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1 Introduction

During the activities of the "ASTRONET-1: Towards a strategic plan for European Astronomy" since September 2005 until December 2010, an European Telescopes Strategic Review Committee (ETSRC) was implemented as a coordinated action between the ASTRONET and OPTICON networks. The main product of the ETSRC was a report suggesting a short and medium to long-term strategy for the cost-benefit optimisation of the use of the existing European 2-4 m optical/IR telescopes.

The main products of the ETSRC report were

a) to identify those goals of the ASTRONET Science Vision that are most effectively delivered by 2-4m-class optical/infrared telescopes;

b) to identify which observational capabilities (site, field of view, instrumentation capabilities & operation modes) are required;

c) to establish an appropriate balance between the scientific, technological and educational goals of 2-4m class telescopes, taking into account contributions from both larger and smaller facilities;

d) among the scientific tasks, consider the appropriate balance between large-scale survey-type efforts, including complementary ground-based programmes in support of European space missions, and free access by individual researchers;

e) develop a realistic roadmap, including any necessary technical developments and upgrades, and organisational/financial arrangements, which would enable a set of European 2-4m-class telescopes to deliver the best scientific output for European astronomy in a cost-effective manner;

f) analyse major needs and opportunities for collaboration on the global stage, e.g. with the US system proposed by the ReStar committee;

g) propose arrangements for open access to all data, e.g. through the Virtual Observatory.

In the framework of the "ASTRONET-2: Coordinating Strategic Planning for European Astronomy" network, the task 5.1 belonging to Work Package 5 has been defined with the goal of providing a platform to implement the proposed measures by the ETSRC. The process is planned to be completed by the end of 2014.

European 2-4 m optical/IR telescopes conform a heterogeneous sample of facilities with different owners, histories and communities. After being for several decades the flagships of European

astronomy, the arrival of 8m class telescopes has assigned them a new complementary role which is still equally crucial.

2 Final Report and Related Activities

A significant progress has been achieved by all the infrastructures. Each telescope/facility is arranging their own roadmap in a different way, but all of them maintain the ETSRC recommendations as the major reference and most of them are taking action in the directions suggested by the ETSRC. In summary, most of the facilities are:

- Working to optimize operations and to reduce costs
- Defining a transition to a more specialized scientific set of instrumentation
- Designing a more sustainable long-term future

Following the schedule defined by the funding agencies and facilities in a common ASTRONET/OPTICON meeting held in Paris in September 2010, funding agencies organized a specific meeting in Madrid January 2011 to study the scenario of a Common Time Allocation Committee (CTAC). The OPTICON project scientist (Prof. J. Davies) presented a study for the CTAC implementation that was discussed and analysed in detail. During the meeting there was a long in depth discussion that involved all stakeholders. It was decided that the CTAC alternative was not the best option.

Medium-size telescopes should try to replace their current multi-purpose suite of instruments by a more specialized scientific set of instrumentation. An smaller number of more specialized instruments could reduce operational costs and could better exploit scientifically the specific circumstances of each facility.

The coordination between ASTRONET and OPTICON is active and very productive. Both organizations monitorize the action within this area.

As an excellent example of coordinated action, UK, NL and ES funding agencies have coordinated efforts to support the development of the WEAVE instrument for the William Herschel Telescope at La Palma. This initiative is considered by ASTRONET as a coordinated action and is one of the (indirect) outputs of the ETSRC report.

2.1 Meetings fully/partially organized within Task 5.1

2.1.1 Agencies Meeting

Place and Date: Spanish Ministry headquarters (Madrid), 18.01.2011

Purpose: To analyse a feasibility study of CTAC and coordinated operations for European medium size telescopes

Organizing institution: MINECO

Participants: Agencies representatives, OPTICON project scientist and representatives

2.1.2 ING and CAHA observatories Open Workshop

Place and Date: Madrid, 22-23.03.2012

Purpose: To review future plans and scientific interest on both observatories

Organizing Institution: Isaac Newton Group (ING) and Calar Alto Observatory (CAHA)

Participants: ASTRONET and agencies representatives, observatories staff, Spanish astronomical community.

2.1.3 Workshop on the contribution of Spanish facilities to the ESA Gaia mission

Place and Date: Madrid, 21.03.2012

Purpose: To review future plans and scientific interest on both observatories

Organizing Institution: Isaac Newton Group (ING) and Calar Alto Observatory (CAHA)

Participants: ASTRONET and agencies representatives, observatories staff, Spanish astronomical community.

2.1.4 International conference Multi-Object Spectroscopy in the Next Decade: Big Questions, Large Surveys and Wide Fields

Place and Date: Santa Cruz de La Palma, 2-4.03.2015

Purpose: To discuss the underlying science aspirations of the impending massive spectroscopic surveys, explore strategies for optimising their scientific impact, summarise lessons learned from previous large-scale surveys, and share the technical challenges of developing and operating the sophisticated instruments which will make these studies feasible.

Organizing Institution: Isaac Newton Group (ING)

Participants: European astronomical community.

3 Specific reports by facility

3.1 Calar Alto Astronomical Observatory

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 operation costs, with the main focus on the 3.5m telescope. This strategy follows recommendations
outlined in the ETSRC report.

The 3.5m telescope will be primarily devoted to the exploitation of an optical and near-IR echelle spectrograph (CARMENES), which will have first light in January 2016. This unique instrument is being developed by a Spanish-German consortium in close collaboration with the observatory.

The consortium will be granted a minimum of 600 nights over the three year period 2016-2018, with the main scientific goal of searching for Earth-like planets around cool stars. This science is protected, but the instrument will be used by other teams for different projects. Other instruments,
specifically PMAS (optical Integral Field Unit) and TWIN (low-res spectroscopy), will be operated and offered to the wider community within the 20% of the open time that CAHA has to offer as ICTS facility.

Regarding the 2.2m telescope, the observatory has recently commissioned an optical echelle spectrograph (CAFE); a wide-field (30x30 arcmin2 FoV) camera (PANIC) is expected to be fully commissioned during 2015. Together with CAFOS (optical imaging, low-res spectroscopy, polarimetry), they will be the instrument work-horses of this telescope. Serious efforts are being made to operate the 2.2m telescope in a cost-effective way.

Beyond the 2018 horizon, it is expected that Calar Alto Observatory will continue the operation of the telescopes with a different corporate and organizational structure.

3.2 ESO/MPG 2.2m telescope at La Silla Observatory

The national MPG 2.2m telescope at LaSilla Observatory (http://www.mpia.de/science/2dot2m) is being operated under a joint MPIA-ESO agreement until September 2016. Available instruments are a wide field imager (WFI) located in the Cassegrain focus, with a 34‘ x 33‘ field of view (http://www.eso.org/public/teles-instr/lasilla/mpg22/wfi/) and the fibre-fed optical echelle spectrograph FEROS (http://www.mpia.de/FEROS/feros.html), with a spectral resolution of

48,000 covering the spectral range 350 - 920 nm. The Gamma-Ray Burst Optical/Near-Infrared Detector GROND (http://www.mpe.mpg.de/~jcg/GROND/) is available via special collaboration agreement only. MPIA seeks a prolongation of the present agreement with ESO with the aim to continue the operation of the telescope by five more years.

3.3 Bernard Lyot 2m telescope (TBL) at Pic du Midi Observatory (France)

From january 2016 on, the national 2-m Telescope Bernard Lyot (TBL), funded by CNRS and Université Paul Sabatier (Univ Fédérale de Toulouse Midi-Pyrénées) will be administrated by Observatoire Midi-Pyrénées (CNRS - UPS). TBL will continue to be operated in full-service mode, offering end-to-end service to the community from the call for proposals, to the observations, data reductions and releases.

The future instrumentation will exploit a spectropolarimetry "niche" and a science case aiming at stellar magnetism, birth, and death of exoplanetary systems. Presently, the only focal instrument at TBL is NARVAL, an optical echelle spectropolarimeter that is an adapted copy of ESPADONS at the CFHT. Following discussions by the French community and TBL science council, funding of 4.5M€ was decided for two instruments.

The first instrument Neo-Narval (budget 500k€), will be dedicated, in addition to core science case of stellar magnetism to the evolved stages of the stars and their planets. Neo-Narval is an improved version of the spectropolarimetre Narval, with the same capabilities in magnetic field measurements, but able to measure radial velocities down to 2 m/s. Neo-Narval is expected to see first light in 2018.

The second instrument is SPIP (budget 4M€), aimed at discovering exo-earths in habitable zones of M dwarfs, and at studying the early stages of planet and star formations. SPIP will also be able to study the evolved stages of stellar evolution and deepen our understanding of stellar magnetism at late stages of star life. SPIP is a copy of SPIROU, a near IR spectropolarimeter (0.9-2.6µm, R~50,000) being build for CFHT. This new instrument is not expected at TBL before 2021.

3.4 Isaac Newton Group of telescopes (ING): 4.2m William Herschel Telescope and 2.5m Isaac Newton Telescope

ING has devised a 10 year strategy that has received broad support from the three funding agencies in Spain, the Netherlands and the UK. A five-year extension to the current agreements was signed in March 2015 by STFC, NWO and IAC. New agreements are being finalised during

2015, which include the ownership transfer of the telescopes to the IAC and the management arrangements for the next 10 years.

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 (UK, NL, ES), France, Italy, Mexico and Hungary. Final design reviews for WEAVE are taking place during 2015. Commissioning at the telescope is planned for late 2017, with science surveys starting in early 2018.

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.

Through the visitor instrument programme ING will host PAUCam, a 40'x40' wide-field CCD mosaic for the WHT prime focus featuring 40 narrow-band filters for precision photometric redshifts. PAUCam was successfully commissioned and saw first light in June 2015. It will be available to the community through normal time allocation committees.

Once WEAVE arrives, WEAVE legacy surveys will take about 70% of the available telescope time. The rest will be retained for PI work allocated by the national TACs. WEAVE legacy surveys will take 5 or more years. The current plan therefore extends out to roughly 2022.

ING has devised plans for refurbishing the 2.5m INT by inviting external groups to provide instrumentation and telescope upgrades in exchange for large amounts of telescope time. The process of selecting instruments is currently on-going.

3.5 Nordic Optical Telescope (NOT, 2.5m)

The NOT is operated by NOTSA (Denmark, Finland, Iceland, Norway and Sweden) since 1989.

The current plan is to continue to offer the optical and near-IR imager/spectrographs ALFOSC and NOTCam 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.

In spring 2013 the NOT Council approved the project to equip the NOT with a clone of the VLT/X-shooter instrument by ~2017. A new agreement has been signed with the IAC, providing the formal background for that development. With FIES upgraded to yield high-precision spec-

tropolarimetry and also permanently available, this will make the NOT a powerful tool for studying a wide range of transient and variable astrophysical sources in the coming decade.

3.6 Telescope Nationale Galileo (TNG 3.6m, Italy)

TNG is being operated since 1998 at Roque de los Muchachos Observatory (La Palma, Spain). TNG has undergone important changes during last years, which will impact the next decade. The installation of HARPS-N in 2012 changed both the science (moving toward exoplanets heavily) and the scheduling approach (having the first really large programme with 80 nights/yr guaranteed to one single project). The advent of Giano in 2014 (the new near infrared echelle spectrograph) enhanced this process towards specialization on high resolution spectroscopy and the preference of large projects. We have now a funded project to upgrade Giano and, using dichroics, be able to feed at the same time the visible and infrared spectrograph, allowing, e.g., parallel observation of exoplanet transits.

In recent years, a strong collaboration with NOT allows Italian community to use nights in the Nordic Telescope and a fraction of TNG time is guaranteed for the Nordic community.

A small fraction of time for small projects and technological demonstrators is always available: we are now trying to finalize and install during 2016 a DMD MOEMS based Multi Object Spectrograph (BATMAN), and during last two years we hosted and tested two hight time resolution atomic clock driven photometer. Finally, the presence of a lasercomb in collaboration with Harvard CfA makes of TNG a real astro-frontier laboratory. We hope to be able to offer the use of the lasercomb in the near future on a regular basis.

OPTICON demand for TNG time increased substantially since the offer of the HARPS-N instrument.

3.7 Robotic Liverpool Telescope (LT, 2m)

Liverpool Telescope is being operated by Liverpool John Moores University since 2004. 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 possibility 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' to 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.

3.8 Carlos Sánchez Telescope (TCS, 1.56m)

Telescopio Carlos Sánchez (Teide Observatory, Tenerife) is in process of having a fully remote control. Nowadays, this is already possible for the infrared camera CAIN-3 and it will be easily exported to the two other instruments, FastCam –lucky imager for the visible- and Wide FastCam – wide field very fast observations for the visible. A software package for the images astrometrization, clearly superior to the ones already existing, is being finished. A new guiding system will be developed allowing simultaneous installation and use of two instruments: CAIN-3 and FastCam for IR and visible images or FastCam and Wide FastCam for extremely high spatial and temporal observations. Finally, the telescope will be used as a test bed for new ground-based and space instrumentation.

3.9 Javalambre Survey Telescope (JST/T250, 2.5m)

The Observatorio Astrofísico de Javalambre (OAJ) is a new astronomical facility located at the Sierra de Javalambre (Teruel, Spain), conceived, constructed and operated by the Centro de Estudios de Física de Cosmos de Aragón (CEFCA; http://www.cefca.es) to perform large sky surveys with two main telescopes of large field of view. The main one is the Javalambre Survey Telescope (JST/T250), a 2.5m Ritchey-Chrétien with a complex field corrector of lenses, providing a field of view at the cassegrain focus of 3 deg diameter. The Javalambre Auxiliary Survey Telescope (JAST/T80), an 83 cm with 2 deg diameter field of view, complements the observations of JST/T250 with additional scientific programs devoted to the photometric calibration of the main telescope.

In summer 2015, JST/T250 is expected to undergo the last phases of commissioning. Starting in 2016, during the first 7 years of operation JST/T250 will be dedicated to conduct J-PAS (http://j-pas.org), a large sky survey of 8500 deg^2 with 54 narrow-band, optical, contiguous filters of 145 Å width, plus 5 intermediate and broad band filters. To do this the JST/T250 will host only one instrument, JPCam, a 1.2 Gpix multi-filter panoramic camera constituted by a mosaic of 14 large-format (9.2k x 9.2k) CCDs covering 4.7 deg^2. The photometric calibration of J-PAS will be performed by the auxiliary telescope JAST/T80 through the survey J-PLUS (http//www.j-

plus.es) using T80Cam, a panoramic multi-filter camera of 2 deg^2 with an only CCD of 9.2k x 9.2k and 12 narrow, intermediate and broad-band optical filters.

JAST/T80 and T80Cam are ready at the OAJ. J-PLUS is expected to start before the end of 2015. JST/T250 is about to complete commissioning and JPCam is in manufacturing process. A similar replica of T80Cam, JPAS-PF (Path Finder), has been manufactured to be used at JST/T250 as an interim camera before the arrival of JPCam, by mid 2016.
The OAJ will offer about 20% of open time of their telescopes as soon as they start scientific operations.