

## Mid-Range Strategies for the Telescopes in the OPTICON Network

A brief informal summary by the telescope directors  
October 10, 2012

### **Anglo-Australian Telescope - AAT (Matthew Colless)**

By 2015/16, the AAT will offer:

- (1) the AAOmega spectrograph with resolution up to 10,000, fed by either the 2dF top-end with 392 optical fibres, or the KOALA integral field unit with a 22"x22" field of view;
- (2) the HERMES spectrograph with  $R=28,000$  or 50,000 in 4 simultaneous  $\sim 25\text{nm}$  bands, fed by the 2dF top-end with 392 optical fibres;
- (3) the SAMI instrument, delivering IFU spectroscopy with 13 "hexabundles" of 61 lightly-fused fibres spanning 15" diameter, configurable over a 1 degree field of view;
- (4) the IRIS2 near-infrared imager and  $R=2400$  spectrograph, with an OH-suppressing fibre feed;
- (5) the UCLES optical échelle spectrograph with an image-slicing fibre feed.

Between 25 and 50% of AAT time is expected to be devoted to the *Galactic Archaeology with HERMES* survey (GALAH; see <http://www.aao.gov.au/AAO/HERMES/GALAH/Home.html>) and other large surveys.

### **Calar Alto Observatory - CAHA (David Barrado)**

The German MPG and the Spanish CSIC have already signed the agreement for the continuation of the operations of the Calar Alto observatory for the period 2014-2018. The goal is to reduce costs by decreasing the suite of instruments, and focusing on the 3.5m telescope. In fact, from a broad perspective, we are following the recommendations outlined in the ETSRC report.

The 3.5m telescope will be primarily devoted to the exploitation of an optical and near-IR échelle spectrograph (Carmenes), which will have first light in 2014. It has been developed by a Spanish-German consortium in close collaboration with the observatory. The consortium will be granted a minimum of 600 nights over this five year period, with the goal of searching for Earth-like planets around cool stars. This science is protected, but the instrument will be offered to other teams for other projects. We expect that other instruments, specifically PMAS (IFU) and perhaps TWIN (low-res spectroscopy), will be operated and offered to the wider community.

Regarding the 2.2m telescope, we have recently commissioned an optical échelle spectrograph (CAFE) and we expect to commission a wide-field (30x30 arcmin) camera (PANIC) in 2013. Together with CAFOS (optical imaging, low-res spectroscopy, polarimetry), they will be the workhorses of this telescope, but we expect to operate the telescope in a more cost-effective way.

Beyond 2018, it is likely that Calar Alto will become a fully project-oriented observatory, with very few teams obtaining most of the observing time, and driving the operation of the telescopes.

### **Canada-France-Hawaii Telescope - CFHT (Doug Simons)**

In 2013 CFHT will continue offering its 3 mainstay instruments, i.e. MegaCam, WIRCAM, and ESPaDOnS. For limited applications our adaptive optics system (PUEO) is also available. We expect to receive our next instrument, SITELLE, in Q3 2013, with commissioning completed by the end of next year. SITELLE is an imaging FTS, capable of optical integral field spectroscopy at  $R\sim 5000$  over an 11 arcmin FOV. An exact date for community access to SITELLE will be determined next year, when we get closer to receiving this instrument.

Beyond SITELE, the next planned instrument is SPIRou, a high-resolution NIR fiber-fed spectro-polarimeter intended to provide  $\sim 1$  m/s velocity sensitivity. SPIRou is currently expected in 2016.

The nominal instrument characteristics of the present three main instruments are:

*MegaCam:*

- 1x1° optical imager using 36 2048x4612 e2v CCD 42-90 CCDs, total  $\sim 340$  megapixels
- Spatial sampling 0.187 "/pixel
- Image stabilization built-in for tip/tilt correction
- 8 filter jukebox holding  $u^*$ ,  $g'$ ,  $r'$ ,  $I'$ , and  $z'$  filters

*WIRCAM:*

- 21.5x21.5 ' near-infrared imager using 2x2 HAWAII2RG detectors
- Plate scale: 0.31 "/pixel
- Filters:
  - Broadband: Y, J, H, Ks
  - Narrowband: Low OH- (1.061 & 1.187  $\mu$ m), Methane, H2, K-cont, Br-g

*ESPaDOnS:*

- High resolution fiber-fed cross-dispersed optical spectrometer
- Polarimetry mode
- Simultaneous wavelength coverage: 40 orders covering 3700 - 10500 Å
- Three modes -
  - spectroscopy 'star + sky' mode,  $R=68,000$
  - spectroscopy 'star only' (no sky),  $R=80,000$
  - spectropolarimetry, linear or circular polarization,  $R=68,000$
- End-to-end throughput:  $\sim 15\%$

### **ESO/Max-Planck Gesellschaft 2.2m (Roland Greidel)**

The telescope is presently being operated under a joint MPIA-ESO agreement until September 2015. ESO offers 3 months/year to the international community (wide field imager WFI and high-resolution optical spectrograph FEROS), MPIA uses 9 months/yr including the simultaneous seven-channel (UBVRJHK) imager GROND. There are presently no plans for new instrumentation. It is unclear at the moment whether the telescope will be operated beyond P96 (September 2015)

### **Haute-Provence Observatory - OHP (Auguste Le van Suu)**

The OHP 1.93m telescope will continue to exploit the recent improvement of Sophie spectrograph, which reaches a radial velocity accuracy of 1-2m/s, and exoplanets and asteroseismology studies will remain the main fields and specialties of the telescope.

A study for a new low resolution spectrograph has been completed and a funding proposal has been submitted to the national French Research Agency (ANR). If funded, it will be installed at the 1.93m Cassegrain focus in 2015 in parallel with SOPHIE for Targets of Opportunity.

The OHP 1.93m telescope will continue to provide access to instruments at the Cassegrain focus; e.g. MYOSOTIS, a multi-object high speed photometer for studies of transneptunian objects. This focus will also remain available for prototyping and tests of new instruments.

For the time horizon beyond 5 years, mostly large programmes of exoplanet studies are planned, especially studies of long-period exoplanet. This will dramatically increase the value of the RV database started in the early 90's with the ELODIE spectrograph.

### **Isaac Newton Group - ING = WHT+INT (Marc Balcells)**

ING has devised a 10 year strategy that has received broad support from the three funding agencies in Spain, the Netherlands and the UK. In the UK, the STFC Council supported all components of the proposed ING strategy, authorised the signature of an extension of the current tripartite agreement until March 2015, and directed the Executive to negotiate a new agreement that would give the UK continued access to the WHT after 2015. The main line of the ING strategy is the provision of a next-generation optical spectroscopy survey facility for the WHT, that will respond to the widespread need, recognised by many and in particular in the ASTRONET strategy documents, for wide-field high-multiplex spectroscopy. This instrument is WEAVE, now being designed and built by a consortium by the three partner countries. The consortium is open to non-ING partners, and France is in fact participating in design work for WEAVE. PDR is expected in 2013 and first light in 2017.

While WEAVE is being constructed, the WHT will continue to offer access to the northern sky to the partners, using its full instrumentation set; it will maintain the visitor instrument programme; will continue to offer telescope time for the development and prototyping of technologies needed for the E-ELT, and will retain its resident student programme. Pending approval of the funding agencies, the ING will introduce long-term programmes on the WHT and INT, offered through a common TAC. Through the visitor instrument programme we will host PAUCam, a wide-field CCD mosaic for the WHT prime focus featuring narrow-band filters for precision photometric redshifts. PAUCam will be available to the community.

Once WEAVE arrives, WEAVE legacy surveys will take a large fraction of the telescope time. We envision that time will be retained for PI work allocated by the national TACs. Precisely how much time will remain available to other instruments and other programmes remains to be decided. WEAVE legacy surveys will take 5 or more years. The current plan therefore extends out to roughly 2022.

### **Liverpool Telescope - LT (Iain Steele)**

The Liverpool Telescope (LT) will continue to specialize in time domain astrophysics with robotic control providing the facility to schedule monitoring observations on timescales from minutes to years. The ability to update the schedule during the night will continue to provide the ability to respond rapidly and automatically to Targets of Opportunity. The instrument complement will consist of:

- IO - A dual beam camera with a 10x10 arcmin optical (u'->z'band) detector plus a 6x6 arcmin near IR (JH) detector capable of simultaneous imaging.
- THOR - A rapid readout (<10 msec) optical lucky imaging camera.
- FRODOSPEC - A dual beam optical medium resolution (R=2500 or 5000) spectrograph
- SPRAT - A high efficiency, low resolution (R=500) optical spectrograph
- RINGO3 - A three beam optical imaging polarimeter

In addition, a scientific and technical case for a larger successor facility, most likely targeted at LSST follow-up from around 2022, will be in development

### **Nordic Optical Telescope - NOT (Johannes Andersen)**

The current plan is to continue to offer the optical and NIR imager/spectrographs ALFOSC and NOTCam through 2014 together with the fibre-fed high-resolution spectrograph FIES, upgraded for spectropolarimetry. From 2015, the plan is to replace ALFOSC and NOTCam by a combined optical/NIR imager and spectrograph, patterned after the X-shooter at VLT and optimised for transient sources. This will then be the only instrument offered at the main focus. Plans for coordinating the instrumentation and operations and exchanging time with the TNG are under discussion.

### **Telescope Bernard Lyot - TBL (Philippe Mathias)**

The future instrumentation at will exploit a spectropolarimetry "niche". Presently, the only focal instrument at TBL is NARVAL, an adapted copy of ESPADONS at the CFHT. Following discussions within the French community headed by the Scientific Boards of TBL & OHP, what is foreseen for TBL is in the short term an improvement of the NARVAL spectropolarimeter, mainly with the aim of increasing the limiting magnitude (presently around 12) by about 2 units, together with an increase of the spectral stability (presently about 15m/s) by a factor of about 3. This is the DEEP-NARVAL project, expected for 2015.

In the mid-term we hope that a copy of SPIRou at the CFHT, foreseen for 2015, can be adapted for the TBL. This is the SPIP instrument (NARVAL in the near-IR: 0.9-2.6micron, R~50,000). This new instrument is not expected at TBL before 2017. The transition to regional funding in ~2015 makes longer-term planning somewhat uncertain at this time.

### **Telescopio Nazionale Galileo - TNG (Emilio Molinari)**

The TNG has undergone important changes during last year, which will impact the next 5 years. The installation of HARPS-N has changed both the science (moving heavily toward exoplanets) and the scheduling approach (having the first really large programme with 80 nights/yr guaranteed to one single project). The advent of GIANO during 2013 can only enhance the process towards specialization on high resolution spectroscopy and the preference of large projects. Forthcoming talks about a strong collaboration with NOT will try to follow what is left of the ASTRONET roadmap, trying to make a common instrumental offer to both communities, with a time horizon from 5 to 10 years from now. A small fraction of time for small projects and technological demonstrators will always be available.

### **Telescopio Carlos Sanchez - TCS (Alex Oscoz)**

The TCS is in the process of optimising operational costs, and its continuity for the mid-term will be discussed. Until then, the TCS will maintain its two main instruments: CAIN-3, an infrared camera, and FastCam, a lucky imaging optical instrument. Besides this, a new instrument, Wide FastCam, is being finished. WFC is a spin-off of FastCam for wide field observations. In addition, a 4k x 4k optical CCD is being tested and will be probably installed at the TCS during some periods. Finally, a project to make the telescope remotely controlled is under way.