

**House of Commons  
Standing Committee on Finance  
2005 Pre-Budget Hearings**

**Building on Canada's Excellence in Astronomy**

**Speaking Notes for  
the Coalition for Canadian Astronomy**

**Presented by  
Michael Jolliffe, Co-Chair (Industry) and  
Gretchen Harris, Co-chair (Canadian Astronomical Society)**

**Thursday, October 27, 2005**

Hello, my name is Michael Jolliffe; I am the Industry Co-Chair for the Coalition for Canadian Astronomy and with me is Gretchen Harris, the Coalition Co-Chair representing the Canadian Astronomical Society. Unable to be with us today is the third Co-Chair Pekka Sinervo who represents the Association of Canadian Universities for Research in Astronomy.

I would like to thank the Committee for inviting us here today. Since our initial appearance before the Committee in 2001, Canadian astronomy has made incredible strides. Canada ranks as a world leader in astronomy and our accomplishments have even been recently noted in the *New York Times*. That success would not have been possible without the Federal Government's initial investments of \$35.9 million in the 2001 Budget and \$20 million in the 2003 Budget.

Those initial investments are due in large part to the support we have received and continue to receive from Members of Parliament from all Political Parties. In 2001, the Standing Committee on Finance recommended that the Federal Government provide the necessary funds to assure that Canada is able to realize the significant economic benefits that arise from its international participation in the next generation of astronomical observatories. We have attached the complete excerpt from that Committee Report to this presentation (Appendix 1).

These investments represented about a third of the resources initially required to successfully launch our Long Range Plan for Canadian Astronomy (the LRP)<sup>1</sup>. We are back before the Committee asking the Federal Government to fund the remaining elements of our plan. We are not hesitant in making this request. If you examine what has been accomplished with those initial investments, you will see that it has been money well spent and the benefits to Canada continue to far out weigh the investment.

We will elaborate on those successes shortly. First though, we will provide some background on the Coalition.

The Coalition for Canadian Astronomy was formed in 2000 and is unprecedented in the Canadian science community. It brings together representatives from the astronomical community, academia and industry to chart a course for scientific excellence in this field.

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<sup>1</sup> The initial LRP, prepared in 1999, sought \$164.9 million over ten years. It identified the Atacama Large Millimetre Array (ALMA) as the highest priority international project for Canadian Astronomer, with this project now at the construction stage. As well, the LRP had the Very Large Optical Telescope (VLOT) and the Square Kilometre Array (SKA) as the next two priorities. At the time, they were both only at the conceptual stage. In particular, the LRP noted that "construction of VLOT would not begin until the middle of the second decade [2015], with operation commencing around 2020." [pg. 64] By 2004, the Mid-Term Review noted that "rapid developments have led Canada to become a significant partner now in the unique Thirty-Metre Telescope [TMT – formerly known as VLOT] project" with ACURA "taking the lead for Canadian participation." The speed at which the TMT project evolved over the last five years created the need to identify an additional \$125 million in the 2005-2011 funding period for Canadian participation in the construction. This is the single largest change to the funding profile originally envisioned in the LRP, and has led to an increase in the LRP funding from \$164.9 million to \$235.7 million. A complete background of the funding request is attached (Appendix 2).

That course is clearly defined in the LRP and re-affirmed through the Communities mid-term review of the LRP. All of Canada's astronomy stakeholders have signed off on this document. It is supported by a community of international experts. Based on Canadian astronomers' science goals and expertise, the Community selected only those projects that offered the best opportunities for international scientific leadership for Canada, rather than pursue every opportunity that arose.

By focusing our efforts, we made it easier for Government to do the same. You will not have rival astronomers coming before you to argue for support for other astronomy projects. We fought those battles internally, and our Coalition and community are united behind the LRP.

Our coordinated effort and focus is the reason for our success – and those successes have been considerable. All Coalition partners are benefiting.

For astronomers themselves, Canadians now have access to the world's leading astronomy projects, providing unparalleled research opportunities. This is critical for the Canadian economy because it keeps our best and our brightest here in Canada. Scientists are amongst the most mobile professionals in the economy of the 21<sup>st</sup> century. We should celebrate the fact that in astronomy, their future is in Canada.

For our university partners, the benefits have been profound. New astronomy departments have been created at several universities. The number of Canada Research Chairs in astronomy has grown from 1 to 23 in four years. Astronomy has received an exceptionally higher percentage compared to other science disciplines. Enrollment in astronomy is booming. The number of graduate students pursuing astronomy has doubled since we launched the LRP. These students all have access to the world's leading astronomy projects, thereby ensuring we are developing the next generation of astronomers who will keep Canada at the forefront of this field for years to come – provided of course that we have the needed financial support.

Our university partners take the field of astronomy and the Long Range Plan very seriously. The Association of Canadian Universities for Research in Astronomy (ACURA) was formed at the very senior levels of university administration with 22 university members representing Universities from St. Mary's University in the east to University of Victoria in the west.

Lastly, our industry partners have benefited in perhaps the most tangible way, at least in terms of the interests of this Committee. As outlined in our written submission, Canada has received a two-to-one direct return for every dollar invested in astronomy so far. This direct return stems from contracts awarded to Canadian companies to design and build major international astronomy projects, which often have price tags in the hundreds of millions of dollars.

Consider just the experience of my own company, AMEC. The Federal Government invested \$38 million to become a partner in the Gemini Twin Eight-Metre telescopes. That led to AMEC being awarded a \$44 million contract to build the enclosures for those telescopes. The structural design expertise generated through the involvement with this project and the earlier Canada-France-Hawaii telescope has now grossed over \$300 million.

High-tech companies all over Canada are now winning contracts to support Canada's astronomical pursuits, providing direct jobs and income to Canadians including companies which are now for the first time, becoming involved in astronomy related projects.

The indirect returns are even more impressive – estimated to be as high as ten-to-one. Work on astronomy projects has led to new business opportunities for Canadian industry in fields as diverse as MRI technology to computer imaging to theme park rides. These spin-offs are also providing jobs and income to Canadians. Perhaps more important, they are doing so in the high-tech field, constantly improving the skills of our workforce and helping keep talented labour here in Canada. The specialized skills that are developed through astronomy projects are being transferred into the broader industrial/business sector.

It is because of these successes that the Federal Government should continue its investments in astronomy. We are contributing to Canada's productivity performance through new jobs, new technologies, skills development and innovation. Not only that, we are furthering our scientific understanding and offering opportunities for young Canadians to be the best in their fields right here at home.

Our Plan can serve as a model for scientific funding in Canada. We have clearly laid out and prioritized goals, the support of all Canada's astronomy stakeholders, and a long-term view to constantly enhancing our position in the world, all the while delivering a clear benefit to the economy.

We have no doubt that a continued investment by the Federal Government in astronomy would be a productive one. Conversely, to walk away from astronomy funding would be profoundly unproductive. It would squander the initial investments that have been made. Canada's partnerships in international astronomy projects would be threatened. Our leading researchers and students would go elsewhere. Canadian firms would no longer be able to bid on contracts for international projects.

We feel the criterion of productivity should apply to Government actions just as much as to the private sector. To invest in a scientific field, let it build up to a world-leading level, and then walk away, is simply not a productive use of Government resources.

Canada is perfectly positioned to maintain its world leadership position in astronomy, along with all the economic dividends that flow from it, only if the Federal Government continues to invest in astronomy research.

Major astronomy projects today require several international partners. We require the Government of Canada to provide long term funding to assure our partners that our participation has a sufficient and stable foundation which will entrust critical project work to Canadians. The private sector cannot play that role for the astronomical community. If Canada wants to maintain its position as a world leader in astronomy, the Government must provide the financial investment.

That is why we are so conscious of our contributions back to the Canadian economy. We want the Committee to understand that an investment in astronomy is a sound one for Government.

Astronomy is also Canada's most productive science. Its benefits are felt in universities, government research facilities and companies. It is also felt among thousands of Canadians. There are some 5000 members of the Royal Astronomical Society of Canada and nearly 3000 members of the Fédération de astronomes amateurs du Québec. There are outreach programs, at facilities large and small throughout Canada, that link hundreds of scientists to hundreds of thousand of citizens, and motivate the young. Astronomy may even be felt in your own backyard. Its' footprint is quite literally the size of the universe

As mentioned, our Plan spells out our scientific priorities for the next seven years. To fully fund that Plan, the Coalition now needs approximately \$235 million over that time period. While it sounds like a lot, it is consistent with the level of support that other nations are putting into this science and is needed to maintain Canada's preeminence in this field. Furthermore, virtually all that money will come back to Canada immediately in various contracts and stimulating high tech development in the country. As one example, AMEC will receive a \$100 million contract by an international consortium for this project once further funding is in place – and that is only one contract for one project for one firm. There are others like:

- DiCos Technologies of Sherbrooke, Quebec, was selected to provide the Master Laser system for the Atacama Large Millimeter Array.
- INO of Saint Foy, Quebec has been contracted to study development of the advanced, super-durable coatings needed for the Thirty Metre Telescope mirrors, and is participating in the conceptual design for an extreme adaptive optics unit.
- Nanowave Technologies of Toronto is providing low noise amplifiers for Band 3 (86-116 GHz) hardware development for the Atacama Large Millimetre Array of radio-telescopes.
- Breconridge in Kanata, Ontario, was contracted to provide a \$100,000 feasibility study for work on the Square Kilometre Array, positioning it for downstream contracts.

We have itemized our funding needs by three-year and seven-year requirements, and we would be happy to share those with you.

Thank you very much for your time today.

## APPENDIX 1

### Securing Our Future

#### Report of the Standing Committee on Finance

November 2001

*Excerpt from Chapter IV: Planning for the Future  
Research and Development  
Pages 97-98*

#### **Canadian Astronomy Long Range Plan**

As part of the government's drive to increase spending on research and development, the Committee notes the submission by the Canadian Coalition for Astronomy. They suggested undertaking a Long-Range Plan (LRP) for Canadian astronomy. Presently, Canada invests \$22 million annually in astronomy research, which in turn provides world-class opportunities for Canada in science and engineering. However, the next generation of astronomical observatories are so complex and advanced that they can only be completed in conjunction with other countries. Furthermore, the Committee heard that:

*If we do not invest in the new round of projects outlined in the LRP, Canadian technology will not be a part of them. These international agreements stipulate that only companies from signatory countries may bid for contracts on these projects. Therefore, if Canada does not fund the LRP, Canadian companies will not be able to compete for the more than \$4 billion worth of work outlined in the LRP. Peter Janson, Chair and Executive Officer, AMEC Inc. Coalition for Canadian Astronomy*

Essentially, the LRP — a ten-year national plan developed by an expert panel of Canadian and international scientists — is the price for Canada to be able to have a seat at the international astronomy table, and to be able to reap the R&D rewards from such collaboration. The LRP has received unanimous support from the House of Commons Standing Committee on Industry, Science and Technology. Already, the Canadian Space Agency has committed \$100 million over the next ten years for the space-borne part of the Plan. The Coalition is seeking between \$140 million and \$164 million over 10 years, depending on whether its CFI application is successful.

*Canada's investment in the long-range plan buys the opportunity for Canadians to participate in designing, developing technology and software, and building and maintaining these facilities. It also provides Canadians access to these new telescopes. The world observatories will help Canada stay at the forefront as we unravel the secrets of the universe over the next ten years. Russell Taylor, Professor of Astrophysics and President of the Canadian Astronomical Society, Coalition for Canadian Astronomy*

The Canadian astronomy community has a history of effective use of resources. For example, for a \$50 million contribution to the \$1 billion Atacama Large Millimeter Array project in Chile, the first major international observatory, Canada was able to obtain access to over 30% of the time on the telescope. In 1990, the Canadian government invested \$38 million to buy its partnership in the Gemini Twin 8-meter telescopes, resulting in over 80 high-tech and engineering companies being able to compete for work on the project, generating significant economic returns for Canada, as well as access for Canadian students and scientists to the most up-to-date technology.

According to witnesses appearing before the Committee, international agreements to go forward on the first part of the LRP are likely in February, so time is of the essence.

**The Committee believes that immediate funding for the LRP is warranted, given the time sensitive nature of this issue. This would help build on our past successes and achieve the government's stated goal of increasing research and development. Consequently, we recommend that the government provide the LRP with the needed funds in the upcoming budget to assure that Canada is able to realize the significant economic benefits that will arise from its international participation in the next generation of astronomical observatories.**

## APPENDIX 2

### Recommended Expenditures for the Period 2005-2011 (millions of dollars)

#### Ground-based

##### **World Facilities**

ALMA	\$22
SKA	24.5
VLOT/TMT	<u>125</u>
Subtotal	\$171.5

##### **Moderate Projects**

Gemini/JCMT/CFHT	\$21.3
Receiver/Correlator Groups	2.0
DAO Telescopes	<u>0.25</u>
Subtotal	\$23.6

##### **People**

HIA Research Staff	\$4.3
Herzberg Fellowships	3.2
NSERC Fellowships	1.6
Experimental Astro Labs	4.9
Research grants	<u>2.1</u>
Subtotal	\$16.1

##### **Computing**

CVO	\$ 3.0
HPC	15.0
Equipment grants	<u>3.5</u>
Subtotal	\$21.5

<b>Education &amp; Outreach</b>	<u>\$3.0</u>
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<b>TOTALS</b>	<b>\$235.7</b>
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