Les Fiducies
Killam
Trusts

Annual Lecture
2010

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Mike Lazaridis
President and Co-CEO, Research In Motion

The Killam Trusts

The Killam Trusts were established in 1965 under the Will of Dorothy Johnston Killam for the benefit of Dalhousie University, Montreal Neurological Institute of McGill University, University of Alberta, The University of Calgary, The University of British Columbia, and The Canada Council for the Arts. Mrs. Killam also established similar trusts during her lifetime for the benefit of Dalhousie and the Canada Council.

To date, close to 6,000 scholarships and fellowships have been awarded to graduate and post-graduate students and faculty. The Killam Trusts also provide funds for Killam Chairs, salaries for Killam professors, and general university purposes.

The Canada Council, in addition to awarding Killam Fellowships, also awards annually the Killam Prizes in Health Sciences, Natural Sciences, Engineering, Social Sciences and Humanities. Worth $100,000 each they are as a group Canada’s premier awards in these fields.

In the words of Mrs. Killam’s Will:

“My purpose in establishing the Killam Trusts is to help in the building of Canada’s future by encouraging advanced study. Thereby I hope, in some measure, to increase the scientific and scholastic attainments of Canadians, to develop and expand the work of Canadian universities, and to promote sympathetic understanding between Canadians and the peoples of other countries.”

Izaak Walton Killam

Born in 1885 at Yarmouth, Nova Scotia.
Died in 1955 at his Québec fishing lodge.

Izaak Walton Killam was one of Canada's most eminent fanciers, rising from a paper boy in Yarmouth, Nova Scotia to becoming head of Royal Securities. Having no children, Mr. Killam and his wife Dorothy Johnston Killam devoted the greater part of their wealth to higher education in Canada.

In spite of his prodigious financial accomplishments, Izaak Walton Killam was a very reserved man who eschewed publicity and was virtually unknown outside a small circle of close acquaintances.

Dorothy Brooks Killam, née Johnston

Born in St. Louis, Missouri in 1899.
Died in 1965 at La Leopolda, her villa in France.

Unlike her retiring husband, Dorothy Johnston Killam was an extrovert who loved company and people generally. After she and Mr. Killam were married in 1922, they lived in Montréal, the centre of the Killam financial empire.

Mr. Killam died in 1955, and it was left to Mrs. Killam to work out the details of their plan in her Will. When she died in 1965, she left their combined estates to specific educational purposes and institutions, as well as a large gift to The Izaak Walton Killam Hospital for Children in Halifax.

Mike Lazaridis

President and Co-CEO, Research In Motion

DR. MIKE LAZARIDIS founded Research In Motion while a student at University of Waterloo. He has since donated $100 million to the university to help establish the Institute for Quantum Computing. Dr. Lazaridis also personally invested $150 million in the Perimeter Institute for Theoretical Physics (PI) , which has generated more than $100 million in additional private and public sector funding for this world leading centre of scientific excellence. Dr. Lazaridis holds honourary degrees from several universities. He is a Fellow of the Royal Society of Canada, an Officer of the Order of Canada, and was named to the Order of Ontario.

Foreword

The Trustees of the Killam Trusts were pleased to have as the 2010 Killam Lecturer Mike Lazaridis , President and Co-CEO of Research in Motion (RIM)

During the course of the evening Mike regaled the audience with anecdotes from his own experiences. In his talk "The Power of a Great Idea", Mike outlined the process of how one goes about taking something as ethereal as an idea and creating a physical representation from it. The invention of the Blackberry was not only quite profitable, it revolutionized the way we do business and the way we interact with others. Mike explained how the essence of the idea was really quite simple and it eventually lead to many more, equally great collaborations and partnerships.

With his talk Mike charted a course from idea development to final product, drawing on examples from his own academic and business experience, from past and current scientific marvels, to popular television shows. The common thread weaving all of these anecdotes together was the importance of collaborative education. Without education there would no longer be the possibility of original ideas. Mike has, and continues to, be instrumental in the support of graduate education in Canada. Similar in idea to Mrs. Killam's will, Mike sees the value in bringing in expertise and talent from other countries to the ultimate benefit of Canadians and all global citizens.

This year our Annual Lecture was a talk given by Mike Lazaridis of RIM. What follows is a transcription of his lecture.

The Killam Annual Lecture 2010 • Mike Lazaridis

If I could add to that comment from the introduction, “if you want to be a philanthropist all you need is money” I can also state that it’s a lot of hard work as you probably know. You must make sure that the investments that you are making are going to have impact.

Now today the topic for the lecture was “the power of an idea or the power of ideas”. We’re going to talk a little bit about that . . . before I get started though I just want to ask people in the audience to answer a question for me. What would you say is your most prized possession? Have you ever thought about this? <someone in the audience yells out Blackberry> Yes, the Blackberry definitely could be up on that list but I would put something even higher . . . your education! How many people in this room could honestly say that if they thought about it their most prized possession would be their education? Can I get a show of hands? It’s interesting, it’s not everyone. I was asked once what my most prized possession was and immediately I thought of my education. Clearly, of all the things that make me who I am, my education is very important. Of course there are many aspects to that education, it’s not just the academic education, it’s the education your parents gave you, that your friends and peers gave you. This whole idea of the power of an idea is really, really important. If you think about it we need to understand where the value is. We talked about business and businessmen, what really separates someone who’s good at business from someone who is struggling is their ability to appreciate and have the insight into the value of a situation. The value of an asset, the value of a relationship, the value of technology. Basically what’s the value of something. I would claim that our education has the highest level of value. It’s infinite as a matter of fact, it’s what separates us from the animals. It’s something we can’t forget. I find that we accept it, we all know it innately but we just forget to talk about it – we take it for granted.

Let me ask you another question. Every morning when you wake up from your nice soft, warm bed and you go to your sink and you turn on the tap and you get running hot and cold water but do you ever sit and think about how that happened? It’s like magic – you just turn the tap and out comes hot, clean, pure water. Do you ever think about that? Do you know that most people don’t even think about it – they just accept it as a fact. The only time they freak out is when they turn it and nothing comes out or it’s orange. Right? Well this is really, really serious because I think that we take a lot for granted. We get in our cars and drive, we complain that the streets are congested, we take things for granted. We don't realize the unbelievable investment and discipline that it took over a period of time to get to the point today where we can turn that tap and we get clean, hot and cold running water. On demand. From almost nothing. That's pretty amazing. We take that for granted. We open that refrigerator and we expect that food to be cold, right? And we expect that food to be safe. What else? We turn on the television and we expect to be entertained. We get upset when it breaks up. Right? We take a lot of things for granted. What's amazing though is we also can't expect it to get better. We're happy and comfortable where we are. We've got a nice house or apartment or student dorm and we've got a job, or an inheritance or possibly a student grant. The one thing that we can never allow to be taken for granted is how we got here and how important our educational system is and how important research is. We can never take this for granted because one of the problems I find is that as a society I find that we're just too comfortable. We don't ask questions, deep questions but we take all this stuff for granted. If you go back just over a hundred years and you look and read some of the history and some of the newspapers, its fun. You can read them off a microfiche and when you read what they talked about you'll see that they kind of took everything for granted too. They're sitting there and they're saying "it can't get any better wow! This is amazing, there are cities, hot and cold running water. We have iceboxes. Getting ice delivered to your house every day." By the way I didn't even know what that was until I saw the Three Stooges and their bit about delivering ice.

All right, so let's get back to the power of the idea. We have got to build in our society a great appreciation for this incredible priceless value of our education system. As well we must recognize the priceless value of our educators and of our researchers. This is incredibly important. This is going to be very important in the future because a lot of the stuff that we take for granted today will make people laugh a hundred years from now. "Those guys had refrigerators! They had television! They drove around in cars that were burning this muck they got out of the ground. It's amazing! Gosh – they had ROADS!! Imagine – roads?! They took perfectly beautiful meadows and they put giant concrete structures over them". That's what they're going to say a hundred years from now and it's all because of the work that we're doing, the investments that we're making and the education we're providing today. That's how it's going to happen.

So let me give you a little bit of insight as to some of the cool stuff that's happening. I bet you've never thought of this – maybe some of you have but I'm going to make a bet that most of you have never thought of this. You know when you go out into space, there's no atmosphere, right? There's maybe five to ten kilometres of atmosphere and then after that it sort of goes down to a vacuum and within a hundred kilometres you're in hard vacuum. Go out a thousand kilometres there's nothing. Imagine that – think of that. There's absolutely nothing – it's called hard vacuum. There's the occasional cosmic ray and photon but physically there's nothing there. There's maybe one hydrogen atom every cubic metre. Nothing! Now did you know that the difference between that hard vacuum a hundred kilometres into space and where you're sitting today is almost negligible. Did you know that all the atoms that make you up are basically 99.99% hard vacuum? There's nothing in there! This for me was a breakthrough when I first realized this. There's nothing inside an atom. Did you know that our understanding of the universe is entirely incomplete? We understand these galaxies, we talk about black holes, but we have no idea of 95% of the universe. It's not that we don't know where it is – it's out there. It's not that we haven't explored it, we have no idea what it is! We can only account for about 5% of all known phenomenon. That's it. 5%! And did you know that most of this knowledge has occurred in the last 200 years. So as a species we've been around for hundreds of thousands of years, millions of years. Most of the progress that has occurred has happened in the last 200 years. This knowledge gain is based on something called a printing press and our ability to standardize and disseminate information, knowledge and build an education system. We became educated. Now remember that 99.99% of an atom is hard vacuum. 95% of the universe is unknown as a phenomena, and yet over the last 200 years we have had some amazing progress.

Some of you showed me your Blackberry when we began. Let's take a look and think about the technology we have available to us today. We've got these incredible fibre optics that are connecting the world. We're moving so much information that most of us don't understand the numbers anymore. We can't even give a name to them, they're so big. We're beyond terra. We're beyond penta. We're somewhere between penta and google. How did we get there? How did we get to where we are today? Well, a few things happened along the way over the last 200 years. Somebody discovered very interesting phenomena, and that's that mathematics exactly predicts and represents reality. Not partially, it's not relative. That's a terrible name by the way relativity – I don't know why we ever used that word on Einstein's theory, but mathematics directly describes reality. Absolutely, positively, directly. Anywhere in the universe. Right now. You can describe phenomena precisely with mathematics. This was a big revelation to me when I was still in high school. My teacher was teaching us trigonometry. We were learning imaginary numbers. Here's one for you . . .who comes up with these names? Imaginary numbers? They're not real – they're figments of our imagination. Do you remember what imaginary numbers are? Do you remember i? ix? Do you remember the idea of what's the square root of minus 1? Do you remember that? So what's the square root of a negative number? That's i. Well the reason we have that is because when you take the square root of a number you end up with plus or minus that number. This is something you have to remember. I was lucky because I was also taking electrical shop and our electronics teacher showed us why imaginary numbers were real and what they meant because what you can do is once you understand the math you can produce something called a demodulator and modulator. And what you discover is that the spectrum that we used for sending radio waves or the channel capacity inside of a wire or fibre is a combination of real and imaginary numbers. It's actually the multiplied sum. What happens is if we didn't understand what imaginary numbers were, if we didn't understand the mathematical principles and laws of imaginary numbers, we would only be able to communicate using half of the available spectrum. Think of that today – the value of spectrum. The wireless spectrum is unbelievable. We pay billions of dollars for a tiny, tiny little sliver of nothing. Ever think about that? Remember the hard vacuum part? Radio waves go through hard vacuums so therefore we're paying billions of dollars to use a tiny little sliver of nothing. There's value for you! This is important because if we didn't know about imaginary math, if we didn't understand the principles behind imaginary numbers, we would have never discovered the modulation opportunities to take advantage of the other half of the available spectrum. That's a lot of capacity. All available spectrum; wireless, wire line, copper wire, fibrotic, wave guides, microwaves. Half of it is only the stuff that we take for granted, that we assume, the common sense approach, the real integer math. If you combine it with imaginary math you get the other half and you can do some amazing stuff because you can modulate both amplitude and phase. That's what it's all about for any of you that are studying signal and communications. So there's one example where math directly describes reality and gives us an insight that has incredible value today. What's another one?

Did you know that less than 200 years ago we thought that electricity, magnetism, static electricity and chemical electricity – batteries – were all different. They were all different forces, they weren't related. You could see people in the King's courtyard and they're having these little entertainment experiments where they got a piece of fur and a piece of paraffin and they're rubbing it and sparking and zapping each other. They thought that was different from the lightening they saw outside. They thought that was different from the chemical batteries that some people were using and playing with. They thought that was different from the lodestones which were magnetic property pyrite metal that was magnetized. So they thought all this was different and as long as they thought this was different they had no idea of its value. However there was a physicist by the name of Faraday who discovered that electricity and magnetism were exactly the same thing. Then Maxwell came up with his famous Maxwell equations. These Maxwell equations exactly describe this transaction, this relationship; the fact that electricity and magnetism are exactly the same thing just different manifestations of the same thing. Why is that important? Because somebody went out and solved these Maxwell equations, which are actually beautiful examples of mathematically symmetry. Now if you take these equations and you solve them you end up with a wave equation. Why is that important? A wave equation predicted that we were able to send information – waves through that hard vacuum, through that nothing that we've been talking about. Math predicted a fundamental phenomenon in the universe called information transfer – electromagnetic radiation exactly. Marconi then figured out that he could potentially build a business on this and he created the whole telegraph industry and the whole ship to shore industry and made a fortune. Actually Marconi was even more than that. He was an actual true researcher and inventor. He created what's called shortwave. At the time, whenever one person wanted to transmit everyone else had to be quiet as the entire spectrum was being used. This was before we discovered that imaginary numbers could actually be applied. We used the entire spectrum of the entire country so I could send my dots and dashes. Could you imagine how expensive that transmission was? Marconi realized that you could break those into channels and you could use filters so everyone could transmit at the same time using the same spectrum. That was a brilliant discovery and that I think was his most important discovery – it wasn't sending that signal across the ocean. So we unify electricity and magnetism and we came up with communications, power generations, power transmission; really important stuff. A/C motors, three phase motors. All of the sudden TESLA comes into this, it's commercialized and it leads the modern revolution. All we did was notice that a magnet and a coil of wire were interchangeable and then we came up with the math to describe that absolutely and a whole industry and a whole new dimension of growth occurred. Wealth creation that we never could have imagined came out of that within 50 years of that discovery.

So what was the next thing that we discovered? Well, we discovered that energy and matter are the same thing. Einstein comes up with his special ultimate equation, his derivation and it was unbelievable that he was able to think this stuff up. It was pure thought. He sat down and did a thought experiment. He thought "If we're able to walk and our molecules and atoms don't fall apart then the laws of physics must be consistent everywhere and the speed of light must be a constant". Then he came up with special relativity and then he solved it and the outcome of that was a five page proof, which boils down to E=MC2, the most famous equation of all time. It's really fundamental. Energy and matter are interchangeable. What did that do for us? A LOT! In 1905 Einstein wrote four seminal papers, three of which absolutely changed the world. One of them was the first proof that atoms exist. Did you know that we had no proof that atoms existed until 1905? He then explained growing and motion using statistics. Einstein used mathematical principles to figure out something that looked random and to infer something that you can't see. He then proved that it existed. That's pretty amazing. Again, power of the idea coupled with the discipline of mathematics as a tool being able to see things that don't exist, or that you can't possibly imagine exist. Breakthrough thinking that highlights the power of research. So what did that do for us? Einstein then explained something called the photoelectric effect which he got a Nobel Prize for. What was that all about? He showed that energy is quantized, which is probably the most important discovery of all time. Why is that important? Because it's quantized it can lead to semi-conductors. If it wasn't quantized we'd be stuck with tubes. Imagine? Walking around with a Blackberry that was running on tubes. You guys might even remember tubes. Remember the reference to the television show the Three Stooges? You probably watched it on an old Admiral TV or an RCA TV, with the tuner knob. Remember that? You actually had to stand up, walk across the room, and adjust the knob? You had approximately eight channels and they were all different back then.

But now, back to the hard vacuum. Because it was quantized we came up with something – you have to understand – you can't see this stuff. There's no microscope that can see these things. This is all in our minds. It's completely a construct of our imagination. It just happens to be accurate. So unlike all the cultural stuff we do, unlike all the social stuff that we do, which is very important – don't get me wrong. Maybe someday we'll discover that there is a correlation between math and that stuff. What's amazing about the discipline of math and physics and science is that it is 100% reproducible and 100% correct. In other words, you can rely on it with your life. Absolutely 100% rely on the results and its predictions. That's pretty important – at least in mathematics and physics. Let's stick to that for now. So quantum mechanics that came out from that understanding. We've unified electricity and magnetism, we've unified energy and matter, we unified something called wave particle duality; we had this problem that articles appeared to be waves and particles at the same time. Quantum mechanics unified those things and when they unified those things it predicted certain effects. One of them was the semi conductor effect. Tunneling is a really important piece of this. You take some sand, you melt it down and you purify it. It's a perfect insulator. No electricity goes through it. You take the math and you realize that if you put a little bit of impurities in there from some rare earth materials and you pluck those atoms down in just the right order then that material can become a conductor. In fact it can become a conductor you can control – you can turn it on and off. It's like that hot water and cold water in the morning, right? But you can actually control it and unlike tubes it never wears out. It runs at incredible speeds and uses almost no power. So semiconductors were a discovery that was made possible by our unification of wave particle duality. By coming up with the equations we predicted this. Now these theories have been in existence now for 100 years literally. And they have been 100% verified in every test that we've ever been able to achieve. Now here's the funny thing. . . relativity and quantum mechanics are irreconcilable when they come together in the middle. So what works for quantum mechanics at the lowest scale predicts something completely bizarre. The prediction of quantum mechanics – the currently correct explanation of particles – tiny particles that you can't see that are mostly hard vacuum, quantum mechanics predicts that the universe has an infinite number of copies. That's what it predicts – it's almost nonsensical. Relativity describes the motion of galaxies, orbits, black holes – neutron stars – all these amazing things. When it tries to predict anything the size of an atom it predicts all atoms are the size of black holes, little mini black holes which we know they aren't. How is it that we can have two theories that are so accurate to the highest degree of precisions that we've been able to put to the test and yet they predict completely nonsensical results when they try and overlap? That's a pretty big deal – that means that we have something wrong. We're missing something. That's what it says to me anyway. So, where does this lead now? Well, we are about to run the biggest experiment of all time. It's being done in Switzerland. It's 100 meters under the ground and it's about 23 kilometres in radius – or 26 km in radius. It's a giant superconducting ring, I think it's got a billion and a half euro budget a year, it's a 10 and a half billion dollar project. It blew up last year, we've been fixing it since. It's basically trying to accelerate protons and anti protons. Now here's a funny one for you. So remember I said at the beginning – imaginary numbers? Remember that? The square root of x is plus or minus x? Okay when Einstein did his derivation, when you look at that derivation, there's a point when he takes the square root of a variable and he throws away the negative result because it's nonsensical. There's no reality – you can't get negative energy. There's a guy by the name of Dirac 30 years later who says "Let's go back and revisit that because I remember in high school when you take the square root of a variable you get plus or minus that variable". Guess what they predicted? That math predicted anti-matter. Sure enough a few years later, they find antimatter from cosmic rays. I mean now we produce it by the millions of particles, which is nothing by the way, but we do produce it between these particle accelerators. So here's math predicting something that we couldn't possibly imagine and it's real and now we use it all the time, we're always producing this stuff.

Getting back to the Large Hadron Collider (LHC), this collider is about to produce an energy level of 14 and a half terra electron volts. Now, that's not a lot of energy, not in absolute terms. But in relative terms it's enormous and the way we do it is to accelerate protons and anti protons in opposite directions, accelerating them at the speed of light and just crashing them together inside of a big giant microscope. It's amazing. Here's something for you. So the smaller the thing you want to see, the bigger the microscope is required. Right? That's pretty amazing. So why is it that we're trying to get at the 14 and a half trillion electron volts? Because we're trying to discover if there is something in that hard vacuum. Something that makes inertia happen. It's called the Hicks field. So quantum mechanics predicts the Hicks field. It's something you can't see, it's even smaller than the atom which is basically nothing. There's no way for us to measure, all we can do is try and produce it. We know for a fact that at 14 terra electron volts we will either see it or not see it. Fifteen billion Euros. . . to see or not see the Hicks field. Why is that important? Just apart from the fact that the Hicks is the only explanation we have from today from the standard model that can explain things like inertia, momentum, mass. Remember our talk about we don't need roads a hundred years from now? Keep that in the back of your mind. Here's the point. . . all this work for the last hundred years has come to this. We've built this standard model, we've tested it the best we can. It predicts something kind of weird called the Hicks field, the Hicks particle. We know that at that energy level we will either see it or not see it, but we know that if it exists we will produce it. Why is that important? It's like one of those beautiful binary results – so powerful. Why? Because if we see it we can throw away all those other crazy theories that are trying to talk around the standard model and we know the standard model at least to that energy level is correct. What happens if we don't see it? It's just as exciting. I would argue it's more exciting because that means that there's something wrong with the standard model. If there is something wrong then we will get to a very new understanding. This new understanding will probably have an absolute fundamental impact on our industry, on our knowledge and social outcome, wealth creation like we've never seen before. We're basically dealing with the origin of mass. What I always found is that science fiction predicted a fantastic future but when we got there we kind of looked at it and said actually they weren't even close. It's far more interesting than they ever thought. Look at Star Trek, at that computer. It's a big room, making funny noises, lights are flashing, yet I don't see any spreadsheets or any word processing. I just see a piece of paper that comes out of this slot. That was their prediction of a computer and we blew past that vision 30 years ago. Can you imagine what would happen if we actually had that understanding? The understanding of what mass is, what inertia and gravity are and we knew how to influence them? Imagine if we could figure out how we could equate these things together through a formula. Imagine if we took all these different things and put them together, imagine what that would predict.

One of the things that we've done as a team a little over 10 years ago I got together with some friends and an entrepreneurial physicist by the name of Howard Burton, and we got together with some entrepreneurial physicists from major universities that were disenfranchised with what was happening in their country and in their schools and we bet on them. There was no doubt we trusted the math. We knew that this day was coming. Because already at the time there was a researcher on our scientific advisory counsel who was also a Nobel Prize winner and she was working at CERN and she was telling me about this. I went there and saw the LEPTON which was the anti electron collider that was there for the past 10 years and she was telling me about the LHC and what the whole point of that was and what that would mean to science and reality as we knew it. That got me pretty excited and I realized that if I bet on these people we're going to be doing something pretty amazing. Now here's the best part – in Canada we're up to 36 million in population. Did you know that? That's kind of small – there are cities in China bigger. We have this great land mass, we've got water, we've got oceans, we've got fish, we've got oil, we've got potash, we've got nickel. We've got most of the fresh water supply of the world –taking you back to that water thing that we take for granted. We also have one of the finest education systems in the world. We really do. What's exciting for me was I realized at the time that the rest of the world was taking theoretical physics for granted. I went around to these universities and I found that they had these offices for one physicist over here and another one in another building in some dark dungeon over there and then they had three of them in that building over there in some space. These are the guys that are trying to figure out the origins of mass and inertia and dark energy and dark matter. They're trying to reconcile all these issues and we're not giving them any resources. It's ok, physicists don't need much, a blackboard, a desk a subscription to a periodical and maybe a little bit of travel money. They stay to themselves, they like wine and coffee and like to get together every once in awhile and discuss stuff on a blackboard. What would be amazing would be – imagine if you put all those people in the same room, imagine if you gave them a real budget and blackboards on all three walls. Because you don't want to cover the window up, they need a window. Imagine if you did that and gave them real salaries and real budgets for holding seminars and colloquiums and lectures in addition to a staff that did things for them. Well that's what we did. We just celebrated our 10th year anniversary a few years ago. We've become probably the largest theory institute in the world for physics. We're looking at about 250 researchers and postdocs and even students. It's the largest in the world right now. It's in Canada. It's in Waterloo. We don't have any palm trees in Waterloo. We don't even have mountains in Waterloo. We don't have any oceans, it's cold. What do we have? We have a commitment by the people of Waterloo, the universities, the Ontario government, the regional government, the federal government and some philanthropists who have donated between Perimeter Institute for Theoretical Physics, which is independent, and IQC which is part of the University of Waterloo, over 600 million dollars to the pursuit of physics. Quantum mechanics, string theory. Because we know that over the next five to ten years there's going to be some major breakthroughs and what's great about it is that Canada's right in there now, because we could afford it. Half a billion dollars isn't a lot of money really. We spent that much on security for a three day event in Toronto. Double that actually. But when you apply it, when you understand the value of theoretical physics, when you understand the historical value of those discoveries and what they meant to value creation and industry in our societies; when you understand the particular point in history where we are right now with the LHC experiment coming, then you understand these gaping holes in our knowledge and all these contradictions and you understand that there are people willing to spend their entire lives trying to solve these things. Basically all they have are ideas and you realize that we can actually make an impact and make a difference in Canada by spending less than half of the security budget for the last G20 G8 in Toronto. That's pretty exciting. It really is. And so that's what we've done, that's why we do it. I don't do this by myself. I have a large staff that work on this thing. It is a labour of love. But it's one where I know that there are tangible benefits for this because I've seen them historically, I've read the books, I've studied, I've taught these people. I've seen what it's done for us at RIM with the Blackberry. Remember 30 years ago I was in university – what was I learning? I was learning this thing called email which I needed to know to do my assignments. That it was a cheap way to communicate with my friends who didn't go to Waterloo because I couldn't afford a long distance phone call. So I used RPN net, typed in the addresses and I could send email all over the world in seconds, well back then it was hours. I was learning things called digital signal processing, wireless communications, CPUs (central processing units), microprocessors, memory, CMOS technology, real time operating systems, compilers. What else were we learning at the time? You can kind of see where this is all leading . . . If you could combine wireless and digital signal processing and email, microprocessors, hand held technology. Where would all this lead? Well, it lead to the Blackberry. We actually envisioned this back then. We can do the same thing now. You can envision where this stuff is going and predict it and invest in it and that's what we're trying to do at Perimeter and IQC. It's pretty exciting to see the intellectual capital we've been able to amass in terms of researchers and postdocs from around the world who have come to a city which is kind of known for a funny technology that's based after a berry. But here's something for you, again it's the largest math faculty in the world at the University of Waterloo. Did you know that? Nobody talks about it. It's a great place because people ask me – why did you put this in Waterloo? I remember all these universities in the United States just saying why don't you just build it here, you're wasting your time up there – no one is going to go there and I said well if you're going to build a physics theory institute wouldn't it make sense to build it near the largest math faculty in the world? And this happened to be in my back yard so that also helped.

I hope I was able to get a sense to you of why I do philanthropy why I'm particularly focused in this area, why I keep pushing for further investment, appreciation of our education system, our universities, our graduate programs, our research; why I try and make it inclusive. I try and bring in the best talent from wherever it happens to be anywhere in the world. I hope if you ever get a chance get on the Perimeter website and take a look at the lecture series. You can see all the public lectures, you can also see the full lectures. Everything is available online and it's amazing because if you go in there and you look at who is actually on there, you're going to see every major physicist in the world has come and given a public lecture in Waterloo. And we should all be proud.

Thank you.

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