imagine we're not getting enough students doing the research aspect as we are just a straight undergraduate degree and studies have shown that the graduates and the undergraduates have different income levels which would make the economy grow better if we were. Should we look at funding that a little differently or can we look at that, or has that been talked about amongst the universities as a whole?

MS. CRAGO: Yes, I think so. I will tell you as a past graduate dean, graduate deans are always hungry for funding for their graduate students and we have very plentiful federal funding for graduate students from the various Tri-councils. I think actually we have data that shows that - one of the things I can say about graduate funding in Nova Scotia is that the predominance of the money went to the Nova Scotia Health Research Foundation. I would say it would be important for us to find ways to spread funding across some of these other sectors that we've been talking about, to make sure that those sectors are well funded.

The good-news story about graduate funding is most, particularly the international students, are funded off the research grant that the professor gets. If you have fairly good research funding, like this $145 million, a portion of that is going to the funding of the graduate students. In Canada, graduate students do a lot of the research. In the United States you get a kind of class of employees known as research associates who do a lot of it. The Canadian model is to train and do research at the same time so the graduate students are really important to the doing of research and that's why people's research grant funding goes often to support the living expense of the graduate student in fellowship format. They are a key element to doing research.

MR. ORRELL: Thank you.

MR. CHAIRMAN: Does anyone else wish to continue? There is certainly no rule that a committee has to go its full time frame. Mr. Epstein.

MR. EPSTEIN: Just a quick point. I'm wondering if you can tell us a little bit about how things are going now with the Nova Scotia Agricultural College and its move away from being part of the embedded civil service to being part of Dalhousie.

MS. CRAGO: Frankly, watching this from within the university, but also from standing outside and saying how is this happening and how do we think it's going, we think it has been remarkably smooth as a process.

I think there's a lot of excitement, and I can talk about it from the researcher end, there's a great deal of excitement among the researchers about the connectivity that this is going to bring with researchers from other disciplines that are located on the Dalhousie campus and some of the possibilities and things we know about from federal funding that they may not have had as much information on in the past, I think, are big assets that they are starting to really appreciate and our ability to connect them, not only to our other disciplines on the campus but to other universities. So I'm feeling a lot of enthusiasm by the researchers.

MR. EPSTEIN: Glad to hear it, thank you.

MR. CHAIRMAN: Mr. Colwell.

MR. COLWELL: I was very intrigued about the work you're doing with tidal power, that must be quite an interesting project overall. What involvement has Dalhousie had with that? That has some tremendous commercial applications down the road.

MS. CRAGO: This is one of the areas where, as I said, we're just getting suited up and we're looking at researchers, who presently have never done work in that area, starting to do work in that area. One of the examples I gave is somebody involved with how to get these turbines to stay on the bottom. We're getting involved at a number of levels, in addition to looking at the environmental impact.

As I said, it's researchers suiting themselves up for an area that they never worked in. They're all working on it and we've established good ties with the group at Acadia that have a centre on tidal energy, to try to get people harnessed to that particular issue. I agree, I think it's something that has some very interesting promise to it.

MR. COLWELL: Yes, and if that can work successfully, which I'm sure it will in the long run, it's going to be quite an economic generator for not only Nova Scotia, but a lot of places in the world where that technology could be sold and utilized.

MS. CRAGO: People have been going to international conferences to try to understand what is happening in other places and what information might they bring back.

MR. COLWELL: That is positive too. Back to the commercialization of products, what kind of structure do you have at Dalhousie now? I know you've changed over a

number of years and we met with Dalhousie years ago when I was first elected and there was some discussion about commercialization products. I know you've made a lot of improvements since then and you were trying at that time but it's a hard marriage between an entrepreneur that has a whole different attitude than a scientist that really has this product or some science built or designed, or whatever you want to call it, to get that to the person who is going to deal with this, who is probably a little bit rough around the edges sometimes, to work together to get the whole thing put together.

MS. CRAGO: Well, this is exactly what his office is all about at Dalhousie.

MR. HARTLEN: At Dalhousie we have an office called the Industry Liaison and Innovation office. It was started about eight years ago. I joined Dalhousie, in private-sector terms, a long time ago - two years ago; in university terms, last week I guess. I came from Innovacorp, that's my background, and I worked for start-up companies before that.

We have a team of folks, there's about seven or eight of us, who all have two things in common: they all have academic credentials and private-sector experience; they've all worked in industry, particularly in business development or sales. Their role within our university is to develop relationships with the university researchers, find out what they're good at, find out what they're interested in, what kinds of companies they're interested in partnering with, and then going out and making those matches. That's the proactive piece.

The reactive piece is we're able to get a lot of references from different companies that know what door to knock on now. I think that was the challenge with universities for a number of years, that they could never really understand what door I knock on if I need to get some help. I think it's becoming more and more apparent in the private-sector community that there is a door at Dalhousie and there's a door at Saint Mary's and there's a door at St. F.X. that people can actually knock on if they're looking for assistance. So that's sort of the structure.

We work to do a number of things. We work to increase the contract research revenue that Dalhousie has and solve problems for industry, dealing with companies like Lockheed Martin or Sunrise Foods, so it runs the spectrum from SME to multinational.

We work at looking at technologies that have been developed within the institution, determining their commercial viability, putting patents on those things that we think have commercial viability associated with them, and then going to the private sector and marketing them, either locally or abroad.

The third thing we work on is around the concept of entrepreneurship because in certain instances there can be platform technology that can be spun out of the university as its own company. We've done a growing number of those, I think we're doing one a year now, and this past year we've spun out a total of five companies. That's good and we need to do more of that because it all helps to grow the economy. Those are the three key

elements that my office is involved working with and it's a full-contact sport, we are out talking to the private sector and we're talking to the research community all the time.

MR. COLWELL: That's very positive because it's a difficult match to make and your groups needs a lot of credit for moving in that direction, so does the university because . . .

MR. HARTLEN: And quite frankly, if we don't have the research capacity at the institution that matches up with what the private sector requirements are, we have a network of folks across Atlantic Canada, so we often refer things to Memorial or UNB or whomever may have the research expertise to help the company; they'll come back again.

MR. COLWELL: That's very positive because anything we can do to help the economy either here or from away the better off we are.

MR. HARTLEN: It's a win-win; it's a win for the private sector and it's a win for the university because we're growing research revenues, we're helping to solve a problem, and we're going to grow the economy.

MR. COLWELL: That's great, thank you.

MR. CHAIRMAN: We've gotten some great information from you this morning and we commend you for what you're doing at Dalhousie as well - great job. Are there any further questions? We do have some time left.

We thank you very much for your presentation this morning and we will give you a few minutes to wrap up if both of you would like an opportunity.

MS. CRAGO: I just want to thank all of you for your attention and for your thought-provoking questions, and we're eager to try to find out what information we can get back to you. I think that as much as industry partners, I think government partnership with the universities is extremely important, and our hope is that we will get more and more. I think you've pointed out to us the importance of getting these stories out so that people can really understand them, so people in government can figure out ways in which they can play their role in making more of it happen. I'm more than certain we all have the same end goal in mind and I think that's one of my really major objectives: to make sure that we all get on the same page with each other and that we all do whatever we can to reinforce each other.

MR. HARTLEN: Thank you.

MR. CHAIRMAN: We did have some requests for information, I don't know if you got all of that recorded. We can get staff to send the info.

MS. CRAGO: I jotted it down quickly, but if people were better at recording that than we were, we'd be happy to have help with our jotting so that we get back as much as we can to you.

MR. CHAIRMAN: Mr. Colwell had a number of requests and we will see that the information is passed along to you. With your jottings and with what we send you, I'm sure we'll get satisfactory results. We will allow you to depart and we have just a little wee bit of committee business to look after. Thanks again.

[10:43 a.m. The committee recessed.]

[10:44 a.m. The committee reconvened.]

MR. CHAIRMAN: Committee members, we have two items that we have to deal with. One is the Daewoo tour, an update. It's my understanding that everything is unfolding as it should for a tour in June, is that correct?

MS. JANA HODGSON (Legislative Committee Clerk): Yes, that's correct.

MR. CHAIRMAN: Arrangements are being made and we will be following through with that.

Our next meeting was to be on March 19th. The NDP caucus is going to be away at that time; it's an outreach. I'm certainly prepared to have a meeting with the committee on March 5th, as an opening date, if that is okay. I'm advised that March 5th is good. So it will be sooner rather than later, if there is general agreement from the committee on that. We will allow staff to line up the appropriate presenters.

MR. ORRELL: Will that be in the morning?

MR. CHAIRMAN: It certainly would be the same time frame, 9:00 a.m. to 11:00 a.m. Is there general agreement on that?

It is agreed.

I think we were planning to have the Department of Community Services as presenters. Is that correct for March 19th?

MS. HODGSON: That's a different committee.

MR. CHAIRMAN: Oh, I'm sorry, that's another committee. Okay, we will leave it up to you, you have our priorities. We've all agreed on the priorities so we will move along with that. Sorry about that.

MR. COLWELL: We didn't agree but we'll go to the meeting anyway. (Laughter)

MR. CHAIRMAN: We're having a meeting sooner rather than later, though, especially for you.

That concludes our business for the day. A motion to adjourn would be appreciated.

MR. COLWELL: So moved.

MR. CHAIRMAN: Thank you, Mr. Colwell.

We are adjourned.

[The committee adjourned at 10:46 a.m.]