Annual Report 2006

Canada-France-Hawaii Telescope Corporation

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.

NATIONAL RESEARCH COUNCIL CANADA

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UNIVERSITY OF HAWAII

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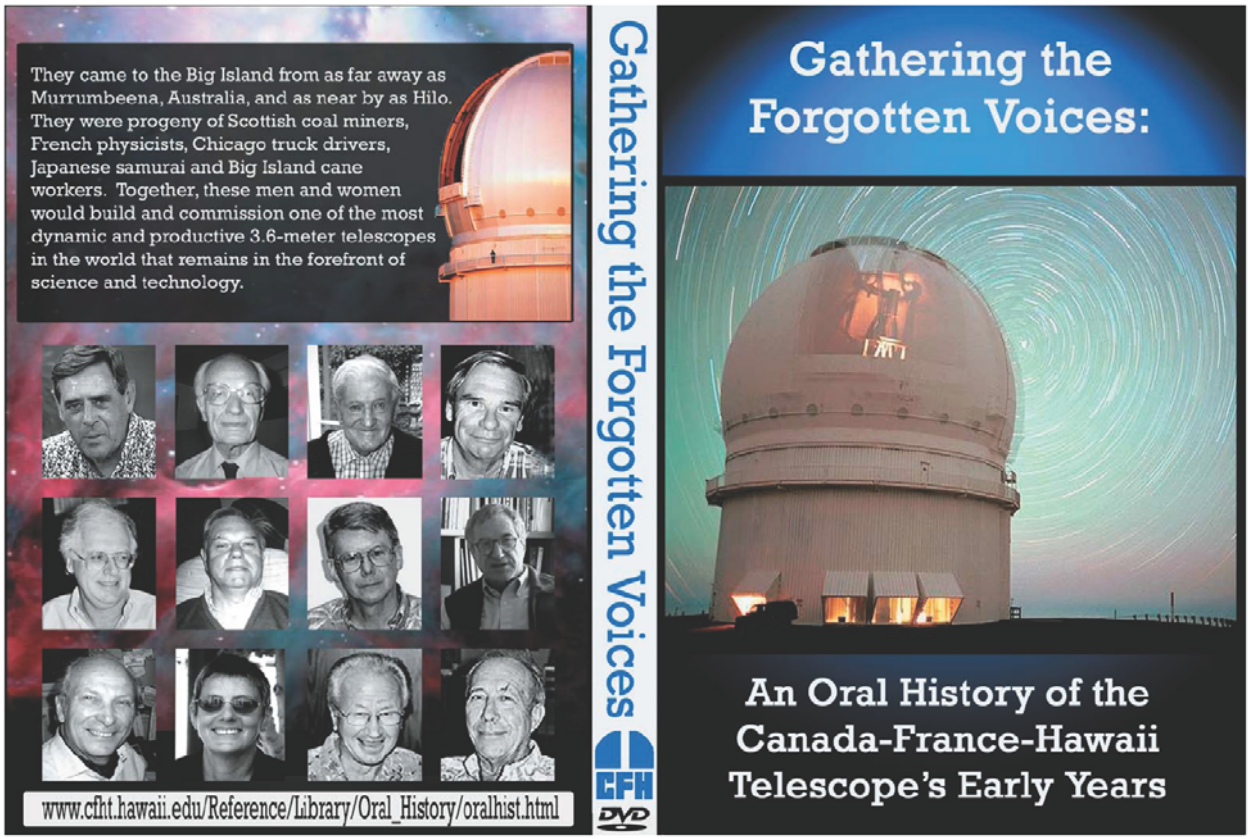
A CFHT-Produced DVD on the Early Years of the Observatory

For the past three years, as the Canada-France-Hawaii Telescope librarian, Liz Bryson has been recording and researching the oral history of the men and women whose vision resulted in the development, design and construction of a world class observatory. The story of the Canadian, French, and Hawaiian collaboration is one fraught with political mystique and adventure. The drama unfolds in 1968, when the French organization INAG (National Institute of Astronomy and Geophysics) was created for the express purpose of building a large 4-meter telescope. To accomplish this end, Dr. Roger Cayrel was appointed to the task of making the telescope become a reality. In the meantime, on the other side of the continent, the Canadians were negotiating for the commissioning of a telescope to be named the Queen Elizabeth II.



However, the "Queenie II" project was subsequently cancelled, leading Dr. Graham Odgers, project coordinator, to state, "In 1967 [the prospect of building the telescope] looked so very bleak." Nevertheless, through a quirk of luck and happenstance, John Jefferies, Institute for Astronomy-Manoa's first Director, met Graham Odgers at a 1969 American Astronomical Society meeting in Honolulu. Said Odgers, "... my piece of luck was that John Jefferies and I (had been) at Cambridge (UK) together. We (had) rowed in the boat together. We knew each other quite well, so I asked Jefferies, "This Queen E II is done for unless we can find a site and bring it back somehow. Could Canada have the site on Mauna Kea?" Jefferies said he would have to make some inquiries. By lucky coincidence, not long thereafter, Jefferies was on sabbatical in Paris studying stellar atmospheres with his colleague, Roger Cayrel. Early on, Roger began to investigate other potential sites on which to construct a French telescope. Roger said to John, "Well I would like you to see the Canaries because we are considering that as a possible site for a large 4-meter telescope." When John Jefferies saw the site, he said, "Well, it's a good site, but in all respects, it is not as good as Hawaii." Then, according to Cayrel, Jefferies made an offer that was "very favorable." Subsequently, negotiations between Canada and France began and by 1972 the official 'go' was given by the Canadian government for a single telescope for Canadian and French astronomers.

The CFHT tripartite agreement was to become one of the first successful models for international collaboration in the astronomical community. In the early years, Drs. Cayrel, Rogers and Jefferies demonstrated an uncanny ability to lead their constituents through many political land mines. Their diplomacy prevailed throughout the course of events, thereby setting a precedent for multi-national cooperation among scientists in astronomy. Another significant outcome of the tripartite agreement was that CFHT is the only international telescope on Mauna Kea partly owned by the state of Hawaii; hence, this means a direct involvement of the people of Hawaii in the operation of the facility.

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Introduction

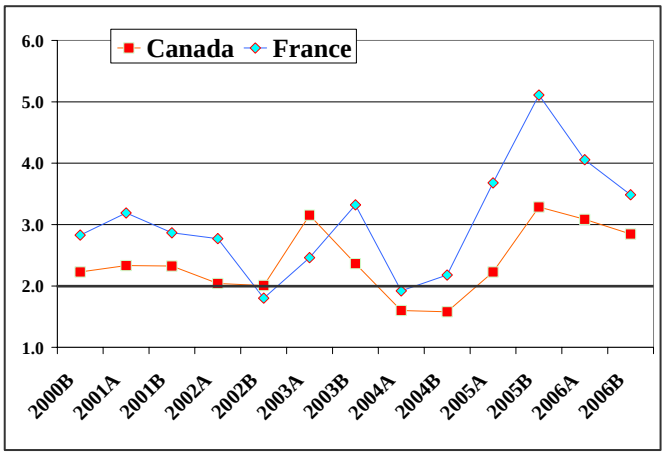
2005-2010: CFHT's Golden Age… Year 2!

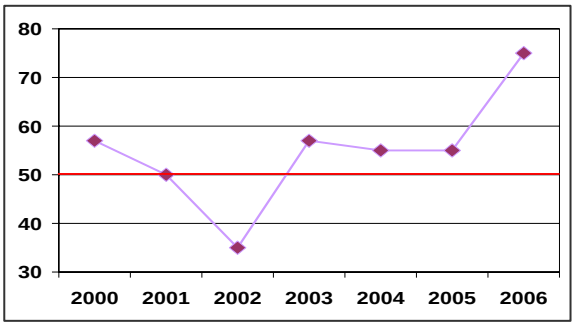
Executive Director Christian Veillet

Year 2 indeed, and what a year it was! The telescope was in high demand with an oversubscription pressure, averaged over agencies and semesters, well above three, and the time lost to problems went for the first time in recent years below the 4% mark. The refereed publication rate increased from 55/yr in the previous three years to 75 in 2006, with the CFHT Legacy Survey (CFHTLS) data leading to more and more exciting scientific results and bringing CFHT, impact-wise, ahead of the 8-m class observatories for 2006.
CFHT's "Golden Age 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. In 2005, the first year of this plan, the Observatory defined its goals for up to the end of 2010 and developed the metrics it would use to measure the quality of its work and assess its success. Per these metrics, 2006 is definitely a very successful year.

The first and likely most challenging goal, undertaken in 2005, is to gradually decrease the amount of **observing time lost** to technical problems, ranging 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 technical problems by 2010. With 3.95% of clear observing time lost to problems, CFHT reached in 2006 its goal of less than 4%, decreasing the 2005 loss by close to 20%. (see p.7 for 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 2006, a Canadian and French averaged pressure larger than 3 demonstrated the importance of the Observatory for these two communities, as seen on the graph on the right.





The **number of refereed publications** based significantly on CFHT observations is also a good indicator of the relevance of the data gathered by the telescope. The graph on the left shows this number fluctuating over the past years. With the CFHT Legacy Survey and more PI programs on MegaCam now producing science, and new exciting programs being undertaken on ESPaDOnS, the number of publications rose in 2006 to an unprecedented 75, well above the 50 mark set as a goal in the Golden Age plan.

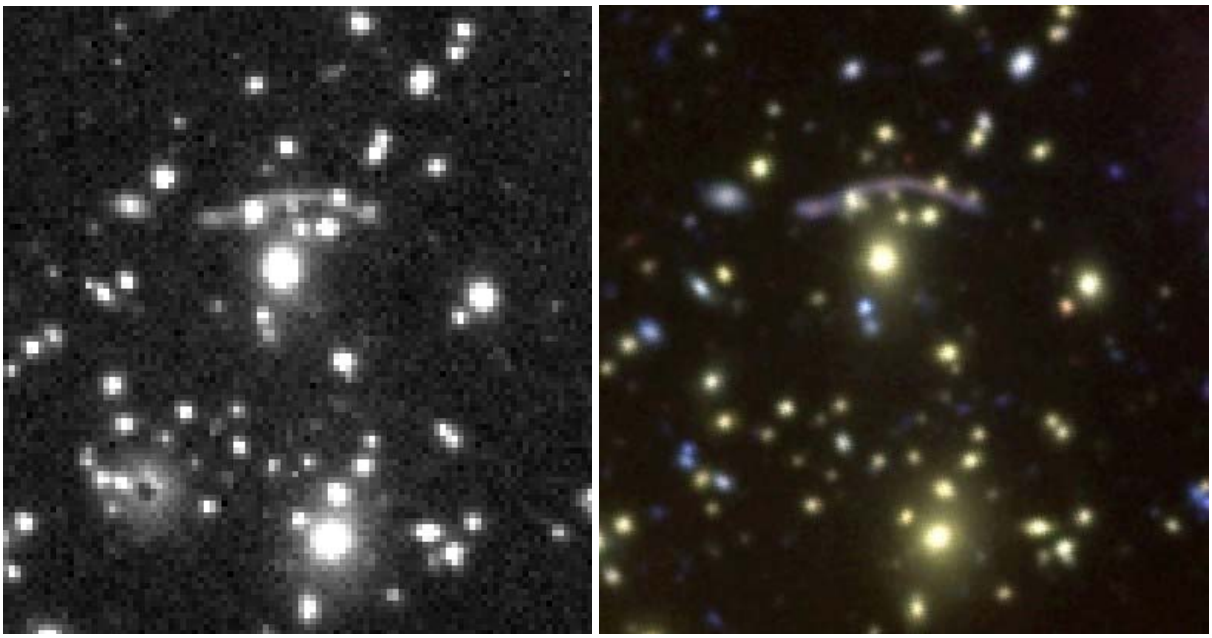
At the end of 2006, CFHT has reached what will be its instrument configuration for the coming years: MegaCam and WIRCam for between 200 and 250 nights a year of wide-field observations, and the rest mainly devoted to ESPaDOnS observations and engineering/instrumentation projects. The completion of WIRCam as an instrument had to be followed by an extensive work to provide a stable reduction pipeline. Although good progress has already been achieved, it is still work in progress at the end of the year.

With less instrumental developments than in the previous 10 years, time was made available to undertake some of the long-term projects envisioned in the Golden Age Plan. The automation project was started, with preliminary meetings to define the scope of the project. While the ultimate goal is to issue a command like “go night” in Waimea at the end of the afternoon and come back the following morning with all data nicely stored and pre-processed without anybody working either at the summit or in Waimea (likely to be just a dream), the main step on the way is to remotely operate from Waimea. For this to happen, we will improve the reliability of the observatory, its accessibility to remote control and monitoring, all of which will contribute to more efficient operations as well as a better handling of problems during the night through remote diagnostics.

The second in-house project, VASAO (Visible All Sky Adaptive Optics), has been mainly looked at on the theoretical side, with not many technological developments. A preliminary feasibility study concluded that it will be extremely difficult to use a polychromatic laser guide star to enable adaptive optics at the diffraction in the visible down to 0.5 micrometers. Nevertheless, the study opened the possibility of a couple of relatively easy experiments to be conducted on the telescope. One would allow testing various algorithms providing the tip-tilt information from two-color differential position measurement. The other one would look at the telescope vibration monitoring with a seismometer in a relatively vibration-less environment while observing on the sky: CFHT is indeed known to have a relatively low level of vibrations. These efforts are done in parallel with a project in development in France, ELP-OA (*Etoile Laser Polychromatique pour l’Optique Adaptative*)

2007 will see the triennial Users’ Meeting, to be held in Marseille in May. It will be a timely opportunity to prepare the post-“Golden Age Plan” era, at a time where CFHT has never been as scientifically productive and at the same time as much challenged by the uncertainty of future funding support.

Twenty years ago: Strong Lensing in Abel 370

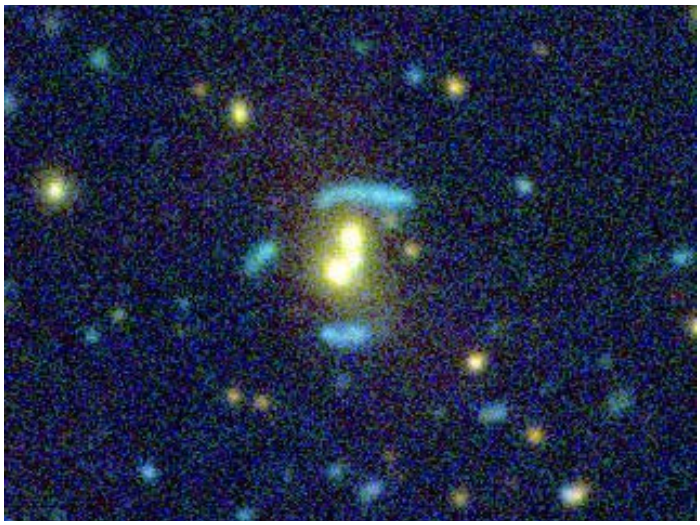


The picture on the left is the first image of a giant gravitational arc, found in a massive nearby cluster called Abel 370. It was published in 1986 (Soucail et al., *A&A*). The same cluster is observed 5 years later. The rapid improvement of the CDD technology is striking, from RCA1 320x512 pixels on the left to RCA2 on the right.

Science Highlights of 2006

Strong Lensing in the CFHTLS

Twenty years ago at CFHT, French astronomers observed for the first time galaxies distorted in giant arcs at the center of the most massive galaxy clusters. These observations brought to light one of the most spectacular effects of what is called "gravitational lensing". According to Einstein's theory of General Relativity, spacetime is curved by the presence of matter. Therefore, the light passing close to an important concentration of mass will be bent. When an observer, a galaxy cluster and a remote galaxy are in nearly perfect alignment, the remote galaxy appears to the observer as one or more luminous arcs resulting from the fusion of images of the remote galaxy distorted and amplified by the galaxy cluster acting as a complex gravitational lens. The shape, brightness and distribution of these gravitational arcs bring invaluable information on the mass distribution of the lensing cluster.



Galaxy group lens in the CFHTLS-SL2S. This example shows a very complex arc structure (in blue), which allows to probe the details of the dark matter profiles associated with the group of yellow galaxies in the center of the image.

Up to recently, only the most massive galaxy clusters and the massive galaxies were the object of gravitational lensing studies. Intermediate-scale structures like the galaxy groups should however be looked at in order to better understand the evolution of the structures in the Universe.

Thanks to a careful inspection aimed at detecting gravitational arcs in one of the four deep fields of the CFHTLS, the team has been able to detect for the first time numerous arcs around galaxy groups. This unexpected discovery provides for the first time direct information on the structure of galaxy groups which are key environments in the formation of structures in the Universe. Scientists will be able to understand the role of dark matter in the evolution of these groups and of the mass concentrations that make the large structures of the Universe.

Giant arcs around a massive cluster galaxy. The white spot on top of the bright blue arc is a satellite galaxy inducing its own distortion on the arc.

Very bright ringlet configuration. It is actually a group of multiple images of a single source, called cusp arcs, merged together in a single arc.

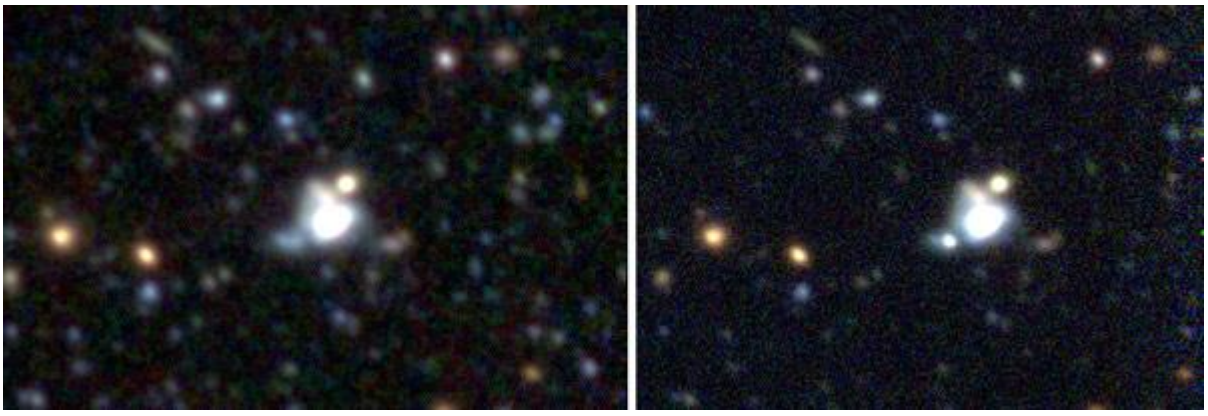
For more details, see Cabanac et al., *A&A* **461**, 873

The Weirdest Type Ia Supernova Yet

Because almost all Type Ia supernovae found so far are not only remarkably bright but remarkably uniform in their brightness, they are regarded as the best astronomical "standard candles" for measurement across cosmological distances. The SuperNova Legacy Survey (SNLS), one of the components of the CFHTLS, makes good use of these standard candles to look at the acceleration of the universe (see Astier et al., The Supernova Legacy Survey: measurement of ΩM, Ω_Λ and w from the first year data set. A&A 447, 31-48).

In the course of their observations, the SNLS team has found a supernova which gives startling evidence that there is more than one kind of Type Ia supernova, a class of exploding stars which until now has been regarded as essentially uniform in all important respects. Dubbed SNLS-03D3bb, it is more than twice as bright as most Type Ia supernovae but has much less kinetic energy, and appears to be half again as massive as a typical Type Ia.

For more details, see "A type-Ia Supernova From a Super-Chandrasekhar Mass White Dwarf Star," by D. A. Howell et al., published in the 21 September 2006 issue of *Nature*.

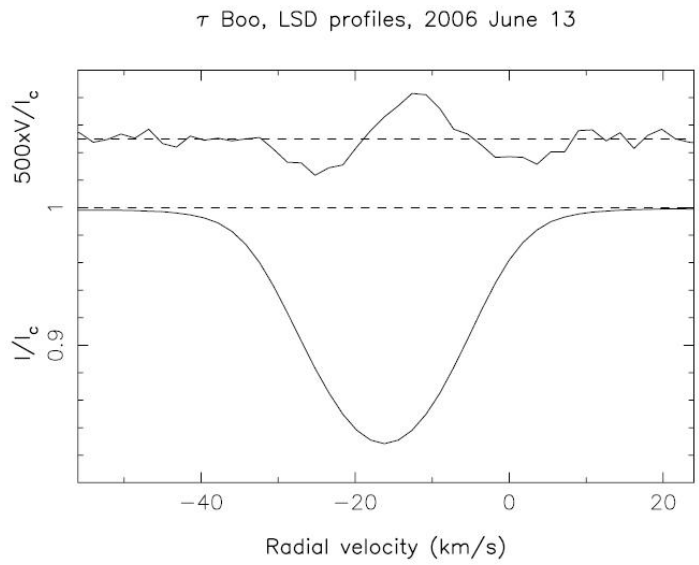


The supernova SNLS-03D3bb was discovered on April 24, 2003 in a small, young, star-forming galaxy, a satellite of the larger galaxy in this picture. Image on the left is before maximum brightness; at maximum brightness (right)

The Harvest of ESPaDOnS Spectropolarimetric Data Continues

ESPaDOnS, the high-resolution spectropolarimeter now solidly established at CFHT, is regularly used by all the communities for spectroscopic and spectropolarimetric projects, moving forward many fields of stellar astrophysics.

Stars hosting giant extra-solar planets are suspected of having magnetic fields, but these fields have so far been measured indirectly only. The study of those magnetic fields is important because they might play a role in the formation of planets or in the migration of giant planets that are now observed very close to their parent star as so-called hot jupiters. A team composed of French and Canadian astronomers, and led by Claude Catala, has for the first time directly measured the magnetic field of such a star, Tau Bootis, an object which is a little bit bigger than our Sun (1.5 solar masses) but much younger (only one billion years old). Tau Bootis is orbited by a giant planet with 4.4 times the mass of Jupiter, on a very close orbit only 5% the Earth-Sun distance. ESPaDOnS has measured a magnetic field of a few Gauss, just a little more than the Sun's, but more complex in structure. Moreover, astronomers have noticed that the planet revolves around the star in synchronization with stellar material located at 45 degrees of latitude. This suggests a complex interaction between the magnetosphere of Tau Bootis and its planet, and calls for new observations to learn more about this star-planet system.



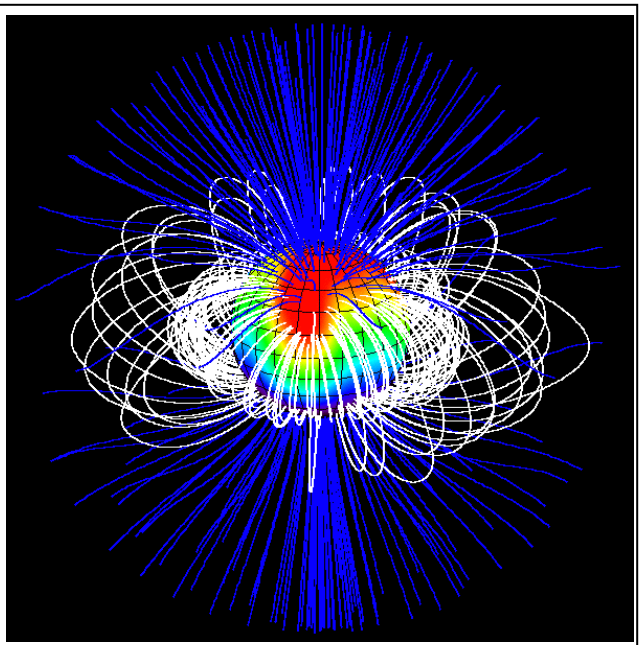
How does ESPaDOnS show us that a star has a magnetic field? All the spectral absorption lines found in a spectrum are added together, to give an average profile shown at the bottom of this graph. The curve shown above the average profile is the value of the circular polarization of the light, which is related to the strength of the stellar magnetic field. When the circular polarization goes above or below zero inside a line, this indicates the presence of a magnetic field.

Magnetic field detection is a specialty of ESPaDOnS, and Canadians astronomers are also studying them for various types of stars. Some stars have a very peculiar chemical composition of the elements mercury and manganese. One of those stars, Alpha Andromedae, also shows evidence that the element mercury is found in 3 isolated spots at the surface of the star. Stellar spots are found in many types of stars and are thought to be formed under the influence of magnetic fields. However, the very high S/N, high spectral resolution, and high temporal resolution spectro-polarimetric data obtained with ESPaDOnS for Alpha Andromedae by Gregg Wade and his colleagues do not show any evidence of a strong magnetic field. How the spots of enhanced mercury are formed on that star will remain a mystery for a while more!

Our Taiwanese partners have also made good use of ESPaDOnS. Ngog Phan-Bao and his collaborators have studied the magnetic fields of two very small and cool M dwarfs, to discover that the magnetic field for one of the two varies very quickly, on timescales of less than 1 hour. This variability is not related to the rotation of the star because the timescale is significantly shorter than its rotation period. Eruptive events are also ruled out by what is seen in the spectrum. The conclusion so far is that the star probably has a complex and inhomogeneous magnetic field, which could be mapped more clearly with additional observations.

While some stars have a magnetic field with a very complex structure made of many loops, others present a regular and simple configuration of their field. Such is the case for V374 Pegasi, which was observed by Jean-François Donati and his colleagues from CFHT, Scotland, and the USA. The target of this study is a very cool star about one third the size of our Sun. Previous theories had predicted for this type of star a more chaotic and less structured magnetic field than in our Sun. The ESPaDOnS observations have however completely surprised astronomers with a simple and organized field that resembles the one of the Earth!

Magnetic fields can have a profound influence on the formation, evolution, and death of a star, and also on the interaction between a star and its planets. The use of ESPaDOnS' capabilities as a spectropolarimeter is an excellent way to gain knowledge on the magnetic fields of a vast range of types of stars.

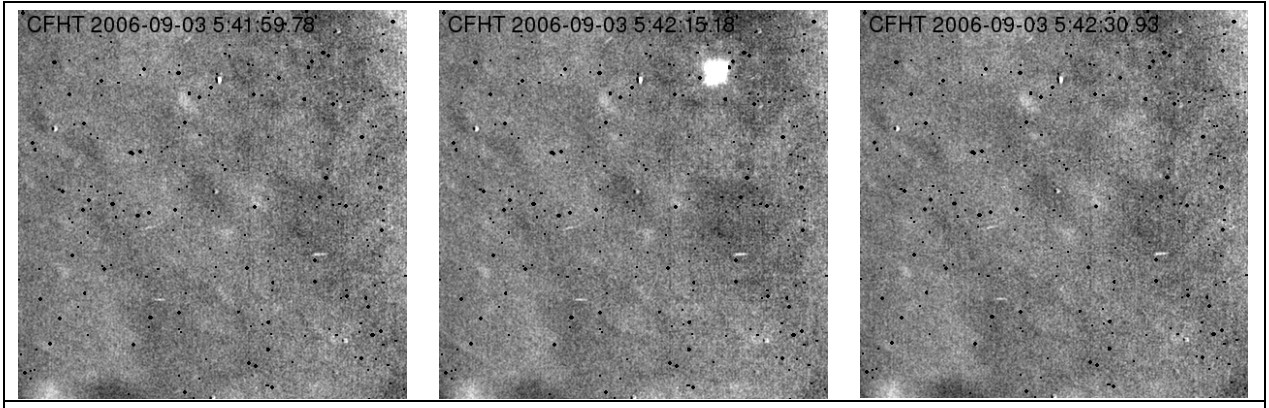


The ESPaDOnS spectropolarimetric observations of V374 Peg were used to make a map of the magnetic field. Contrary to what was expected, the magnetic field has a very simple configuration.

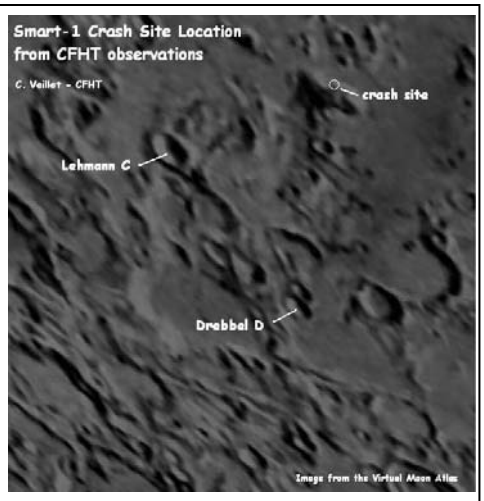
SMART-1 Lunar Firework

With the ESA SMART-1 lunar mission scheduled to end up with a programmed crash on the Moon on the dark crescent of the Moon on Labor Day weekend, telescopes were mobilized in North and South America, Hawaii and Australia to try to capture the thermal flash produced by the impact of a ~200kg mass the size of a washing machine impacting at a low angle the surface of the Moon at 2km/s.

The evening of the impact and the night before, the instrument available at CFHT was WIRCam: with a very wide field of view and a very sensitive array, it was not the ideal instrument to observe the crash. The observing strategy was tested and checked the night before the crash. On the evening of the event, WIRCam images processed in near real time were piped from Waimea into SMART-1's control room at ESOC in Darmstadt, German. The CFHT view of the impact flash by the SMART-1 team brought a visual to a successful space mission and was shown in the media all around the world.

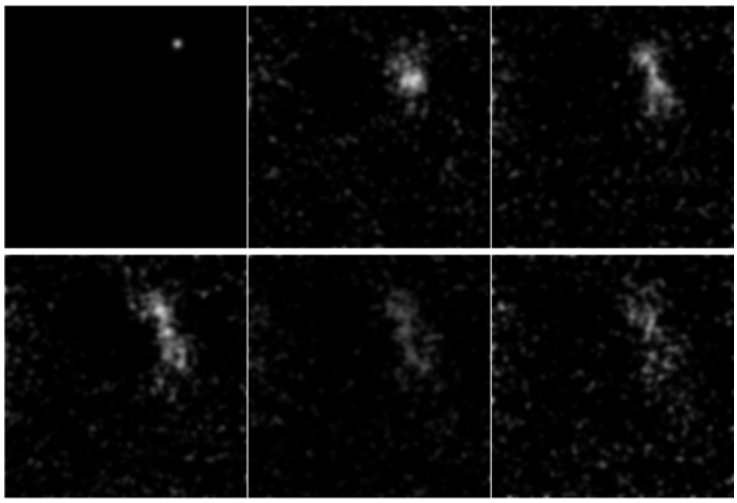


The sequence of three images showing the impact (middle) and the same field before and after, as sent to ESA in near real time. Approximate time and date of the beginning of the exposure is given on the upper left of each image.



The CFHT images of the impact were collocated with the few features visible on the poorly lit surface of the Moon (earthshine produces only a very low contrast). The image above shows the crash site identified using the Virtual Atlas of the Moon. SMART-1 crashed on the slopes of a mountain ~1km high, a site confirmed by the analysis of the last data transmitted by the spacecraft and an accurate restitution of its last orbit.

With a dead time of close to 5s between two consecutive images, the exposure time was set at 10s: a 70% chance to record the impact. The narrowest filter available was used, as the earthshine-illuminated lunar surface is very bright for a camera designed to look at the remote universe more than our closest celestial neighbor. The picture below is a mosaic of 6 images processed to remove the background of the lunar surface, from left to right and top to bottom, starting with the image of impact. The post-impact images show a cloud of dust expanding and dissipating with time, the first time ejecta following a lunar impact are observed! Analysis to be done…

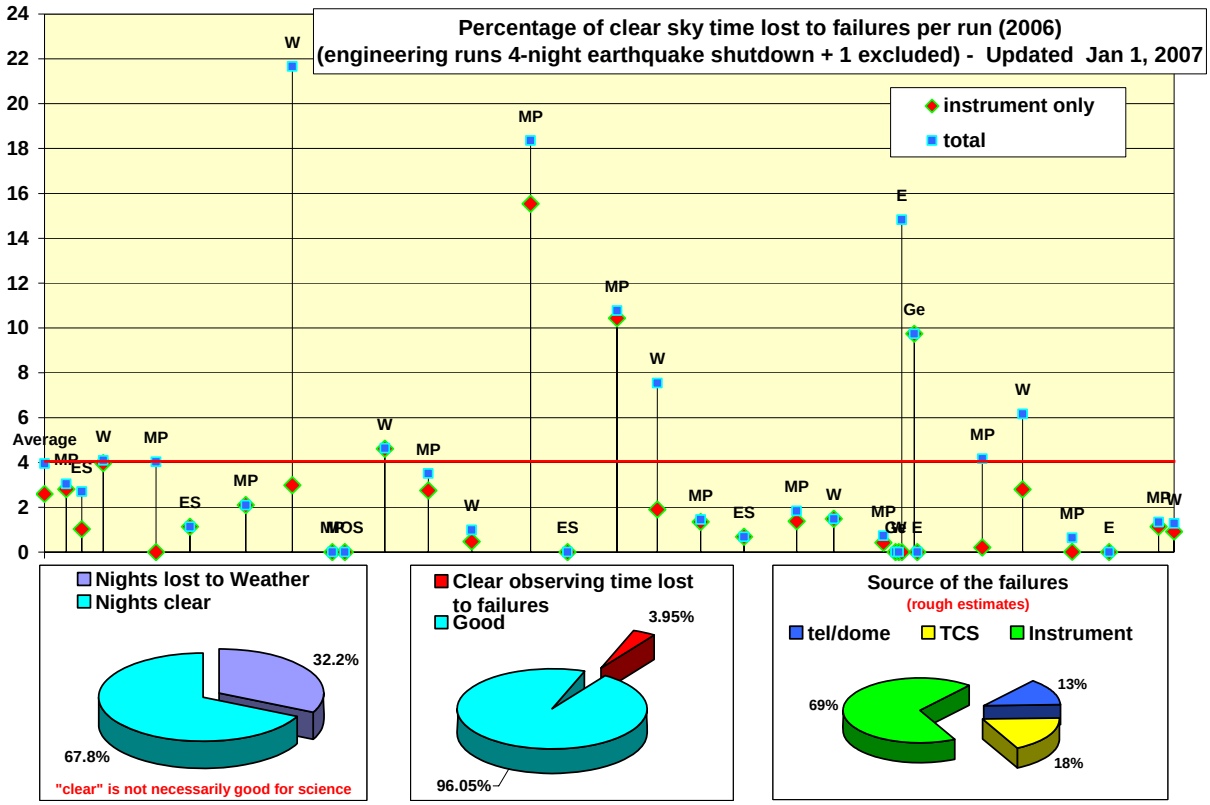


Operations Report

Observing Efficiency

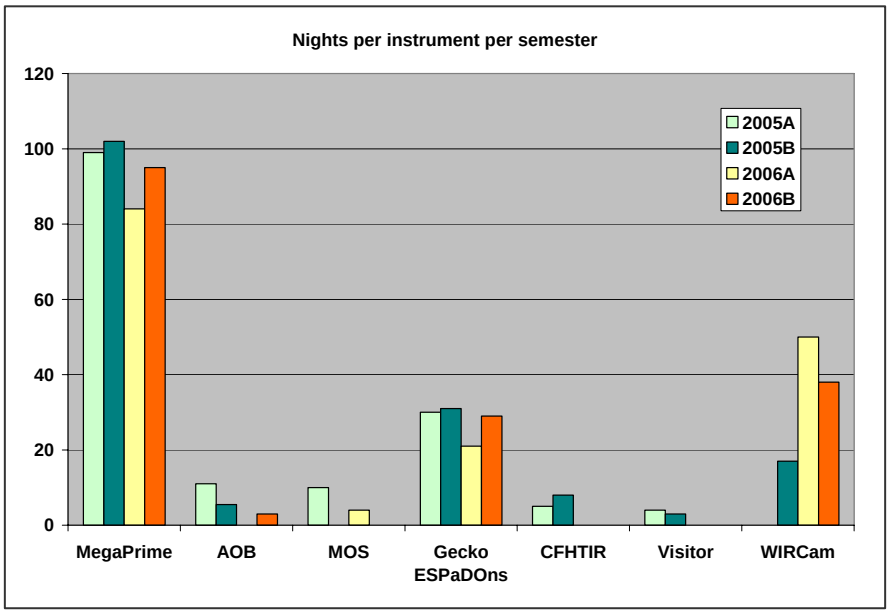
The graph below summarizes the observing time losses due to instrument and telescope failures. The goal for 2006 was to limit the losses to a maximum of 4% of clear weather. We were able to meet this goal, losing only 3.95% to problems of any kind, earthquake excluded. One should realize that a couple of glitches per night, each generating a loss of 10mn of observing time, end up with already 3.5% of the observing time lost!

The reliability of **MegaPrime/MegaCam**, already dramatically improved in 2005, was still the object of closed attention, especially on the filter changing system. As a result, the time lost to problems due to this instrument decreased again in 2006, thanks also to a very efficient preventive maintenance program. The second semester did not see any major problem in spite of heavy use. As seen on the graph below, the MegaPrime runs (labeled MP) were, over the second half of the year, much better in average than the 4% level set as a goal for the year.



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 CFHT’s web site.

Instrument Statistics



The graph opposite shows the number of nights scheduled for PIs and the CFHTLS over the four semesters of 2005 and 2006. Three instruments, MegaCam, WIRCam and ESPaDOnS, took most of the 2006 observing time, with the occasional runs on AOB or MOS in Fabry-Pérot mode. This three-instrument regime is likely to endure over the coming years. CFHT observed for nearly 300 nights in Queued Service Observing mode. The likelihood of ESPaDOnS offered in QSO mode sometime in 2008 will eventually bring QSO as the almost exclusive mode of observation at the observatory.

Queued Service Observing in 2006

During 2006, we offered two instruments, MegaCam and WIRCam, 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 2006, observations for MegaCam in the QSO mode were scheduled for about 200 nights while WIRCam was scheduled for close to 100 nights in total. Thus about 80% of the telescope time available is now used under the QSO mode at CFHT. During each semester, about 40-50 different programs were available for each instrument. Among the QSO programs for MegaCam, of course, is the CFHTLS which represents about 50% of the total observing time made available in the queue mode for this camera. During the last year, operational overheads have been minimized by making several improvements on the cameras, in particular for WIRCam which is now operated with great efficiency. The first semester of 2006 was a difficult one because the weather was very bad: almost 50% of the time was lost for each instrument, maybe the worse statistics ever for Mauna Kea. Despite this, completion for A programs was quite good. The second semester was much better, with spectacular statistics on program completion for MegaCam! Indeed, for MegaCam, the amount of data taken for A + B + C programs resulted in our best semester ever, with a completion level of 94%! The observing efficiency well exceeded 90% during a lot of nights. WIRCam observations went well too, although the time lost to weather and technical issues was much worse. WIRCam observing efficiency is now excellent and ongoing work aims at improving it even more. Globally, the time used between the different Agencies during 2006 was also fairly shared, not a small feat considering the global scheduling constraints on all these programs.

The entire observing chain QSO→NEO→TCS is very efficient, robust and flexible. A challenge for the coming year is to integrate ESPaDOnS within the NOP scheme. It will greatly benefit from this high efficiency and the flexibility to solve complex scheduling issues related to several ESPaDOnS scientific programs.

Earthquake, Sunday October 15, 2006

Just after 7:00 a.m. a pair of earthquakes of magnitude 6.7 and 6.0 off the north-west coast of the Big Island resulted in extensive minor damage throughout the state. Fortunately CFHT experienced no injuries to staff or to their immediate families, nor any serious equipment failures, although telescope operations were impacted.

Headquarters

Staff assessment at headquarters was initiated within 10 minutes of the earthquake. No structural failures occurred nor were any windows broken or doors jammed, although most offices and hallways were left cluttered with fallen acoustic ceiling tiles and books. Several ceiling light fixtures fell and could have resulted in injury had rooms been occupied. A small number of drywall seams were cracked. The most heavily affected rooms were the library and the main conference room.

Waimea Headquarters - Conference Room

Computers in the computer room and associated disk arrays remained in their racks, which themselves remained upright. Roughly 14 disk drives out of a total of some 350 required replacement or attention. No data or software was lost.

The office was mostly back in operation by Tuesday morning thanks to intense cleanup efforts by the Waimea staff. The USGS reported a maximum ground surface acceleration of 1.059 g at the Waimea Fire Station.

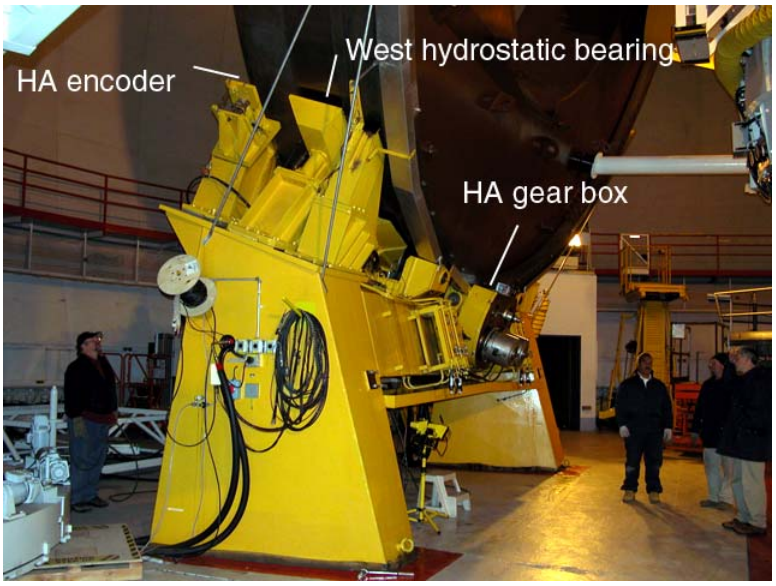
Telescope and Summit Facility

No one was in the building at the time of the earthquake. Several teams responded to the summit through the day to assess damage and to ensure an orderly shutdown of MegaPrime and WIRCam, the first arriving within 30 minutes of the earthquake. HELCO power failed at the time of the earthquake, but the CFHT emergency generator came on-line automatically within 5 minutes.

We experienced no fluid (water, glycol or hydraulic) spills or fluid line ruptures. A large plate glass window on the 5th floor visitor's gallery was shattered. No science instruments or their essential support equipment was damaged. As in Waimea, building damage was mostly limited to items which fell off shelves.

Summit Facility - Dome Bogies

The dome and its bogies were displaced laterally in an East-West direction by up to 2 centimeters, causing lateral constraint rollers on the bogies to bind, which in turn prevented dome rotation. Bogie and



Telescope Horseshoe, Bearings and HA Drive

side-roller alignment required a day of readjustment before dome rotation could be restored. No problems were encountered with dome shutter operation.

At the time of the earthquake the telescope was pointed at zenith. Locking pins were in place and hydrostatic oil pads were off-oil. Nonetheless, during subsequent inspection it was clear from shallow scratches on the HA bearing surfaces of the horseshoe that the entire moving structure of the telescope (tube, horseshoe, east and west beams and south journal) moved along the polar axis multiple times through approximately 3.5 centimeters and rotated about the HA axis by 7 centimeters measured at the periphery of the horseshoe.

Scratches on Horseshoe at East Hydrostatic Bearing

The front face of the horseshoe contacted its two massive earthquake clips, resulting in minor localized damage to the precision HA incremental encoder track on the forward cylindrical face of the horseshoe.

Several bolts on the northwest earthquake clip were bent. The incremental HA encoder itself appears to have survived, but its mechanical interface to the horseshoe was destroyed, as was its drive roller. A two square centimeter area where the HA encoder roller contacts the machined outer reference face of the horseshoe was scored and remains unusable. As a result, the incremental encoder was subsequently moved from the west to the east side of the pier and moved outboard to avoid the scored zones on the reference surface.

Despite the severe shaking, no critical damage was evident at the HA drive gearbox interface to the horseshoe drive sprocket, at any of the hydrostatic bearings or on any of the declination axis bearings or drive train. The telescope polar axis remained aligned as indicated by initial inspection and subsequent telescope pointing tests.

During post event telescope checkout the HA and Declination drive trains were initially inspected visually and then driven through zenith by hand to 'feel' for damage. Both drives were smooth. Telescope structure bolt torques were checked throughout most of the telescope. Loose bolts were limited to a set on the horseshoe earthquake clips which were replaced and 5 of 12 on the declination axis-to-caisson central attachment. The latter bolts have been known to work loose in the past. Replacement bolts are on order and will be replaced as soon as possible.

Micrometer profiles of the HA incremental encoder track on the flat edge of the horseshoe confirm the presence of localized 100 µm x 2 cm x 1 cm track defects (bumps), some near the point of contact with the earthquake clips which have resulted in poor telescope tracking and elongated images in this area. We plan to remove the bumps by hand – stoning the affected area.

Telescope Horseshoe, Bearings and HA Drive

Damage to HA Incremental Encoder Roller

Outreach

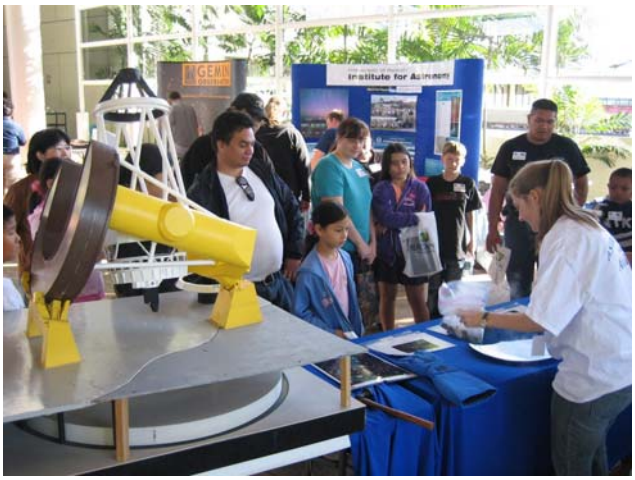
2006 has been another year of successful outreach at CFHT, although marked with some change. Long time outreach coordinator, Rémi Cabanac left CFHT in September. Mary Beth Laychak stepped into the role of coordinating outreach activities upon Rémi's departure. Most of the activities are still the responsibility of the members of the Outreach Group; Liz Bryson, Moani Akana, Grant Matsushige, Lisa Wells, Billy Mahoney, Tom Benedict and Rachael Zelman, but the entire staff of CFHT responds with great dedication whenever they are asked for their assistance. We continue to strive to maintain a balance between participating in numerous activities while still preserving our enthusiasm.

2006 also marked the debut of the Oral History DVD, "Gathering the Forgotten Voices" created by Liz Bryson. The DVD was unveiled at the Board of Director's meeting in December. Liz will continue to put the complete transcripts of the interviews on the library's website. The outreach group would like to express its gratitude to all of the volunteers, friends and family members who participated in all of the activities in 2006. Because of their efforts, CFHT remains a respected and active participant in the community, both in Waimea and across the Big Island.

Star Gazing Parties:

- January 26th-Star Party with Waimea Middle School in conjunction with their Science Fair displays

- December 2nd- Christmas Star Gazing Party



Onizuka Day – UH Hilo

Fairs and Festivals:

- January 28th - Onizuka Day at UH Hilo
- February 10/11- Kona Science Fair (judging)
- February 13th- Pa'auilo K-8 Science Fair (judging)
- February 25th - Hilo Science Fair (judging)
- March 8th-Girl Scout Women in Science Day at UHH
- March/April - Mentoring for the Waimea Middle School Bot Ball team
- April 22nd – Earth Day Waimea.
- April 29th – Healthy Keiki Fest Waimea
- May 6th – Astro Day Hilo. CFHT posters were very popular as usual
- October 28/29th - American Cancer Society Relay for Life, Waimea. 16 person team, finished 4th in amount raised and 3rd in laps completed
- December 9th - Robot Competition in Hilo

CFHT HQ and Summit Visits:

- January 27th- Jean-Francois Sygnet, visiting French Astronomer
- Feb 13th- students from Laupahoehoe HS visit HQ
- Feb 23rd- group of home schooled students visit HQ
- July 11th- Talk to Girl Scouts from Kauai at the Visitor's Center about Mauna Kea and CFHT
- August 3rd – Summit Tour for YMCA silent auction winners
- August 4th - Summit Tour for student interested in becoming an astronomer
- August 5th- Universe Tonight talk at the Visitor's Center

- August 14th and 15th: HQ visit from Kanu O Ka Aina 3-5th grade students

- September 1st –Summit Tour for HPA silent auction winners

- September 1st- Mauna Kea Natural History Tour with Bill Stormont by 10 CFHT staff members

- November 14th –Summit Tour for High School Students from Samuel Robertson Technical Secondary – School in Maple Ridge, BC

- December 7th- Summit Tour for High School Students from Westview Secondary School in Maple Ridge, BC

Star gazing at the Relay for Life - Waimea

Miscellaneous:

- CFHT continues to co-host (with Keck) the West Hawaii Astronomy Club meetings every other month. Rémi and Pierre are active members

- Creation of the Robot Club by Tom Benedict and Billy Mahoney. Community Club holds monthly meetings at CFHT

- July 4th- Charity event, Parker Ranch Rodeo's Calf Dressing Event

- September 19th- Kanu O Ka Aina Open House. Attended at the invitation of the 3-5th grade teacher after they visited CFHT in August

- October 7th- Public Talk regarding Pluto

- November/December- CFHT Holiday food drive for both staff and visitors to the Star Party. All food collected went to the Kawaihae Transitional Shelter

- All year: public lectures to school classes

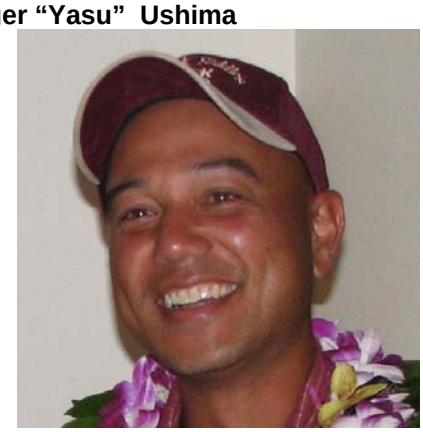
The CFHT team at the Relay for Life - Waimea

The Personal Touch

Coleen Hickman

Coleen Hickman, a member of the business office, retired to Texas with her husband Henry after 20 years of dedicated service. Coleen, a Big Island girl at heart, started to work at CFHT in 1986 and, over the years, brought a lot of joy to the front office and the accounting office. Apart from her dedication and attention to detail, Coleen was a prime instigator of many of the front office ladies 'antics', and is well missed for her pleasant and comic side. She and Henry now reside in Fredericksburg, just outside of San Antonio.

Roger "Yasu" Ushima



Roger (Yasu) Uchima, an energetic member of the daycrew who, among many other tasks, looked after the organization and running of the summit preventive maintenance program, left the summit in August to return to his previous work on heavy industrial equipment with Isimoto Contracting in Hilo. Roger, a dedicated young Dad, is looking forward to spending more time with his son Kendric and working on his budding cattle ranch on the Hamakua coast.

Susan Brotman

Susan Brotman left CFHT in January 2006 after four years of service as an Instrumentation Specialist. She arrived when MegaPrime was being built at the Observatory, and participated in its completion and in the first difficult years of the MegaCam operations. Susan decided to exchange the maintenance of our instruments for that of gardens as a landscaper in Waimea!

Tomoko "Tomo" Matsumoto

Tomoko Matsumoto left CFHT in February 2006 to start a new career in real estate. Tomo worked for several years as the PC systems administrator and also developed parts of the ESPaDOnS software environment. She also played a significant role in data distribution operations. While we miss seeing her around the halls we still see her at her new office right across the park.

David Valls-Gabaud

David Valls-Gabaud spent nearly three years at CFHT as Visiting Astronomer. He brought to the Astronomy Group a broad range of scientific interests and helped activate its scientific life, organizing the seminars and participating in the preparation of the Annual Reports. He came to CFHT from Toulouse but went back to Paris Observatory in April 2006.

Thierry Forveille

Thierry Forveille has been for more than six years one of the French Resident Astronomers (RAs) at CFHT. Thierry, an avid user of Pueo, followed the evolution of the Observatory and ended up observing also with MegaCam and WIRCam! The many roles he played over his tenure include support astronomer for Pueo, Project Scientist following the development of WIRCam, and Queue Coordinator for our wide-field cameras. His good knowledge of observations as well as his wide range of astronomical interests made him an important player in the scientific life of the Observatory. He came to us from LAOG in Grenoble. It is where he went back in April 2006…

Rémi Cabanac

Rémi Cabanac has been for three years a very active Canadian Resident Astronomer. He came to CFHT from ESO with already a good experience of the work in a modern operational observatory. He brought to us an indefectible enthusiasm and an endless energy he dedicated to many activities, from Queue Coordination to support of ESPaDOnS. In addition, he played a very important role in the Public Outreach program of the Observatory, which developed significantly under his leadership. Rémi left CFHT in September 2006 to join the *Télescope Bernard Lyot* (TBL) at Pic du Midi as Scientific Director. We miss him very much, but the TBL and NARVAL (ESPaDOnS' clone) are in good hands!

New Faces

Tyson Arruda

Tyson Arruda joined CFHT in October of 2006 as Mechanical Technician. He came from Keck Observatory with more than five years of experience in maintaining heavy equipment on Mauna Kea.

Larry Roberts

Larry Roberts joined CFHT as Electrician in August 2006, filling the position left vacant more than nine months earlier by Tom Beck. He came from Sunrise Park Ski Resort in Arizona where he was tending the ski lift equipment.

Ferdinand "Ferd" Babas

Ferdinand Babas joined CFHT in April of 2006 as the assistant system administrator. Ferd lives in Hilo and comes with a solid background in information technology including work at banks and Internet service providers. He has already gotten himself involved in several projects in addition to PC support.

Adam Draginda

Adam Draginda joined CFHT in June of 2006 as Queue Observer. In the course of his studies for a BS in Physics and Astronomy from University of Victoria, he worked for Gemini South and HIA in the Co-Op program.

Rachael Zelman

Rachael Zelman joined CFHT in May of 2006 as Queue Observer. After a BS in Mathematics and Physics at Bowling Green U. (Ohio), where she observed RR Lyrae, she has been an instructor for Astrocamp in California.

Stéphane Arnouts

Stéphane Arnouts joined CFHT in September 2006 as French Resident Astronomers following the departure of Thierry Forveille. Stéphane came from Marseille with his wife and two children. He brings to CFHT an extensive knowledge in image processing and photometric redshift determination. Even though far from home, Stéphane will still work with the Galex team, while providing his skills to the operation of CFHT's wide-field imagers and the development of the WIRCam reduction pipeline.

Current Staff at CFHT

Akana, Moani	Administrative Specialist	Mahoney, Billy	Data Base Specialist
Albert, Loïc	Resident Astronomer	Manset, Nadine	Resident Astronomer
Alles, Rosemary	Systems Programmer	Martin, Pierre	Director of Science Operations
Arnouts, Stéphane	Resident Astronomer	Matsushige, Grant	Sr. Instrumentation Specialist
Arruda, Tyson	Mechanical Technician	Mizuba, Les	Detector Specialist
Atapattu, Rohendra	Operations Engineer	Morrison, Glenn	Resident Astronomer
Babas, Ferdinand	Assistant System Administrator	Potter, Sharon	Safety Specialist
Baril, Marc	Instrument Engineer	Roberts, Larry	Electrician
Barrick, Gregory	Optical Engineer	Rodgers, Jane	Finance Manager
Benedict, Tom	Instrumentation Specialist	Sabin, Daniel	Mech. Designer / Instrument Maker
Bryson, Elizabeth	Librarian	Salmon, Derrick	Director of Engineering
Burdullis, Todd	Senior Service Observer	Stevens, Mercédes	Administrative Assistant
Cruise, William	Telescope Control Systems Eng.	Taroma, Ralph	Observatory Facility Manager
Cuillandre, Jean-Charles	Staff Astronomer	Teeple, Doug	System Programmer
Dale, Laurie	Administrative Specialist	Thomas, James	Computer Systems Engineer
Draginda, Adam	Service Observer	Veillet, Christian	Executive Director
Elizares, Casey	Mechanical Technician	Vermeulen, Tom	Systems Programmer
Fischer, Linda	Resource Specialist	Ward, Jeff	Detector Engineer
Forshay, Peter	Service Observer	Warren, DeeDee	Director of Finance & Administration
Gajadhar, Sarah	Electrical Engineer	Wells, Lisa	Observing Assistant
George, Teddy	Observing Assistant	Withington, Kanoa	Software Manager
Ho, Kevin	Instrumentation Manager	Wood, Roger	Automotive Mechanic
Lai, Olivier	Resident Astronomer	Woodruff, Herb	System Administrator
Laychak, Mary Beth	Service Observer	Woodworth, David	Senior Observing Assistant
Look, Ivan	Mechanical Design Engineer	Zelman, Rachael	Service Observer
Luthe, John	Observing Assistant		

Comings and Goings

Arnouts, Stéphane	Arrival	Sep	Lawson, Terry	Departure	Feb
Arruda, Tyson	Arrival	Oct	Lin, Ethan	Visitor	May departure
Babas, Ferdinand	Arrival	Mar	Lin, Li-Hwai	Visitor	Mar - Jul
Bocquet, Aurélien	Visitor	Apr - Aug	Matsumoto, Tomoko	Departure	Jan
Brotman, Susan	Departure	Jan	Roberts, Larry	Arrival	Aug
Cabanac, Rémi	Departure	Sep	Uchima, Roger	Departure	Aug
Draginda, Adam	Arrival	Jun	Valls-Gabaud, David	Departure	Mar
Forveille, Thierry	Departure	May	Yu, Po-Chieh "Jack"	Visitor	Feb – Sep
Hickman, Coleen	Departure	Mar	Zelman, Rachael	Arrival	May

Financial Resources

The three Member Agencies supported the CFHT annual budget in 2006 as shown in the table at the right, in US funds.

These contributions reflect a 1.74% increase over the prior year, in accordance with the Golden Age Plan.

Under a collaborative agreement with CFHT, the National Taiwan University remitted $65,022, as reimbursement for costs associated with its use of the Corporation's facilities. Other sources of funds included $40,711 from mid-level facility use credits and $169,781 in earned interest allocated to the contingency reserve fund.

Agency Contributions

NRC	$2,870,000
CNRS	2,870,000
UH	665,507
Total	$6,405.507

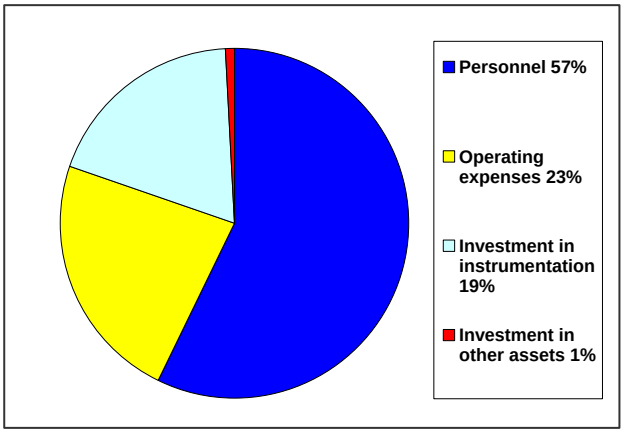
From the operating fund, expenditures were allocated to the areas listed in the table at right.

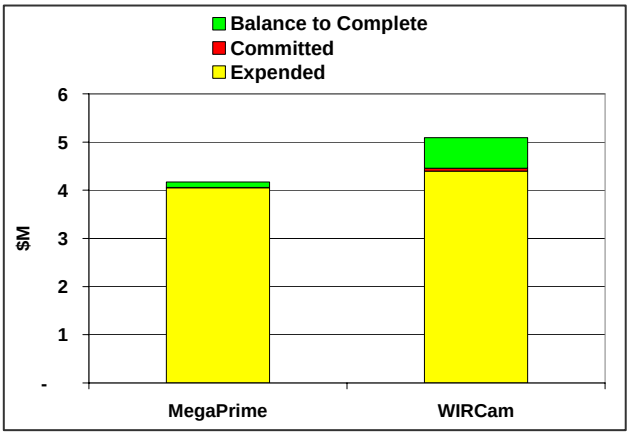
During the year, $97,059 were disbursed from the instrumentation fund for the current projects of the Wide-field Imaging Plan, which brings the total investment under this multi-year program to $10,126,087. The current appropriation and the portion committed to date are shown in 2006, 94% of total appropriations under the Wide-field Imaging plan were spent or committed.

Overall in 2006, resources from all CFHT funds were allocated to the categories of expenditures shown in the pie chart below.

Operating Fund Expenditures for 2006

Observatory facilities and operations	$702,205
Base facilities and operations	701,531
Instrumentation	73,980
Science	69,357
Personnel	4,575,289
General expenses	362,145
Transfer from Reserve	(79,000)
Total Operating Fund Expenditures	$6,405,507





CFHT Committees

Board of Directors

Executive Secretary to the Board of Directors: Mercédes M. Stevens

Claude Catala (F)	Observatoire de Paris - LESIA
Dennis Crabtree (C)	Herzberg Institute of Astrophysics
Jean-Gabriel Cuby (F)– Chair	Laboratoire d'Astrophysique de Marseille
Gregory Fahlman (C)	Herzberg Institute of Astrophysics
James Gaines (H)	University of Hawaii
Jean-Marie Hameury (F)	Institut National des Sciences de l'Univers
Robert A. McLaren (H) – Treasurer	University of Hawaii
Richard Normandin (C)	National Research Council Canada
Harvey Richer (C) - Vice-Chair	University of British Columbia
Daniel Rouan (F) – Secretary	Observatoire de Paris-Meudon

Scientific Advisory Council & Time Allocation Committee Members

Pierre-Alain Duc (F) - Vice-Chair ; TAC	Commissariat à l'Energie Atomique
Christ Ftaclas (H) - TAC	University of Hawaii
Laura Ferrarese (C) - TAC	Herzberg Institute of Astrophysics
Jean-François Gonzalez (F) - TAC	Centre de Recherche Astronomique de Lyon
Cécile Gry (F)	Laboratoire d'Astrophysique de Marseille
Hendrik Hoekstra (C) - TAC	University of Victoria
Robert Jedicke (H)	University of Hawaii
George Mitchell (C)	Saint Mary's University
Patrick Petitjean (F)	Institut d'Astrophysique de Paris
Nicole St.-Louis (F) - Chair	Université de Montréal

CFHT Executive

Christian Veillet - Executive Director	DeeDee Warren - Director of Finance and Administration
Derrick Salmon - Director of Engineering	Pierre Martin – Director of Science Operations

Audit Committee

Bernard Adans (F)	Centre National de la Recherche Scientifique
Daniel Gosselin (C)	National Research Council Canada
Russell Miyake (H) - Chair	University of Hawaii
Peter Peacock (C)	National Research Council Canada
Hubert Rédon (F)	Centre National de la Recherche Scientifique

Contracts Review Committee

François Baudin (F)	Institut National des Sciences de l'Univers
Robert McEwen (C) - Chair	National Research Council Canada
Michel Rancourt (C)	National Research Council Canada
Gérard Vivier (F)	Institut National des Sciences de l'Univers
Duff Zwald (H)	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 2006A

Adami	MegaPrime	Un domaine vierge dans les amas de galaxies: Imagerie U des galaxies les plus faibles de Coma
Balogh	WIRCam	The stellar masses of nearby, mass-selected groups
Beuzit	AOB IR	Stellar multiplicity and extra-solar planet formation
Bohlender	ESPaDOnS	Planet-star interactions with ESPaDOns - a multi-wavelength approach
Bouvier	WIRCam	Isolated Planetary Mass Objects (IPMOs) : nearing the end of the IMF
Carignan	MOS/FP	Hα Kinematics Survey of the SINGS (SIrtf Nearby Galaxy Survey) Sample
Carney	ESPaDOnS	Line broadening in luminous metal-poor stars: Turbulence or absorption of planets?
Catala	ESPaDOnS	Magnetic fields in the pre-main sequence Herbig Ae/Be stars
Cheng	WIRCam	Deep WIRCam Imaging in the HDF-North Region: Complete the missing link
Connors	MegaPrime	An Earth Trojan Search in the MegaPrime era
Cowie	WIRCam	A bolometric approach to galaxy formation and evolution
Cowie	WIRCam	A bolometric approach to galaxy formation and evolution
Deharveng	WIRCam	Triggered massive-star formation on the borders of Galactic HII regions
Dinh	ESPaDOnS	Probing the inner hole in the rotating disk around Herbig Ae/Be stars
Dinh	ESPaDOnS	Circumstellar disk around AGB and post-AGB stars
Donati	ESPaDOnS	Investigating the origin and evolutionary impact of magnetic fields in very hot stars
Doressoundiram	ESPaDOnS	Imaging of the Na and K exosphere of Mercury in support of the Bepi Colombo mission
Doressoundiram	WIRCam	Visible-infrared colors of the outer solar system objects
Ebeling	MegaPrime	The matter distribution in and around the most massive galaxy clusters at 0.5<z<0.7
Elbaz	WIRCam	WIRCam Imaging in GOODS-N: Establishing a Link between High-Redshift, Star-Forming Galaxies.
Fingerhut	WIRCam	Probing the Uniformity of the Local Sheet Environment (PULSE)
Forveille	AOB IR	A deep search for very cold brown dwarfs companions
Hoekstra	MegaPrime	Comparison of the weak lensing mass to the baryonic constituents in X-ray luminous clusters of galaxies
Huang	WIRCam	Are GRBs with redshift z> 6 common or not ?
Hudson	MegaPrime	Spatially-resolved ages and metallicities in early-type galaxies from u* imaging
Hutchings	WIRCam	Star and Galaxy Counts at Different Galactic Latitudes
Ibata	MegaPrime	The extended disks of galaxies: a new galactic component?
Kneib	WIRCam	The WIRCam Deep Survey (WIRDS): Tracing Mass Evolution of Galaxies out to z3
Kwok	WIRCam	Near-IR deep narrow band imaging of Planetary Nebulae
Lee	MegaPrime	Triggered Star Formation in M17
Lee	WIRCam	Triggered Star Formation in M17
Lemasle	ESPaDOnS	On the reality of the transition zone around 9-12 kpc in the galactic abundance gradient.
Lim	WIRCam	First Global Maps of Nearby Galaxies in Molecular Hydrogen Gas
Lyo	MegaPrime	Deep and wide-field optical/infrared survey of the ρ Ophiuchi down to the brown dwarf and planetary-mass objects (MegaPrime)
Lyo	WIRCam	Deep and wide-field optical/infrared survey of the ρ Ophiuchi down to the brown dwarf and planetary-mass objects (WIRCam)
McGrath	WIRCam	Origin of the earliest massive galaxies
McHardy	WIRCam	The evolution of the sub-mJy radio population: WIRCam imaging of a GMRT/*Spitzer*/X-ray Deep Survey Area
Mondal	WIRCam	A deep near-infrared survey of brown dwarfs and substellar objects in young clusters IC 348 and NGC 1333
Morrison	MegaPrime	Galaxy evolution in clusters during formation
Morrison	WIRCam	Optical/NIR SED's: determining the nature of the ultra-faint radio population
Moutou	ESPaDOnS	Deep spectro-polarimetric follow-up of the transiting extrasolar system OHP-TR-1
Muzzin	MegaPrime	Detecting Clusters of Galaxies at 1<z<2 in the Spitzer SWIRE Legacy Fields
Omont	WIRCam	Large Scale Structures aroundz=1.5-2 Radio Galaxies
Paletou	ESPaDOnS	Characterising the magnetic topologies in the core regions of protostellar accretion discs
Petit	MegaPrime	Trouver les TransNeptuniens exotiques
Sanders	MegaPrime	Hawaii UV/NIR imaging of the HST-ACS COSMOS 2-deg sq. Treasury field
Sanders	WIRCam	Hawaii UV/NIR imaging of the HST-ACS COSMOS 2-deg sq. Treasury field
Shkolnik	ESPaDOnS	Planet-star interaction with ESPaDOnS - a multi-wavelength approach
Simard	WIRCam	WIRCam Imaging in GOODS-N: Linking Different Classes of High-Redshift, Star-Forming Galaxies.
Soucail	MegaPrime	Distribution de masse d'amas de galaxies lointains: ètude combinèe X et weak lensing à z~0.5.
Tholen	MegaPrime	The population of asteroids interior to Earth's orbit
Tully	MegaPrime	MegaCam imaging of the M81 group
Willis	WIRCam	ZEN3: a narrow J-band survey for Lyman-alpha emission at z=8 using WIRCam
Willott	MegaPrime	A very wide survey for z=6 quasars and cool brown dwarfs
Willott	WIRCam	The WIRCam Deep Survey (WIRDS): Tracing Mass Evolution of Galaxies out to z~3
Yan	WIRCam	WIRCam Observations of Bok Globules
Yee	MegaPrime	GALAXY CLUSTERS AS A DARK ENERGY PROBE

Approved Programs 2006B

Beaulieu	WIRCam	The effect of metallicity on the Cepheid Period-Luminosity relation
Bohlender	Gecko	The Interstellar $^{12}C/^{13}C$ Isotope Ratio and the Diffuse Interstellar Bands
Boselli	MegaPrime	Arecibo Galactic Environment Survey (AGES): optical follow-up
Bouvier	MegaPrime	Isolated Planetary Mass Objects (IPMOs) : nearing the end of the IMF
Bouvier	WIRCam	Isolated Planetary Mass Objects (IPMOs) : nearing the end of the IMF
Carney	Gecko	Line broadening in luminous metal-poor stars: Turbulence or absorption of planets?
Catala	ESPaDOnS	Magnetism of pre-main sequence A and B stars in young open clusters: the influence of environment, age and rotation
Chen	WIRCam	Searching Embedded Stellar Content in the W3/W4 Ridge
Chiueh	MegaPrime	Galaxy Clusters as a Dark Energy Probe
Cuby	WIRCam	Searching z ~ 8 galaxies with WIRCAM.
Davidge	MegaPrime	Tracing the Outer Regions of M81
Davidge	WIRCam	Tracing the Outer Regions of M81
Deharveng	WIRCam	Triggered massive-star formation on the borders of Galactic HII regions (II)
Delorme	WIRCam	On the track of Y dwarfs: A Wircam Survey to find the coolest Brown Dwarfs known
Dinh	ESPaDOnS	Probing rotating disks around Herbig Ae/Be stars
Dobler	ESPaDOnS	Magnetic fields of fully-convective dwarfs
Donati	ESPaDOnS	Magnetospheres and accretion flows of classical T-Tauri stars
Ebeling	MegaPrime	
Forveille	ESPaDOnS	Magnetic fields of fully-convective dwarfs
Galland	AOB IR	Investigating low-mass companions around early type stars
Harrington	ESPaDOnS	
Hu	WIRCam	
Huang	WIRCam	Are GRBs with redshift z>6 common or not?
Ibata	MegaPrime	Structures of the outer halo of Andromeda
Ibata	MegaPrime	What is the nature of the dark matter: cold or warm? A pilot study in Pal 5
Ibata	MegaPrime	Structures of the outer halo of Andromeda
Kneib	WIRCam	The WIRCam Deep Survey (WIRDS): A deep look in the CFHT-LS D1 and D4 field
Landstreet	ESPaDOnS	Magnetic Doppler Imaging of Ap stars
Lèbre	ESPaDOnS	A spectropolarimetric study of Blue Stragglers in M67 : Mixing as a constraint to the Blue Straggler phenomenon
Lyo	WIRCam	Search for a nearby intermediate-aged pre-main sequence stellar cluster (WIRCam)
Magnier	MegaPrime	
Masiero	MegaPrime	
McConnachie	MegaPrime	The physical properties of the proto-galactic building blocks of M31
McGee	WIRCam	Hα luminosity function at z > 2
Mondal	WIRCam	Detection and Characterization of the Substellar Population and Surrounding Dusty Disks in IC-348
Moraux	MegaPrime	Very low mass eclipsing binaries in h and χ-Per and M34
Moraux	WIRCam	Infrared monitoring of the Orion Nebula Cluster with WIRCam
Morrison	MegaPrime	
Morrison	WIRCam	
Moutou	ESPaDOnS	Deep spectro-polarimetry, transmission spectroscopy and induced magnetic activity of the exoplanet system HD189733
Muller	WIRCam	Looking our closest neighbour with WIRCam
Muzzin	MegaPrime	Detecting Clusters of Galaxies at 1 < z < 2 in the Spitzer SWIRE Legacy Fields
Nakashima	ESPaDOnS	Spectropolarimetric Observations toward AGB Stars with a Possible Rotating Disk
Petit	ESPaDOnS	Magnetic braking of solar-type stars in the open cluster α-Persei
Petit	MegaPrime	Trouver les TransNeptuniens exotiques
Pierre	MegaPrime	Complete coverage of the XMM-LSS/SWIRE/APEX field
Puravankara	WIRCam	The IMF in Cometary Globule Gal 96-15: the influence of external trigger on the formation of low-mass stars and brown dwarfs
Sanders	WIRCam	
Shang	AOB IR	Imagine the Remnant Cavities around Young T-Tauri Stars with the AO
Shang	WIRCam	Searching Remnant Outflow Cavities in Near-IR Around Young T Tauri Stars
Shkolnik	ESPaDOnS	
Shkolnik	ESPaDOnS	
Soucail	MegaPrime	Distribution de masse d'amas de galaxies lointains: étude combinée X et weak lensing à z~0.5
Tholen	MegaPrime	
Tully	MegaPrime	
Walawender	WIRCam	
Wehner	MegaPrime	Intracluster Light in Low-Redshift Rich Clusters of Galaxies
Wilkinson	MegaPrime	A MegaCam survey of a newly discovered Milky Way halo stream
Willis	WIRCam	ZEN3: a narrow J-band survey for Lyman-alpha emission at z=8 using WIRCam
Willott	MegaPrime	A very wide survey for z=6 quasars and cool brown dwarfs
WIRDS	WIRCam	
Yee	MegaPrime	Galaxy clusters as a dark energy probe

2006 CFHT Refereed Publications

All CFHT refereed publications are 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."

Adami, C., et al. 2006. A deep wide survey of faint low surface brightness galaxies in the direction of the Coma cluster of galaxies. A&A 459, 679-692

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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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