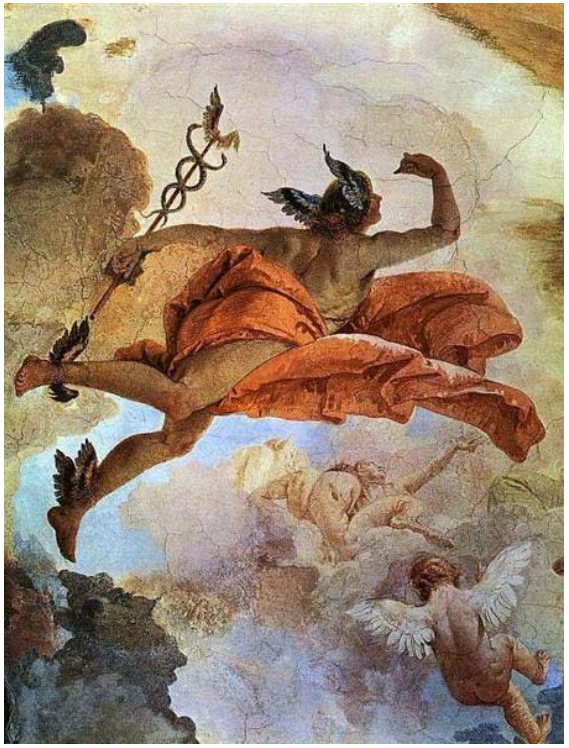
HERMES@AAT

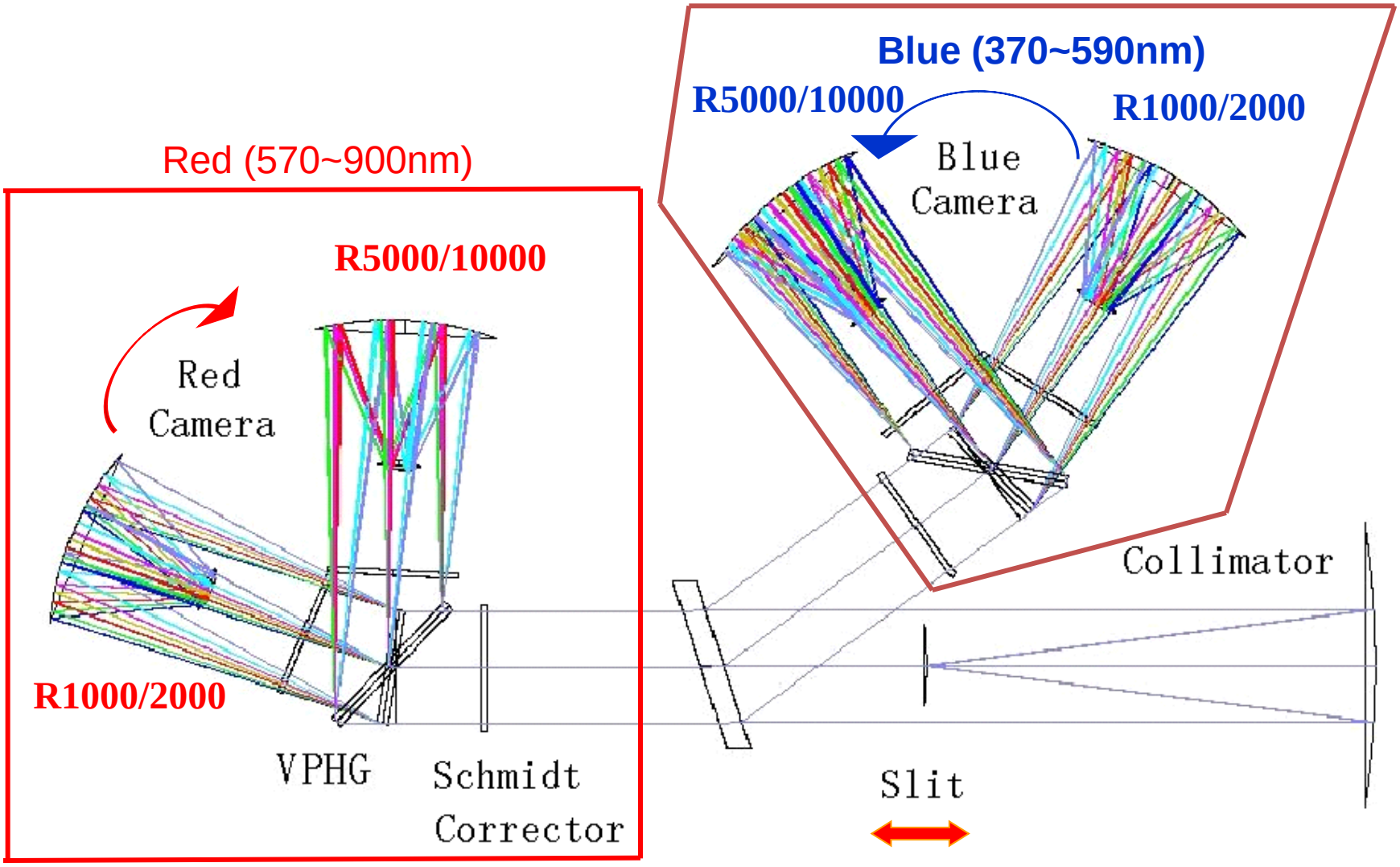


HERMES will be the next major instrument for the 3.9-m AAT

currently under construction at AAO. It will provide a unique and powerful new facility for multi-object astronomy. The concept was first presented at a 2007 workshop held to determine the astronomical community's priorities for new AAT instrumentation.

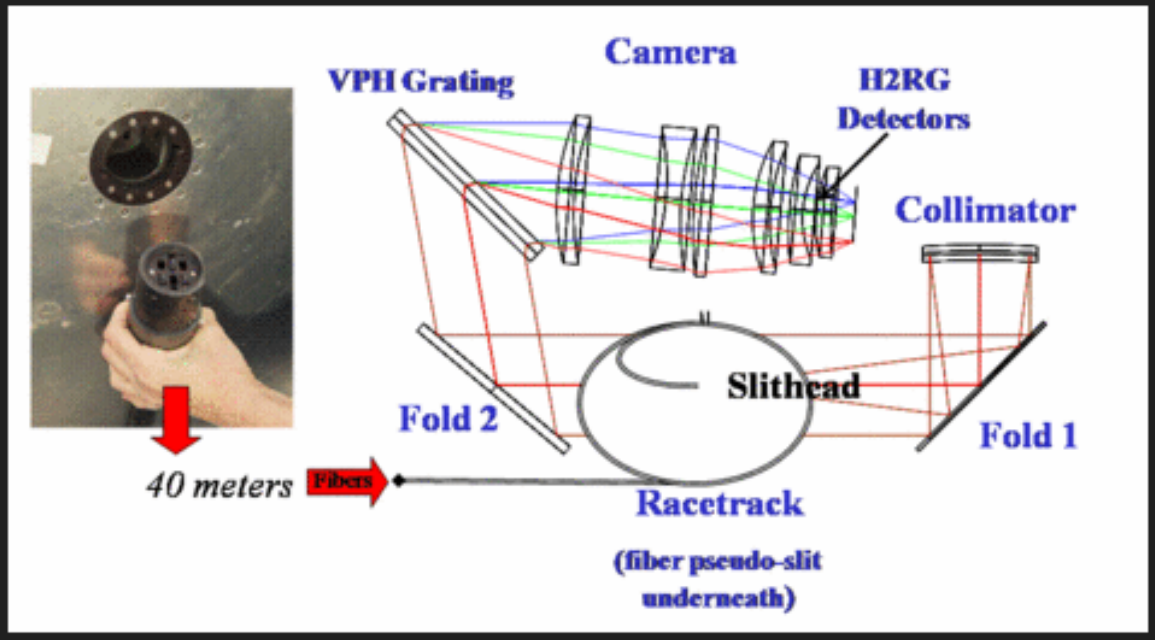
The HERMES system is built upon the AAT's existing two-degree field (2dF) optical fibre positioner, which can collect the light from 400 stars at a time. The positioner feeds a powerful new spectrograph which covers four optical bands simultaneously at a spectral resolution of ~28,000.

LAMOST-LRS Optical System



APOGEE Spectrograph

APOGEE is a high-resolution near-infrared spectrographic survey of ~100,000 stars in the Milky Way galaxy. The spectrograph will work in H band, from 1.52 to 1.69 microns, with a resolution of order 20,000. The APOGEE spectrograph uses 300 low-OH ("dry") fused silica fibers with a FOV of 2" that will transfer light from the plug plate on the SDSS-III telescope focal plane to a room in the adjacent support buiding housing the bench-mounted APOGEE spectrograph. Each one of the 300 fiber trains consist of two fiber runs in series. A 2-m fiber run (so-called "fiber harness") goes from the plug plate to a



A schematic illustration of the APOGEE spectrograph fiber link and optical layout

Gran Telescopio Canarias

For the

Mid-resolution InfRAreD Astronomical Spectrograph

(MIRADAS)

The basic MIRADAS concept is a near-infrared multi-object echelle spectrograph operating at spectral resolution R=20,000 over the 1-2.5 μm bandpass. MIRADAS selects targets using ~20 deployable probe arms with pickoff mirror optics, each feeding a 4.0x1.2-arcsec field of view to the spectrograph. The spectrograph input optics also include a "slit slicer" which reformats each probe field into 3 end-to-end slices of a fixed 4.0x0.4-arcsec format – combining the advantages of minimal slit losses in any seeing conditions better than 1.2-arcsec, while at the same time providing some (limited) two-dimensional spatial resolution. The spectrograph optics then provide a range of configurations providing the observer with the ability to choose between maximal multiplex advantage and maximal wavelength coverage, with several intermediate options, depending upon the needs of the science program. Its

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– General Parameters

Parameter	Value	Comment
Target field of regard	5-arcminute diameter	Each probe arm patrols a "slice of pie" wedge of this circular field
Individual target field of view	4x1.2-arcsec	
Slit slicer geometry	3 slices of 4.0x0.4-arcsec ea.	
Detector focal plane	4096x2048 pixels	Mosaic of 2Kx2K HAWAII-2RG
Continuum sensitivity	J=18.0 mag H= 17.7 mag K = 16.7 mag	S/N=10 for 1-hour on-source exposure
Emission line sensitivity	$5x10^{-18}$ ergs/cm^2/s (point) $8x10^{-18}$ ergs/cm^2/s (resolved)	S/N=10 for 1-hour on-source exposure; resolved source assumes 1 square arcsecond detect cell

Gran Telescopio Canarias

For the

Mid-resolution InfRAreD Astronomical Spectrograph

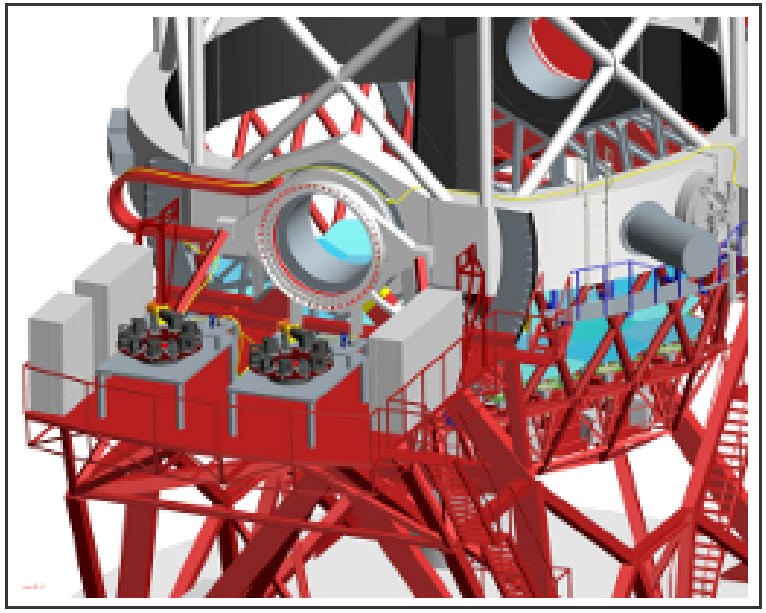
(MIRADAS)

key cases include:

- Massive Stars in the Milky Way
- Chemo-Dynamics of the Inner Milky Way
- Building Blocks of Galaxy Evolution at Intermediate Redshift
- Infrared Spectro-Polarimetry: New Windows on Stellar Astrophysics

MEGARA

Multi Espectrógrafo en GTC de Alta Resolución para Astronomía



MEGARA (Multi-Espectrógrafo en GTC de Alta Resolución para Astronomía) is an optical Integral-Field Unit (IFU) and Multi-Object Spectrograph (MOS) designed for the GTC 10.4m telescope in La Palma. At its early stage, the MEGARA@GTC IFU will cover 12 arcsec x 14 arcsec and the MEGARA@GTC MOS will allow observing up to 94 objects in a region between 1 arcmin x 1 arcmin and 3.5 arcmin x 3.5 arcmin around the central bundle (the goal for first light is to have two spectrographs running these two modes simultaneously). Both the IFU and MOS capabilities of **MEGARA** will provide intermediate-to-high spectral resolution (R=5600, 10000 and 17000).

MEGARA

Multi Espectrógrafo en GTC de Alta Resolución para Astronomía

Case	Lead	Also involved	Modes	Setups
Nearby disk galaxies	A. Gil de Paz	J. Iglesias, M. Mollá, S. Sánchez, P. Sánchez-Blazquez, A. Sarajedini, J. M. Vílchez, M. García-Vargas, A. Castillo-Morales, Y. Tsamis, D. Mayya, D. Rosa, O. Vega, M. Chavez, M. Rodríguez, E. Carrasco	IFU Compact+ IFU Sparse+ Rob. Actuators	LR-U, LR-G, LR-R, LR-I, MR-B, HR-R (IFU), MR-U, MR-UB, MR-B, MR-O, HR-R (actuators)
Massive stars in the Local Group	A. Herrero	M. García, S. Simón, D. Mayya, E. Bertone, E. Carrasco	IFU Compact+ Rob. Actuators	MR-U, MR-UB, MR-B, HR-R (IFU+actuators)
SF feedback	C. Muñoz-Tuñon	J. M. Rodríguez-Espinosa, J. Méndez-Abreu, J. A. L. Aguerri, S. Silich (external), G. Tenorio-Tagle (external)	IFU Compact+ Rob. Actuators	HR-R, HR-I (IFU), LR-G, LR-R, LR-I (actuators)
Intermediate-z BCDs	J. Gallego	L. Rodríguez (external), S. Pascual, P. G. Pérez-González, C. Eliche Moral, A. Gil de Paz, D. Rosa	Rob. Actuators	LR-G, LR-R, LR-I (actuators)
High-z clusters	P. G. Peréz-González	J. Gallego, S. Pascual, C. Eliche Moral, I. Trujillo, O. Vega, D. Rosa	IFU Compact+ IFU Sparse+ Rob. Actuators	LR-U, LR-G, LR-R, LR-I (IFU+actuators)
Open clusters	D. Barrado y Navascúes	N. Huelamo	Rob. Actuators	LR-R, HR-R, HR-I (actuators)
Planetary Nebulae	C. Sánchez-Contreras	A. Gil de Paz, O. Vega, M. Rodríguez	IFU Compact+ Rob. Actuators	MR-B, HR-R (IFU+actuators)
GCs in dE	J. Cenarro	N. Cardiel, P. Sánchez-Blázquez, E. Bertone	IFU Compact+ Rob. Actuators	LR-B, LR-G (IFU+actuators)

GYES

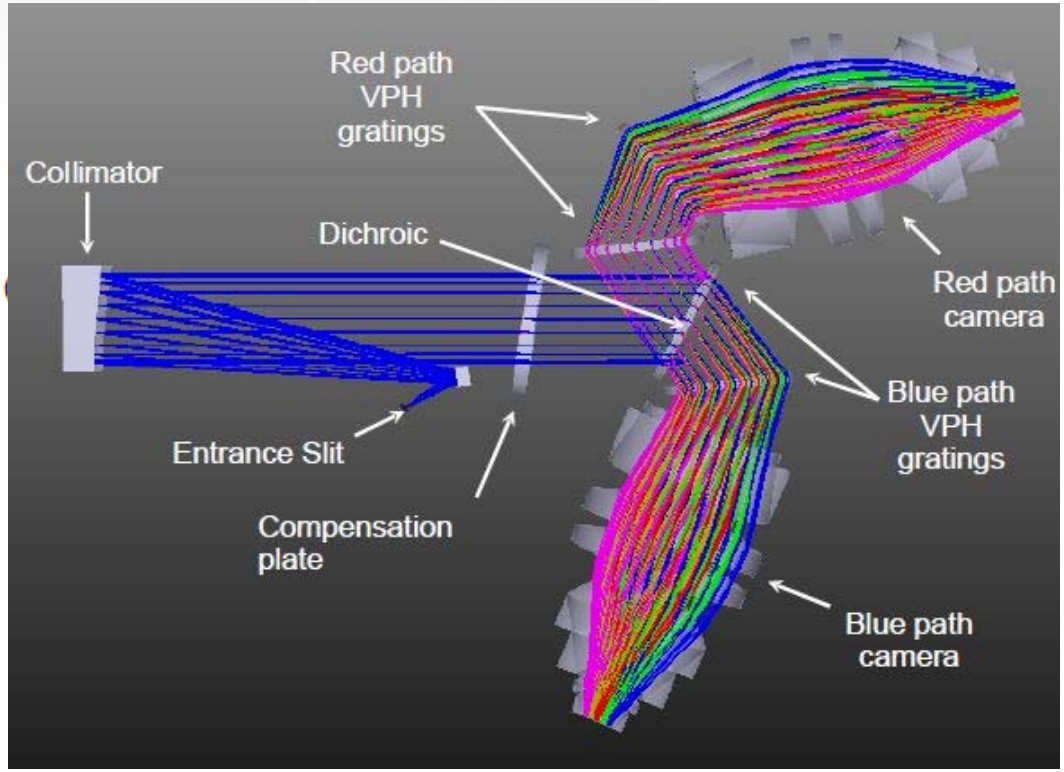
a wide-field multi-object spectrograph at the prime focus of CFHT

- Multiplex - 500 objects
- Large field of view - 0.9deg (diameter)
- Spectral domains - blue and red
- Resolution 20,000 (centre of domains)
- Efficiency - 20% throughput - optimize telescope time
- Simplicity - fixed wavelength settings - no mechanism in spectrograph - limited maintenance
- Schedule - Gaia initial data release (2014-2015)

The main requirements

- 2 spectral domains with R=20,000
  - 390-450nm
  - 588- 670nm
- Aim: S/N=100 at V=14 in 1 hour
  Up to 1 million stars will be observed
- Accurate metallicities & abundances for numerous species (to V=16
- Accurate radial velocities down to V=18 for cool stars
  - sigma Vr < 1 km/s

Phase A has begun from the beginning of 2010, now: down



http://gyes.obspm.fr/index.php

September 2010, ESO Call for LoI for Wide-Field Spectroscopic Survey Facilities.

May 2011, ESO selected two phase A studies, among the 7 proposals:

MOONS + 4MOST
Kick-Off meetings in September 2011
Final build decision by ESO will occur in Spring 2013.

Multi-Object Optical and Near-infrared Spectrograph

MOONS is a project for a multi-object spectrograph on the VLT. Its spectral coverage will range from 800 (ideally 500) to 1800 nm. The multiplex will be 250 (ideally 500) fibres allocated to objects and the same amount for blank sky positions. Two spectral resolutions will be available: medium (3000-5000) and high resolution (20000). MOONS is a "GIRAFFE-like" instrument that will be able to share the positioner OzPoz from the FLAMES facility in UT2.

The science cases of the instrument are:

- Galactic Archaeology (GAIA follow-up)
- Cosmology and large-scale structures
- Galaxy formation and evolution
- First galaxies and re-ionization

The consortium is headed by UK-Astronomy Technology Center and Institute for Astronomy (Royal Observatory, Edinburgh) and gathers the Centre for Astro-Engineering at Universidad Catolica (Chile), GEPI, Max-Planck-Institut für extraterrestrische Physik (Germany), INAF (Italy) and NOVA - Nederlandse Onderzoekschool voor de Astronomie (Netherland).

Leading Institutes

- Leibniz-Institut für Astrophysik Potsdam (Germany)
- Ludwig-Maximilian Universität, München (Germany)
- MPI für Extraterrestrische Physik, München (Germany)
- GEPI

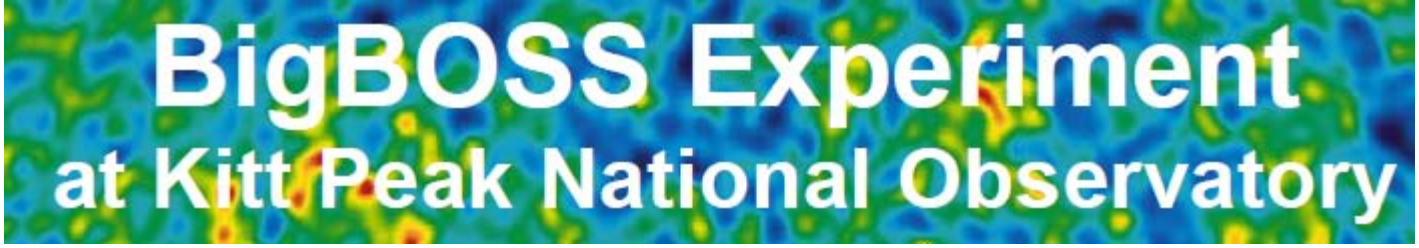
▲ 4MOST

4-meter Multi-Object Spectroscopic Telescope

The project 4MOST aims at dedicating a telescope and multi-object spectrographs to spectroscopic surveys. These surveys will be carried on simultaneously in order to optimize multiplex and observing time. The 4MOST facility will be hosted on **NTT or VISTA**. A medium resolution spectrograph will be fed 1500 fibres (goal 3000) distributed over a 2° diameter field-of-view (goal 3°). Spectral resolution will be 3000 (goal 5000) in the blue: 420-650 nm (goal 380-650 nm) and 5000 (goal 7500) in the red: 650-900 nm (goal 650-1000 nm). A high resolution spectrograph will be fed by 10-20% of the fibres and cover the spectral ranges 390-450 nm and 585-675 nm with a resolution > 20000.

The science cases of the facility are:

- Gaia follow-up (radial velocities, atmospheric parameters, abundances)
- eROSITA follow-up
- Euclid (and other imaging surveys) follow-up



Telescope	
3° linear FOV	
3.8 m diameter aperture, f/4.5	
1.8 m linear obscuration	
Focal length 17.1 m	
Wavelength response 340–1060 nm	
Blur <28 μm RMS (0.35 arcsec)	
Focal surface	
4000 mm convex sphere	
950 mm diameter	
Fiber System	
5000 robotic fibers	
Fiber diameter 1.45 arcsec (120 μm)	
Fiber actuator spacing 145 arcsec (12 mm)	
Spectrographs	
Bandpasses	
Blue:	340–540 nm
Visible:	500–800 nm
Red:	760–1060 nm
Resolution	
Blue:	3000
Visible:	2960
Red:	4140
Cameras	
4k×4k pixels per channel	
3 pixel minimum sampling	
Pixel size	
Spatial:	0.75 arcsec
Blue:	0.488
Visible:	0.732
Red:	0.732
QE (400–1000 nm)	>80%
Read noise	<2.5 e
Dark current	<0.03 e/s/pixel
Pixel rate	100 kpixel/sec/port
Instrument cycle time (parallelizable)	
CCD readout	40 s
Fiber positioning	60 s
Telescope slew and guide lock	<60 s

The Next Generation CFHT

priority for the international astronomical community. The Next Generation CFHT (ngCFHT) would provide this missing capability by combing a wide field (1.5 deg^2), a large collecting area (primary diameter = 10m), a high level of multiplexing (800- 3200 fibers) and a range of spectral resolutions (1500-20000).

The Next Generation CFHT

In early 2011, the Long Range Plan for Canadian Astronomy stated that the scientific case for ngCFHT was "unassailable" and recommended that a technical and scientific study for ngCFHT be undertaken to better understand the project cost, risk and schedule. This concept study is now underway will proceed throughout 2011 and 2012, with the goal of submitting the final report to the CFHT SAC and Board in late 2012. For more information, or to get involved in the