

PERIMETER INSTITUTE
“Friends of the Library” Transcript

Intro by Michael Higgins, President, Saint Jerome’s University.

Michael:

Creativity unbound, pushing at the ‘Perimeter’ is a multi-layered topic. And, in that, it is like the speaker. Multi-layered, Dr. Howard Burton, Executive Director of the Perimeter Institute for Theoretical Physics, is an ideal speaker for this annual series, because his work is at the cutting edge of creativity.

At the Institute, Howard’s work involves working closely with scientists of international reputation, recruiting thinkers of impressive credentials, initiating and sustaining educational outreach programmes, and exploring the points of convergence and interconnection that exist between the humanities and sciences.

Howard is ideally positioned for this challenge because of his own academic background: He has a BSc in Physics and Philosophy from the University of Toronto, and a Masters degree in Philosophy from the University of Toronto, as well as a Doctorate in Theoretical Physics from the University of Waterloo, prepare him well for the deeper dialogues that define the makings of a complex and life-enriching civilization.

And reality is complex. That is its nature, its beauty, its theology. To explore that complexity is the mandate of the Academy, of the think-tank, of every creative artist and savant. And that exploration must have a public dimension to it. We have an obligation; we thought-producers, probers and artisans of meaning, to educate our fellow citizens to new ideas, and to new modes of seeing things.

Howard’s commitment as a public intellectual, to make available to all who are curious, the pioneer and the fledgling, the temerarious, and the risky, in the knowledge that all learning is inherently exciting and potentially ennobling, cannot be gainsaid. It is ignorance, after all, in the end, that we must fear.

Howard’s weekly column in the learning section of our local paper, *The Record*, is a splendid example to my mind, of an intellectual’s civic duty. It isn’t simply a pedagogical moment, a marketing opportunity, an easy stipend – well, it’s certainly not that, an easy stipend...

It is a way of being prescient, as an intellectual, to the larger community. Reciprocity, responsibility, fearless exploration. That is what we should all be about.

I remember many years ago, in the early 1970s, I had the opportunity of spending a year studying under James N. Cameron. He was then the University Professor – distinguished University Professor at Toronto, who taught, actually, in three particular divisions: English, Philosophy, and Theology. And one of the things he also did was to write regularly for the New York Review of Books. In fact, he became the most prominent Canadian contributor to the New York Review of Books. I remember one special occasion, however, in a course that he taught, with just the two of us, on Newmann. He took me aside and talked about how important it is to respond to Letters to the Editor. To write them. To engage with the public. To accept our full responsibility as educators. Not only to talk to ourselves, but to talk to those who depend upon our learning. Every academician, every researcher, and every public intellectual has a responsibility to resist ‘self-

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isolation’, as Cameron would call it, to listen to the larger citizenry, and to engage in a constructive dialogue with the public.

Howard Burton takes seriously Cameron’s own charge. And I, for one, am grateful. The 2005 Friends of the Library, Dr. Howard Burton, and his “Creativity Unbound: Pushing the Perimeter”.

Dr. Burton:

When Michael Higgins invited me to give this talk, I immediately accepted without giving it a great deal of thought, despite a schedule which is starting to become somewhat burdensome. I have a lot of time for Michael, with his unique combination of penetrating insights and at times unstoppable loquacity, and am naturally disposed, *a priori*, towards doing whatever he might request.

Well, accepting is the easy part: then there is always the issue of what, precisely, to say. The interesting thing about public speaking engagements such as this one with substantial themes on matters such as creativity and the like, is that forcing one to think of something appropriate to say inevitably gives one a larger view and brings a perspective, and sometimes an insight, that might otherwise go unnoticed.

Doubtless knowing my propensity for running off at the mouth and trying to stitch together, in an ad-hoc way, grand themes of human behaviour on rather tenuous foundations, Michael assured me that the format of the talk was to be rather informal and personal, rather than any rigorous presentation of some central thesis. I nodded dutifully as he cautioned me, but as he is sitting down now and, relatively speaking, out of harm’s way, I shall take this opportunity to hold forth for some brief time on a central thesis - but out of respect for Michael, I shall attempt to do it in the most informal and casual way.

I had never imagined myself in the position of running an academic institution. In fact, I had never imagined myself running anything at all – indeed, for the first three quarters of my life I spent a good portion of my life running away – dipping my toe in the waters of life and often not finding it entirely to my liking. I was never a particularly good student throughout my academic career - I was invariably plagued by a restlessness and an intellectual wanderlust that precluded me from achieving success by settling down and seriously devoting myself to one field of study.

But it was more than that. As I flitted about from topic to topic in my twenties, I began to notice a particular pattern emerging: I would skip off math class to play chess, read novels in physics classes, doodle away on math problems during philosophy lectures and thumb through physics books on the subway. In short, I would deliberately, and at times provocatively, resist from doing whatever it was I was “supposed” to be doing at the time. Now, I certainly don’t want to unduly glorify what was, in essence, a fairly typical (albeit exaggerated) form of adolescent immaturity and rebelliousness that was in many ways flagrantly counter-productive, but at the same time, with the benefit of hindsight, I think there are key elements of my behaviour at that time that may well indicate essential aspects of the creative process writ large, namely: a passion for concepts and a healthy disrespect for authority and established rules. This, Michael, is my

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thesis: the creative process is built upon harnessing the twin drivers of passion and obstinacy. Lucky for me, I was (and still am) relatively well-endowed with both.

Of course, there is a big difference between necessary and sufficient conditions, as any scientist or logician will tell you; merely demonstrating determination and disrespect for authority is hardly a recipe for creativity – football hooligans and corrupt politicians are but two examples of this. But the point I am trying to make is that in order to embark on any creative enterprise, one must have the confidence, determination and willfulness to find one’s own way. For me, my central discovery as a young man was that the world is a great deal more interesting, varied, integrated and intellectually rich than one might discover solely through a typically specialized university curriculum – moreover, if we’re not careful, that same narrow curriculum might very well prevent one from developing any real sense of the magnificent (and overlapping) richness of the world. Stop putting people into boxes. Concentrate instead on the majesty and the power of their ideas. Read widely. Break down barriers.

Reading, of course, is the key – a point that is certainly appropriate to emphasize during a lecture for the Friends of the Library. For not only is reading the only natural way to get rigorous exposure to provocative ideas and historical awareness, but reading gives one a freedom, an experience of intellectual breadth, that simply doesn’t exist elsewhere. Every trip to the library or the bookstore is like designing one’s own academic program, based solely on one’s own burgeoning and varying interests. Reading is an inherently revolutionary activity whose sole goal is to “expand” the mind and consistently expose oneself to new ways of thinking.

And so, while I short-sightedly ignored the drab (but damned useful, I later found out) techniques of solving differential equations, I read Dostoevsky and learned about the myriad complexities of the human condition; I read Dickens and learned about the egregious oppressiveness of the British Class system; I read Orwell and learned about the perils of extremism and the hypocrisy of the chattering classes; I read *The Economist* and came to appreciate how a rigorous discussion of political events independent of economic factors was not only naïve, but effectively nonsensical; I read Einstein and discovered how strongly he was influenced by Spinoza and Mach. I tried reading Hegel but got lost so often I gave up. That too was progress, of an admittedly different sort. More generally, I learned by a sort of literary osmosis that the big issues: “What is the good life?” “How should we structure a society?” “What is the world made of and what are the fundamental laws of nature?” “What is truth?” are questions that have been addressed, from a panoply of penetrating perspectives from Aristotle to Isaiah Berlin. Interesting questions are interesting questions. Period. They consistently held the fascination of the world’s greatest minds and were a testament to the limitless potential of the human intellect. So it was that Leibnitz could concern himself with both diplomacy and metaphysics while inventing calculus in his spare time. Da Vinci could paint the Virgin on the Rocks and the Mona Lisa before turning his attention to designing helicopters; Russell could write textbooks on relativity and morality while exploding the framework of set theory. This is what wading one’s toes into the great storehouse of human accomplishments drilled into me – that boundaries between fields, sometimes helpful, often specious, should always be questioned. That great revolutions in our understanding invariably occur when people move out of their box and somehow begin to look at the world from a new, broader perspective.

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And reading widely does other things as well: it teaches one humility, for it gives one a taste of how much there really is out there and, correspondingly, how little one really knows.

This much I absorbed. But to really make a contribution to some field, one nonetheless has to knuckle down and develop some real expertise at something. That is hard; and requires stick-to-it-iveness and discipline, two commodities, as you might imagine, that I didn't have in very large supply. Here is where the ticking of time can be useful – after a stint in Holland doing various things – teaching, editing and the like - I eventually decided at the relatively advanced age of 29 to pursue a PhD in theoretical physics, recognizing that it was my last kick at the can to learn something profound about the fascinating world of mathematical physics. I hardly held out any allusions about the prospect of an academic life – I knew well that positions were few and far between and would likely involve hustling for penurious postdoc positions in depressingly out of the way places where I had no interest in going, so I adopted a rather idealized approach: I was going to concentrate on simply learning things that interested me without any particular regard to the prevailing winds of academic fashion. Then, having drunk deep from the tree of knowledge, I would return to the “real world” and begrudgingly, get a real job and make some money. It was, I recognized, now or never – and the fact that my wife was a corporate lawyer, albeit one who was motivated to have children, gave me the opportunity to seize the day and pursue my interests for a little while longer.

Four years later, after having finished my PhD at the University of Waterloo, I knew the jig was up and began to make investigations into my prospects into “the real world” with a vengeance by seeking a position in mathematical finance. I had no love for or interest in that field, but one has to eat, and panegyrics of intellectual breadth or inquiries into the ontological status of geometrical relationships in the physical world do not, unfortunately, do much for putting food on the table. To make matters more complicated still, my wife and I had recently started a family.

So I too, in early 1999, turned my attention to the canyons of Wall Street; and after hustling around was eventually able to procure a position. But faced with the soulless prospect of spending my days doing quantitative analysis in a cubicle in lower Manhattan, I began to reconsider. After all, this was 1999, and for those of you who recall the glory days of 1999, everybody seemed to be getting rich with very little effort. People were IPOing everything everywhere and so I thought to myself that there must be opportunities for me as well. So I investigated a few companies that seemed interesting. I knew that if I wrote to the human resources department, however, I'd be out of luck as they'd ruefully inform me that I wasn't a software engineer, or MBA or whatever they were looking for at that moment. I therefore wrote directly to the CEOs instead, boldly announcing: “Here I am. Here are my qualifications. I'm an interesting, clever, dynamic person (if I do say so myself) and I'd doubtless be a wonderful fit for your company (whatever it does), so please help save me from a lucrative career on Wall Street.”

And a few responded. But the person who was by far the most interesting was Mike Lazaridis. “You can certainly work at RIM” he told me. “We're always looking for bright people.”

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“But,” he said, “It’s funny that I should have received your letter, because I was just starting to think about doing something philanthropic, and I’ve always been interested in physics, and maybe we should talk.” And so we got together and talked. And – I’ll cut this down, because it’s a longer story and it diverges somewhat from the central point that I’m trying to make – my central thesis that I haven’t forgotten about Michael – but, it came to pass that Mike and I met, and he, as you know, is a very dynamic person. He’s somewhat speculative, and thinks about all sorts of interesting ideas. So he says to me: “You’re a physicist, and I’m interested in all sorts of things in physics. Tell me what’s going on in physics.” And then we had this large, rather woolly conversation about physics, and the future, and possibilities, and ‘information transfer’, and energy, and who knows what else. And I, for the life of me, couldn’t figure out where it was going. Then after we had spoken for about – roughly – three hours or so, he turned to me and said, “So, are you interested?”

And I thought to myself, ‘Interested in *what?* I don’t know what we’re talking about!’ And then he pulled out a napkin, and wrote a number down on the napkin and at this point it dawned on me that we were now engaged in the salary negotiation part of this mysterious position. Back then I was pretty poor at salary negotiations. I’ve improved since. So I unthinkingly said, “Sure, fine.” The whole thing was, after all, very unreal.

After we had concluded this bizarre pact, I turned to him and asked: “What now? Would you like me to write reports? Would you like me to do some investigations? What should I be doing?”

And he turned to me, and said, “I don’t think you should do anything right now. I’ve seen this sort of thing happen before – it reminds me of when we started RIM. Things are going to take off soon and now is your chance to relax. I just want you to think. That’s all I want you to do.”

“Okay.” I said.

So I left the restaurant, and I phoned my wife and told her “I think I have a job.” And she said, “What do you mean, ‘you think you have a job’? What about this thing on Wall St?”

“Oh, no - this is completely different” I said. I met this guy in a restaurant. He gave me a napkin. Different job altogether.”

And she said, “Well, what do you have to do for this job?”

“I have to think. That’s my job.”

So we had a good laugh about that and obviously didn’t take it terribly seriously. And, two days later I got a couriered cheque in the mail for a pro-rated version of our napkin agreement and I said to myself, “Oh my gosh. I guess I better start thinking.”

One of the first things I thought of was a name. It didn’t seem to be a very big deal at the time – both Mike and I recognized that we needed at least a working title for this inchoate “thing” I was thinking about and the name “Perimeter” itself was the result of my daily walk along the

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Boardwalk. How to name something without referencing unwanted connotations or celebrated individuals? How do come up with something different, but not conspicuously or deliberately so? After a few minutes, the name “Perimeter” came to mind. It had obvious connotations of “being on the edge/pushing the boundaries”, representing the anglo-Greek acronym “pi” so common in the mathematical sciences and reflective of not only the tradition of scholarship of the Ancient Greeks, but also Mike’s Greek heritage. And it also had “RIM”, the source of his wealth, in the title. It seemed good enough for a working title and worked on several different levels and would certainly suffice until we gave the matter more serious thought. And then the lawyers came along and incorporated it and that was that.

And so there it was, what an odd opportunity: a reasonably well-read, independent, stubborn fellow in his early to mid 30’s without a great deal in the way of solid accomplishments to date, faced with a seemingly remarkable opportunity to do *something* transformative, but with no clear mandate, no clear process, no clear direction and no clear sense of whether or not the entire venture would be able to generate any serious momentum at all.

This was the beginning of Perimeter Institute. What was I equipped with to begin this exciting, transformative adventure? A love of mathematical physics, a passion for big questions, a knowledge of my profound ignorance and a strong independent streak with a healthy distrust of authority. I had no real organizational experience, no financial experience, no management experience, no public relations experience, no fundraising experience, no public speaking experience, no experience in leading a Board, no grant-writing experience, no political lobbying experience – in short, no real administrative experience whatsoever. I had no idea where things would go and how the Institute would evolve. All I had was a deep and abiding belief in the liberating power of ideas and an overpowering frustration that these ideas were generally unappreciated by a society all too focused on superficial material gain.

Looking back almost six years later, it seems that, mystifyingly, that seems to have been enough. Everything that has been achieved at Perimeter, from the selection of research areas to the recruitment of faculty, from the creation of summer schools for high school kids to the monthly public lectures, from the incorporation of musical events in our building to the construction of the building itself has been done within a combined spirit of: “How can we make a difference?” and “Why not?”.

Why not try to create a research environment that is distinct, explicitly harboring both orthodox and unorthodox approaches to foundational issues in physics (after all, think of those scientists who made revolutionary breakthroughs in our understanding when on the outside of the mainstream)? Why not try to engage the broader community with different types of public scientific programs (after all, think of the success of Brief History of Time, at least from a purchasing perspective)? Why not try to create an ideal, stimulating environment with a meaningful overlap of art, music and science (after all, think of the historical interchange between the arts and sciences from Pythagoras to Einstein)? In short, why not try to change the culture? Why not do it in Canada? Why not in Waterloo? Why not, indeed?

Is this, strictly speaking, “creativity”? Well, it’s certainly different than what a painter, filmmaker or novelist does. But there is, in my view, an essential, defining feature in common:

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every time a writer sits down to write something – be it a play or a novel or even a lowly newspaper article, the same questions presents itself: What do I have to say? What is the point? In short, why write? In much the same way that a novelist or an essayist or a playwright is concerned with having “something to say”, Perimeter Institute is concerned with also having something to say, although in our case it is phrased somewhat differently: “How are we making a difference?” “What is the point? How would the world be different if we didn’t exist?”.

Being close enough to the white heat of creation, feeling the burden of responsibility of starting something from nothing, forced me to ask myself these questions daily and measure myself and the Institute’s accomplishments accordingly. Perimeter Institute was not created, of course, as a response to anything. There was no groundswell of grassroots popular support demonstrating in the streets demanding we move forwards with a private-public sector partnership for theoretical physics. There was no overwhelming clamoring for public events on science and society. Even in this academic town, there was hardly a mounting concern of the growing drift between the scientific and cultural realms, no widespread lament that our age of increasing specialization precluded meaningful opportunities for discussion and dialogue on a whole spectrum of issues of substance.

No, there was none of that. For my part, there was only the resolute conviction that if we build it, and build it appropriately, they will come. Innovative researchers will come, dynamic visiting scientists will come, the general public will become engaged, government will be supportive. There was the passionate determination to do something interesting, to take advantage of this marvelous platform to spread the gospel of the power of ideas: to try and change the culture in a conspicuous and meaningful way. Passion and stubborn determination. Why not try? Go big or go home.

The last six years for me have been an incredible roller coaster and I feel truly blessed to have had the opportunity to exercise my passions and my obstinacy to the fullest degree. Today, the Institute is a long way from the full realization of all of our goals (and, as you might expect, the goalposts keep moving with every stride forward), but I think we’re off to a very interesting start and in many ways we’ve already surpassed my wildest dreams of what might be possible.

And along the way, as I lurched from one issue to another and began to necessarily develop some expertise in a variety of different administrative arenas, something else happened that I had least expected. All the reading that I had done, all the solitary intellectual excursions that I had taken, began to be – shockingly enough – *useful*. From Gogol and Chekhov, I gained an understanding of bureaucracy while Machiavelli and Aristophanes taught me everything I needed to know about Ottawa and Queen’s Park. Kingsley Amis, David Lodge and Robertson Davies prepared me for the rigours of academic politics, while Iris Murdoch convinced me of the basic human need for intellectual stimulation. Amos Oz, Nadine Gordimer and Leo Tolstoy taught me deep insights into the human condition which were invariably useful for management problems of all sorts. Herodotus and Homer taught me marketing, while the immortal Dostoevsky gave me deep and sometimes blinding glimpses into the tortured soul of the frustrated academic.

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Who knew? Certainly not me. Of course, in retrospect, I suppose it’s quite likely that several of my university professors told me as much, but I certainly wasn’t listening. I was doubtless otherwise engaged, obstinately pursuing my passions.

David: Howard has agreed to take questions for – for five or ten minutes.

Dr. Burton: No questions. Perfect.

David: Here we go. To the left.

Male: Howard, we really appreciate the fact that the Perimeter Institute has a cultural manager. It’s a stunning thought that (inaudible). Whose idea was it, do you mind?

Dr. Burton: Well, that was my idea. But rather than discuss attribution and ownership, let me instead try to elaborate why this was done, why I was interested in expanding the mandate of “outreach” to specifically include high-level musical and artistic experiences. On a practical level, it definitely helps with recruitment. It’s very important for people who are coming from London or Paris or New York, or – or even Arkansas, or wherever, to think that they’re coming not only to a place where they can do the best possible science, but where they can be stimulated to the fullest possible extent, through a variety and interesting and diverse cultural experiences. So that’s one reason why we do this.

Another reason is that it’s part of our ongoing motivation to interact constructively and coherently with the surrounding community. We want to make a difference. We want to engage people. We want to bring people into our building, so that not only can their quality of life be enhanced by high-quality cultural events, but they might also, in coming into our building, they might be exposed to some things that they wouldn’t be exposed to in the normal course. Even if they go to chamber music concerts on a regular basis, by coming to Perimeter and hearing a chamber music concert at Perimeter, they’re also indirectly being exposed to some aspects of theoretical physics, which might tweak their interest, and might get them further involved. So this is all an integral part of broadly engaging with the community, and indirectly promoting science.

And then there’s the third reason, which in some ways is very much the most relevant: I did it because it seemed like a fun and worthwhile thing to do and I could.

Male (2): Howard, making a difference is a fundamental game for Perimeter. How will you know when you arrive? How do you make your success?

Dr. Burton: That’s a characteristically good question. I’ll waffle a little bit, but only hopefully a little bit. I think there are standard metrics and non-standard metrics of measuring success, as you well know, better than anyone. And they’re both very important. So what are they?

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Well, the standard metrics from a scientific perspective, are the number of publications, the number of citations, objective assessments of the quality of the work that’s being done, measuring the impact of the publications and the work and the ideas from conferences and workshops that we’re holding, the quality and number of visitors who come and so forth. But that’s not the only component from a scientific perspective, nor is it necessarily the driving component. There has to be a sense that the place is working, that there’s a buzz. It is vital that there’s a sense that we are really achieving our core objective of having a very attractive and protective atmosphere that nurtures ideas, where people are taking creative risk, that things *happening*. And that’s something which is much less tangible, much harder to objectively assess. And so how do you ascertain that?

Well, you make sure that you have informal feedback groups. You talk to a lot of people who have never been to PI and try to understand why and what their impression of the place is. You talk to people who do come for visits before they go back to their home institutions. You travel. You ask people for their candid comments as to whether the place is working or whether it’s not working, and you begin to develop a picture of whether or not the place is really doing well or not.

You can also tell by hiring, of course. That’s the obvious thing. If you get super high quality people to come, it’s clear that you’re moving in the right direction, and you can look at the vector of that hiring to see if you’re getting increasingly stronger and stronger applicants. But it’s those intangibles, that word-of-mouth, that sense of whether the place is really happening that’s extremely important. This is all from a scientific perspective. There are similar ways of evaluating the institute from an outreach perspective. We have all these outreach programs: student camps, public lectures. How can you tell what impact these things are having?

Well, you do the same sort of thing. So you go through and you measure things according to the obvious measurables. How many students, how strong the students were, you track the students; how much influence have you had; did they all go off to strong schools and do graduate work, or did they become lawyers or something godawful like that? No offense, of course.

So you can do it that way, but you have to get a sense from – from the wider community. Well, are the educators really excited? Do they really think that Perimeter’s making a difference and contributing, or is it just all smoke and mirrors? Are the students really captivated and really engaged? When you talk to them outside of their particular classes, or outside of their programmes, do they think it’s all over their heads and, well, it’s nice to be here, but we really understand something, or are they really motivated? So you have to do both, assess things from both formal and informal perspectives.

Moderator: George?

George: Howard, just to put Perimeter in perspective, what are you and your associates thinking about these days? Are you into quantum computing or cosmology, or are the particular interests sort of evolved over the first six years, and can you concentrate on that?

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Dr. Burton: Sure. So, I didn't talk about the research mandate and would be happy to mention that now in general before pointing to some specifics as to what sort of research is being done. The overall mandate of the institute is, as you know, to focus on basic foundational research in theoretical physics. We're not motivated toward any applied technologies, per se, but rather trying to get a deeper conceptual understanding of the basic underpinnings of physical law.

So that's the mandate. But there's also a clear recognition that we are a physics institute and not a math institute and much of foundational physics can be extremely arcane and highly mathematical and quite speculative, so that it would be in our best intellectual interests to try to balance formal approaches with more phenomenologically oriented work. That is to say, we must be forever vigilantly searching for tie-ins to the physical world, to the real world. That is one principal reason why, for example, we are excited about quantum computing. Not only because it is new, sexy and potentially relevant to our understanding of the deep conceptual chestnuts of quantum theory, but also because there's a whole spectrum of associated experimental avenues, from photonics, to NMR, to quantum dots, and so forth that give us natural interaction with the real world. So that was one area, one example of what we do and why.

Another area where we're looking to expand is in particle physics, and in cosmology. So these are obvious places to look, in terms of getting some sort of play with the real world. Then we also have more speculative areas, more mathematical, more formal areas, such as superstring theory and other approaches to quantum gravity that are reflective of our desire to simultaneously pursue different approaches to fundamental issues.

I mentioned quantum computing, quantum information theory – foundations of quantum theory, – so that roughly makes up the current orientation we have now. We're moving into cosmology. We're determined to have a stronger focus in particle theory. There are many exciting future opportunities in selected aspects of condensed matter physics. We have a strong and burgeoning groups in string theory in canonical quantum gravity, and foundations of quantum theory, and in quantum information theory, and we're looking particularly to explore the overlap of cosmology, particle physics and string theory, because these fields are, we feel, a real target of opportunity for us, well within our mandate.

David: Thank you very much, Howard.