The Canada-France-Hawaii Telescope Corporation operates the CFHT 3.6 m telescope near the summit of the 4200 m dormant volcano Mauna Kea on the Big Island of Hawaii, USA. Support is provided by the National Research Council Canada, the Centre National de la Recherche Scientifique of France, and the University of Hawaii according to the agreement signed June 1974. CFHT is dedicated to the exploration of the Universe through observation.
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Introduction

2005-2010: CFHT’s Golden Age… Year 1!

At the end of my Introduction to the 2004 Annual Report, I briefly introduced “2005-2010: CFHT’s Golden Age”, a plan submitted to, and endorsed by, the CFHT Board of Directors in December 2004: a plan exciting enough that the staff, the Agencies, potential other funding partners or new customers would be ready to devote time, energy or funds to maintain CFHT at the forefront of astronomy up to the early years of the next decade. Focusing on the excellence of the services rendered to the community, on the efficiency of the Observatory and on leading-edge instrumental developments, this plan is intended to allow the CFHT Corporation to work at its best for the last six years of the decade and be ready for the era beyond 2010. 2005, the first year of this plan, gave the Observatory the opportunity to better define its goals for up to the end of 2010 and to develop the metrics it would use to measure the quality of its work and assess its success.

The first and likely most challenging goal is to gradually decrease the amount of observing time lost to technical problems, which range from a simple glitch to a major failure of the telescope or the instrumentation. The ultimate long-term goal is to lose less than 2% of the clear weather observing time to problems by 2010. With only 4.88% of clear observing time lost to problems, CFHT reached its 2005 goal of less than 5% (see p.7 for more details).

The oversubscription on the observing time offered to CFHT’s main communities, often called “pressure”, is a good indicator of the relevance of the Observatory and of its instrumentation. The goal of the Golden Age plan is to have this pressure stay above 2, a value considered as a healthy minimum by most observatories around the world. For the two semesters of 2005, a Canadian and French averaged pressure larger than 3 clearly demonstrated the importance of the Observatory for these two communities, as seen on the graph on the right.

The number of refereed publications is also a good indicator of the relevance of the data gathered by the telescope. Here again, a goal has been set for the duration of the plan: at least 50 publications per year in refereed journals significantly based on CFHT data. The graph on the left shows this number fluctuating over the past years. With the CFHT Legacy Survey and PI programs now ramping up on MegaCam, and new exciting programs being undertaken on ESPaDOnS, the observatory should be able to maintain a scientific yield considered as high for a relatively modest aperture telescope.
The Golden Age plan calls for various current projects to be completed and new ones to be undertaken. The graph below highlights the main objectives of this plan. On the operation side, three instruments will have to be maintained and hopefully upgraded to increase the overall observing efficiency of the observatory. WIRCam is indeed operational at the end of 2005, though still to be fine-tuned and its on-sky efficiency to be improved. The reliability of MegaPrime has significantly improved, with more still to be done. ESPaDOnS’s first year of operation was very productive, to the delights of many eager PIs. On the instrumentation side, Fly-Eyes, an on-sky test of novel detectors for wave-front sensing on PUEO, CFHT’s adaptive optics, was resurrected at the end of 2005, once the workload of the WIRCam project lessened. The completion of these tests should happen in 2006. The Golden Age plan also calls for a new instrumentation development. By the end of 2005, the feasibility study of VASAO, “Visible All-Sky Adaptive Optics”, was initiated. If indeed feasible, VASAO could offer CFHT the ability to image a small field at the limit of diffraction in the visible without any natural guide star around, even for the tip-tilt correction. Measuring the seeing inside and outside the dome has been in the books for a long time, and work started in mid-2005 on the “DIMM” project, with the installation of a dedicated small telescope in the dome. This project should be completed by mid-2007.

Beyond 2005, two areas will trigger heavy in-house developments:
- The first one is related to ESPaDOnS, which should be offered in QSO mode some time in 2007. Many of the scientific programs are based on the monitoring of single targets over a few nights, something difficult to schedule in normal visitor mode, when the PIs come to the telescope to conduct their observations QSO would allow a more efficient use of the instrument and a better yield of the highest ranked programs. Once ESPaDOnS observations have moved to QSO mode, a fiber feed to ESPaDOnS from one of the prime focus cameras (most likely WIRCam), will allow the use of those many hours in long wide-field QSO runs when seeing is too bad for imaging, but good enough for spectroscopy.
- The second area of development will address the remote operation of the summit facility from Waimea, with, as the ultimate goal, the complete automation of the night time operations. Concurrently, this automation project will bring to the current operations better remote testing and diagnosis capabilities, therefore leading to a better efficiency of the overall observation process.

At the end of 2005, CFHT has reached what will be its instrument configuration for the coming years: between 250 and 300 nights a year of wide-field observations in QSO mode, and the rest mainly devoted to ESPaDOnS observations and engineering/instrumentation projects. With challenging operations as well as state-of-the-art developments to prepare the Observatory for 2011 and beyond, CFHT is looking ahead to an era of excellent services to the communities it serves, and exciting in-house developments by a highly dedicated staff: the ingredients for a healthy Corporation in the years to come…
Science highlights of 2005

CFHTLS: Let the publications begin!

The 2004 Annual Report presented spectacular preliminary results on two of the Canada-France-Hawaii Telescope Legacy Survey (CFHTLS) key scientific topics:

1. Through the study of type Ia supernovae (SNe Ia), determine the nature of the Dark Energy driving the accelerating expansion of the Universe via a measurement of the equation of state parameter $w$.

2. Through the measurement of the cosmic shear, derive properties of the dark matter power spectrum and the biasing as function of angular scale and redshift.

2005 saw the acceptance for publication of two major papers, one on each of these two “hot” topics.

SNLS

The figure on the right illustrates the results from the SNLS (SuperNova Legacy Survey) component of the CFHTLS, released in November 2005 (Astier et al., A&A 437, 31). With just one year of observation and 71 SNe Ia used for the study, the SNLS team was already able to place strong constraints on cosmological models. The results agree well with other measurements, either from similar determinations using SNe or from other sources.

The actual fit to SNe data can be seen on the figure below, where the SNe discovered and followed-up by the SNLS cover the 0.3 to 1 redshift interval. Each of them was observed using with an 8-m class telescope to confirm its type and measure its redshift. Keck, Gemini and the VLT were used for these follow-ups. The higher noise in the photometry at high redshift is clearly seen on this graph. The photometric calibration of the CFHT images is therefore a key to the success of the project and is generating a lot of efforts, not only throughout the SNLS collaboration and at CFHT, but also among all the MegaPrime users. These efforts will actually benefit more than just the SNLS program! It should be noted that the uncertainty on the cosmological parameters is not only limited by the photometry of the SNLS high redshift SNe. It is also limited by the low redshift sample currently available.

With the efficiency of MegaPrime operation steadily improving, the SNLS should reach its objective of ~700 SNe Ia after five years of CFHTLS observations, therefore dramatically improving the uncertainties on the cosmological parameters related to the Dark Energy.
Cosmic Shear

Cosmic shear (cosmological weak lensing) observations provide Dark Matter investigations with an invaluable complement to other methods like the one we just described based on the SNe Ia observations. With its Wide component ultimately covering 170 deg$^2$, and the four 1 deg$^2$ fields of its Deep component going to higher redshift, the CFHTLS is currently one of the best surveys tackling this problem. Preliminary results had shown that a clear and reliable cosmic shear signal was indeed measurable in a subset of 25 deg$^2$ of the Wide. By the end of 2005, the first two papers on Cosmic Shear from the CFHTLS were submitted for publication, one for the Wide (astro-ph 0511089) and the other for the Deep (Sembolini et al., A&A 452, 51). The figure below shows result from the Deep only and combining Deep and Wide data, thus partially breaking the degeneracy on $\Omega_M-\sigma_8$. This is the consequence of measuring the large and small scales simultaneously.

$\Omega_M$ and $\sigma_8$ constraints with the Deep only on the left, and combining Deep and Wide data on the right. The contours show 0.68, 0.95 and 0.999 confidence regions. Errors include statistical, covariance and residual systematic contributions. The models are pure Cold Dark Matter fit to the data, marginalized over the redshift distribution. With $\Omega_M = 0.3$, the combined analysis gives $\sigma_8 = 0.86 \pm 0.05$ at 1$\sigma$.

Though based on a small fraction of what will ultimately be offered by the CFHTLS, these first Cosmic Shear results augur extremely well for forthcoming studies based on the combination of wider patches of the Wide component and deeper images of the four Deep fields. These studies are likely to bring the best cosmological constraints from weak lensing observations.

From the Very Wide...

While the Very Wide component of the CFHTLS was descoped to allow the cosmology drivers of the survey, considered of higher priority, to proceed at a good pace, the study of the Kuiper Belt remained one of the exciting areas of the CFHTLS. In the course of the Ecliptic Survey (Very-Wide) component of the CFHTLS, tens of KBOs are regularly discovered and their dynamical properties nicely nailed down, thanks to the priority given to the follow-up of the discovered objects. Among them, an exotic object, nicknamed Buffy, was found on a nearly circular orbit which never brings it closer to the Sun than 50 au. A circular orbit of that size is by itself not explained by most of the current models of the Kuiper Belt. In addition, Buffy exhibits a very high inclination of 47 degrees, making it an even more puzzling object.
ESPaDOnS’ First Year of Exciting Science

ESPaDOnS is a bench-mounted high-resolution échelle spectrograph fiber-fed from a Cassegrain module. The spectrograph is located in the Coudé room and housed in a thermal enclosure to minimize temperature and pressure fluctuations, which affect the spectrograph’s stability. The Cassegrain module contains all the necessary calibration facilities and the optics needed to perform polarimetry.

Between December 2004, when ESPaDOnS was first offered to the astronomical communities, and December 2005, 18 polarimetry projects and 7 spectroscopy projects were programmed at the telescope, exploring many aspects of astrophysics, from studies of diffuse interstellar bands to magnetic fields in various types of stars.

One of the first projects that produced a refereed publication was led by 2 Canadian astronomers, Gregg Wade and John Landstreet, who looked for the progenitors of Ap/Bp stars. Those hot stars have strong, globally-ordered magnetic fields of strengths of thousands of Gauss, over a thousand times the Earth’s own magnetic field. The strong magnetic fields introduce peculiarities in their spectra, hence the name Ap/Bp. Those magnetic stars make up about 5% of all ordinary A and B stars. The ESPaDOnS observations has led to the discovery that about 10% of the Herbig Ae/Be stars (which are thought to be younger versions of the A and B stars) observed for this project, also have magnetic fields of that order, strongly indicating that they are indeed the progenitors of the magnetic Ap/Bp stars.

On the French side, the leader of the team which designed and built the instrument, Jean-François Donati, and his collaborators, have detected a 1 kG magnetic field in the innermost region of the accretion disk around FU Orionis. FU Ori is a young star which suddenly appeared in the middle of a dark cloud in 1936, after its disk started to “drop” matter onto the star. Such magnetic fields have been suspected for a while on stars of that type, but this is the very first time that such a field was directly detected, thanks to spectropolarimetric observations.

Most of the projects used the Zeeman effect, which affects the circular polarization in atomic lines of a spectra when there is a magnetic field. The Zeeman effect was however detected for the first time in molecular lines forming in magnetic regions (spots) on the surface of active stars. The project, conducted by European astronomers, was led by Svetlana Berdyugina. The molecular Zeeman signature is reminiscent of that observed in sunspots, and will help understand the magnetically active M stars on which is was detected.

Various observers have also contributed the discoveries of 5 new magnetic Ap stars, the second hot O star with a detected magnetic field, linear polarization in an evolved post-AGB star and a supergiant, and circular polarization on a M4.0 dwarf.

ESPaDOnS was also regularly used by CFHT’s astronomers, who have carried out a couple of spectroscopic programs to understand the physics of dust formation around some hot stars, and to independently determine the distance to the Pleiades, a fundamental measurement whose exact value
affects almost all areas of astrophysics. Spectropolarimetric projects were also carried, to study the linear polarization in the emission lines of the Seyfert II galaxy NGC 1068, and the dynamo mechanisms in low-mass fully convective stars.

Thanks to a very reliable and user-friendly instrument, the ESPaDOnS programs carried out in the first year have already led to the publications of 5 papers...

**Sunspot**

Part of the spectra of a solar sunspot between 705 and 706 nm. The top panel shows the intensity of the light in the molecular TiO line. The bottom panel shows the circular polarization, Stokes V; the pattern is caused by the presence of a magnetic field inside the sunspot.

**EV Lac**

Same plot for the active M star EV Lac. Note how the features are similar to those found in a sunspot.
Observing efficiency

The observing efficiency of **MegaPrime/MegaCam** was a very pressing issue and made CFHT very busy throughout 2005. Plagued by various problems due its complexity as well as its heavy use, the camera and its various components were failing too often, leading to significant losses of observing time and undue pressure on the staff. Thanks to the experience gathered from the first two years of operation of this amazing instrument, it was possible to devise of a careful maintenance plan and to design and implement various upgrades of sub-systems found to be weakness points. As a consequence, MegaPrime behaved much better in average over the year. A couple of major failures still led to a significant loss of observing time, but they were solved through careful analysis and remediation and should therefore not happen again with such catastrophic consequences. Some work remains, especially on the filter changing system, and is planned for 2006.

The graph below summarizes the observing time losses due to instrument and telescope failures. The goal for 2005 was to limit the losses to a maximum of 5% of clear weather. In spite of the MegaPrime failures already mentioned, we were able to meet this goal, losing only 4.88% to problems of any kind. One should realize that a couple of glitches per night, each generating a loss of 10mn of observing time, end up with already 3.5% of the observing time lost!

This graph shows also the percentage of “clear nights” over the year. It is information to use carefully, as clear weather is not necessarily good enough for gathering useful scientific data. Detailed statistics for the QSO nights is available in the QSO pages of CHFT’s web site.
Instrument statistics

2005 observing time was again largely dominated by long MegaPrime runs. ESPaDOnS, the new spectro-polarimeter, was offered over the whole year and highly used, yielding impressive scientific results (see p.12 in this report). The use of Pueo, CFHT’s Adaptive Optics bonnette, decreased significantly, a clear sign that Adaptive Optics is now routinely used on 8-m class telescopes. As long as Pueo is limited to natural guide stars and mostly infrared observations, it is of little interest to the communities CFHT is serving. MOS, CFHT’s multi-object spectrograph, is still requested for programs where the spatial density of sources makes its use still competitive with other similar instruments on larger telescopes. WIRCam was successfully used for its first “shared risk” scientific observations at the end of semester 2005B.

Queued Service Observing in 2005

During 2005, it was the first time that two instruments were offered and used under the New Observing Process (NOP). The main objectives of this ambitious operational mode are to improve observing efficiency, increase science productivity and add value to the data. The NOP is composed of an ensemble of software designed to plan and perform the observations (Queued Service Observing), acquire the data (New Environment for Observing), analyze and process the data (Elixir), and, finally, distribute and archive the data (DADS).

The front-end of the NOP scheme is the Queued Service Observing (QSO) project, which seeks to obtain astronomical data under the optimum sky conditions for each science program. Other goals include a fair balancing of the different Agency time, obtaining data for programs with time critical constraints (e.g. monitoring supernovae), and improvement of the observing efficiency. In 2005, observations for MegaCam in the QSO mode were scheduled for about 210 nights, close to 60% of the total telescope time available at CFHT! During each semester, about 40-45 different programs were available. Among the QSO programs, of course, is the CFHTLS which represents about 55% of the total observing time made available in the queue mode. During the last year, operational overheads have been minimized by making several improvements on the camera (faster guide probes, fully automated focusing model). The first semester of 2005 was a difficult one because the weather was much worse than usual and time was lost to several technical issues with the camera. The second semester was much better, the best so far with Megacam! For the second semester, the amount of data taken for highly ranked programs (A + B grades) was spectacular, with a completion level of 88%. In particular, the December 2005 run was exceptional with 8.2 hours of validated per night of average, with an observing efficiency well exceeding 90% during several nights. The time used between the different Agencies during 2005 was also fairly shared, not a small feat considering the global scheduling constraints on the programs.

During the semester 2005B, we also commissioned WIRCam within the QSO mode. A new Phase 2 Tool version was designed, implemented and used by several PIs with great success. Several new observing modes were made available for WIRCam, for instance micro-dithering and nodding pattern. The entire observing chain QSO->NEO->TCS was implemented and used to gather high quality data for several programs. Everything is ready for 2006 and the subsequent years!
It has been a busy and productive year for the development of the Wide-field InfraRed Camera (WIRCam) at CFHT. All components have been received and integrated, and the instrument is on the sky for science.

The cryovessel and filter wheel had been received from the Laboratoire d’astrophysique de Grenoble (LAOG) and the Image Stabilizing Unit (ISU) had been received from the Laboratoire d’études spatiales et d’instrumentation en astrophysique in 2004. The optics were received in early March 2005 from the Université de Montreal and were integrated into the cryovessel, along with the two engineering arrays, in time for the first WIRCam engineering run at the end of March.

This run and the subsequent two engineering runs were very successful in finding and correcting some initial bugs in the guiding and some issues with rotations of various parts of the camera with respect to each other. The two arrays were only being readout using four outputs, also.

The time period from the end of March to June was spent accepting the final two science arrays, mounting and measuring the positions of the arrays at GL Scientific, and building an SDSU III system to readout all 32 outputs on all four science arrays. This was all done successfully, however, and by the June run, we were on the sky with all four science arrays. First light!

Of course, the work didn’t stop there. The hardware was in place for a fast readout of the camera, but the software still needed to catch up. In addition, interlaced, on-chip guiding was turning out to present its own special problems. Queue Service Observing and the New Observing Procedure (QSO/NOP) also needed to be modified to work with WIRCam. Real-time analysis of the images was needed to give the QSO observers information to decide which queues to run when. Also, many modes had to be implemented and tested such as automated pointing correction and guide-star acquisition, micro-dithering, wide dither patterns, and nodding. The focus differentials for the filters needed to be measured, the zero points of the system found,
and the image quality verified along with the usual number of testing in preparation to do science with a new instrument.

Much of this has been accomplished and the first science was done, on a shared risk basis, in November, 2005. Science observations and engineering went on together for the rest of the semester so that the camera is now scheduled for normal operations for all of semester 2006A.

The results of these efforts have been very encouraging. The image quality has been measured below 0.5 arc-seconds across the full array, and has been seen as low as 0.4 arc-seconds in Ks band. The noise performance of the arrays is currently at about 30-40 e- with some amplifiers somewhat above this. The cryovessel has been kept cold for as much as six months at a time, though occasional pumping while cold is needed to maintain vacuum during exchanges. The guiding has been shown to work at full speed (50 Hz) on stars as dim as 12th J magnitude with the J filter and as dim as 15th J magnitude with the J filter at reduced guider speeds.

Of course, being operational and on-the-sky for science does not mean the end of work on the camera. The speed-up of the readout is nearing completion and should be ready for the April 2006 run with a single read time of ~1.2 seconds (two reads are needed for correlated, double sampling). The noise on the images is higher in places than expected and work is continuing to bring this noise down, hopefully to under 30 e-. Guiding is being continually improved to take into account all of the various science requirements and to respond to the changes to the science readout. Observing overheads are being studied for way of reducing them to maximize integration time. Also, now that some science images have been obtained, much effort is going into designing and implementing an automated data reduction pipeline, Elixir-IR.

This is one of the first images taken with WIRCam! The whole mosaic is seen on the upper left, while a zoom of the lower left corner of the upper right detector is seen above. On the left, a star from one of the corners is highly magnified, demonstrating the high optical quality of WIRCam. The seeing was good enough to show the under-sampling of the image due to the 0.3" pixels...
The personal touch

Renaud Savalle
Renaud Savalle joined CFHT in 1999 as software engineer specialized in data base design and management, hired to work on the development of the Queued Service Observing project. He actually stayed with CFHT for six years and played a paramount role in the practical implementation of QSO. His deep knowledge of astronomy has been a real asset to the project as well as to the outreach activities of the Observatory. Renaud went back to France, bringing his skills to yet another observatory (OAMP).

Tom Beck
Tom Beck, our summit electrician, retired from the summit daycrew in November after 10 years with CFHT. Prior to coming to CFHT Tom had worked at the Pearl Harbor Public Works and at ALCOA as an industrial high-voltage electrician for a number of years. His quiet but insightful comments and guidance, and his obvious work ethic came to be much appreciated by the staff during his time with us. Tom appears always to be busy - when not working at CFHT he has raised koi, built several homes and run a sizeable ranch which he and wife Luana can now spend at least a little quiet time on.

Todd Szarlan
Todd Szarlan left CFHT in June 2005 to join the Santa Barbara Infrared Corporation, where he is in charge of optical testing. Todd had been with CFHT since March 1999 in the optics group, then later in the instrumentation group. While at CFHT, Todd took care of keeping the primary mirror and most other optics clean, keeping most of the instruments set up and happy, and occasionally doing strategic lens flips. He is sorely missed, but we wish him the best of luck in his new endeavor.
Outreach

2005 has been a rich and full year for the CFHT outreach group. Rémi Cabanac continued to coordinate the outreach activities and to make sure that the information is available to everyone. Most of the activities were still the responsibility of a hard core of volunteers among which Mary-Beth Laychak, Liz Bryson, Moani Akana, Grant Matsushige, and Lisa Wells, but we wish to underline the dedication of the entire staff when time comes to help. We have the feeling that we achieved a good balance between the number and diversity of activities that CFHT staff can face without lowering the required enthusiasm of the volunteers.

The outreach group made full use of the new archiving environment TWIKI, installed by Liz Bryson, Tito Jankowski, and Jeff Mori. This internal site hosts the outreach activity archives and all pictures of outreach activities gathered over the last 2 years. The outreach group wishes to express its gratitude to all the volunteers and their families who participated in these activities which truly makes what CFHT is well known for, an exceptional working environment and an asset to the community, in Waimea and across the Big Island.

Star Gazing Parties:
- August 6: Star Gazing at HP
- August 28: CFHT Star Gazing (Back to school)
- December 3: Christmas Star Gazing Party

Fairs and Festivals:
- January 29: Onizuka Day at UHH.
- February 15: Hilo Science fair (judging).
- February 16: Paauilo Science Fair.
- March 9: Women in science in Hilo.
- April 16: Astro day: a lovely day as usual at Prince Kuhio Plaza in Hilo. CFHT small posters were very popular!
- April 16: Waimea Keiki Fest: many visitors and much interest, small posters again very popular.
- April 22: Waimea Country School’s Annual Science Fair.
- August 28: Waimea Parker Ranch Fair, with an interview about CFHT on KAPA FM.
- November 4: Science Fair in Kona.

CFHT HQ and Summit Visits:
- Jan 16: CFHT summit visit by K. Meech astrobiology students.
- Feb 3: Waimea Middle school grade 3 class visited HQ.
- Feb 10: Wainakeana Middle School classes visited HQ: a group of 40 people!
- Feb 16: Visit of Kohala school students.
- Feb 17: Summit visit for VIPs.
- Feb 22: Honoka’a Astro class high school visit to the summit (visit of both CFHT and Keck), (teacher Alison
Simmerman) 40 students (80 expected).
- Feb 22: Summit visit for VIPs.
- March: Kindergarten 1st & 2nd visit to CFHT HQ.
- May 4: VIP tour of the summit.
- May 7: CFHT public lecture at the Onizuka Visitor Center. Liz Bryson gave a talk at the visitor center on Mauna Kea Oral History Project.
- May 27: CFHT HQ tour for a group of 75 Paauilo kindergarten, first and second graders.
- June 2: CFHT HQ tour+talk for a group of Waimea Ho'okupono special program.
- July 25: VIPs visit HQ.
- October 7: The Supernovae Legacy Survey investigators visit the summit.
- October 14: Make a difference day Parker School students at HQ.
- October 28: Summit visit for the “Make-a-Wish” foundation.
- November 6: World Healing Center visit.

Miscellaneous:
- Since its foundation CFHT co-hosts (with Keck) the West Hawaii Astronomy Club (WHAC) meetings every second months. Rémi and Pierre are active members, giving public talks.
- Participation in Kohala Electric car project.
- Aug 11: Charity event, Calf Dressing Parker Ranch Rodeo.
- September 24: Visitor Information Station support dinner at Hale Pohaku.
- October 3-7: Sponsoring of a Japanese film Crew Zero Corporation at the summit.
- November 17: ‘OHANA lecture at the International Lunar Observatory Workshop.
- November 22: MK Natural History Visit with Bill Stormont
- All year long: public lectures to school classes.

New Faces

Sarah Gajadhar - Electronics Engineer
Sarah joined CFHT in August after working in high tech and government environments in Ottawa. She has a degree in Electronic Systems Engineering, and has found her previous experience in systems modeling to be very useful in supporting MegaPrime. She is also interested in learning more about the telescope control system. Sarah enjoys being able to leave the snow at the summit and go to the beach even in January.

Marc Baril – Instrument Engineer
Marc came to CFHT in August from HIA (Victoria, British Columbia), where he worked for a year and a half on instruments for the Thirty-Meter Telescope, Gemini and the Dominion Astrophysical Observatory. Marc holds a PhD in experimental solid-state physics from Simon Fraser University where he undertook spectral studies of mineral luminescence and its application to dating geological deposits. When he isn’t tweaking readout code for WIRCam’s IR sensors, Marc can be found woodworking, star-gazing and keeping sharp tools away from his toddling son.
Current Staff at CFHT

Akana, Moani
Albert, Loïc
Alles, Rosemary
Atapattu, Rohendra
Baril, Marc
Barrick, Gregory
Benedict, Tom
Brotman, Susan
Bryson, Elizabeth
Burdullis, Todd
Cabanac, Rémi
Cruise, William
Cuillandre, Jean-Charles
Dale, Laurie
Elizares, Casey
Fischer, Linda
Forshay, Peter
Forveille, Thierry
Gajadhar, Sarah
George, Teddy
Hickman, Coleen
Ho, Kevin
Lai, Olivier
Lawson, Terry
Laychak, Mary Beth
Look, Ivan

Akana, Moani
Albert, Loïc
Alles, Rosemary
Atapattu, Rohendra
Baril, Marc
Barrick, Gregory
Benedict, Tom
Brotman, Susan
Bryson, Elizabeth
Burdullis, Todd
Cabanac, Rémi
Cruise, William
Cuillandre, Jean-Charles
Dale, Laurie
Elizares, Casey
Fischer, Linda
Forshay, Peter
Forveille, Thierry
Gajadhar, Sarah
George, Teddy
Hickman, Coleen
Ho, Kevin
Lai, Olivier
Lawson, Terry
Laychak, Mary Beth
Look, Ivan

Administrative Specialist
Resident Astronomer
Systems Programmer
Operations Engineer
Instrument Engineer
Optical Engineer
Instrumentation Specialist
Instrumentation Specialist
Librarian

Luthe, John
Mahoney, Billy
Matsumoto, Tomo
Manset, Nadine
Martin, Pierre
Matsushige, Grant
Mizuba, Les
Morris, Glenn
Potter, Sharon
Rodgers, Jane
Sabin, Daniel
Salmon, Derrick
Stevens, Mercédès
Taroma, Ralph
Teeple, Doug
Thomas, James
Uchima, Roger
Valls-Gabaud, David
Veillet, Christian
Vermeulen, Tom
Ward, Jeff
Warren, DeeDee
Wells, Lisa
Withington, Kanoa
Wood, Roger
Woodruff, Herb
Woodworth, David

Observing Assistant
Data Base Specialist
Assistant System Administrator
Resident Astronomer
Director of Science Operations
Sr. Instrumentation Specialist
Detector Specialist
Resident Astronomer
Safety Specialist
Finance Manager
Mech. Designer / Instrument Maker
Director of Engineering
Administrative Assistant
Observatory Facility Manager
System Programmer
Computer Systems Engineer
Mechanical Technician
Resident Astronomer
Executive Director
Systems Programmer
Detector Engineer
Director of Finance & Administration
Observing Assistant
Software Manager
Automotive Mechanic
System Administrator
Observing Assistant

Comings and Goings

Beck, Tom
Barril, Marc
Gajadhar, Sarah
Kim, Sam
Lawson, Terry
Levine, Eric
Lin, Ethan

Departure
Dec
Augu
Aug
Sep departure
Dec
Nov - May
Mar-Jul, Nov-Jan

Arrival
Dec
Morrison, Glenn
Mugridge, Paul
Savalle, Renaud
Szaran, Todd
Yan, Chi-Hung
Wang, Shiang-Yu
Woodruff, Herb

Arrival
Jul
Visitor
Jan – Apr
Departure
Mar
Departure
Jun
Visitor
Sep departure
Visitor
Jun
Arrival
Sep
Financial Resources

The three Member Agencies supported the CFHT annual budget in 2005 as shown in the table at the right, in US funds.

These contributions reflect a 1.8% increase, in anticipation to the Golden Age Plan. Under a financial framework established by the Board of Directors, the operating budget had been frozen during the years 1996 - 2004 at its 1995 amount without adjustment for inflation.

Under collaborative agreements with CFHT, Korea Astronomy Observatory and National Taiwan University remitted $200,000 and $100,666 respectively, as reimbursement for costs associated with their use of the Corporation’s facilities. Other sources of funds included $11,881 from the daily surcharge credits at the mid-level facility and $122,002 in earned interest allocated to the contingency reserve fund.

From the operating fund, expenditures were allocated to the areas listed in the table at right.

During the year $1,458,616 were disbursed from the instrumentation fund for the current projects of the Wide-field Imaging plan, which brings the total investment under this multi-year program to $10,029,028. The current appropriation and the portion committed to date are shown in 2005, 92% of total appropriations under the Wide-field Imaging plan were spent or committed. Overall in 2005, resources from all CFHT funds were allocated to the categories of expenditures shown in the pie chart below.
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Institut National des Sciences de l’Univers
University of Hawaii

C Nominated by the National Research Council Canada
F Nominated by the Centre National de la Recherche Scientifique, France
H Nominated by the University of Hawaii
Approved Programs 2005A

Ann MegaPrime Search for Dwarf Satellite Galaxies in Nearby Giant Spiral Galaxies
Balogh MegaPrime UV-derived star formation rates in galaxy groups at z~0.5
Balogh MegaPrime Mapping the infall regions of the supermassive galaxy cluster RXJ1347.5-1145
Berdyugina ESPaDOnS A probe of the internal structure of starspots with the molecular Zeeman effect
Beuzit AOB IR Stellar multiplicity and extra-solar planet formation
Bolhander Gecko Red The Interstellar $^{12}$C/$^{13}$C Isotope Ratio and the Diffuse Interstellar Bands
Catala ESPaDOnS Magnetic fields in the pre-main sequence Herbig Ae/Be stars
Charpinet LAPOUNE Determination of the structural parameters of the pulsating B subdwarf PG 1325+101 from asteroseismology
Chiueh MegaPrime Galaxy Clusters as a Dark Energy Probe
Donati ESPaDOnS Is the activity of O and early B stars magnetically driven?
Donati ESPaDOnS The first magnetic images of classical and weak line T Tauri stars
Donovan MegaPrime Measurement of cosmological parameters using weak lensing
Drouin ESPaDOnS Seeking the progenitors of magnetic Ap/Bp stars: a search for magnetic fields in Herbig Ae/Be stars
Durant AOB IR Phase resolved infrared photometry of Anomalous X-ray Pulsars and broadband energy spectra.
Foing ESPaDOnS Dry High-Resolution Spectroscopy & Spectropolarimetry of Diffuse Interstellar Bands, Fullerenes and PAHs
Fontaine LAPOUNE Determination of the structural parameters of the pulsating B subdwarf PG 1325+101 from asteroseismology
Forveille AOB IR A deep search for very cold brown dwarfs companions
Hanes MOS Global clusters as Dynamical Probes of Early-Type Galaxies: Omnipresent Dark Halos or Not?
Hoekstra MegaPrime Comparison of the weak lensing mass to the baryonic constituents in X-ray luminous clusters of galaxies
Ishiguro MegaPrime Contemporaneous survey of dust trails by ground-based telescope and Spitzer
Jedicke MegaPrime Survey of major mass loss events in comets
Johnson ESPaDOnS Abundance Ratios in NGC 6791 with ESPaDOnS
Kawasaki MegaPrime Dwarf Galaxies in the Hercules Cluster
Kwok CFHTIR Imaging of Planetary Nebulae at Molecular Hydrogen Emission
Landstreet ESPaDOnS A spectropolarimetric survey of magnetic stars in open clusters: searching for links between magnetic fields and stellar evolution
Lee ESPaDOnS Spectropolarimetry of Raman scattered Balmer wings in young bipolar planetary nebulae
Lin CFHTIR Combined Near-IR Stellar and Atomic Hydrogen (HI) Gas Imagining of QSO Host Galaxies
Lin MegaPrime MegaCam `i` and `z` survey of DEEP2 fields
Lyo MOS Low-mass population studies in the Ursa Major Group and the Coma Berenices
McGrath MegaPrime Characterization of the luminosity function for mJy radio sources
Meech MegaPrime The deep impact mission encounter support
Park MegaPrime Wide Field CCD Photometry around NGC 6822
Petit MegaPrime Kuiper Belt dynamical structure: recoveries and follow-up
Price MegaPrime Exploring the Variable Universe
Reipurth MegaPrime Ultra-deep Hα imaging of Herbig-Haro flows
Renner MOS Physical characterisation of the Karin young asteroid family
Robin MegaPrime Cinématique du bulbe galactique : vers une meilleure compréhension de la formation des bulbes
Sanders MegaPrime Hawaii imaging (UV/NIR/mm) of the HST-ACS-COSMOS 2-Degree Treasury field
Schneider ESPaDOnS Etude du comportement de l'étoile τ Boo
Segall MegaPrime À la recherche de la queue du Dragon: la matière noire dans les galaxies naines (suite)
Seymour MegaPrime The Origin of the microJansky radio source population and its link to the X-ray and Far Infrared background.
Smith MegaPrime Spatially-resolved ages and metallicities in early-type galaxies from u* imaging
Sohn MOS Spectroscopy of Early-Type Galaxies in Abell Clusters at Moderate Redshifts
Stalder AOB IR AO studies of high redshift radio sources near bright natural guide stars
Takamiya CFHTIR Intergalactic globular clusters in Virgo
Tholen MegaPrime The population of asteroids interior to Earth's orbit
Tully MegaPrime MegaCam Imaging of the M81 Group
Wade ESPaDOnS Magnetic Doppler Imaging of Ap stars
Willott MegaPrime A Very Wide survey for z=6 quasars and cool brown dwarfs
Yee MegaPrime Galaxy Clusters as a Dark Energy probe
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2005 CFHT Refereed Publications

All CFHT refereed publications are now located in a dataset on ADS at: http://adsabs.harvard.edu/abstract_service.html

The following criteria are used to judge whether a paper is considered a CFHT publication: "A paper must report new results based on significant observational data obtained at CFHT or be based on archival data retrieved from the CFHT archive. If data from multiple telescopes are included, the CFHT data should represent a significant fraction of the total data."

Coustenis, A. et al. 2005, Maps of Titan’s surface from 1 to 2.5 μm, Icar, 177, 89-105.
David, T.J. The evolved stellar content of NGC 147, NGC 185, and NGC 205, AJ, 130, 2087-2103.
Lodieu, N. A study of the young open cluster Collinder 359, AN, 326, 1001-1006.

Glossary

**CEA**: Commissariat à l’Energie Atomique, the French Agency responsible for the construction of MegaCam, under contract to CFHT.

**CFHTLS**: The CFHT Legacy Survey takes advantage of MegaCam's large field of view to conduct 3 different surveys totaling over 5000 square degrees in 5 years. The survey will play a crucial role in studies ranging from the nearby KBOs, to brown dwarfs in our Galaxy, to the distribution of matter in the Universe.

**MegaCam**: A large mosaic of 40 charge-coupled device (CCD) imaging chips that provides a field of view on the sky of one square degree, about five times the area covered by the full moon. It is on the sky since 2003.

**MegaPrime**: In order to make the best use of MegaCam, a completely new prime-focus environment is needed. The many separate activities involved in this work are grouped under the MegaPrime project. Apart from the original construction, this is the largest development project ever undertaken at CFHT and is the principal activity for much of our technical staff.

**WIRCam**: Wide-field Infrared Camera. This 16-million pixel camera provides a field of view on the sky somewhat greater than 40% of the area covered by the full moon. It was a major instrumentation project at CFHT and was constructed in collaboration with external partners for deployment on the sky in 2005.

**ESPaDOnS**: The échelle spectro-polarimeter which gives a complete optical spectrum in a single exposure with a spectral resolution of about 70,000. ESPaDOnS arrived at CFHT in 2004.

**HIA**: The Herzberg Institute of Astrophysics manages Canada's involvement in major astronomical observatories in Chile and Hawaii, and participated in the MegaPrime project.
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