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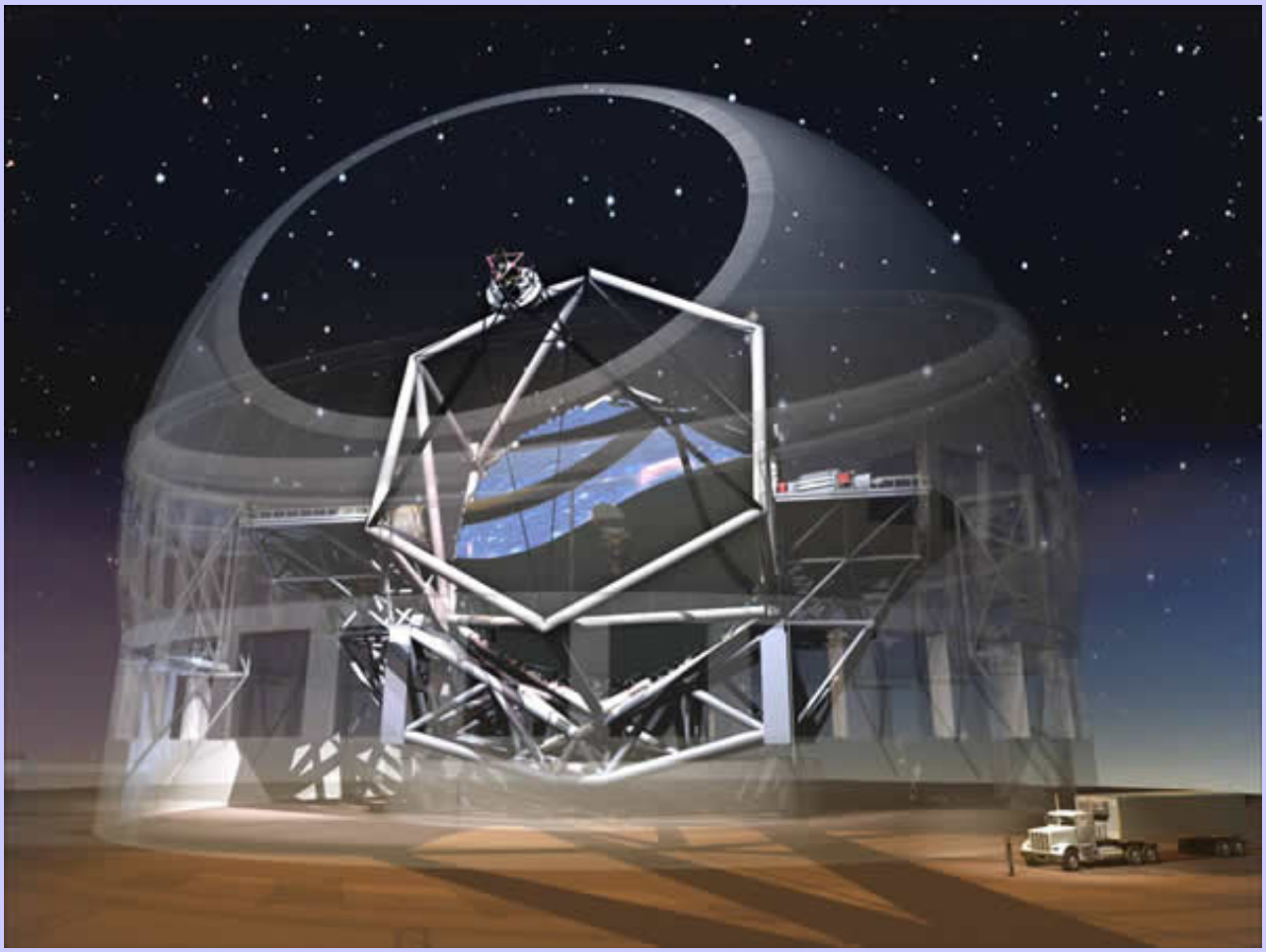

On the Cover

A futuristic look at TMT. For more on the status of the Thirty Meter Telescope please see Ray Carlberg's feature article.

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E-Cass Soap Box

Our winter of discontent is being transformed, albeit slowly, into glorious "spring" with the arrival of warm winds, budding trees and the Vernal Equinox issue of E-Cass! Once again thank you to the many contributors who helped produce this issue of E-Cassiopeia. Ray Carlberg has an informative update on TMT while Brenda Matthews and Mike Reid give us food for thought in their article on the status of women in Canadian astronomy. Jim Hesser has a note on the 2009 International Year of Astronomy as well as a plea for help - take a look and put Jim on your speed dial now! A delightful article that you won't want to miss is Alan Dyer's colourful and playful look at public astronomy education as developed in national planetaria. As well, we have the usual pot pouri of timely reports and news updates.

Welcome to Spring and wishing you the very best in the coming season!

Brian Martin (brian.martin@kingsu.ca)

From the president...

Peter Martin

I had the pleasure of speaking at the annual congress of Mexican astronomers last week. While there and in some subsequent exchanges I was able to provide some input on how CASCA is organized and operates and likewise how to develop and promote a Long Range Plan (LRP). This was a reminder of how much our community has advanced since CASCA was formed more than 35 years ago.

Hope Springs eternal for additional funding for the LRP, but the pre-equinox federal budget was alas more Winter-like (though not a complete deep freeze; for example there was a welcome renewal of CFI funding for another competition). Nevertheless, all-party support for the LRP is strong and the LRP continues to resonate at many levels in government. Furthermore, there is a growing understanding of the Coalition for Canadian Astronomy's position emphasizing the importance of funding all aspects of the LRP program, including the "people" aspects identified with NSERC and outreach, not just the hardware. And so although there has not yet the breakthrough that the Coalition has been working toward, progress can be noted. It will be interesting a year from now to reflect on whether the ratchet has slipped.

This is the time of year that NSERC awards are announced. I expect that like in the last few years there will be many disappointments, basically caused by a lack of funds available to the GSC to disburse. For example, the funding available for the returning grantees was considerably lower than their combined expiring grants, not to mention the inflation that had occurred over the five-year periods of these grants. The average funding available for new applicants was about $15,000, not really adequate to support the research programs of the outstanding young people being hired across the country. A further surprise sprung upon all GSCs at the last moment was a requirement for a minimum grant size, about $15,000. While this is consistent with my observation above, it does upset the culture of GSC 17 somewhat.

One area where we probably collectively missed an opportunity was in the instrumentation grant (RTI) category. Traditionally the funding made available to a GSC is some portion of the funds requested by the applicants, and so in a year of low demand like in our GSC this year, our community's share of the RTI pool goes down.

There have been some singular honours for our members recently, including the

Gerhard Herzberg Canada Gold Medal for Science and Engineering for Dick Bond and Officer of the Order of Canada for Jaymie Matthews. Ours is such an active and successful community that I'm sure I've missed some, and so while we congratulate these two for their accomplishments perhaps this will prompt some letters to the editor!

Feature Articles

Thirty Meter Telescope Project Update by Ray Carlberg

Women in Canadian Astronomy: 15 Years of Demographic Data (pdf only) by Michael A. Reid and Brenda C. Matthews

International Year of Astronomy 2009 – help needed by Jim Hesser

Thirty Meter Telescope Project Update

by Ray Carlberg

The TMT project is now entering the second half of the detailed design phase (DDP). In Canada our full DDP funding (US$17.5M, modulo exchange rate variations) has now been secured through a new NSERC grant ($6M), with matching funds from NRC ($3M in-kind) and Toronto, UBC and Victoria ($0.5M cash). This marks the fourth successful peer review major funding application for the LOT/TMT project in Canada.

Our primary goal is to obtain a “second to none” ownership (a 1912 phrase from the Chief Astronomer of Canada arguing to establish what became DAO) of the TMT observatory, which is planned to be 25% of the partnership. To reach this goal we expect to deliver to the project four major sub-systems: the telescope enclosure, the telescope structure, the Wide-Field Optical Spectrograph (WFOS) and the first light adaptive-optics system, NFIRAOS. It is fair to say that Canadians have never been so deeply engaged in the creation of a major astronomical facility. In addition we share in overall procurements for the project. For instance, we are currently purchasing primary mirror blanks (unpolished) from several international glassmakers. These blanks will be provided to polishing firms that we have been working with to help them develop methods that meet our requirements, schedule and cost targets.

A very nice development is that TMT has now established that the cost of a high segmented mirror observatory scales as approximately the mirror diameter to the 1.1 power, rather than the classical “Meinel Law” of costs going as diameter to approximately the 2.5 power. TMT has studied 25 and 30m designs, however, the same 1.1 power is close to the inflation corrected cost of the Keck 10m.

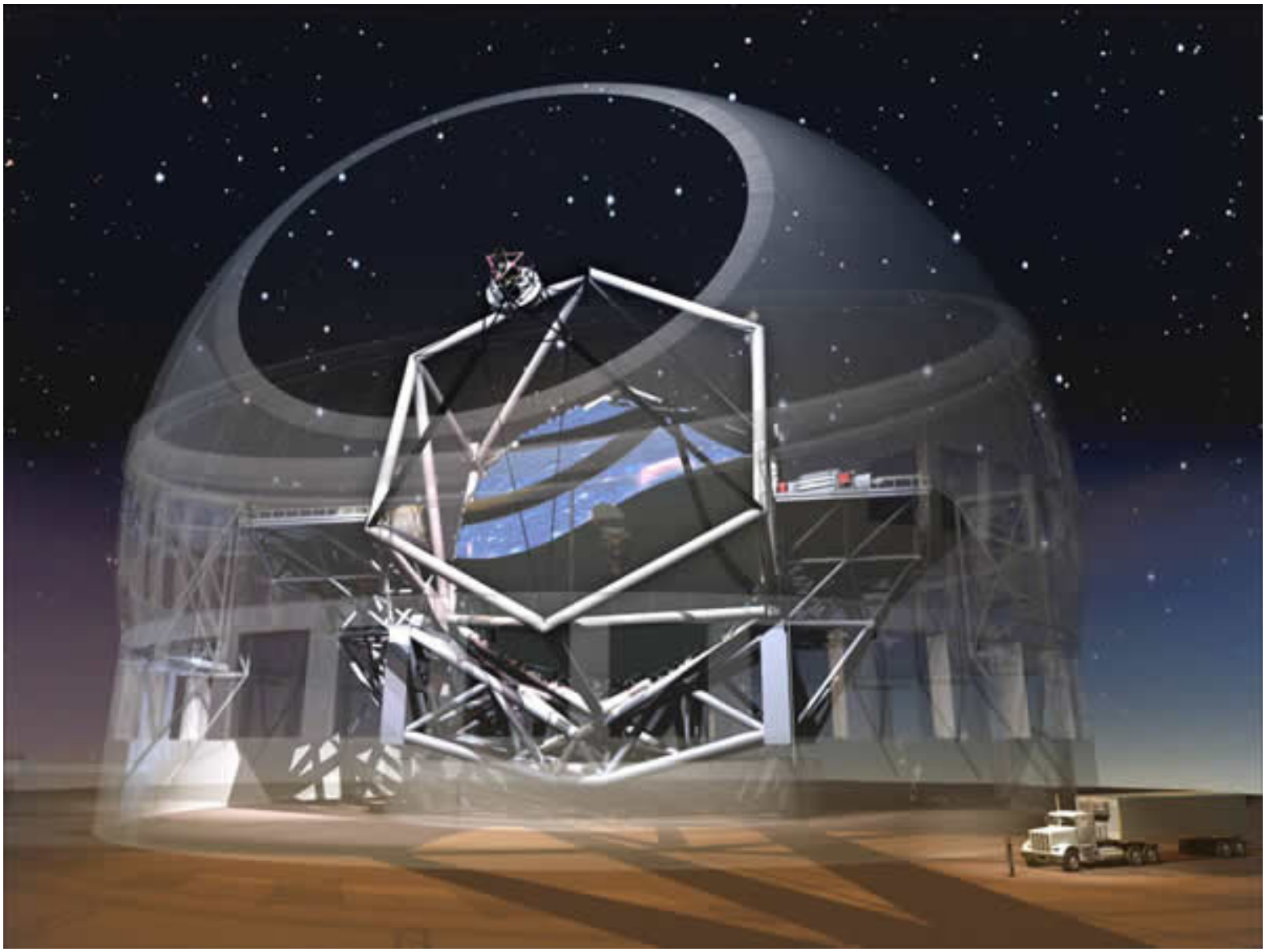
Overall the project is working towards making the transition to the construction phase after the successful cost review and re-scoping work of the fall of 2007. The SAC meeting of December 2007 defined an observatory that is expected to cost about US$750M (2006 year dollars) with a basic operating cost of US$25M per year. Ongoing scientific renewal can be estimated as approximately $15M a year. Therefore an initial twenty year operating agreement has a total cost of about $1550M.

A draft construction plan is being prepared for external review in June 2007 as one of the major current activities. This core proposal will be used by all the TMT partners as a part of the fund-raising discussion with our individual sponsors. After the proposal is done the project will re-engage in basic design work to better refine the overall design of the telescope in preparation for a construction start in 2009. Particularly important is to revisit the instrument design work now

that the SAC has refined specifications and more resources are available to do the work.

The partners now need to make it clear what their financial commitments are. Caltech and UC are having separate discussions with their donors and internal mechanisms for supporting research. AURA has been required to leave the TMT project (and the competing GMT project) to help NSF resolve which of the two projects (or both, or some merged version) it should support to benefit the US national community. The NSF continues to pay the grant that was awarded to TMT to support the design work. The TMT Board has entered into a series of discussions with the National Astronomical Observatory of Japan to consider their potential role as a TMT partner. Because both NSF and NAOJ need to fulfil their ALMA constructions first, the plan for TMT is that the three initial partners (Caltech, UC and Canada) will begin construction of a very basic (but still very exciting observatory) which future partners will help upgrade. Aside from the basic desire to do TMT science, TMT would like to be in a position to exploit discoveries from ALMA and JWST. Moreover, the European ELT project (now a 42m aperture) just getting underway is a highly credible venture, but one which TMT enjoys a considerable lead which it does not want to lose.

In Canada we are properly financed for the design phase, but need to press our case for construction funds in 2009. Because the enclosure is one of the first items that must be built, followed immediately by telescope structure work, it is critical to the schedule and our position within the project that we be able to move forward. The Canadian Coalition for Astronomy is doing a truly remarkable job discussing the funding needs of the entire Long Range Plan with the Canadian government. Of course we do not know what the government will decide or what further review will be required before any money can be allocated, but simply knowing that several agencies in Ottawa are listening is important for the project.



The enclosed figure shows many aspects of the current TMT structural design. Most of the structure displayed is the result of work undertaken in Canada by AMEC Dynamic Systems Limited under contract to ACURA. Novel design features include the support structure for the secondary mirror, the “flaps/wind-fence/eyelashes” around the opening, and of course the overall shape of the enclosure. It is interesting to note that the overall footprint is about equal to that of the existing Keck observatory

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Women in Canadian Astronomy: Fifteen Years of Hard Data

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Abstract

Achieving diversity within the Canadian astronomical community is of interest to individual scientists, academic departments, funding agencies, and society as a whole. However, until recently, there had been no coordinated effort to study the gender demographics of the Canadian astronomical community. In 2001, we gathered and presented such demographic information for the period from 1991-2000. The present work reports the results of our follow-up survey, conducted in 2006, which covers the period from 2000-2005. We find that the representation of women in Canadian astronomy has improved markedly over the last five years. We also find that the size of the Canadian astronomical community has grown substantially over the same period. The improving representation of women remains strongest at the lowest levels of academia, with smaller gains achieved at each stage of advancement. We find that women are being hired into faculty positions at a rate approximately consistent with their representation in the applicant pool.

1 Background

Five years ago, we presented the results from the first survey ("Survey 1" hereafter) of gender demographics within the Canadian astronomical community, tracing the relative representations of men and women through different academic levels during the years 1991-2000[1]. We found that women were significantly underrepresented at all levels of Canadian astronomy during the period studied, but that the trend was toward greater equality. As in other countries, we found that the ratio of women to men is highest at the lowest levels of academia we studied (i.e., among graduate students) and declines steadily, reaching its minimum at the level of full professor. The responses to Survey 1 represented only approximately half the astronomy population in Canadian academia (by number), being most acutely affected by the lack of participation of three of the largest departments in the country.

[1]Reid, M. .A., & Matthews, B. C. in the January 2005 edition of STATUS, the bi-annual newsletter of the American Astronomical Society's Committee on the Status of Women in Astronomy

2 Introduction

This followup survey ("Survey 2" hereafter) has been conducted to trace the representation of women in the five-year period 2001-2005. Data were requested for a period of six years (2000-2005) to ensure continuity. Our goal was to achieve more complete statistics by increasing the degree of participation in the community. This is of greater importance as these data are among those requested of members of the Coalition for Canadian Astronomy by government officers in relation to the LRP. In addition to the data requested as part of Survey 1, we have requested the numbers of incoming graduate students in MSc and PhD programs each year. Over time, these data, when compared with the number of graduands, can be used to assess the overall level of attrition from graduate programs.

3 Description of the 2006 Survey

3.1 Participation

For Survey 2, we broadened our scope to include smaller departments in community colleges where physics programs exist. We invited a total of 57 institutions to participate in the survey and received responses from 30. The full list of institutions polled in both iterations of the survey is shown in Table 1. In the table, asterisks indicate incomplete or otherwise problematic responses. In most cases, after contacting institutions which had submitted problematic or no responses, we were able to obtain accurate data. However, there were a few exceptions. The Survey 2 data provided by Université de Montréal were largely incomplete and were therefore excluded entirely from our analysis. The University of Alberta did not submit demographic information about their postdoctoral fellows, but we have used the rest of their submission. The University of Waterloo submitted only the *changes* in the number of people in each category for each year, from which we cannot reconstruct the absolute numbers of people in each category, so we have excluded their submission from the analysis. Two major centres of astronomical research did not participate meaningfully in either iteration of the survey: Queen's University and York University. However, we are happy to be able to add to the list of respondents several major institutions which did not participate in the first iteration of the survey.

The great majority of the institutions which did not respond to Survey 2 were small universities and colleges. It is likely that most of these did not respond because they employ no personnel whose primary activity is astronomy.

Table 1: Institutions Surveyed

	Survey 1 (1991-2000)		Survey 2 (2000-2005)	
Institution	Inv.	Rep.	Inv.	Rep.
Acadia University	N	-	Y	Y
Algoma University College	N	-	Y	N
Augustana University College	N	-	Y	Y
Bishop's University	N	-	Y	N
Brandon University	N	-	Y	Y
Brock University	N	-	Y	N
Canadian Institute of Theoretical Astrophysics	Y	Y	Y	Y
Capilano College	N	-	Y	N
Carleton University	N	-	Y	N
Concordia University	N	-	Y	Y
Dalhousie University	N	-	Y	N
École Polytechnique de Montréal	N	-	Y	N
Herzberg Institute of Astrophysics (Victoria)	Y	Y	Y	Y
Herzberg Institute of Astrophysics (Penticton)	N	-	Y	N
The King's University College	N	-	Y	N
Lakehead University	N	-	Y	N
Laurentian University	N	-	Y	N
McGill University	Y	Y	Y	Y
McMaster University	Y	Y	Y	Y
Memorial University of Newfoundland	Y	Y	Y	N
Mount Allison University	N	-	Y	Y
Queen's University	Y	N	Y	N
Redeemer University College	N	-	Y	N
Royal Military College of Canada	N	-	Y	Y
Ryerson Polytechnic University	N	-	Y	N
Simon Fraser University	N	-	Y	N
St. Francis Xavier University	N	-	Y	N
St. Mary's University	Y	Y	Y	N
Trent University	Y	Y	Y	Y
Trinity Western University	N	-	Y	N
Wilfrid Laurier University	N	-	Y	N
University of Alberta	Y	N	Y	Y*
University of British Columbia	Y	Y	Y	Y
University of Calgary	Y	Y	Y	Y
University College of Cape Breton	N	-	Y	Y
University College of the Fraser Valley	N	-	Y	Y
University of Guelph	Y	Y	Y	Y
Universitié Laval	Y	Y	Y	Y
University of Lethbridge	N	-	Y	Y
University of Manitoba	Y	Y	Y	Y
Université de Moncton	Y	N	Y	N
Université de Montréal	Y	Y	Y	Y*
University of New Brunswick	N	-	Y	Y
University of Northern British Columbia	N	-	Y	Y

Continued on next page...

Table 1 – Continued

University of Ottawa	N	-	Y	Y
University of Prince Edward Island	N	-	Y	Y
University of Regina	Y	Y	Y	N
Université Sainte-Anne	N	-	Y	N
University of Saskatchewan	Y	Y	Y	N
University of Sherbrooke	N	-	Y	Y
University of Toronto	Y	N	Y	Y
University of Victoria	Y	N	Y	Y
University of Waterloo	Y	Y	Y	Y
University of Western Ontario	Y	Y	Y	Y
University of Windsor	N	-	Y	N
University of Winnipeg	N	-	Y	N
York University	Y	N	Y	N

3.2 Methodology of Survey 2

Survey submissions were gathered using a web-based form. Because it allowed for automated, real-time validation of survey data, this format ensured greater uniformity and accuracy in the survey responses than the paper version used in the previous iteration of the survey. We also hope that the development of an online version of the survey will make it easier to administer annually. This will address the primary complaint of non-respondents to Survey 1, which was the necessity of compiling information covering long time intervals.

Participating institutions were first asked to indicate whether they employed anyone in the following categories between 1 Jan 2000 and 31 Dec 2005: full professors, associate professors, assistant professors, postdoctoral fellows, and other staff, such as sessional lecturers, instrumentationalists, observatory staff, etc. Among the professors, there were separate categories for full-time and part-time positions. The data on part-time faculty are excluded from our results because there were only 2 data points (1 male and 1 female part-time associate professor). For each year, participating institutions were also questioned about the number of students entering MSc or PhD programs and about the number of degrees awarded to graduates of these programs.

After selecting the categories relevant to their institution, participants were asked to indicate the number of men and women in each position for each year. To address a failing of Survey 1, Survey 2 forced participants to distinguish between an entry of '0' in any category and a non-response. Only one complaint was received about the format of the survey (from the University of Waterloo, whose data were not included in the survey for the reason discussed in the previous section), and that complaint can be addressed with revisions to the explanatory text. In order to make it easier for institutions to participate, we hope to administer the survey in this online format annually from now on.

4 Results: Representation of Women Improving

The essential and most encouraging finding from this survey is that the proportional representation of women in Canadian astronomy has risen in all categories but one (postdoctoral fellows). However, the news is not entirely rosy. Among graduate students, women are well on the way to comprising 50% of the total. But among faculty, it appears that women are still being hired out of proportion to their representation among the available candidates. Table 2 shows the mean proportional representation of women at all levels of Canadian astronomy over three five-year intervals: 1991-1995, 1996-2000, and 2001-2005. The categories of entering MSc students, entering PhD students, and "other" were not included in Survey 1 and so do not appear for the interval 1991-2000. For the period covered exclusively by Survey 2 (2001-2005), we have supplied the percentage of women at all institutions participating in Survey 2 as well as their percentage representation at only those institutions which participated in both iterations of the survey. Figures 1–6 show the representation of women in each category as a function of time between 2000 and 2005, using all of the Survey 2 data.

The data from both Surveys 1 and 2 show that the proportional representation of women is highest at the lowest levels of the academic hierarchy. From 1991–1995, 14% of MSc degrees in astronomy and astrophysics were awarded to women and the percentage of women dropped nearly monotonically with increasing academic rank. The same trend is seen in the results of Survey 2: over the last five years, women earned 44% of MSc degrees in astronomy and astrophysics but made up only 4% of full professors. Encouragingly, however, there have been great leaps in the representation of women within each category. For example, comparing only the institutions participating in both survey iterations, the percentage of MSc degrees awarded to women rose from 14% in 1991–1995 to 48% in 2001–2005. At most levels of academia, the percentage of women in Canadian astronomy has doubled or better since 1991–1995. However, as shown in the right column of Table 2, not only does the percentage of women decline with each level in the hierarchy, the percentage *increase* in their representation also declines with seniority. Although women more than tripled their numbers among MSc students between 1991–1995 and 2001-2005, their representation among associate professors less than doubled. It is worth noting that the percentage improvement in the representation of women among full faculty cannot even be calculated because there were no female full professors reported in Survey 1.

How should we interpret the fact that the representation of women is improving faster at lower levels of academia? Unfortunately, the data in hand do not constitute a sociological study and can't tell us what social factors might be at work. A close look at the numbers shows that, although the total number of women in any job category is small, they are being retained in the system. For example, Survey 1 found that 2 PhD's were awarded to women between 1991 and 1995 and that there was 1 female assistant professor of astronomy. If both of these female PhD recipients stayed in academia and if each spent about 6 years as a postdoc before being hired into a faculty job, we should expect there

to be about 3 female assistant professors of astronomy in Canada by the year 2000. In fact we find that there were 4 female assistant professors of astronomy in Canada in the year 2000. Thus, we can conclude that, subject to a strong caveat about small number statistics, female PhD graduates are being retained in the system. The most recent data suggest that the trend of retaining female PhD graduates has continued to the present day. Between 2000 and 2005, there were approximately 4 women and 9 men hired into assistant professor positions. The equivalent numbers for associate professors are 4 women and 8 men. Hence, it appears that, as the representation of women in the candidate pool has increased, so to has the rate at which they are hired.

The recent increase in the representation of women among Canadian astronomy faculty is attributable, in part, to the University Faculty Award (UFA) program of the Natural Sciences and Engineering Research Council of Canada (NSERC). The mandate of the UFA program is "to enhance the recruitment, retention and early career progression of women and Aboriginal people in tenure-track faculty positions in the natural sciences and engineering, in Canadian universities, by providing opportunities for them to establish a strong research record". Many of the recent hires of women into faculty positions have been through the UFA program. In future iterations of this survey, we will attempt to specifically track the number of hires made under this program to assess its effect. At present, we lack the data to comment authoritatively on the influence of the UFA program. We do, however, wish to point out that, contrary to the assertion commonly made in the lunch rooms and hallways of academia, the UFA program has not resulted in a particularly strong bias *against* male job candidates. Although there is evidence from our survey that women are being hired somewhat out of proportion to their representation in the pool of applicants, men still account for about 70% of new hires. Moreover, it is possible to interpret the mandate of the UFA program as specifically *intending* to facilitate the hiring of women in greater proportions than their representation in the candidate pool. Such a measure would seem to be temporarily necessary to ensure that gender parity is achieved.

A potentially troubling result emerges when we consider the situation among female graduate students in astronomy and astrophysics. As shown in Table 2, women are more likely than men to finish MSc degrees but they are less likely to finish PhD's. During the interval 2000–2005, women made up 39% of entering MSc students and 44% of graduating MSc students. Conversely, women made up 34% of entering PhD students, but only 28% of PhD recipients. We caution the reader here that the small-number nature of these statistics makes the significance of this finding uncertain. However, we emphasize the importance of recognizing potentially adverse conditions which may affect women, rather than holding them accountable for the poor statistics afforded by the size of the Canadian astronomical community.

4.1 Strong Growth of the Canadian Astronomical Community

The data collected for Survey 2 show some interesting statistics beyond those related to gender. According to the data, the overall size of the Canadian astronomical community has grown substantially over the last five years. The total number of professors has swelled from 79 in 2000 to 103 in 2005. Impressively, the number of postdoctoral fellows has nearly doubled from 44 to 77 over the same interval. However, the number of graduate degrees granted has tripled, from 13 in 2000 to 36 in 2005.

5 Conclusions

This is the second of the two large multi-year surveys we have conducted of the Canadian astronomical community on behalf of the Canadian Astronomical Society. Over the 15 years of data, we find an improving trend in the fractional representation of women. The gains are smaller at each subsequent level of academic hierarchy. In addition, the very small number statistics of the Canadian community means that the hiring of one woman into an academic department can radically change the percentage of women. We therefore stress the importance of noting the absolute numbers of the population as well as the fractional changes.

The survey data demonstrate that the overall size of the Canadian astronomical community is increasing. Between 2000 and 2005, the number of graduate degrees awarded in astronomy at the participating institutions tripled from 13 in 2000 to 36 in 2005, the number of postdocs rose from 44 to 77, and the number of full-time faculty rose from 79 to 103. Thus, the number of candidates for faculty positions is increasing faster than the number of available positions.

We would like to emphasize that, again because of the small overall size of the Canadian astronomical community, participation in this ongoing survey by all institutions is essential. Particularly because the absolute numbers of women at many levels of academia are still so small, missing contributions from one or two institutions can have a significant effect on our interpretation of the results. Furthermore, we emphasize that the information gathered in this survey is of interest not only to the Canadian astronomical community itself. One of the goals of the Canadian Long Range Plan for astronomy was to increase the representation of women at all levels. Hence, those outside our community to whom we are accountable are actively interested in ensuring that we are achieving our goals. We intend to conduct this survey annually from now on, imposing a fixed term during which institutions will be requested to submit responses. Having made the process of participation as simple as possible, we very much hope for 100% participation in future surveys.

Table 2: Mean Percentage of Women in Canadian Astronomy

Category	1991–1995	1996–2000	2001–2005[1]	$\frac{(2001--2005)}{(1991--1995)}$
Full Professor	0	0	4 (6)	NaN
Associate Professor	10	13	18 (16)	1.8
Assistant Professor	12	23	31 (30)	2.6
Postdoctoral Fellow	7	17	14 (14)	2
Other	n/a	n/a	13 (13)	–
PhD's Granted	9	14	28 (39)	3.1
Entering PhD Students	n/a	n/a	34 (34)	–
MSc's Granted	14	20	44 (48)	3.1
Entering MSc Students	n/a	n/a	39 (42)	–

[1] Figures in parentheses were calculated using only those institutions which participated in both Surveys 1 and 2.

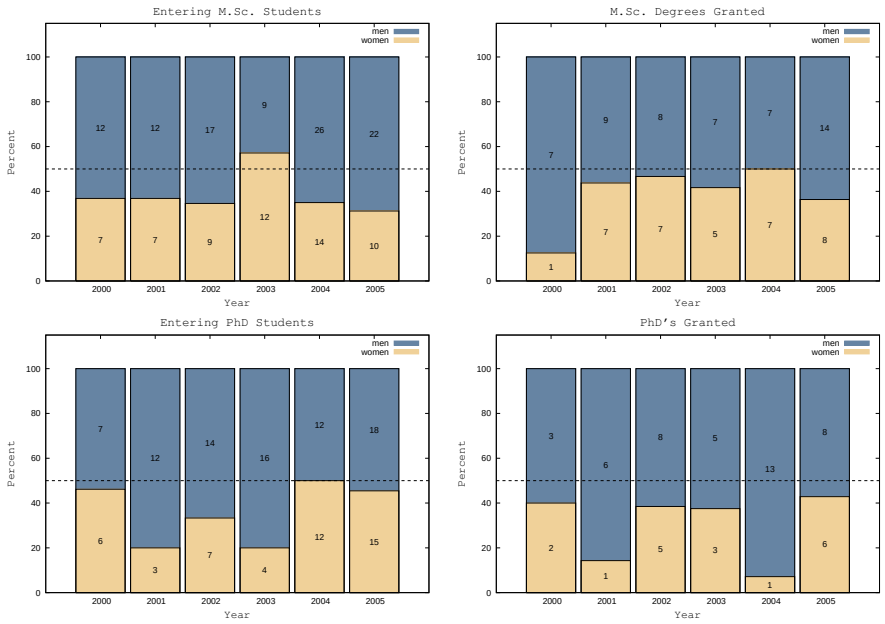


Figure 1: Gender distribution of students beginning and graduating from MSc and PhD programs in astronomy and astrophysics over the period 2000-2005. The number in each bar indicates the absolute number of people in that category. The dashed line indicates exact gender equality.

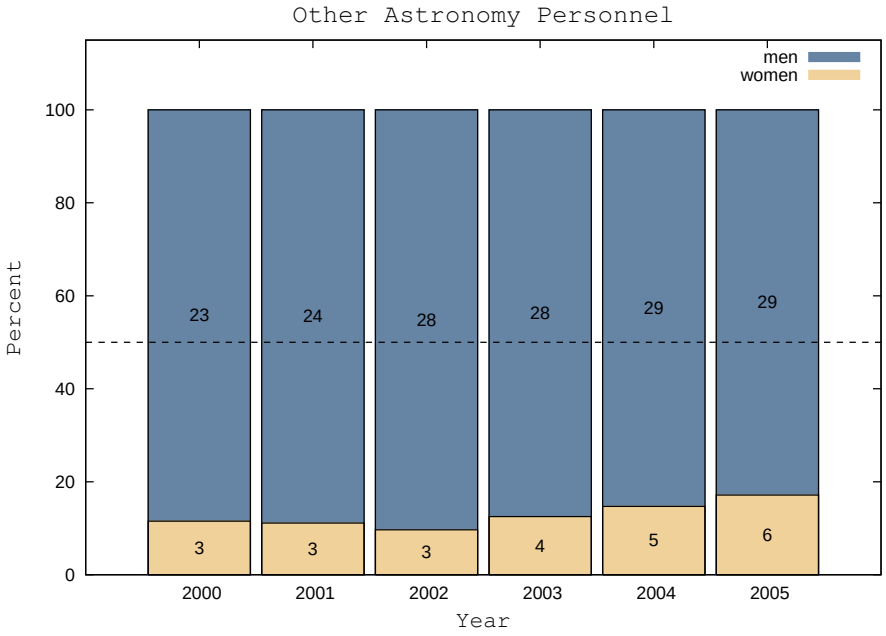


Figure 2: Gender distribution of employees in the "other" category, including sessional lecturers, instrumentationalists, observatory staff, etc. over the period 2000-2005. The number in each bar indicates the absolute number of people in that category. The dashed line indicates exact gender equality.

Figure 3: Gender distribution of postdoctoral fellows in astronomy and astrophysics over the period 2000-2005. The number in each bar indicates the absolute number of people in that category. The dashed line indicates exact gender equality.

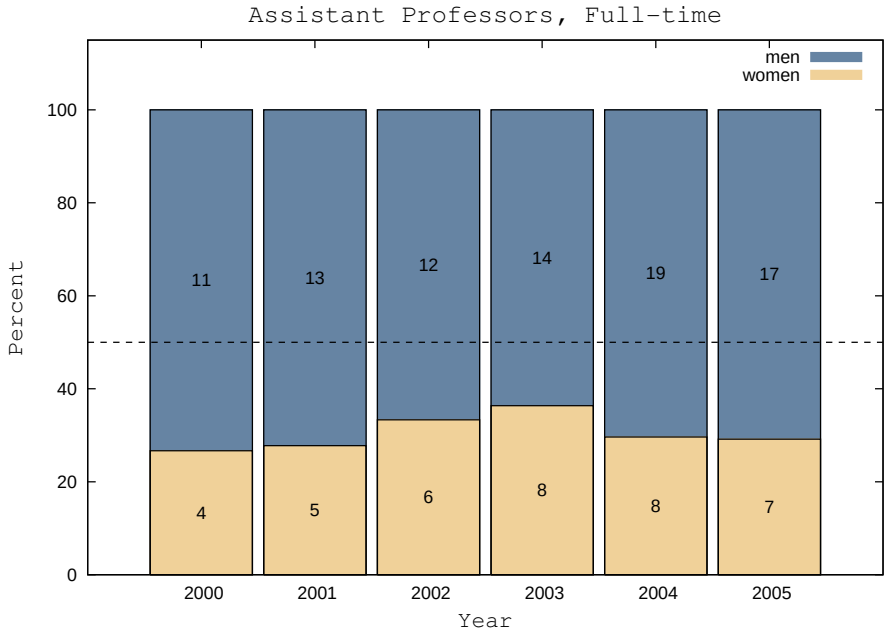


Figure 4: Gender distribution of assistant professors of astronomy and astrophysics over the period 2000-2005. The number in each bar indicates the absolute number of people in that category. The dashed line indicates exact gender equality.

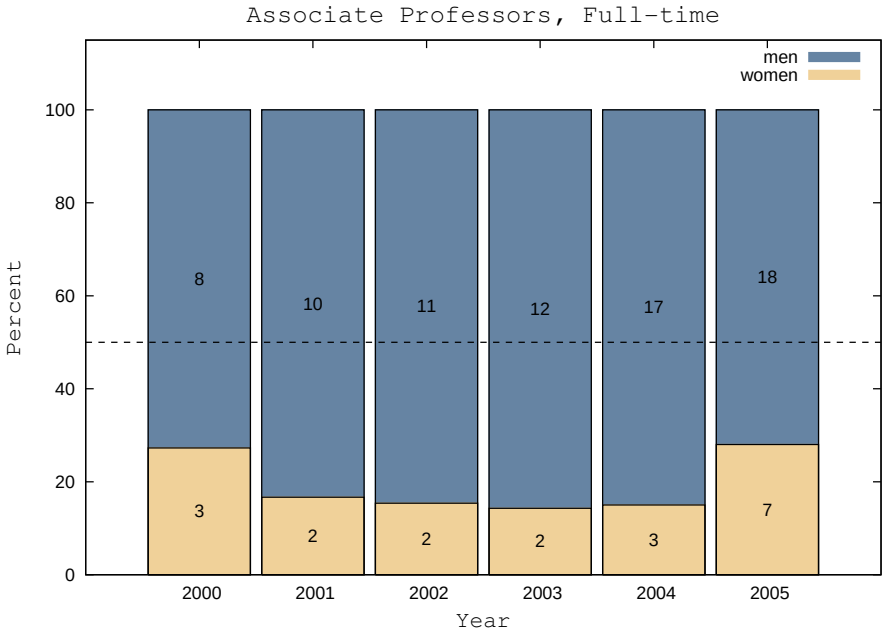


Figure 5: Gender distribution of associate professors of astronomy and astrophysics over the period 2000-2005. The number in each bar indicates the absolute number of people in that category. The dashed line indicates exact gender equality.

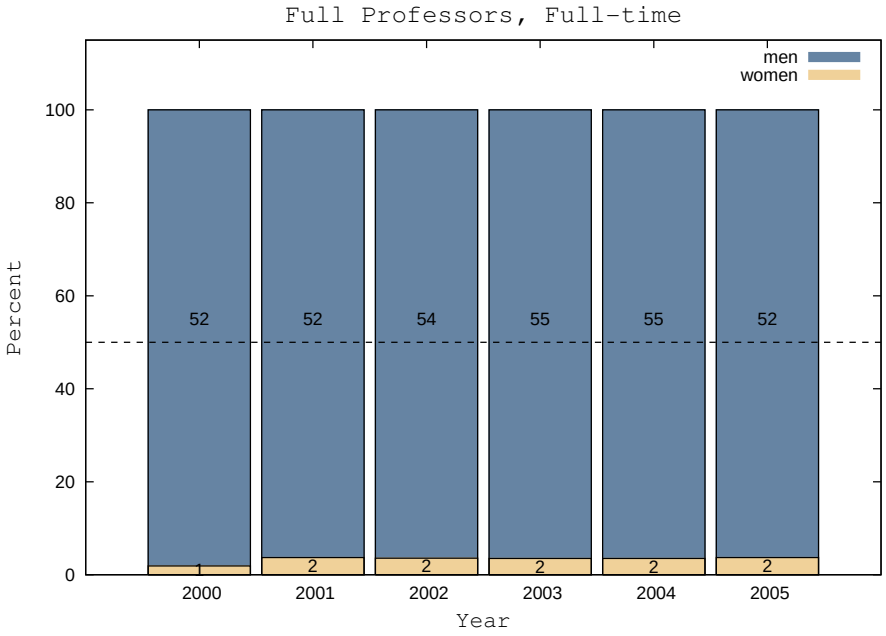


Figure 6: Gender distribution of full professors of astronomy and astrophysics over the period 2000-2005. The number in each bar indicates the absolute number of people in that category. The dashed line indicates exact gender equality.

International Year of Astronomy 2009 – help needed

The International Year of Astronomy 2009 (IYA2009) will be a global celebration of astronomy and its contributions to society and culture, stimulating worldwide interest not only in astronomy, but in science in general, with a particular slant towards young people. IYA2009 will mark the monumental leap forward that followed Galileo Galilei's first use of the telescope for astronomical observations, and portray astronomy as a peaceful global scientific endeavour that unites astronomers in an international, multicultural family of scientists working together to find answers to some of the most fundamental questions that humankind has ever asked.

IYA2009 is, first and foremost, an activity for the citizens of Planet Earth. It aims to convey the excitement of personal discovery, the pleasure of sharing fundamental knowledge about the Universe and our place in it and the value of the scientific culture. While the focus is on 2009, activities whose impact extends beyond 2009 are being planned. See www.iya2009.org for more information.

The vast majority of IYA2009 activities will take place on several levels: locally, regionally and nationally. Several countries have already formed National Nodes to prepare activities for 2009. These Nodes are collaborations between professional and amateur astronomers, science centres and science communicators.

In Canada, the Canadian Astronomical Society (CASCA), the Royal Astronomical Society of Canada (RASC) and the Fédération des Astronomes Amateur de Québec are working together to develop the Canadian activities. We also have participation from the National Research Council and the Canadian Space Agency, as well as a representative of the planetarium community.

As Dennis Crabtree described in the Autumn Equinox *Cassiopeia* we have formed a small Steering Committee to facilitate local initiatives and activities, to organize a limited range of national activities, and to do what's needed to accomplish the local and national activities, such as fundraising, searching for sponsors, creating and maintaining a website etc.

The Steering Committee has participated in international coordination meetings and we have applied to Canada Post for a series of commemorative stamps. We have secured the participation of Bob McDonald (of *Quirks and Quarks)*, as well as of Cheryl Bartlett (Cape Breton University) to lead our efforts involving the First Nations and Inuit communities. *But we*

need a lot more help with organizing both local and national activities (many of which will support the local activities): we need people to work with us to organize the programs we will put on in Canada; to publicize our efforts, particularly through a really attractive web site; to raise funds to support our activities, and so on. We continue to seek someone able to devote significant time to lead co-ordination of Canadian activities, as described by Jayanne English to CASCA members last November. It's going to be an exciting time as we ramp up to 2009! If you are interested in being part of IYA2009 planning, please contact one of the following to indicate in which of the foregoing areas you'd like to help:

Jim Hesser (CASCA), jim.hesser@nrc.ca
Rémi Lacasse (FAAQ), remi@astromirabilis.com
Peter Jedicke (RASC), PJedicke@fanshawec.ca

News

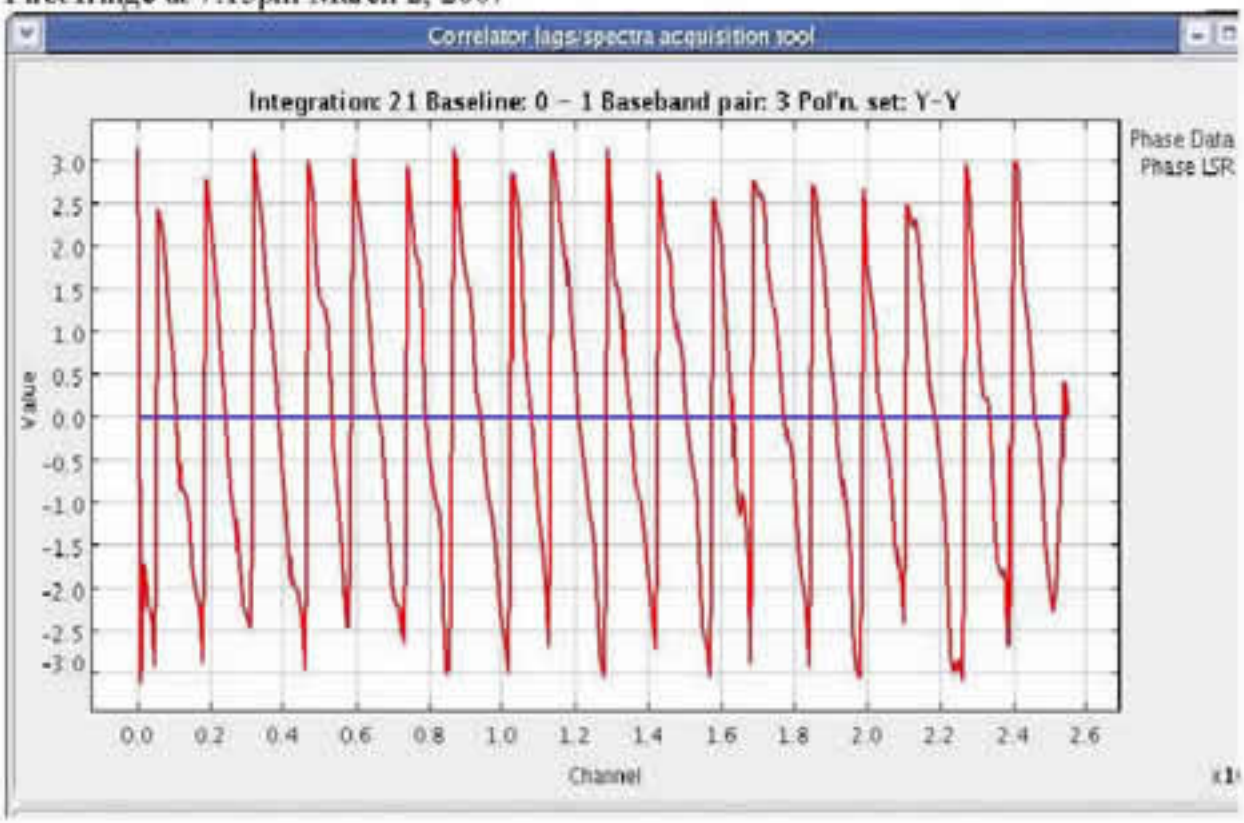
ALMA Update

1 Recent news

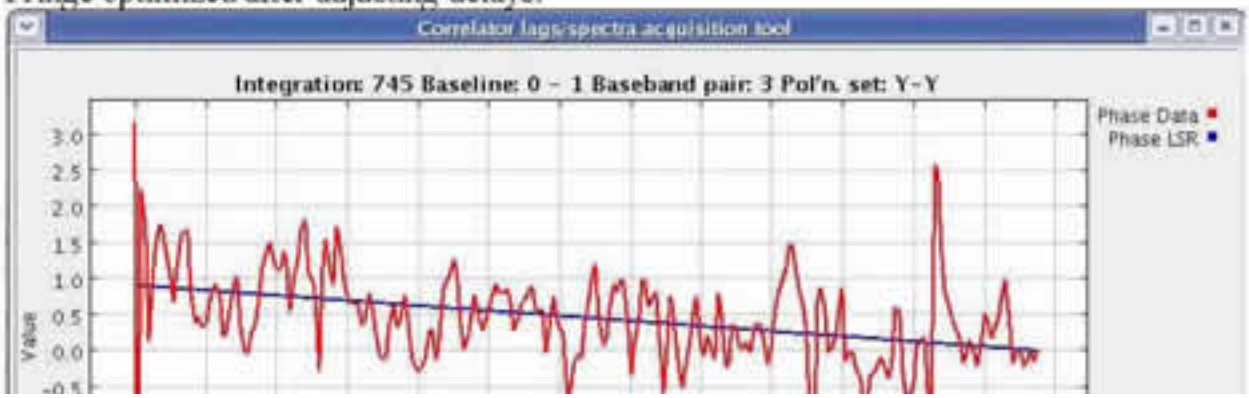
1.1 Construction Progress

On March 2, 2007, ALMA reached a major milestone with the observation of first fringes on an astronomical source at the ALMA Test Facility at the VLA site in New Mexico. Achieving fringes on Saturn represents the first complete end-to-end test of the hardware and software of ALMA and requires the integration of state-of-the-art components from the telescopes on down the electronic chain.

First fringe at 7:13pm March 2, 2007



Fringe optimized after adjusting delays.



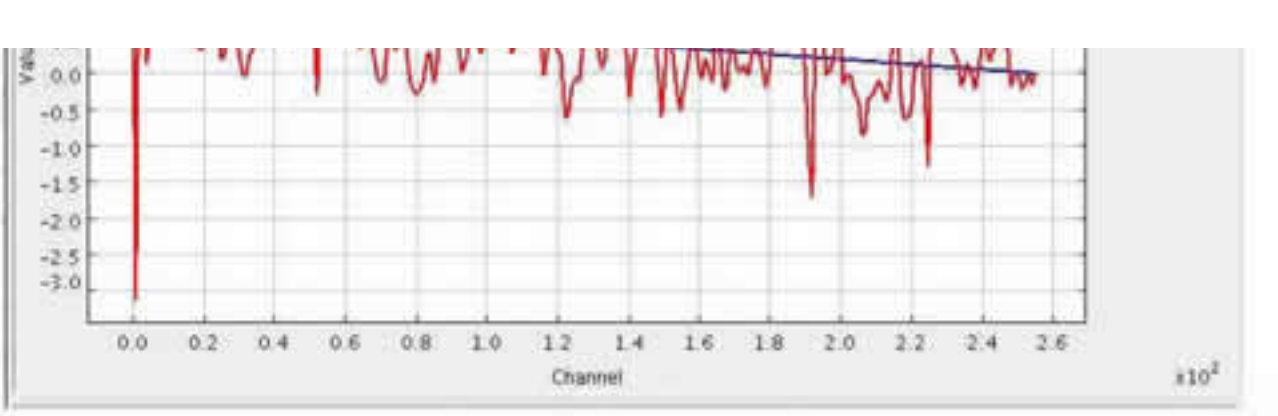


Figure 1: first fringes on an astronomical source (Saturn) with the ALMA Test Facility.

The remaining Key Staff of the Joint ALMA Office (JAO) have now been appointed: Prof. Richard Hills as the ALMA Project Scientist, and Dr. Alison Peck as the Deputy Project Scientist. Richard Hills is Professor of Radio Astronomy, and a member of the Astrophysics Group, in the Physics Department of Cambridge University, UK. His work is well known to all who are in the field of millimeter and sub-millimeter-wave astronomy. Among the many topics that he has worked on with great distinction, Prof. Hills is especially well known as an expert in radio astronomical instrumentation, telescopes, and interferometry. Dr. Alison Peck is a staff member of the Submillimeter Array (SMA) at the Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA. Dr. Peck is responsible for all science and observer scheduling at the SMA telescope on the summit of Mauna Kea, HI. As such, her responsibilities range from designing and implementing a system of dynamic scheduling, optimizing data taking, and reduction procedures to outreach activities. We look forward to their leadership in, among other matters, the science commissioning and science verification of ALMA.

In Chile, work continues at the high site to finish the building at the Array Operations Site, which is now powered by a temporary generator. The Operations Support Facility (OSF) is now under a roof and work continues on the VertexRSI Site Erection Facility. Production antennas will be assembled here beginning in the second quarter of 2007. There are currently close to 400 people working at the ALMA site.

At the North American Front End Integration Center (FEIC) in Charlottesville, Virginia, the first cartridges for Bands 3 (3mm), 6 (1mm), 7 (.85mm), and 9 (.65mm) are installed in the cryostat and the warm cartridge amplifiers are now attached; any two cartidges may be operated simultaneously. ElectroMagnetic compatibility tests of LO driver interference with Band 3 were completed. In Hawaii, the remaining tests with the prototype water vapor radiometers on the SMA have been completed and the radiometers will be returning soon to Europe.

1.2 ALMA Operations

The next version of the ALMA Operations Plan has been completed and was the subject of an intense review by a panel of international experts commissioned by the ALMA Board. The review panel included Andy Woodsworth (former HIA astronomer, Director General of NRC's Institute of Information Technology, and Vice President, recently retired). The oral report by

Chair Pierre Cox was quite positive; the Board will receive and consider the written report at its 26-27 March 2007 meeting in Tokyo.

In parallel to the international review, the NSF organized a similarly intense review of the proposal submitted by NRAO/AUI for NSF operations funding. The review committee was chaired by Jean-Rene Roy (Gemini) and Ernie Seaquist (U. Toronto) was a member. The outcome of this review will have an impact for Canada, as our astronomers receive direct support from the North American ALMA Regional Center located at NRAO. There has been no official communication as to the results of the review yet, but it is known that the oral report was also quite positive.

1.3 ALMA Science Meetings

In Canada, we are developing preliminary plans for an ALMA workshop in Calgary in the summer of 2008, probably after the CASCA meeting in Victoria. This workshop would follow on the very successful workshop on Submillimeter Observing Techniques held in Victoria in August, 2006. The 2008 workshop would focus more closely on ALMA and will provide an opportunity to introduce ALMA software to the Canadian community and also to begin to prepare the community for first science with ALMA.

There will be an ALMA information session, probably in a lunch period, at the CASCA meeting at RMC in June 2006.

NRAO is planning a science workshop on "Transformational Science with ALMA: Through Disks to Stars and Planets" to be held in Charlottesville, Virginia June 22-24, 2007. This workshop will likely be limited to about 60 people so I encourage anyone who is interested visit the web page at

http://www.cv.nrao.edu/naasc/disk07/

The ANASAC is beginning to discuss possible topics for scientific workshops in 2008. If anyone has any suggestions for future workshop topics, please pass them on to Doug Johnstone or Chris Wilson, who are the two Canadian members of the ANASAC.

1.4 Science Software Testing

Many aspects of the ALMA Science Software have undergone major tests in the last three months, specifically the Observing Tool, the Pipeline, and the Offline systems.

In mid-February, the ALMA Observing Tool, which will incorporate the "Phase I" (proposal) and "Phase II" (observing setup) tools, underwent its fourth user test. Lewis Knee (HIA) participated in this test. The main focus was to test the Phase II software to be used by non-expert users and to test a new interface to the expert mode developed since the third user test. In the non-

expert mode, it is possible to set up simple single field interferometry observations using simple correlator configurations. Expert mode allows more complex correlator setups as well as the ability to define multiple fields (i.e., mosaics). Future releases will add additional functionality to both the expert and non-expert modes.

In March, Raymond Rusk was in Socorro to help support the latest round of testing for CASA, the Common Astronomy Software Applications package, by external users prior to the September 2007 beta release of casapy. This CASA test received close external scrutiny from NRAO management. During the week, Fred Lo, director of NRAO, met with the CASA developers to discuss project requirements from the developer's perspective and to emphasize to the developers the importance of casapy's success to NRAO. He particularly emphasized the importance of communications between the CASA team in Socorro and his office in Charlottesville. He also met separately with both the NRAO internal testers and with the external testers.

Representatives from all three partners in the ALMA project (with Lewis Knee as the North American ALMA Science Center Canadian representative) participated in an intense week-long data reduction exercise. Based upon AIPS++, CASA has undergone an intense effort to develop functionality and a new user interface (based on Python with Java GUIs) in advance of a planned beta release this autumn. The testers used CASA to reduce data from a number of telescopes, including BIMA, DRAO, GBT, PdBI, and VLA. Basic functionality for interferometric data reduction seems to be in good shape with an adequate task-based user interface. Single-dish functionality has been added to CASA but the user interface still needs to be integrated into the rest of the package.

Finally, the ALMA Pipeline completed its fourth user test in March. The seven testers included James di Francesco (HIA) and Chris Wilson (McMaster) and included testers from all three ALMA partners. This was the first test to include end-to-end processing of the science target, including flagging, calibration, and imaging. The completed test report is expected to be available by about mid-April.

2 ALMA Science Advisory Committee

Doug Johnstone, the new Canadian ASAC member, will be traveling to Japan in early May for the next face-to-face meeting. The significant charges to the ASAC this time are: to review the status and capabilities of the ALMA Compact Array; review the science in the second version of the Design Reference Science Plan (updated to include the Compact Array); review the current status of molecular line databases; and discuss the operational plan for ALMA.

3 ALMA Developments in Canada

3.1 Band 3 Receiver Development

The last three months have been busy ones for the Band 3 Receiver Development Team. The preliminary in-house acceptance of the second cartridge to be shipped went extremely well, with the outside reviewers "fully satisfied" with the receiver. Delivery of the cartridge to the Front End Integration Centre in Charlottesville for integration into the receiver cryostat is expected soon.

As mentioned in the last issue, the team is continuing to prepare for the production phase which will start in under a year and during which one cartridge per month will be delivered to the ALMA Project. To be prepared for this intensive schedule, the project continues to undergo detailed production planning, contract preparation for outsourced packages, and the complete automation of the test sets. Everything is proceeding very well and the extremely important Critical Design Review is scheduled for the end of March 2007.

In recognition of his work on the low-noise amplifiers crucial to the Band 3 project, Frank Jiang was presented an NRC Outstanding Achievement Award in January by Dr. Coulombe, President of NRC.

For more information on the ALMA Band 3 Receiver Project contact Keith Yeung (Project Manager, keith.yeung@nrc-cnrc.gc.ca), Stephane Claude (Project Engineer, stephane.claude@nrc-cnrc.gc.ca), or Doug Johnstone (Project Scientist, doug.johnstone@nrc-cnrc.gc.ca).

3.2 Software

Software development work in Canada continues at HIA and the University of Calgary. Faced with a large body of Glish-base documentation for the image analysis module that must be rewritten for the casapy framework, Raymond Rusk spent some time considering the best way to change and to maintain the documentation in the future. Since the framework is still undergoing rapid changes, inclusion of "live" Python example code in the documentation seems a sensible solution. This code can be automatically extracted for periodic testing. With "live" Python examples illustrating the functionality of the image analysis and coordinate system tools, when underlying C++ code changes make an example obsolete this is soon revealed through periodic exercising of the live examples. Work on the examples has gone hand-in-hand with extensive modifications to the image analysis component to increase robustness. Many of the old Glish-based test scripts still need to be translated to Python. Raymond will continue to work on this over the next few months.

Shannon Jaeger continued work on the MSPlot tool and its higher level plotxy/flagxy interfaces to CASA. Several new plot options have been added, improving the functionality of the tool. In mid-February, she spent time in Socorro working closely with Urvashi Rao Venkata, Kumar Golap and Sanjay Bhatnagar. Later this month, Shannon and Urvashi will debut re-factored TablePlot and MSPlot tools.

Arne Grimstrup has been in Garching, Germany since early January 2007 working with the ALMA Common Software (ACS) group. He will return to Calgary in mid-March to continue his

ACS work from there.

Chris Wilson wilson@physics.mcmaster.ca

Canadian ALMA Project Scientist

(with input from Jim Hesser, Doug Johnstone, Lewis Knee, and Raymond Rusk)

File translated from TEX by TTH, version 3.40.

On 22 Mar 2007, 07:50.

Milestones at NRC's HIA (2007 Jan.- March)

edited by:

Dr. Jacques P. Vallée

NRC is bestowing an Outstanding Achievement Award to **Nianhua (Frank) Jiang** for his work on low noise amplifiers for the ALMA Band 3 receiver. This work has attracted an industry partner, Nanowave Technologies [**NW**] in Toronto, who has licensed the technology. NW delivered 43 prototyping units to HIA in 2006, and 15 more before April 2007, and will deliver 145 in March 2008, and 140 more in March 2009.

On February 20 and 21, the NRC HIA Advisory Board visited Victoria for its annual meeting and deliberations. Chaired by **Ernie Seaquist** (U. Toronto), the focus this year was on progress towards accomplishing the LRP projects, and the way forward to realize the goals of the Mid-term LRP Review.

HIA thanked Marten van Kerkwijk (U.Toronto) & Sara Ellison (U. Victoria) who ended their terms on the **Canadian Time Allocation Committee** for Gemini & CFHT, and welcomed there Michael Balogh (U.Waterloo) & Dae-Sik Moon (U.Toronto).

HIA thanked Henry Matthews (HIA Penticton) who ended his term on the **Canadian Time Allocation Group** for JCMT, and welcomed there Tracy Webb (McGill - Montréal).

In January, **David Loop** became Group Leader of the Astronomy Technology Research Group in Victoria. David joined the ATRG-V in 2004 as a Systems Engineer. He replaces **David Crampton**, who will remain within the ATRG-Victoria as an "éminence grise".

In January, **Keith Young** had accumulated 30 years of service for the federal government, **Kathy Gibbard** reached 15 years of service, while **Tim Hardy & Ian McCrae** attained 10 years of service.

In the year 2006, the HIA CADC [**Canadian Astronomy Data Centre**] delivered a total of 51 TeraBytes of data to 4000 registered users, giving a mean rate of 1.6 MegaBytes/second [**1.6 MBps**]. Current outgoing peak limit is 12 MBps. Also, the JCMT Archive at the CADC has been rebuilt to accommodate new receiver data [ACSIS & SCUBA2]. CADC issued in February its first world-wide release of the CFHT LS/Terapix images and catalogues.

CANARIE (a research internet network) provided NRC with resources for a new optical network, to tap into CANARIE's own network. NRC HIA in Victoria will become a "Western Canada Gateway" working at 1250 MegaBytes/second [**1250 MBps**]. Current incoming peak limit is 125 MBps. Telescope data will thus be able to reach HIA much faster.

"Out of order", a galactic classification review by **Sidney van den Bergh**, was published by the prestigious journal Nature on 18 January.

Du neuf à l'IHA du CNRC (jan. - mars 2007)

édité par:

Dr. Jacques P. Vallée

Le CNRC octroie le Prix d'Accomplissement par Excellence à **Nianhua (Frank) Jiang** pour son travail sur les amplificateurs avec faible bruit pour le récepteur Bande 3 d'ALMA. Ce travail a attiré un partenaire industriel, Nanowave Technologies [**NW**] de Toronto, qui a obtenu la license. NW a livré à l'IHA 43 unités prototypes en 2006, et 15 autres avant avril 2007, et en livrera 145 en mars 2008, et 140 autres en mars 2009.

Les 20 et 21 février, le Bureau consultatif de l'IHA du CNRC a visité Victoria pour sa rencontre annuelle et ses délibérations. Présidé par **Ernie Seaquist** (U. Toronto), le thème central de cette année était le progres vers l'accomplissement des projects du LRP, et le chemin à parcourir pour arriver aux buts de la Révision à moyen terme du LRP.

L'IHA remercie Marten van Kerkwijk (U.Toronto) & Sara Ellison (U. Victoria) qui ont fini leurs termes sur le **Comité Canadien d'Allocation de Temps** pour Gémini et TCFH, et y accueille Michael Balogh (U. Waterloo) & Dae-Sik Moon (U.Toronto).

L'IHA remercie Henry Matthews (HIA Penticton) qui a fini son terme sur le **Groupe Canadien d'Allocation de Temps** pour le TJCM, et y accueille Tracy Webb (McGill - Montréal).

En janvier, **David Loop** devint Chef du Groupe de recherche technologique en astronomie à Victoria. Il s'est joint à ce groupe en 2004 comme ingénieur de systèmes, et remplace **David Crampton** qui demeure au sein du groupe en tant qu'"éminence grise".

En janvier, **Keith Young** a souligné 30 ans de service pour le gouvernement fédéral, **Kathy Gibbard** a donné 15 ans de service, et **Tim Hardy & Ian McCrae** ont atteint 10 ans de service.

Durant l'annéee 2006, le CCDA [**Centre Canadien de Données Astronomiques**] du CNRC a livré 51 TeraBytes de données à 4000 utilisateurs enregistrés, soit une moyenne de 1.6 MegaBytes/seconde [**1.6 MBps**]. Notre limite actuelle d'envoi est de 12 MBps. Aussi, les Archives du TJCM au CADC furent rebaties pour inclure de nouveaux récepteurs [ACSIS & SCUBA2]. En février, le CCDA a annoncé partout dans le monde la disponibilité des images et catalogues du TCFH LS/ Terapix.

Un réseau de recherche internet, CANARIE, a mis au CNRC des ressources pour un nouveau réseau optique, pour nous relier. L'IHA du CNRC à Victoria deviendra la "Porte de l'Ouest Canadien" au rythme de 1250 MegaBytes/seconde [**1250 MBps**]. Notre limite actuelle de réception est de 125 MBps. Les données des télescopes vont pouvoir arriver plus vite à l'IHA.

"Hors d'ordre", une synthèse de classification des galaxies par **Sidney van den Bergh**, fut publiée dans le prestigieux journal Nature le 18 janvier.

News from the JCMT

Gary Davis, Director

The James Clerk Maxwell Telescope is in the midst of an extremely ambitious programme of development in which the entire instrument suite is being replaced in preparation for the JCMT Legacy Survey. I provided a comprehensive description of the development programme in the Autumn 2006 issue of Cassiopeia; in this article, I provide a brief update.

Earthquake!

One of the most exciting events at the JCMT during the last six months had nothing to do with astronomy: an earthquake of magnitude 6.7 occurred off the Kohala coast on the morning of 15th October 2006. Although residents of the Big Island are accustomed to frequent small earthquakes, this was the strongest in over two decades. Fortuitously, the JCMT was conducting inclinometry at the time: this is a well-established procedure by which we measure the profile of the antenna track by slowly rotating it over a few hours and recording the readings of three mercury-based tilt meters. The output from the sensors is shown in Figure 1, in which the main quake and the aftershock are both evident. Fortunately, the facility was undamaged and once exhaustive engineering checks were carried out, we were back on the sky the following night.

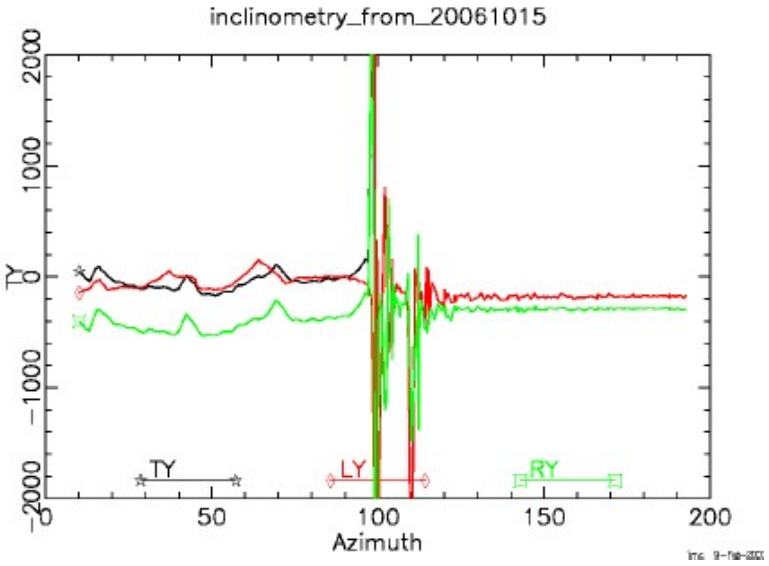


Figure 1. *Output from the inclinometers, used to measure the "tilt" of the telescope, before, during and after the earthquake. The main mag 6.7 quake was followed a few minutes later by a mag 4 aftershock.*

Heterodyne System: HARP/ACSIS

The new heterodyne system at the JCMT consists of HARP, a 4x4-pixel array receiver for the 345-GHz band, and ACSIS, a multichannel backend spectrometer. The HARP/ACSIS combination was made available to users during semester 06B on a shared-risk basis, and at the time of writing this article its commissioning is very nearly complete. HARP's diagnostic power as as the JCMT's first spectral imager (and the first in the world in the 345-GHz band) has been stunningly demonstrated. The image in Figure 2, for example, was obtained by the ACSIS team during their guaranteed time. The image shows ^{12}CO J=3-2 emission from the region in and around the well-known Rosette Nebula. The observations required about 20 hours of fast raster-scanning. The frame is 2.5º across and contains ~10^6 spatial pixels, making this the first megapixel image ever recorded in the submillimetre. (In fact, on each of four individual nights since December, the volume of raw HARP/ ACSIS data acquired exceeded the volume of all heterodyne data previously taken at the JCMT!) The complex structure of the region is evident; an optical image of the region denoted by the rectangle is shown for comparison in Figure 3.

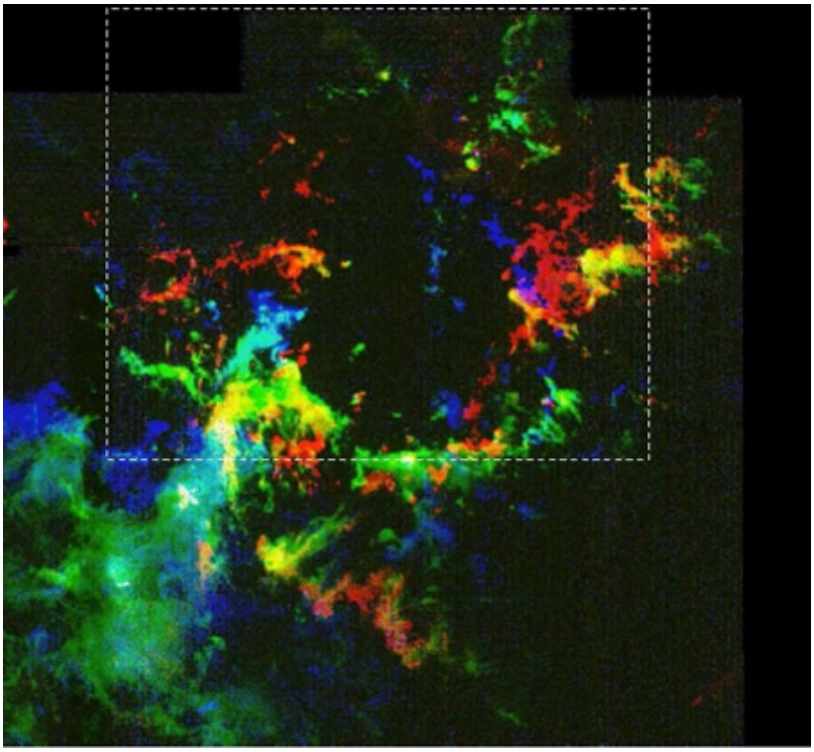


Figure 2. *^{12}CO J=3-2 emission toward the Rosette nebula. The image is ~2.5° across. Integrated emission across three locity ranges is displayed as blue (-3 to 11 km.s), green (11 to 15.7 km.s) and red (15.7 to 25 km.s). Courtesy of Bill Dent and the ACSIS team at DRAO.*

Figure 3. *Optical image of the region denoted by the dashed rectangle in Figure 2. Sharpless 2-275, courtesy of David Malin and the UK Schmidt telescope.*

Continuum System: SCUBA-2

The flagship of the development programme is, of course, SCUBA-2. This revolutionary continuum camera will map the submillimetre sky up to 1000 times faster than SCUBA at each of two wavelengths (450µm and 850µm), and is on course for delivery to Hawaii this summer. Two science-grade arrays (one at each wavelength) will be installed before the instrument is mounted on the telescope, and commissioning is expected to take until the end of 2007. There will then be a period of observations with the reduced instrument before the remaining six arrays are installed in spring/summer 2008.

The JCMT Legacy Survey (JLS)

The JCMT Legacy Survey programmes are due to at last begin collecting their first photons using HARP in the summer months of 2007. This will be preceded by a Science Verification phase in April-May. Representatives of survey teams will visit Hilo to work with the observatory in establishing quality control procedures for their surveys. These procedures will then be embedded within the nightly pipeline so that survey managers can make quality assurance decisions on survey data following each night's observing. Several Canadian astronomers are closely involved with these preparatory activities.

The JCMT Science Archive

The advent of new instruments with extremely high data rates, and the prospect of numerous surveys lasting several years, led to the initiation of the JCMT Science Archive project, a collaboration between the observatory and the Canadian Astronomical Data Centre (CADC). The first phase of the project, in which raw ACSIS data cubes will be delivered to observers via the CADC, was recently completed. This was a major milestone involving a huge amount of work at both sites. The second and final phase will enable the generation and delivery of reduced cubes

and advanced data products (catalogues, maps, etc). Reduced cubes are already being generated and requirements for the advanced data products are being captured with the advice and guidance of the JCMT Data Users Group, comprised of representatives from the legacy survey teams.

Subarcsecond Astronomy

Our ongoing work to develop an interferometric capability at 345 GHz, in collaboration with the Submillimeter Array and the Caltech Submillimeter Observatory and called the eSMA, continues to make good progress. The conversion of RxW for dual-polarisation use in B and D bands is now complete and the instrument is being re-commissioned as I write. We anticipate issuing a Call for Proposals this summer for a pilot programme and in order to prepare the community for this opportunity, a very successful workshop was convened in Leiden in February. Participants were invited to develop science cases for using the eSMA across a range of areas, from high-z galaxies to local debris discs.

The Future

Finally, the agreement between the three agencies which provide operational funding for the JCMT (including NRC for Canada) has a break point in 2009. Following the highly-successful review of the observatory in 2005 by a panel chaired by Martin Harwit, and in order to fully exploit the investments which have been made in SCUBA-2 and the other instruments, all three agencies have indicated their wish to continue operating the JCMT until (at least) 2012. A formal agreement to this effect is currently under discussion between the agencies and it is hoped that a final announcement on this issue can be made within the next few months.

Gary Davis
Director JAC (JCMT & UKIRT)
Professor of Physics and Engineering Physics, University of Saskatchewan (on leave)
g.davis "at" jach.hawaii.edu

Reports

Canadian TAG for James Clerk Maxwell Telescope - Summary for Semester 2007a

GAT Canadien du Telescope James Clerk Maxwell - Sommaire du semestre 2007a

Canadian TAG for James Clerk Maxwell Telescope - Summary for Semester 2007a

GAT Canadien du Telescope James Clerk Maxwell - Sommaire du semestre 2007a

Submission and refereeing

Proposals requesting telescope time were uploaded to the NorthStar web site at http://proposal.astron.nl Proposals retrieved by the Canadian Time Allocation Group [CTAG] were each sent to two external referees. As usual, there was a high percentage (83 %) of responses from referees (only 1 reminder was issued).

Soumission et arbitrage

Les demandes de temps sont envoyées au site web de NorthStar http://proposal.astron.nl Les demandes récupérées par le Groupe d'Allocation de Temps Canadien (GATC) pour le Télescope James Clerk Maxwell (TJCM) furent envoyées chacune à deux arbitres externes et, comme d'habitude, environ 83 % des arbitres ont répondu (1 rappel seulement).

Statistics & oversubscription

The total amount of Canadian time requested (16h for CANSERV, 53h for student-protected payback, and 914h for 23 new proposals), greatly exceeded the 252h available, resulting in a Canadian oversubscription of **3.90**, demonstrating a continuing strong interest by the radio astronomy community.

Statistiques & sursouscription

Le temps canadien total demandé (16h pour CANSERV, 53h pour repaiement pour protection d'étudiant, et 914h pour 23 nouvelles demandes), surpasse les 252h disponibles, donnant un taux de sursouscription de **3.90**, ce qui démontre un grand intérêt constant par la communauté radioastronomique.

CTAG meeting

The voting members of CTAG are:

Réunion du GATC

Les membres votants du GATC sont:

Fiege, Jason (Univ. Manitoba, Winnipeg)
Hall, Pat (York Univ., Toronto)
Houde, Martin (Univ. Waterloo)
Matthews, Henry (NRC HIA, Penticton), Chair/Président
Redman, Russell (NRC HIA, Victoria)

The NRC CTAG is ably assisted by **Jacques Vallée** for the technical secretarial duties, computer processing, communication linkage, interfaces with HIA and NorthStar, and the corporate memory.

Le GATC du CNRC reçoit l'aide compétente de **Jacques Vallée** pour le secrétariat technique, l'analyse computationnelle, les liaisons de communication, interfaces avec IHA et NorthStar, et la mémoire corporative.

On this occasion, the CTAG met in Victoria (NRC HIA) on 2007 January 13 to discuss proposals to use the JCMT. Taking into account

Le GATC s'est réuni à Victoria (IHA du CNRC) le 13 janvier 2007 pour évaluer les demandes de temps canadiennes. Le GATC a ordonné les demandes de

comments from referees, technical assessors, and the CTAG's own assessments, the proposals were ranked in order of merit and a provisional time allocation was made.

temps selon le mérite scientifique, tenant compte des commentaires des arbitres, des évaluateurs techniques, et de l'évaluation du GATC, et une distribution provisoire du temps a été faite.

CTAG Notes

1. CTAG reiterated that CANSERV is limited to 'urgent' proposals. The maximum time per proposal is 4h, and the 'urgency' aspect must be well justified.

2. CTAG notes that the CANSERV allotment is less this semester, owing to the late semester starting date (1 March).

Points d'intérêt du GATC

1. Le GATC réaffirme que CANSERV est restreint aux demandes 'urgentes'. Le temps maximum d'une demande est de 4h, et l'urgence doit être expliquée.

2. Le GATC note le temps restreint de CANSERV pour ce semestre, dû au début tardif de ce semestre (1 mars).

International TAC

ITAC members met by teleconference on January 29. The ITAC includes the Chairs of the Canadian, UK, and the Netherlands TAG's. It overseas the division of time between the partners and also assesses all "purely international proposals".

Allocations for successful proposals are posted on the JCMT Web pages in Hawaii. In all cases, further information is sent to the PI's in the form of feedback

CAT International

Les membres du CATI se sont rejoints via télécon le 29 janvier. Le CIAT est composé des présidents des TAGs du Canada, du RU, et des Pays-Bas. De plus, le CIAT divise le temps entre les partenaires et évalue les demandes 100% internationales.

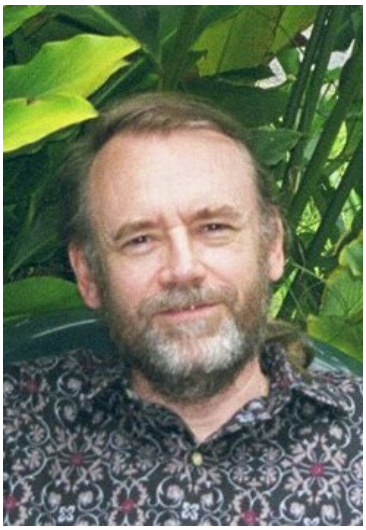
On peut voir sur la toile du TJCM à Hawaii la liste des demandes de temps fructueuses. Des informations plus détaillées sont envoyées par le GATC aux chercheurs principaux.

from the CTAG.

Dr. Henry Matthews
Chair, Canadian Time Allocation Group (CTAG) for JCMT

Dr. Matthews is at NRC HIA, where his research concentrates on the physics of the ISM.

henry.matthews@nrc-cnrc.gc.ca



Dr. Henry Matthews
Président, Groupe d'Allocation de Temps Canadien (GATC) pour le TJCM

Dr. Matthews est à l'IHA du CNRC, Ses recherches portent sur la physique du milieu interstellaire.

henry.matthews@nrc-cnrc.gc.ca

Briefly Noted

Ellesmere Island Site Testing 2007

As reported in the Autumnal Equinox edition of Cassiopeia, the high Arctic has conditions that may be as good as – if not better than – the Antarctic for world class astronomy. Based on this expectation, site testing equipment was placed at two locations on Ellesmere Island last summer in order to provide quantitative measurements of the skies and weather during the winter months.

The program to continue this site testing has recently been approved for logistical support by the Polar Continental Shelf Program of Natural Resources Canada. PCSP will provide a base camp, tents and transport from Resolute to our sites on Western Ellesmere Island. The site testing this year is collaboration between Carlberg (University of Toronto), Steinbring & Fahlman (NRC-HIA), Bruce Cole (Environment Canada) and Brad Wallace (Defence Research and Development Canada). The preliminary evaluation system consists of weather equipment and a sky camera at each of two sites. The data is being fed into flash memory and was to be transferred south via satellite modem; the system itself is powered by a small wind turbine. Unfortunately, the modem-computer communication failed after about a week but the data in flash memory is expected to be intact. This summer the plan is to recover the data in flash memory and install a 3rd "TMT style" all sky camera on a higher peak, with preliminary results to be published this fall. And, the satellite modem system is going to be made a lot more robust.

We are hopeful that these initial results will confirm the promising astronomical properties of the sites, and are planning to return in 2008 with a campaign to measure astronomical seeing and (possibly) the mid-IR sky brightness and transparency. Discussions with a US based group, interested in operating a small transit telescope for photometric monitoring of stars for variability and planet detection, are underway. There is definitely room for more activity and student participation, however at the present time we have no support other than our internal funds for this program. We certainly look forward to reporting in the fall on our results!

40 Years of Pulsars: Millisecond Pulsars, Magnetars and More

Aug 12-17, 2007 McGill University, Montreal Canada
www.ns2007.org

This conference is to celebrate the anniversary of the discovery of radio pulsars in the summer of 1967. We will highlight the important discoveries of the last 40 years and address the most interesting and topical areas of neutron star astrophysics today.

Keynote speakers:

- Anthony Hewish (Cambridge) and Joseph Taylor (Princeton)

Public lecture

- Jocelyn Bell Burnell (Oxford), evening of August 14th

Scientific topics:

- pulsar searches and timing; accretion and recycling
- millisecond pulsars in the field and in globular clusters
- young neutron stars, including magnetars, traditional Crab-like pulsars, and isolated neutron stars
- glitches, precession, and nulling
- binary pulsars, including

the double pulsar
- constraints on mass, radius, and the equation of state
- new and future instrumentation.

Abstract submission May 1st
Early registration deadline June 15th
Accommodation deadlines June 30th - July 12th

In The Classroom

Education Notes by Heather R. (Scott) Theijsmeijer

Rewarding Students in the Classroom by Heather R. (Scott) Theijsmeijer

News from Canada's Planetariums by Pierre Chastenay, Alan Dyer, Erik Koelemeyer, Scott Young

News from Canada’s Planetariums

By Pierre Chastenay[1], Alan Dyer[2], Erik Koelemeyer[3], Scott Young[4]

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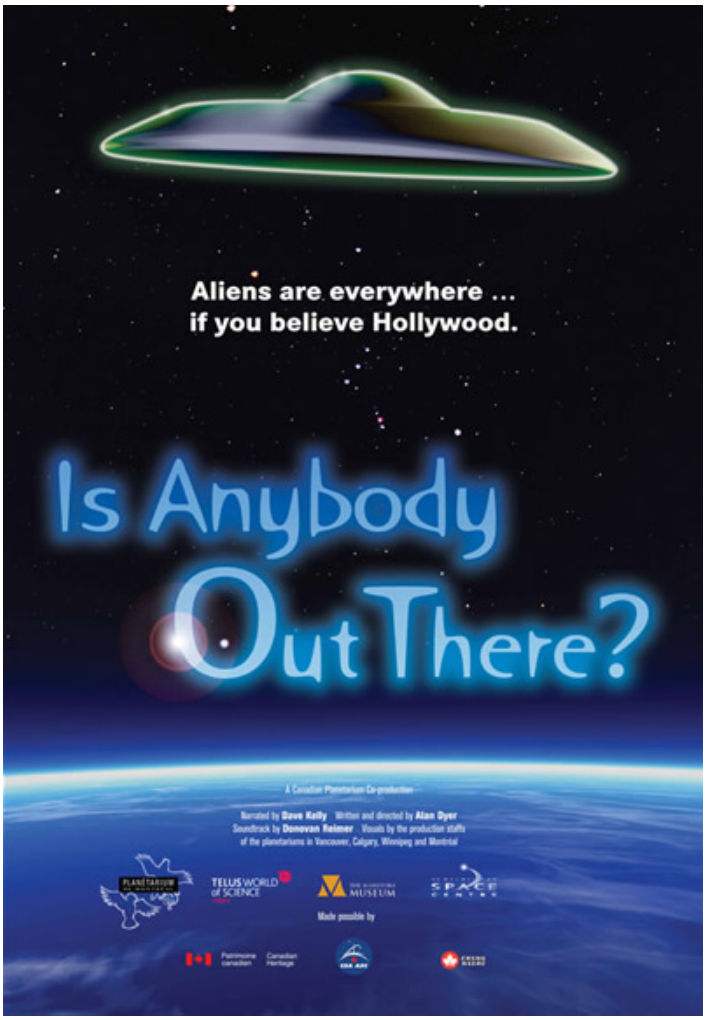
4 Manitoba Planetarium (contact: scyoung@manitobamuseum.ca)

In 2004 a group of four planetariums in Canada came together to co-produce a major astronomy show that played across the nation. In our first national show, *The Quest For Origins*, we focused on leading-edge Canadian research about the origin of stars, galaxies and the universe, taking CASCA’s Long Range Plan as the basis for much of the content.



In 2006, four Canadian planetariums worked together to jointly produce a major show about life on other worlds. The show answered the question so often asked of all astronomers, “Do you believe in life in outer space?”

After the success of the first show, we came together to create a second joint venture, this time a show about the perennially popular topic of alien life. The production process began in June 2005, with a face-to-face meeting in Montréal among the partner facilities: the Montréal Planétarium, the Planetarium at the Museum of Man in Winnipeg, the TELUS World of Science in Calgary, and the H.R. MacMillan Space Centre in Vancouver. The final show*, Is Anybody Out There?*, opened at all four theatres less than a year later, simultaneously on May 20, 2006, on time and on budget.

Art All-Sky Collage

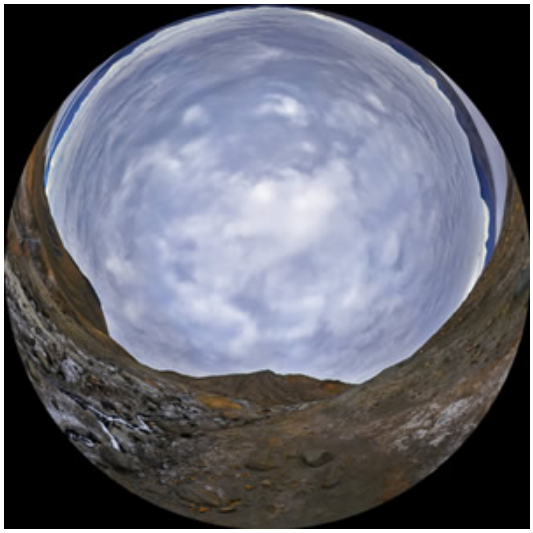
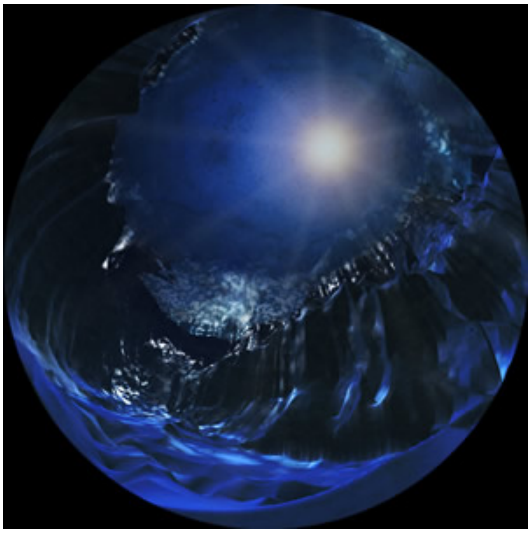


Photo All-Sky Arctic



Computer Generated All-Sky Europa

Dome-filling images anchored most of the scenes in the show. Some were image collages for use with video and other effects. Others were real-life scenes shot on location , such as the perpetual springs on Axel Heiberg Island in the high Arctic, an analog for what might be found on Mars. Computer-generated landscapes provided the backdrop for scenes such as under the ice on Europa and other alien worlds.

Leveraging Money

We created our consortium first and foremost because it offered a way to get more money to produce shows. For our latest project, the production budget was $310,000, up considerably from our first consortium show. While small by most standards for a documentary production, that figure is still ten to twenty times the normal budget of a show produced by any our partner facilities on their own. So by pooling the resources of four theatres we increased our production budget by a factor of ten.

Of the $310,000, about half was covered by grants, while the remainder was brought forward as in-kind contributions from the four partners (essentially, salaries of the many people involved in this project) and a few external consultants (mostly scientists and educational consultants). Outside funding came from federal government agencies: the Museum Assistance Program of Heritage Canada, the Canadian Space Agency, and the National Science and Engineering Research Council.

While we were still required to contribute a lot of our own staff labour, the grant funds made it possible for us to extend the show's production values beyond what any of us could afford on our own. For example, we were able to conduct extensive location shooting, including on-camera interviews with experts ranging from SETI researchers to scientists working on extremophile life in Arctic Canada.

The other reality for us in Canada is that one institution alone probably would not have been able to secure federal grants. Leveraging those funds was possible only because we were applying for them as a group, for a program that would play both in English and French across Canada. We've found that when planetariums speak as a group they are loud enough for governments and other funding agencies to hear.

Distributed Production

The writing of grant proposals was undertaken by the Montréal Planétarium in 2004. After funding was approved early in 2005, we divided the production tasks along the lines of each facility's area of expertise. Writing the script and directing the show production was done by Alan Dyer from Calgary. Principle photography and preparation of panorama scenes was assigned to the Manitoba Planetarium and their expert photographer Hans Thater. Financial management and the many tasks related to the French version of the show were the specialty of Pierre Lacombe and Pierre Chastenay of the Montréal Planétarium, while in Vancouver Erik Koelemeyer concentrated on the 3D animation work. Staff at each facility (the credit roll lasts several minutes!) took on additional work preparing materials shared by all facilities: location video shoots, graphic artwork, computer-generated alien landscapes, marketing materials, the final edited video, as well as performing all the local installation tasks.

The show's hosts were shot against black in TV studios. The English host, Dave Kelly, was shot in Calgary, while the French host, Patrick Masbourian, was shot later in Montréal. Each followed the same storyboarding so they would both fit into identical scenes. The hosts were composited with friendly ETs for this "dancing with aliens" scene and other sequences that had the hosts interact with computer-generated characters. All the composites and effects had to be done twice, for the English and French versions.

To qualify for national funding, our shows have to be produced in both French and English, which for a multimedia production poses some unique challenges. For *Is Anybody Out There?* we decided to go with a host who appears on camera, usually amid some alien setting. We wanted a host with a hip, MTV-style of delivery, to create a casual "blue-jeans-and-T-shirt" feel to the show that did not take itself too seriously, yet did not skimp on the science. For the on-screen talent we sought out personalities from pop culture, from youth-oriented TV programs, not scientists.

But we feared the headaches that shooting two different hosts, in two different languages, at two different locations would entail when we tried to sync them up in soundtracks that for technical reasons should ideally have identical timing. Well, it worked. The success was largely due to Montréal's hard work producing a tightly edited and reworded French translation of the script. As a result, the French host's on- and off-camera narration synced up remarkably well to the previously recorded English host.

Scientists and Songs

In *Quest for Origins* we put four astronomers on video in scripted cameo appearances, each introducing a segment of the show. With *Is Anybody Out There?* we raised the bar a few notches, and shot nearly two dozen astrobiology experts on video, sometimes in a studio but often by going to them and shooting them against a portable green screen in their offices or labs.

The interviews were conducted by Alan Dyer and Vancouver's video crew at such locations as the SETI Institute in Mountain View, California, the University of Washington in Seattle (for Peter Ward and the Rare Earth hypothesis), the University of Victoria, the Herzberg Institute, and in Vancouver with researchers from the University of British Columbia and Simon Fraser University. French interviews where arranged by the Montréal Planétarium and conducted in Montréal with scientists from the Canadian Space Agency, the Université de Montréal and McGill University.

The hours of videotape were edited down to several quick-cut interview montages that punctuate the show, with each expert adding just a choice "sound bite" phrase or comment, sometimes just a word. We wanted to include real people in the show, to have them present the diversity of opinions, pro and con, about the prospects for alien life. Yet we wanted to avoid dull "talking heads." We think the final mix did that, adding energy and pace to the show, as well as putting a face on the science, balancing fact and fiction, evidence and opinion.

Soundtrack production was contracted to Canadian composer Donovan Reimer. In addition to original compositions for the show, Donovan tracked down the rights to "alien theme" pop music from the past few decades. The soundtrack made use of clips from such classics as Sheb Wooley's *The Purple People Eater*, The B-52's *Planet Claire*, Tommy James' *I Think We're Alone Now*, and the Moody Blues' *I Know You're Out There Somewhere*. This was the first time we employed a soundtrack made largely of "needle-drop" music, as this was the first time we had the budget to pay for it. The result was a soundtrack that has become an attraction on its own, generating lots of positive comments from the audience. People liked hearing music they knew.

The potentially technical and jargon-laden subject of extremophile life was dealt with by creating cartoons of lovable extreme-loving cellular creatures, like this acidophile who also happens to speak French.

What Did We Learn?

If we were to do it all again for a show as complex as *Is Anybody Out There?*, we would want to employ additional staff or contracted expertise to handle more of the production research and co-ordination. Even so, we feel by pooling the in-house resources we already have we can carry off a show production of excellent quality for much less than the cost of hiring an outside production company to do it all. Unlike institutional IMAX theatres, who have no production expertise on staff, and have to pay high prices for independent film companies to produce suitable shows, planetariums are populated with skilled and talented production staff.

In our case, a consortium worked because each of our four facilities had, over the years, independently developed expertise in a key area of show production. This was done without any form of coordination, almost by chance. But the result was an almost perfect blend of skills among the four facilities. Working well together will become increasingly important as more planetariums look for high-quality productions for the emerging medium of immersive video that fills an entire dome with a high-resolution video image capable of all forms of science visualization.

A production consortium is a practical and affordable method for the creation of content for all planetariums, but especially new digital theatres,

with their need for many animators and new media artists. In the end we like the dynamics and trust we've established among our planetarium facilities after two productions. We hope the experience will allow us to extend our consortium to larger projects as all our theatres look toward major upgrades from the 1980's technologies many of us still work with to 21st century planetariums fitted with immersive video projection.

All images courtesy Canadian Planetarium Consortium © 2006.

Rewarding Students in the Classroom

In the latest issue of the Astronomy Education Review (http://aer.noao.edu/), Patrick Len of Cuesta College discusses the results of different reward structures used in introductory astronomy classes, particularly when the reward systems were used in conjunction with electronic response systems ("clickers"). His results were then used to highlight the difference between collaborators (those who prefer working in groups) and self-testers (those who prefer working independently), and their change in attitudes throughout the course. An undertone of his article, however, brings to light an important issue in any classroom: whether reward structures can indeed motivate students to perform better on assessments.

How wonderful would it be if all students could be satisfied simply with the reward gaining knowledge? These students are often a pleasure to teach – they are engaged in discussion in class and offer thoughtful responses on tests and assignments. They are students who are *intrinsically motivated* – they learn for the sake of learning and a greater understanding of astronomy is their reward.

Unfortunately, in an introductory astronomy course, these students are not in the majority! Most students are there because they "need the credit." These students are *extrinsically motivated* – there is something outside the realm of the course motivating them to do the work. It could be the credit itself, needed to graduate, or perhaps they need a science course to maintain a scholarship (in that case, the motivator is money).

How then, does a teacher or professor go about motivating his or her students, each of whom could have a different intrinsic or extrinsic motivator themselves? Being able to motivate your class can lead to an improvement in attitude in the course, as well as a learned fondness for the material itself – and this is especially pertinent in a course such as introductory astronomy, where many students have almost no background in the subject!

In younger grades, physical motivators work well – candy, money or toys may be made available for students who do well. I don't recommend this at the college or university level (although who knows, tossing a piece of candy to students who participate in a lecture might encourage others to do so!). Personally, I find that even my highest-level students love receiving stickers on returned work when they do well.

On a less tangible level, instructors can motivate by rewarding learner participation through well-timed "positives" – not praise, per se, but encouraging words to lead the student to continue participation and improvement. There are a number of ways of doing this:

- **Non-verbal Positives**: The easiest “praise” to give, is given without even saying anything! Examples include: smiling, giving the “OK” hand gesture, giving the thumbs up, whistling, or giving any gesture indicating excitement and success.
- **Self-talk Positives**: Include your personal feelings or experience in the topic at hand. Examples include “This used to really stump me,” “I love when the pieces all fit together like this,” or “I have always wondered about this.”
- **Narrative Positives**: Describe the actions taken by the student as he/she completes them. This reinforces their participation and encourages them to continue. These statements always begin with “you,” as the instructor is narrating to the student. Examples include: “You are curious as to what might happen next,” or “You are trying to follow this line of reasoning.”
- **Reward Statements**: Reward statements highlight feelings of self-worth (and hence, motivation) in a positive way. Examples such as “Creative solution,” “You did it!” and “That was tricky,” promote intrinsic motivation on behalf of the students.
- **Avoid Praise**: It seems to go completely against common sense, but praise is an expression of judgment, and is not as successful in motivating students as the methods above. Instead of encouraging independent thinking, it encourages approval seeking. Well-meaning statements such as “That’s a nice lab,” or even “Good idea,” impart a judgment – it’s subtle (and a hard habit to break), but can have very different effects on your students over long periods of time.

A great many students seek the reward that comes from praise and acceptance from those superior to them (teachers, professors, parents, older siblings, etc.), and as instructors, it is often very easy to give. However by tweaking your method of motivating your class, more students will learn to become self-motivated, and enjoy the process of learning astronomy.

Education Notes

Upcoming Conferences and Workshops

Cosmos in the Classroom 2007 is a national symposium on teaching astronomy for non-science majors, sponsored by the Astronomical Society of the Pacific and Pomona College. This three-day, hands-on meeting will address everything from tips on teaching introductory astronomy to methods of fostering communication among instructors and ways to address the needs of under-served audiences. They are also currently accepting abstract submissions for posters and workshops.	Program dates: August 2 – August 5, 2007 Location: Pomona College, near Los Angeles For more information, visit http://www.astrosociety.org/events/cosmos.html .
The Banff Centre presents a two-week Science Communications program, aimed at both scientists and communicators who are interested in "exploring new ways of telling science stories." Chaired by Jay Ingram, the program will explore science communication in print, visual and interactive media, as well as other communication formats through daily seminars and workshops.	Program dates: August 13 – August 25, 2007 Application deadline: April 13, 2007 Location: Banff, Alberta For more information, visit http://www.banffcentre.ca/programs/program.aspx?id=597 .

Upcoming CASCA-Westar Lectureships

There are several upcoming CASCA-Westar Lectureships to take note of. Doug Johnstone will be discussing Canada's role in telescope projects to college astronomy students March 29 as part of a CWL at Selkirk College in Castlegar, British Columbia, as well as presenting a public talk entitled "A Star Is Born! Shining Light on the Nebulous Past of a Celestial Miracle" that same evening.

The Saskatchewan Summer Star Party will also be hosting a CWL astronomer mid-August, to speak as their Fr. Lucien Kemble Memorial Lecture keynote speaker. The star party attracts nearly 300 amateur astronomers from western Canada and the northern United States. Also, a CWL astronomer will be taking part in the University of Lethbridge's upcoming "Night Sky over Lethbridge" event.

Sound like fun? We are still looking for more astronomers to be added to the list of potential CWL speakers. An average CWL visit will normally last about two days, and involve 2-3 presentations in the local area. For example, in addition to the main public evening lecture, there might be a presentation to students at a community college, another to a high school, etc. The goal is to maximize the benefit of the CWL to the host community. Please contact Heather Theijsmeijer (theijsh@rainbowschools.ca) for more information or to add your name to the list.