Annual Report of the Ground-Based Astronomy Committee (GAC): May 2013

MEMBERSHIP:

During the 2012 - 2013 year the GAC commitee members were:

Tim Davidge (2009-2013; Chair) National Research Council, Pauline Barmby (2012-15) University of Western Ontario, John Hutchings (2009-13) National Research Council, Roland Kothes (2009-13) National Research Council, Laura Parker (2012-15) McMaster University, Kristine Spekkens (2011-14) Royal Military College, Kenneth Tapping National Research Council, continuing member, spectrum management, Kim Venn (2009-13) University of Victoria, Ludo van Waerbeke (2011-14) University of British Columbia

Davidge, Hutchings, Kothes, and Venn are slated to end their terms this year, and a new chair will be named.

DISCUSSIONS:

During the past year, the committee discussed and made recommendations on the following issues:

1) The future of the JCMT 2) Gemini governance, and the future role of Canada in the Gemini partnership 3) Guidelines for the future useage of the CFHT 4) The scientific priority of the ngCFHT

Statements made by the GAC on these issues can be found on the CASCA website.

FACILITY REPORTS: EXISTING FACILITIES

ALMA (Report by James Di Francesco)

The Atacama Large Millimeter/submillimeter Array (ALMA) was formally inaugurated on March 13, 2013, and construction of the facility, will continue until the end of this year. The first round of ALMA observing (Cycle 0 - Early Science) was completed at the beginning of January. Canadians were involved as PIs or Co-Is in 13 projects that obtained Cycle 0 data. For the next round (Cycle 1 - Early Science), worldwide demand continued to be strong, with 1133 proposals submitted for the ~800 hours of available observing time, including 26 led by members of Canadian institutions. (Including co-Is, 55 unique individuals from 14 Canadian institutions were involved in ALMA Cycle 1 proposals.) Of the 196 Cycle 1 proposals selected by the Proposal Review Committee as 'high priority," six were led by Canadian PIs, a factor of 2 increase over Cycle 0, even though the number of proposals given such status increased by a factor of 1.75. Cycle 1 observing began in late January 2013, but progress has been delayed due to several technical issues, including on-site power generation stability. It is likely that Cycle 1 will be extended by ~3 months, so a greater number of Cycle 1 projects will be completed. The call and deadlines for Cycle 2 proposals will likely be pushed back by a similar amount, to September and December 2013 respectively.

CFHT (Report by John Hutchings)

CFHT proposal numbers and time subscription have remained high, and publications and impact are as high as on the Gemini telescopes. More nights have been available to Canadians, and proposal pressure has kept pace with that. CFHT remains a significant resource for our research.

The CFHT dome shutter failure in spring 2012 interrupted normal observatory operations from April to June. Efforts continue to achieve a long-term solution, including upgraded electronic drive motor controllers and a monitoring program to reduce the risk of further failures. The shutter problems delayed the dome venting project, but the first vent was successfully installed in April 2013; the remaining eleven are scheduled for installation in September.

Apart from some minor problems, the MegaCam, WIRCAM, and ESPaDons instruments have continued to operate well. In May 2012, four new Large Programs were awarded time for the 2013A-2016B semesters. Results from the Preliminary Design Review of the SPIROU project in October 2013 led the SAC to recommended that no further funding or other observatory resources be directed to this project. The Board accepted this recommendation. Development has continued on SITELLE, an imaging Fourier transform spectrometer, and there was a SITELLE workshop in Quebec in mid-May 2013 that was well attended by astronomers from a number of countries. The Final Release (T0007) of the CFHT Legacy Survey data occured in late 2012, wrapping up the observatory's formal involvement in this long and productive project.

Looking ahead, it is clear that the CFHT will lose its impact as more large telescopes and instruments come into use over the next decade. There have been two initiatives to deal with this: (1) short-term improvements and instrumentation, and (2) a major upgrade of the entire facility.

In January 2013, CFHT issued an Announcement of Opportunity for the development of "new capabilities" for the observatory. These could include modest-scale new instruments, upgrades to existing instruments, or other improvements to observatory operations, as long as they are "available to the CFHT community on an accelerated timescale" and within a budget of $3 million. Proposals are due in August 2013, and the announcement of the successful proposing teams will follow in October. The LRP assigned this activity a medium level of priority, with the statement that such improvements should have a commitment to at least 5 years of scientific use. In the current schedule and submissions, this would keep the telescope busy until at least 2020, and in some cases several years beyond that.

The major upgrade study to construct the next generation CFHT (ngCFHT) has been very active, and in the past year two large studies have been completed - on science cases and design considerations. Both are available on the CASCA website. These were submitted to SAC and the board late last year, and has been followed up in March 2013 by a workshop. The studies have converged on a 10m class telescope with a wide field multi-object spectrograph which will fit on the current site and pier, with little change in overall size. The work has involved scientists from a number of potential partner communities, and is recognized as a unique and compelling way forward, with recognized urgency to get under way quickly.

It has become clear that there is a conflict between the use of the short-term improvements, and the desired schedule to complete the ngCFHT. For example, it has been suggested that the CFHT could be used to conduct a large imaging survey that would serve as Canadian `buy in' for EUCLID. Such a survey would lock the useage of the CFHT for an extended period of time. Both this committee and the LRPIC have placed a major re-development of the telescope as a higher priority for CFHT. Statements from both committees are posted on the CASCA website. Discussion are on-going at the time of this report, and it is clear that the long-term viability of CFHT is receiving significant attention.

DAO (Report by David Bohlender)

The DAO telescopes continue to see interest from the community. During the calendar year 2012 there were 41 proposals requesting 474 nights for the 1.2-m telescope, with a corresponding subscription rate of 129%. There were 23 proposals requesting 311 nights for the 1.8-m telescope, which corresponds to a subscription rate of 88%. There were 21 refereed publications based in whole or in part on DAO data and 4 conference proceedings and circulars.

It is anticipated that automation of the 1.8 metre telescope will re-kindle interest in this facility, and efforts to automate the 1.8-m Plaskett Telescope using lessons learned from similar efforts for the 1.2-m telescope are underway. The the 1.8-m primary mirror will also be re-coated in the coming months.

Work continues on the DAO Spectroscopic Plate Archive, which now has almost 2000 digitized spectra available. Typically 80 new spectra are added each month. The content of the DAO Science Archive also continues to be enhanced with new and archival CCD data, although the latter files require substantial manual effort to retrofit FITS headers to the files. This archive now contains more than 175,000 datasets obtained from 2008 onwards.

DRAO (Report by Andrew Gray)

Synthesis Telescope: The ST continues to function well and is fully utilized for scientific observing. Fifty full synthesis fields were observed in 2012 for 11 projects, similar to previous years and representing productive utilization of 95% of available telescope time. The majority of targets continue to be Galactic, although a modest number are extragalactic, including supernova monitoring in M51.

26-meter Telescope: the 26MT returned to service in July 2012 after successful repairs to damage incurred the previous Feb. Some final calibration measurements were then made for GMIMS, and in Dec 2012 the dual-circular polarization focus box that GMIMS used was replaced with a new dual-linear polarization one designed for the extragalactic Zeeman splitting project that will dominate telescope time for the next 2 years. Extensive work has also been done in restoring the signal path electronics and digital spectrometer that was used for the CGPS so that they can be used for the Zeeman project. This system has since been used to acquire data to supplement ST observations and appears to be working well.

Solar Radio Flux Monitor: thrice-daily calibrated flux measurements of the Sun at 10.7cm wavelength continue to be produced with few and minor interruptions. These measurements form the well-known (and historically named) "Ottawa 10.7cm flux" and are distributed freely via the spaceweather.ca website, in a collaborative effort between NRC, NRCan, and CSA.

Position encoder and pointing model upgrades made to FM1 reported previously were very successful, and were extended to FM2 in 2012 with similar success. This has both improved reliability of the equipment and decreased scatter in measurements between the two flux monitors.

The commencement of operations of the Next-Generation Solar Flux Monitor (NGSFM) have been delayed, and is not now expected until 2014. The instrument will ultimately record fluxes at multiple wavelengths, and feed a spectrometer with high time resolution to allow unprecedented studies of solar activity.

Gemini (Report by Kim Venn)

For the 2013B semester, the requests for Gemini observing time increased, with oversubscription rates to CanTAC of 2.2 for G-N and 2.4 for G-S. While GMOS continues to dominate both the Canadian and partnership time requests (>50%), requests to use NIRI, Flamingos-2, and GEMS were also strong (>15%). Canadians also continue to request AO.

The Gemini Board of Directors and the Science and Technology Advisory Committee (STAC) increased in size due to the appointment of new US members, in keeping with the partnership shares after the withdrawl of the UK. Changes to the Canadian governance include Michael Balogh becoming the Chair of the Board, which is a non-voting position, and Bob Abraham joining the Board as the second Canadian representative. Craig Henke is the current Canadian representative on the Users Committee.

The following work has been done, or is being planned, for Gemini instruments:

GPI: GPI commissioning is the top priority in the coming semester. PI time will be available on GPI. Flamingos-2: F2 will have the imaging

and long slit mode available in 2013B. It is anticipated that the MOS mode will be made available in 2014. GEMS/GSAOI: GeMS/GSAOI had a highly succesful SV program early in 2013, and this instrument pairing is now being used for science programs. There remains only minor final commissioning testing to be completed. GMOS: The detectors on GMOS-S will be upgraded with Hamamatsu CCDs in 2013B. Planning is also underway to perform a similar detector upgrade to GMOS-N, probably in 2014. Altair: Plans are underway to upgrade ALTAIR, with the intent of increasing the delivered Strehl ratio and sky coverage. NIRI: NIRI will be re-furbished, and restored to its original operational state. This includes spectroscopy. This work will likely be done in 2014. Visiting instruments: Gemini has changed its policies for visitor instruments. In 2013 there will be two visiting instruments (TEXES, DSSC). These saw significant demand from the US community for 2013B.

There are two new developments of note. First, Gemini plans to make time available for large programs. The basic notion is to dedicate the time formerly used by the UK for large programs, and partners will have the option of opting out of large programs. The current plans are for large program proposals to be peer reviewed by the Gemini large program TAC (LPTAC), which will have representatives from all participating partners (currently Canada, Australia, Argentina, and the US). Potential investigators will be encouraged to collaborate across the participating partnership.

The second development is that starting in 2014, Gemini will institute a new program for technologocal development studies. These are intended for minor projects, such as instrument upgrades (<$500K) and small development projects ($50-$100K).

Finally, later this year it is planned that Gemini will start the process to plan for the next new instrument. Gemini will issue a Request for Proposals in October 2013 and subsequently contract with a number of teams (1-3 expected) to conduct funded feasibility studies that address the science case, design, and cost for different instrument designs.

JCMT (Report by James Di Francesco)

The James Clerk Maxwell Telescope (JCMT) continues to be Canada's workhorse for submillimetre observing. Canada's partnership in JCMT will end at the end of September 2014. In semesters 13A and 13B, 24 and 18 JCMT proposals were respectively submitted to the Canadian Time Allocation Committee (CanTAC) for review, with accompanying oversubscription rates of 2.6 and 3.8 respectively. 48 (13A) and 39 (13B) unique individuals were involved in JCMT proposals. These numbers relate to the 40% of time available for PI-led projects (of which 25%, i.e., 10% of the total, is available to Canadians). The remaining 60% of total time is devoted to observations for the ongoing six JCMT Legacy Surveys (JLS) which include large numbers of Canadians.

In November 2012, Doug Johnstone of NRC became the Associate Director of JCMT, and is involved (among other duties) in managing overall JLS progress. His January 2013 analysis which traced past survey progress suggests that SCUBA-2 observations of the six JCMT Legacy Surveys will not be completed by September 2014. He recommended that the JLS coordinators prioritize their observations accordingly, and this is a cause of concern among the JLS teams. Meanwhile, on-sky commissioning of POL-2 and FTS-2, the two Canadian-made instruments that provide polarization data and Fourier Transform spectroscopy from SCUBA-2 observations began and is continuing. There may be only one remaining call for proposals (an extended semester 14A, running February-September 2014) accessible to Canadians. A prospectus for new operations of JCMT, similar to one circulated for UKIRT in October 2013 and available on the Joint Astronomy Center website, will likely be released by the end of May 2013.

A report by an ad hoc panel led by Tracy Webb (McGill) on the current state and future of Canadian engagement in submillimetre and millimetre astronomy, including ALMA and JCMT, was released to the

CASCA membership in March 2013. Called "A Roadmap for Canadian Submillimetre Astronomy," the report made several recommendations for ground-based facilities, including continued Canadian engagement in JCMT beyond 2014 and future engagement in the Cerro Chajnantor Atacama Telescope (CCAT), a 25-m diameter submillimetre telescope situated ~600 m above the ALMA site. A present concern is how the Canadian community can leverage on its 25-year heritage in submillimetre astronomy, especially in the competitive ALMA era, with no direct access to a single-dish telescope after September 2014. How the recommendations made in the Roadmap can be accommodated within the 2010 Long Range Plan and the present economic and political environment remain unclear.

OMM (Report by Robert Lemontagne)

The Observatoire du Mont-MÃ©gantic (OMM) welcomes proposals from any professional members of the Canadian astronomical community. The OMM is available for classic observation programs using: an IR Spectro-imager (R ~ 40-1500), a wide-field IR camera (30 arcmin), a long slit optical spectrograph (R ~ 500-4000), a FTS optical spectro-imager and a low noise wide-field optical Fabry-Perot EMCCD imager.

The OMM IR wide-field camera is also available for queue mode observations. Short scientific programs that cannot justify a long observing run over many nights are accepted in queue-mode. Proposals are limited to a maximum of four (4) hours of total integration time for priority targets. Queue-mode observations are carried on by graduate students from UniversitÃ© de MontrÃ©al and UniversitÃ© Laval.

For the period covering April 2012 to March 2013, the observatory received forty-five (45) observing proposals, nine (9) of which were for queue-mode. The pressure factor was 1.3. Thirty-eight (38) nights, or 11% of the available nights, were scheduled for queue-mode observations. The remaining nights were either scheduled for classical observations (286), engineering (17) or public viewing (6 half-nights in July and August).

About 130 nights were clear or partially clear (at least 4 consecutive hours) and usefull for scientific observations.

Several upgrades are planned in the coming 6 months, and these include the installation of a tip-tilt f/8 secondary in June, a new wide-field optical camera (45 arcmin), the replacement of the current IR detectors with ASIC devices, and a new high-precision polarimeter in September-October.

FACILITY REPORTS: FUTURE/PROPOSED FACILITIES

CCAT (Report by Pauline Barmby and Mike Fich)

CCAT is moving ever closer to reality. The 25-meter submillimetre single-dish telescope will be located on a very high site in Chile. It was first proposed in 2007, was highly ranked in both Canadian and US long-term planning exercises, and is now nearing the end of its engineering design phase. This process will provide the final total cost of the project, and financial commitments will be required by January 2014. Canadian participation in CCAT is organized through an association of universities - the Canadian Atacama Telescope Constorium - led by M. Fich of the University of Waterloo. CCAT is currently exploring funding scenarios for the Canadian contribution to the project, a minimum of $21M (US) for a 15% share, with a goal of $35M for a 25% share. The science case for CCAT is available at www.ccatobservatory.org.

CHIME (Report by Gary Hinshaw)

The Canadian Hydrogen Intensity Mapping Experiment (CHIME) project broke ground this year on its Pathfinder telescope in the southeast quadrant of DRAO. The Pathfinder consists of two 20 m wide cylindrical telescopes, each 35 m long which will be outfitted with 256 dual polarization receivers operating in the 400 to 800 MHz band.

First light for the Pathfinder is expected in mid-2013. The Pathfinder is a test bed for the full CHIME facility, which will consist of 5 cylindrical telescopes covering an area of 100 m x 100 m, with 2560 receivers, in the southwest quadrant of DRAO. Both the Pathfinder and full CHIME will map the intensity of neutral hydrogen in the universe over half the sky between redshifts 0.8 and 2.5. These data will produce the largest-volume survey of the universe ever conducted. The sensitivity of the full CHIME telescope will allow it to characterize the baryon acoustic oscillation (BAO) scale and, in turn, measure the expansion history of the universe over the epoch when Dark Energy became the dominant constituent. The CHIME project is a collaboration between DRAO, UBC, U. Toronto, and McGill university, and is funded by the Canada Foundation for Innovation.

SKA (Report by K. Spekkens)

The SKA is a radio telescope that will have a collecting area of a square kilometre over a frequency range of 70 MHz - 10 GHz. Expected to be fully operational by 2024, it will provide 50 times more sensitivity and 10,000 times greater mapping speed than existing facilities. This will enable transformational science in five key areas: strong-field gravity via pulsars, cosmic magnetism, probing the dark ages, galaxy evolution, and the search for life in the Universe.

In the past 18 months, the SKA has moved into a pre-construction phase following the selection of the SKA sites and the release of detailed phase 1 (10% SKA) and phase 2 (full SKA) deployment plans. Canada is one of 11 voting member countries of the SKA Organisation (SKAO), which will fund and direct the pre-construction phase as well as develop the funding, legal and operations frameworks for phase 1. In the current project timeline, the SKA pre-construction phase will last until 2016, phase 1 science operations will begin in 2020, and full science operations will begin in 2024.

The SKA pre-construction phase (2013-2016) will evaluate a range of new technologies that enable the SKA design. The design work cost will be distributed among the SKAO member nations. A request for proposals for work package consortia to carry out design work was released in March 2013, with a proposal deadline of June 2013. NRC is contributing to proposal request responses in several areas, including correlator design, composite dishes, and focal plane array receivers. In addition, a Canadian team is leading the data delivery and tiered data distribution elements of an international work package consortium response for the Science Data Processor design. There has been significant progress towards forming a Canadian SKA Industry Consortium to facilitate industry participation in Canadian work package contributions: meetings held in February 2013 and April 2013 to finalize the legal framework for the consortium.

Phase 1 of the SKA (2016-2020) will expand upon the (fully funded) precursor instruments in Western Australia (ASKAP) and South Africa (MeerKAT) to a 10% SKA. The precursor instruments will be complete in 2014-2015, and will carry out a variety of scientific surveys. In SKA phase 1, 190 antennas will be added to MeerKAT to form a 254-element high-sensitivity array with cooled single-pixel feeds operating from 1-3 GHz, while ASKAP will be expanded from 36 to 96 antennas with uncooled phased-array feeds, providing large fields-of-view at frequencies from 0.7-1.8 GHz. A sparse aperture plane phased array operating from 70 - 450 MHz will also be sited in Western Australia. A Canadian SKA Science Advisory Committee will soon be established to allow the community to provide input on the scientific drivers for the phase 1 design.

In phase 2 of the SKA (2020-2024), the South African site will be developed into a 3000-antenna facility equipped with both focal plane arrays (to achieve a large field of view) and single pixel (to achieve high sensitivity) operating from 0.45 - 10 GHz. Phase 2 of the low-frequency array (70-450 MHz), comprising millions of dipole antennas, will be sited in Western Australia. Full science operations at both sites are expected by the middle of the next decade.

TMT (Report by T. Davidge)

The TMT is an international partnership to construct a thirty meter telescope optical/near-IR on Mauna Kea. In addition to Canada, the current participants are Japan, China, India, the University of California, and Cal Tech. The current plans are for construction to start in 2014-2015, and science operations to commence in 2022. Initially, there will be three science instruments: WFOS (Wide-Field Optical Spectrograph), IRMS (Infrared Multiobject Spectrograph), and IRIS (Infrared Imaging Spectrograph). There is a highly developed science case that can be found at www.tmt.org.

There have been two major developments in the past year. First, a major step forward for the construction of the TMT was the issuance of a building permit by the Hawaiian Board of Land and Natural Resources in April 2013. The next step is to seek final approval of construction plans from the State of Hawaii Department of Land and Natural Resources.

The second major development is that the TMT has entered into a cooperative agreement with the NSF to explore a partnership to build a large optical/NIR telescope. While it should be emphasized that the NSF is not a partner in the TMT consortium, the agreement is viewed as a highly positive step that signals formal interest by the NSF to join the project. The NSF will have members on the TMT Science Advisory Committee and the Board of Directors. The involvement of the NSF at this stage will likely also be beneficial when proposals by existing participants are reviewed by their funding bodies.

A key part of the TMT-NSF agreement is the hosting of science workshops to generate interest in the US community, and spur collaborations between astronomers in the various communities. The first such event will be held in Waikaloa HI in July of this year. This event will also be the venue for the meeting of science working groups, which will continue to provide input for the facility science case. Canadian astronomers are encouraged to get more information on this meeting at the TMT web site.