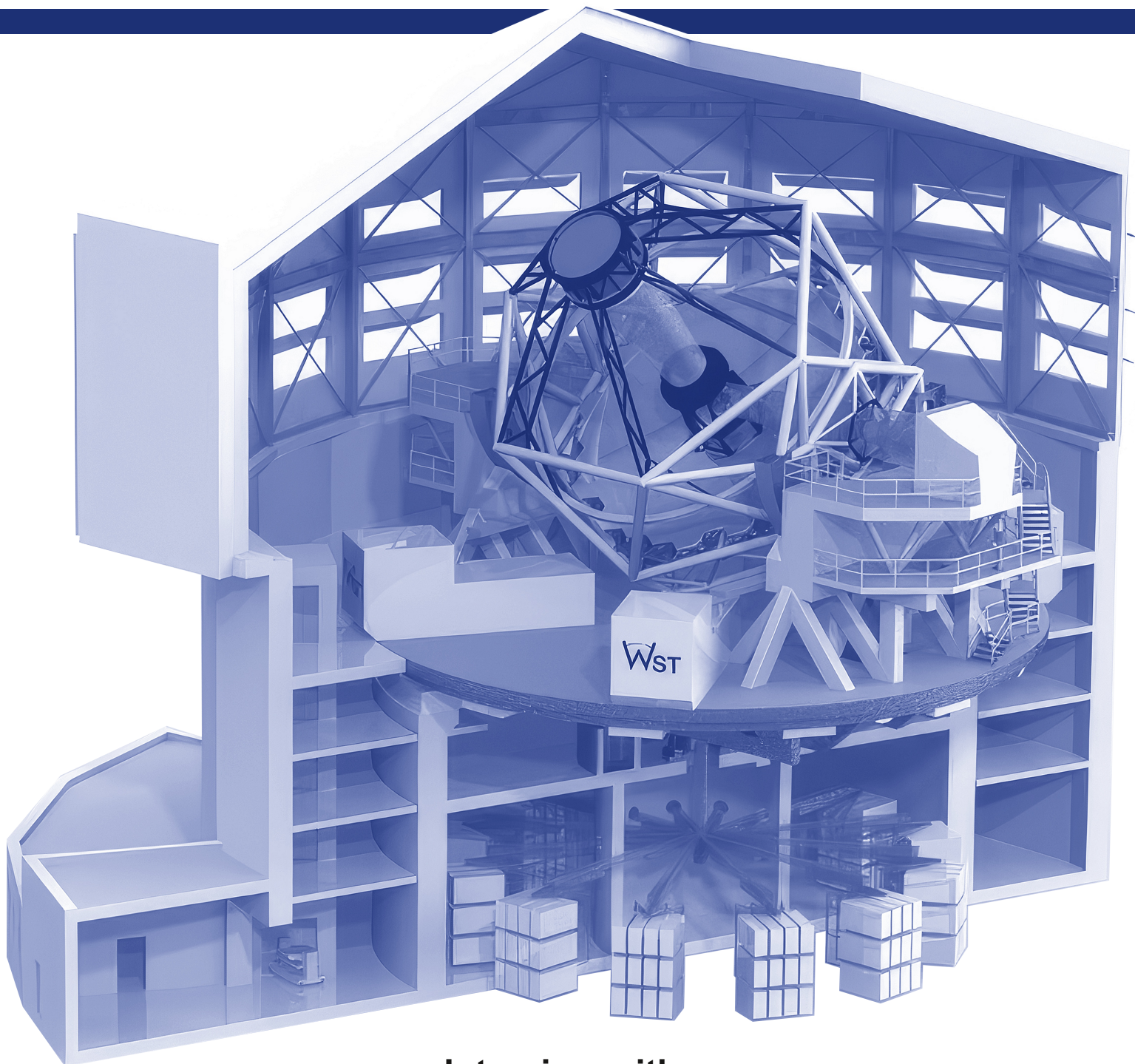


Issue 1 - June 2025

THE **WST** *CHRONICLE*

Pushing the Boundaries of Spectroscopic Surveys



**Addressing
outstanding science**

**Interview with
V. Mainieri and
C. Cudennec**

**The telescope optics
and instruments**

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**Funded by
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Credit: ESO

COORDINATOR MESSAGE

You are reading the first issue of the *WST Chronicle*, a magazine we aim to publish regularly to serve as an information link between the WST project and the whole scientific community. As this is the first issue, I would like to provide an overview of the key events that have shaped the project's current state.

The idea of building a wide-field spectroscopic facility on a 10-m class telescope has been a long-standing topic of discussion within the community. The initiative began in Europe, under the ESO umbrella, with the *SpecTel* project, which conducted an initial science case and concept study between 2016 and 2020 (Ellis et al., 2017; Pasquini et al., 2016, 2018). The study was halted at ESO due to limited resources. It was later revived as a community-led project when the WST consortium was established to respond to the EU Horizon *Infradev* concept study call in 2022. Although the proposal was not selected, the consortium carried out a self-funded interim study to further develop the concept. In March 2024, a significantly improved proposal was submitted to the same call. We were pleased to learn of its success in July of that year. The EU-funded concept study officially began in February this year and is expected to last for three years.

In parallel, ESO launched the *Expanding Horizons* initiative in July 2024. Its goal is “to search for its next innovative ground-based programme and to identify the next transformational facility that will advance humanity’s understanding of the Universe whilst fostering international collaboration.” The alignment of the EU concept study with ESO’s *Expanding Horizons* initiative was undoubtedly excellent news for all of us, as it provides a clear framework for our study, which we intend to propose to ESO in July 2027 — a deadline that aligns well with the EU Horizon concept study timeline.

The consortium is now moving at full speed to develop the design of the facility we have all dreamed of for years. At the same time, we have



engaged extensively with the broader community, expanding the science team to 700 members. Thanks to this remarkable collective effort, we are now defining a transformative science case that aims to deliver breakthrough discoveries in the 2040s.

In this issue, we present an overview of the consortium and its organisation, the science drivers, the ambitious top-level requirements, the project timeline, the baseline design of the telescope and the current status of the instruments’ designs. You will also have the opportunity to meet Vincenzo, the project scientist who effectively leads such a large and diverse group of scientists spanning nearly all fields of astronomy, and Corentin Cudennec, the young and imaginative optical designer at the core of the telescope’s optical concept.

The *WST Chronicle* was thoughtfully prepared by Henri Boffin and Maria Cristina Fortuna, together with the whole WST communication team, with valuable input from the entire Project Office and numerous members of the consortium. I extend my sincere thanks to all of them, and to the whole consortium, for their dedication and unwavering commitment to the project.

Finally, I hope to see many of you at the EAS Special Session SS7, on 23 June in Cork, Ireland.

Roland Bacon, WST coordinator

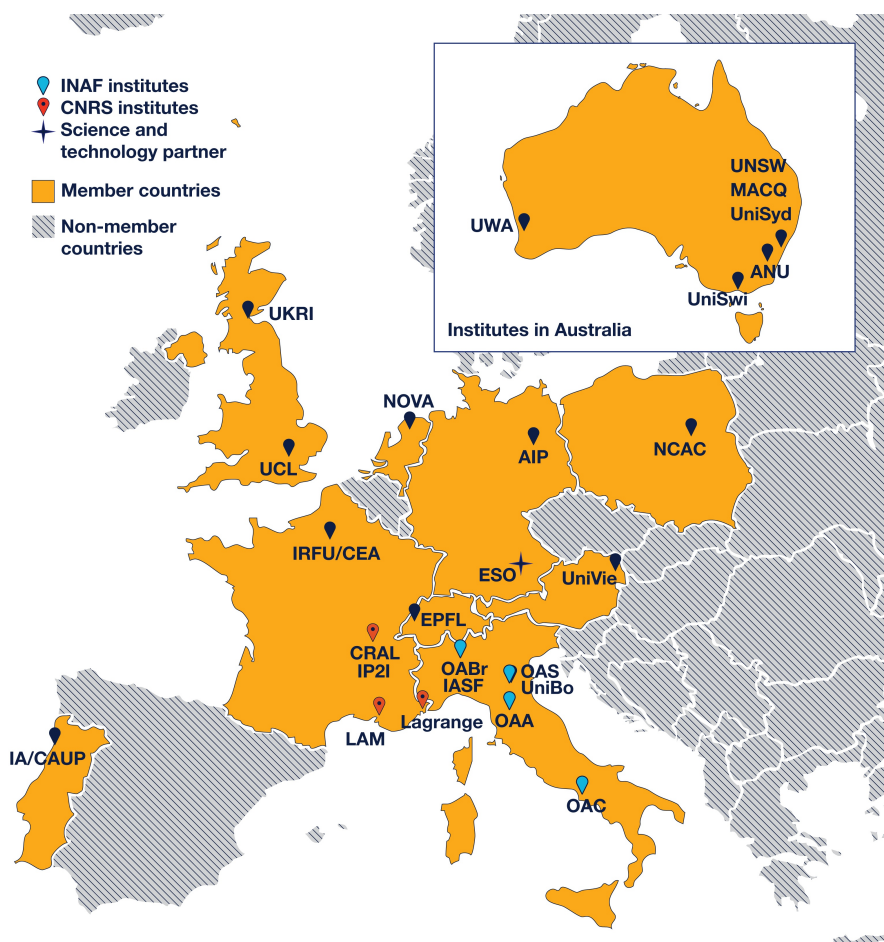
THE WST CONSORTIUM AND ORGANISATION

Designing a facility as ambitious as the WST, including all the different aspects – science, telescope, instruments, operations, and sustainability – is a challenging and complex undertaking. Consequently, a robust international consortium comprising 26 research institutes and universities has been set up. The Italian institutes are mostly under the INAF umbrella.

The consortium brings together all the expertise required to perform the concept study and encourages tight collaboration across the various institutes. Specifically, the consortium’s members possess extensive experience in both the development of state-of-the-art instrumentation and large-scale spectroscopic surveys. Collectively, they have developed (or are developing) an impressive number of optical telescopes, multi-object spectrographs (MOS), and integral field spectrographs (IFS). The consortium’s institutes are distributed over ten countries—nine of which are in Europe, the other being Australia.

The consortium’s activities are organised into six work packages dedicated to general services, science related activities, telescope, instruments, and operations. Each work package is further divided into activity-specific sub-work packages, each having a coordinator.

The consortium is coordinated by Roland Bacon, who is seconded by the deputy coordinator, Sofia Randich, and assisted by the Project Manager, Flora Paganelli. The Project Office also includes the coordinators of



the Work Packages and the Facility Scientist. Its current composition is available at www.wstetlescope.com/project/project-office. The Project Office reports to an international advisory steering committee comprised of one or two senior members for each partner institute. This committee provides strategic direction, guides decision-making, tackles challenges, allocates resources, and monitors project progress. ■

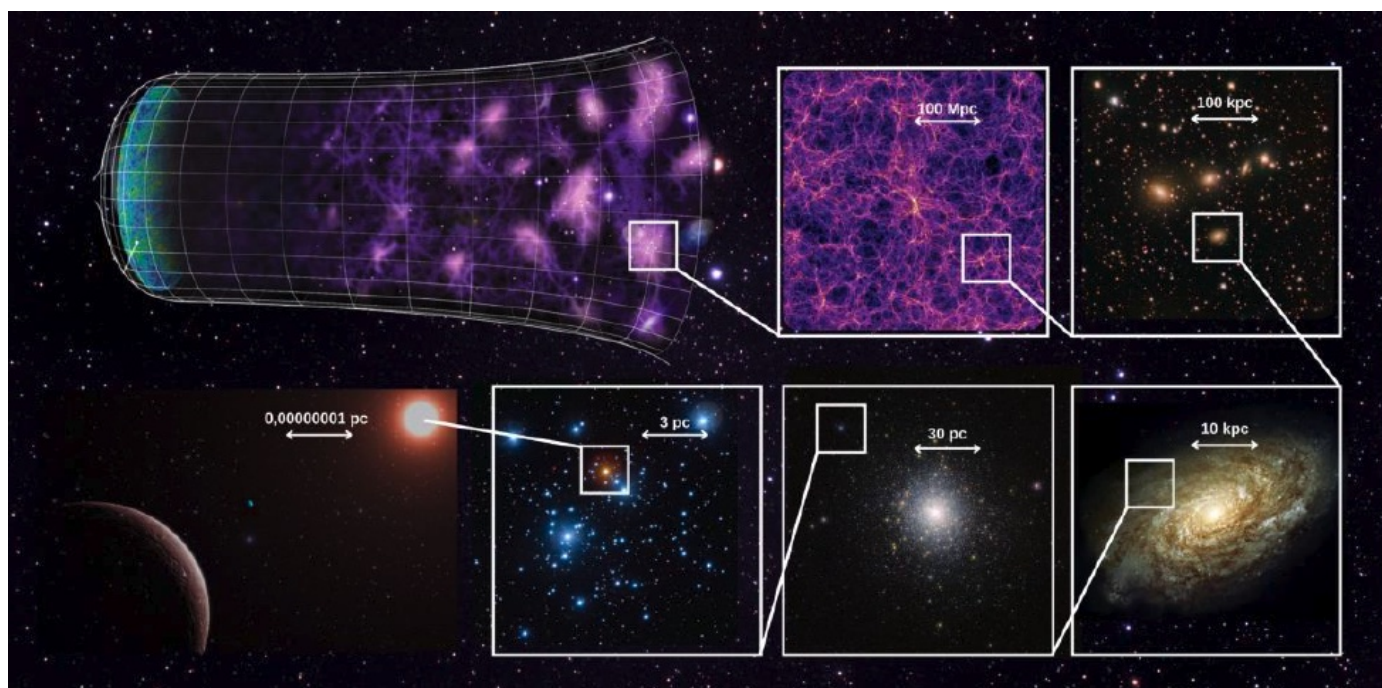
ADDRESSING OUTSTANDING SCIENCE

Science is the very reason and motivation of the WST. The demand for a facility dedicated to spectroscopic surveys is an interest shared worldwide and figures explicitly in many strategic science plans (such as the European Astronet Roadmap 2022–2035, the US 2020 decadal survey, the 2016-2025 decadal plan for Australian astronomy, and the Canadian astronomy long-range plan 2020-2030). The WST is the answer to this demand from the scientific community and has the potential to make a transformational scientific impact on its own. In addition, the WST will have strong synergies with existing or forthcoming large ground-based and space-based facilities (e.g., Euclid, Roman, LSST/Rubin, Gaia, ELT, SKAO, Einstein Telescope), greatly enhancing their scientific capabilities.

The WST, allowing combined MOS and IFS observations, will address outstanding scientific

questions across all spatial and time scales in the areas of cosmology; galaxy assembly, evolution, and enrichment, including our own Milky Way; the origin of stars and planets; time domain and multi-messenger astrophysics (WST White Paper v1, Mainieri et al. 2024, arxiv:2403.05398).

On very large scales, observations by the WST will cover uncharted territories for high redshift cosmology, probing primordial perturbations and testing inflationary models, as well as putting tight constraints on the mass of neutrinos. The combination of MOS and IFS observations, sampling a very wide range of physical scales, will allow us to study the flow of gas in and out of galaxies and its relation to the environment in which they live. The WST will be uniquely positioned to dissecting the baryonic and dark matter properties of dwarf galaxies, the most common type of galaxies found in the Universe today. ■■■



The WST will be a revolutionary spectroscopic facility addressing many open questions in astrophysics over a large range in physical scales: from the formation of the large-scale structures in the early universe (hundreds of Mpc), to the interplay of galaxies in the cosmic web (tens of Mpc), to the formation of our own Galaxy (kpc scales), to the evolution of stars and the formation of planets around them (sub-pc scales).

Credit: Rossella Spiga (INAF).

- ■ ■ The unique combination of chemistry, kinematics and ages for millions of stars will maximise our ability to reconstruct the formation history of the Milky Way and its satellites. The combination of MOS and IFS will allow the study of both dense clusters and distributed young stellar populations, bridging effectively the gap between local and large-scale star formation. The study with unprecedented detail of the star formation processes in massive and dense environments will be an ideal window to understand early stellar evolution and planet formation. The WST will further be transformational in tracing the chemical elements in the coma of comets transiting inside and outside the Solar System. Additionally, the WST will be instrumental for the expected revolution in multi-messenger astrophysics with the next generation of Gravitational Wave detectors, allowing to characterise the large population of merging binary neutron stars, also caught into their spiral-in phase, prior of the actual merger.

These are just some broad examples of the predictable scientific impact of the WST. The science team, through its five working groups, is now actively working on shaping the science drivers for the WST. Now is an exciting time to join this effort! ■

We are in a very exciting phase of the project. Interested in being involved in the Science team?

Fill in the form at www.wstetlescope.com/for-scientists/participate or scan the QR code.



The WST Science Team

The enthusiasm of the astronomical community for the WST is testified by the ever-growing Science Team, which includes more than 700 members from 34 countries across five continents, covering the wide range of science that this new facility will be tackling. The WST project is effectively devoted to an open science policy, allowing any professional astronomer to join the Science Team.

The Science Team, which plays a key role in providing the science driven requirements for the WST, is led by the project scientist, Vincenzo Mainieri, and it is organised in five working groups, each being coordinated by two or three scientists:

Galactic

Vanessa Hill, Rodolfo Smiljanic, Eline Tolstoy

The WST will play a transformational role for the study of our Galaxy. Science drivers are developed around the origin of elements, the origin of the Milky Way system, and the origin of stars and planets. The high-resolution MOS will deliver key and precise chemical abundances down to faint stars, while the low-resolution MOS will significantly enlarge the volume up to which information on chemo-dynamics will be accessible. The IFS will allow detailed studies of stellar populations in dense regions of the Galaxy, such as the Bulge or the central parts of star clusters and massive star forming regions.

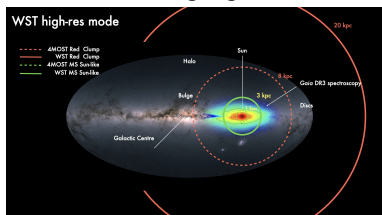


Image credit: Laura Magrini (INAF).

Resolved Stellar Populations

Martin M. Roth & Anna McLeod

The WST will become a unique, unrivalled facility for the spectroscopic study of resolved stellar populations, also beyond the Milky Way, up to nearby Local Volume galaxies, by providing a wide-field IFS for crowded fields, and simultaneously a 2-degree diameter MOS for surrounding areas where crowding is not an issue.

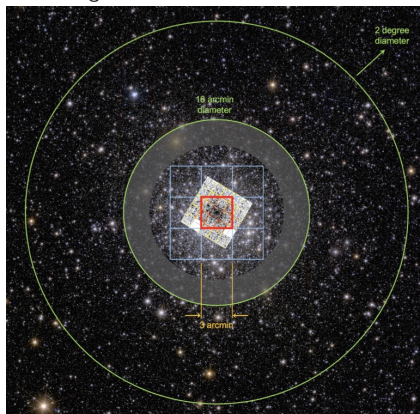


Image credit: Martin Roth (AIP).

Time domain

Richard I. Anderson, Cyrielle Opitom, Paula Sánchez Sáez

The WST will provide an unprecedented spectroscopic characterisation of transient and time variable phenomena. Time-domain and multi-messenger astronomy are tightly connected since multi-messenger events are typically of a transient nature. The WST is being conceived with a time-domain mindset, to enable maximum operational flexibility and rapid data processing, with science cases spanning all physical scales from Solar system objects to Cosmology and all-time scales from hours to decades.

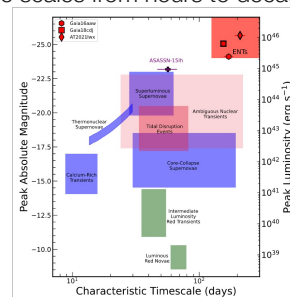


Image credit: Hinkle et al. (2024).

Extra-galactic

Francesco Belfiore, Richard Ellis, Mark Sargent

An outstanding issue in current extra-galactic studies is a better physical understanding of the interplay between dark, stellar, and gaseous material including how primordial and metal-enriched gas flows in and out of galaxies on various scales. The WST will allow answering such questions with a large spectroscopic survey at redshift $1 < z < 5$, corresponding to a formative period in cosmic history, and deep IFS observations to trace the cosmic web in emission.

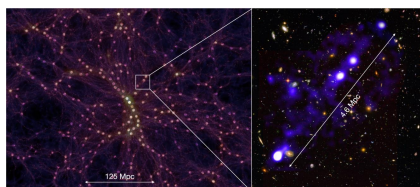


Image credit: Roland Bacon (CRAL).

Cosmology

Michele Moresco, Jean-Paul Kneib, Sofia Contarini

With the use of modern cosmology probes like supernovae, the Cosmic Microwave Background, galaxy clustering, and weak lensing, astronomers demonstrated that the expansion is accelerating! The latest experiments, like DESI, are now challenging the standard Λ CDM cosmological model. The WST will be instrumental to unveil the true nature of our Universe and its dark components by sampling significantly increased cosmological volumes where signatures of non-Gaussianity on very large scales can test models of inflation, over large look-back times, thereby directly probing the growth of structure and cosmic expansion history.

The WST will be sampling with unprecedented statistics and accuracy both the densest regions of the Universe (clusters of galaxies) and the under-dense regions (voids) that will be very powerful cosmological probes.

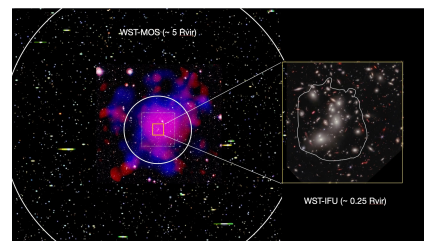


Image credit: Johan Richard (CRAL).

“THE WST IS A ONCE IN A LIFETIME OPPORTUNITY”

An interview with **Vincenzo Mainieri**, WST Project Scientist

What does it mean to be the Project Scientist for the WST?

I am ultimately responsible for coordinating the work of the science team to define the science drivers for this new facility. This means interacting with a very broad and diverse range of scientists and science cases, as well as with our technical team.

What is your particular interest in working on the WST project?

Being the Project Scientist for the WST is a unique – I would even say once in a lifetime – opportunity to effectively shape a major facility for astronomy.

What first drew you to astronomy, and how did that lead to the WST?

I got to astronomy relatively late, well within my physics studies at the university in Rome. One night, I was watching the sky with the amateur telescope of a friend, which we put on the balcony of his apartment in the centre of Rome. Now, this is not one of the best astronomical sites on Earth, but the beauty of the surface of the Moon and the rings around Saturn really touched me and triggered my interest in focusing on astrophysics. Through my research, I got involved and led many surveys, mostly spectroscopic, and at ESO I have been project scientist of several multi-object spectrographs (4MOST, MOONS, MOSAIC). This has naturally led me to the WST.

Do you have a story or moment from the project that stands out?

I’m sure I will have many more moments to remember as the WST progresses, but let me mention two for now. In preparation of the Horizon proposal, we had one week of work in Lyon with the project office: this was quite intense, but it was also very

pleasant, and I have very nice memories of that time spent with Bianca, David, Philippe, Pietro, Roland, and Sofia. The other was the first international WST conference we organised in Vienna in 2023: seeing in person so many scientists discussing the exciting science that we will be able to do with the WST was a great experience.

What are the greatest challenges you are facing in this project?

One of the greatest challenges is to follow a very large science team, meet their expectations and be sure that they can apply their amazing ideas to the project. This can be overwhelming at times, but I want to thank the coordinators of our five scientific working groups for their vision, enthusiasm, and commitment to the project that help me immensely.

What do you think makes the WST unique?

The people, for sure! This is what makes a project unique. Working with such a large and diverse international team is something I really enjoy; the diversity of ideas is enriching and I’m learning a lot. Needless to say, the fact that

this is a very ambitious facility is another unique aspect.

What kinds of surveys are planned?

The WST will be the spectroscopic survey facility for the next 50 years or so. As such it will perform large area surveys but also at high spatial resolution to trace a wide range of physical scales.

Is there anything you would like to stress in particular?

Again, I would like to convey the excitement of working in a project like the WST, where we have effectively the possibility to shape a major astronomical facility that will be used for decades to come by many younger generations of astronomers.

What’s one thing about the project you wish more people knew?

I hope more and more people will be able to join our “busy weeks”, such as the one we had last year in Varenna, Italy. It is really a great experience, both for the work one can do, but also a great team building exercise. ■

Mini **Bio**



2003	PhD in Physics, University of Rome
2003 - 2006	Postdoc, MPE
2006 - 2008	Research Fellow, ESO
2008 - 2015	User support Astronomer, ESO
2015 - now	Full astronomer and MOS Project Scientist, ESO
2021 - now	Project Scientist for the WST

THE WST TOP LEVEL REQUIREMENTS

The WST — the Wide Field Spectroscopic Telescope — is a 12m-class wide-field spectroscopic survey telescope with parallel operation of a large field-of-view, high-multiplex multi-object spectrograph (MOS), having both low- and high-resolution modes, and a giant panoramic central integral field spectrograph (IFS).

The table below gives the top-level requirements of the WST. These requirements are the result of a carefully balanced trade-off between scientific objectives, technical feasibility, risk and cost. They reflect the maturity of the project, following two years of detailed investigation and community engagement.

These ambitious requirements will place the WST MOS and IFS capabilities far ahead of the existing or planned competing facilities (see page 10). Using the collecting area and the fibre multiplex gain as a measure of the survey speed, the WST MOS will be 27 times faster than PFS@Subaru, 22 times faster than MOONS@VLT, and 6 times faster than MUST. The WST IFS, with its large field of view, good spatial resolution and large simultaneous spectral range, will outperform all existing and planned panoramic IFS. For example, using the etendue metric, it will be 19 and 162 times faster than the European

MUSE@VLT and the US KCWI@Keck, respectively. Thus, not only will the WST perform significantly better than any existing or planned MOS or IFS instruments, but the parallel operation of its MOS and IFS capabilities as a single facility will represent a significant advance in the overall scientific capability available to astrophysicists and cosmologists. Its built-in time-domain capabilities will position WST as a cornerstone of multi-messenger science in the 2040s.

As with previous ESO flagship telescopes such as the VLT and the ELT, the WST is expected to have an operational lifetime exceeding 50 years. To ensure the facility remains at the forefront of scientific discovery over such a long timescale, a strategy for long-term evolution and upgradeability is being developed. This will allow the WST to adapt to evolving scientific priorities and to take advantage of emerging technologies.

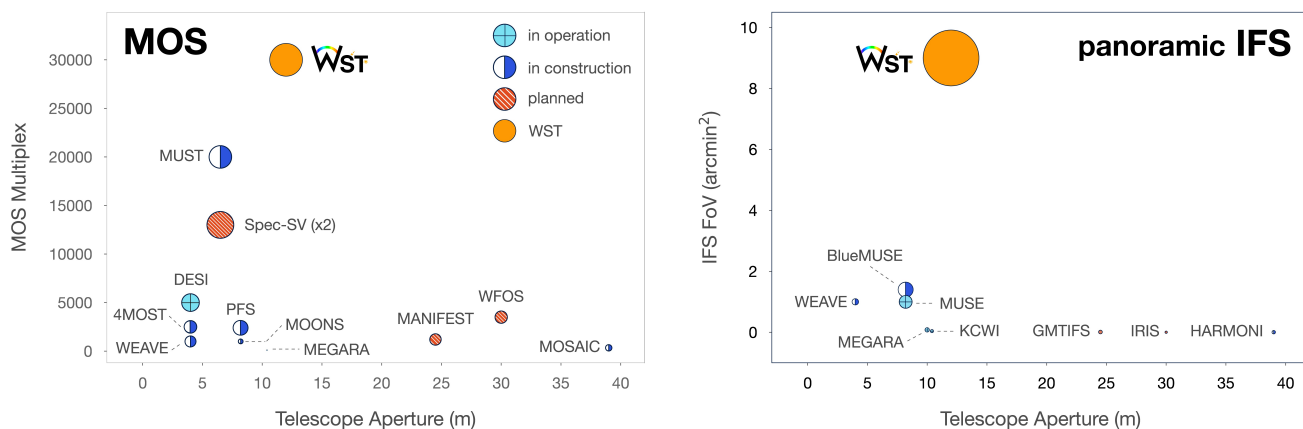
Several upgrade paths have already been identified, including:

- Implementation of GLAO for the IFS,
- An infrared extension of the MOS-LR, and
- Deployment of mini-IFUs within the MOS. ■

Telescope Aperture	12 m, seeing limited
Telescope FoV	3.1 deg ²
Tel. Spec Range	0.35–1.6 μm
MOS LR Multiplex	30,000
MOS LR Resolution	3,000–4,000
MOS LR Spec Range	370–970 nm (simultaneous)
MOS HR Multiplex	2,000
MOS HR Resolution	40,000
MOS HR Spec Range	350–970 nm (3–4 regions)
IFS FoV	3 × 3 arcmin ²
IFS Resolution	3,500
IFS Spec Range	370–970 nm (simultaneous)
IFS Patrol Field	13 arcmin diameter
MOS & IFS parallel operations	
ToO implemented at telescope and fibre level	

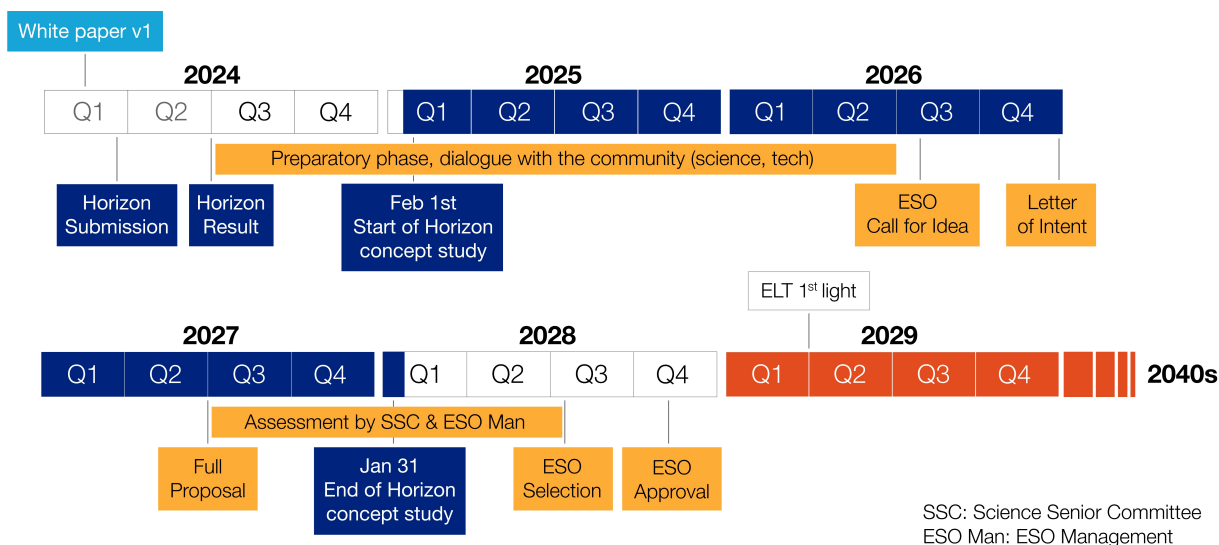
Abbreviations

FoV	Field of View
GLAO	Ground layer adaptive optics
IFS	Integral field spectrograph
IFU	Integral field unit
MOS	Multi-object spectrograph
ToO	Target of Opportunity



Comparison of the WST MOS (left panel) and IFS (right panel) capabilities with existing and proposed ground-based spectroscopic facilities. The circle areas are proportional to the etendue (i.e., aperture times field of view area). For clarity, MOS or IFS with small multiplex or field of view are not shown in these figures. Multi-IFUs (e.g., KMOS, Hector or MaNGA) or sparse-field panoramic IFS (e.g., HETDEX) are not shown in this comparison, which only considers panoramic (monolithic) IFS with 100% fill-factor. However, multi-IFUs are considered as a possible WST upgrade to the MOS components.

TIMELINE



SSC: Science Senior Committee
ESO Man: ESO Management

The three-year WST concept study, funded by the EU Horizon programme (<https://cordis.europa.eu/project/id/101183153>), is highlighted in blue, while the current Expanding Horizons ESO timeline (<https://next.eso.org/timeline/>) appears in yellow.

THE TELESCOPE'S OPTICS

The Wide-field Spectroscopic Telescope is required to provide 12-m class collecting power and two simultaneously available foci, with different optical properties:

a. A 2° focal surface for fibre-fed Multi-Object Spectroscopy (MOS), up to $\sim 32,000$ fibres;

b. A 3×3 arcminute² focal surface, located anywhere within a 13 arcminutes diameter patrol field, for Integral Field Spectroscopy (IFS) at a gravity-stable station.

The above summarises the originality, but also the complexity of the system:

1. Unprecedented étendue (larger than Rubin/LSST) – large collecting power, large MOS and large 3-D fields of view;
2. Very different focal ratios for the MOS (fibres) and IFS (image slicers), very large volumes of the instruments;
3. Simultaneous operation of two fields, both focal surfaces cross-registered and actively held to specification in a continuous and transparent manner for the instruments.

Several MOS configurations had been explored at an early stage; in November 2023, a corrected Cassegrain MOS configuration, with a pickup and optical transport of the IFS patrol field from its Cassegrain location to Nasmyth then down to Coudé was selected as the most promising solution. Several iterations have been performed since then, with optical

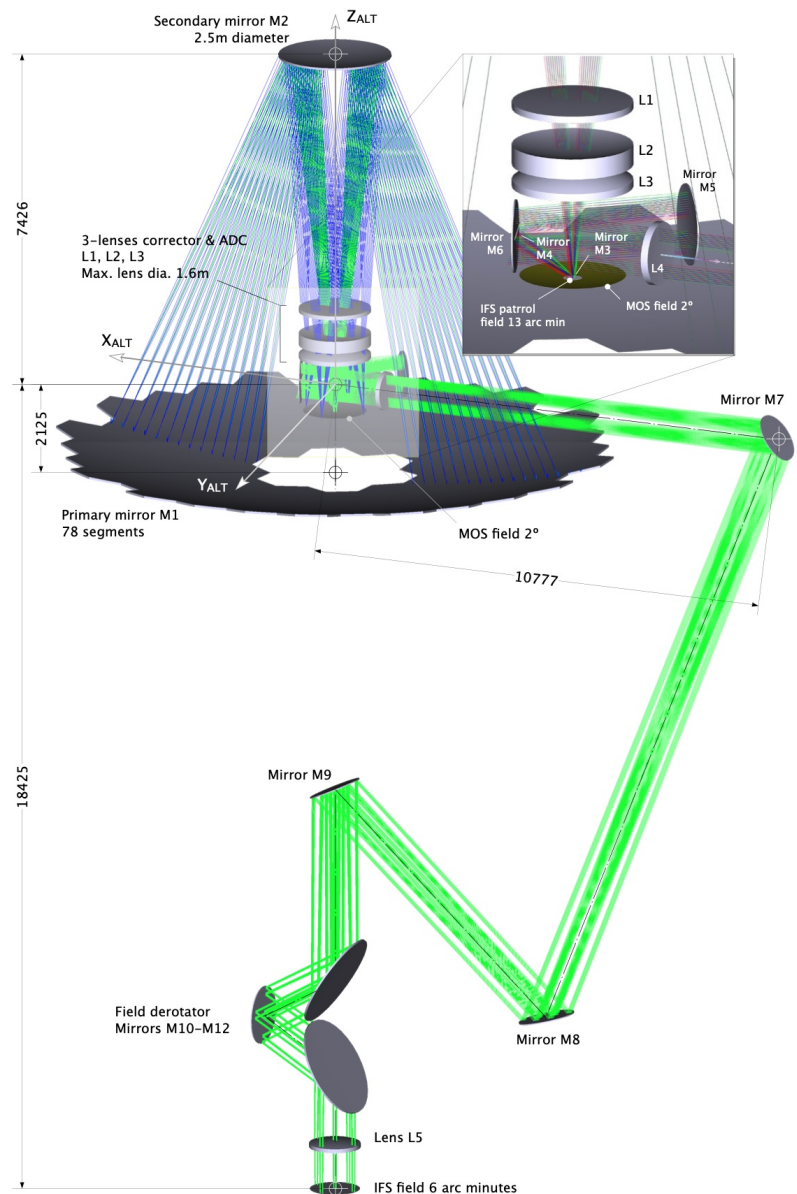


Figure 1: The WST's overall optical layout.

■ ■ ■ quality, throughput, optical interfaces with instruments, feasibility, structural and functional considerations, and system operability amongst prominent and at times conflicting criteria. At the time of writing of this article, the IFS path is still the subject of design iterations but Fig. 1 shows a promising configuration. This design includes a suitably sized and conjugated surface (M6) allowing for ground-layer adaptive optics upgrade. Access and design space are however severely constrained. Options for reducing the size of the IFS optical detorator are also being explored.

For the telescope, the design strategy is to rely on proven technologies and operational concepts. This applies to segments (ELT-like, including supports) and, to the possible extent, to other functional units. Simultaneous dual-foci operation is an evident exception. A favourable feature of the design is that, for all practical purpose, the MOS optical path is the common path. Therefore, the telescope can be actively driven on-sky from the MOS field, with IFS controls and metrologies having to deal with differential perturbations only. In a nutshell, the optical solution mitigates the system-level complex-

ity of simultaneously controlling both foci to specification.

The as-designed optical quality at the MOS focus is illustrated in Fig. 2. At the IFS, the layout shown in Fig. 1 is still evolving but already delivers excellent optical quality.

The need to relay the IFS field to a gravity-stable station inevitably implies a large number of optical surfaces. The project team includes leading expertise (LMA, IP2I) in coating technologies. A specific activity is devoted to enhanced coating solutions in the 0.37-0.98 μm range. With multi-layer coatings tailored to surfaces dimensions and incidence angles, preliminary, yet still conservative, estimates indicate that a throughput higher than 80% from the primary mirror down to the IFS focus is probably achievable.

This design study, led by Philippe Dierickx — telescope system engineer and coordinator — greatly benefited from the essential and invaluable contributions of Corentin Cudennec and Will Saunders, as well as from the insightful discussions with numerous experts from the consortium. ■

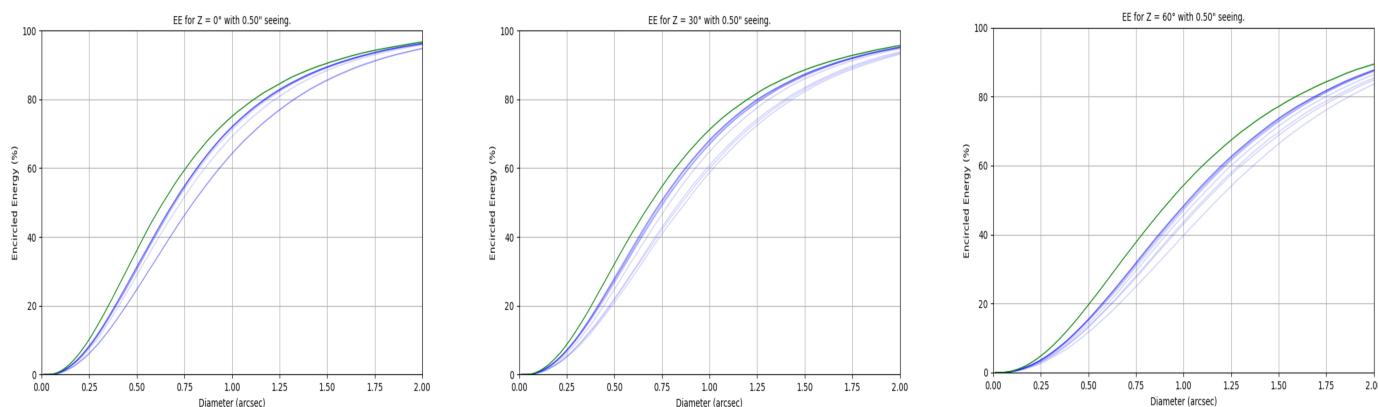


Figure 2: As-designed optical quality at the MOS focus. The blue lines correspond to the combined telescope-atmosphere, for different field positions. The green line corresponds to natural seeing only (i.e., a 12m telescope with zero aberrations). The three plots refer to zenithal distance $z=0, 30,$ and 60° , respectively. The wavelength range is 0.37-1.60 μm .

“LEARNING MANY TECHNICAL ASPECTS OF THE TELESCOPE IS VERY STIMULATING”

An interview with **Corentin Cudennec**

When did you start working on the WST?

I started my PhD in November 2024, but I previously worked on the WST during an internship. At the time, my work focused more broadly on the telescope design, and I also had the opportunity to spend a few months at ESO during the internship. It was my first experience of living abroad, and I really enjoyed it. The atmosphere was very pleasant, I met many nice people, and Munich was a great place to visit. I've always been interested in astronomy, and a few years ago I discovered optical engineering. Since then, I've been fascinated by instrument design, whether for astronomy or not. Initially, I wasn't sure if I wanted to pursue a PhD, but when my optical design teacher mentioned the possibility of doing a PhD project on this topic, I didn't hesitate long.

What are the principles for designing such a wide-field telescope?

From the optical point of view, the telescope relies on a Cassegrain design, and then we have the relays to modify and stabilise the image before it reaches the integral field spectrograph (IFS). The relays magnify, adjust, and redirect the beam. These two parts — the Cassegrain and the relay — are quite different, both in terms of what we're trying to optimise and the constraints they pose. On the one hand, the Cassegrain is a very classic type of optical design, so we're trying to push its performance without having a lot of room to manoeuvre. On the other hand, for the relay, we are working on two different designs, as there is more freedom on where we can place the mirrors and lenses.



Corentin Cudennec is a PhD student at the Centre de Recherche Astrophysique de Lyon (CRAL), where he is working on optical engineering for the WST. His work has been dedicated mostly to the Cassegrain and relay of the telescope, as well as on the IFS cameras.

What are the main challenges you are facing?

Mainly taking into account the mechanical constraints. Whenever I think of a new way to fold the light to get it where I want it, I'm blocked because there isn't enough room, and something ends up intersecting the light path or other objects.

In which areas is the WST most innovative?

I'd say that the innovation in the WST comes mainly from the instruments. For the telescope, we're mostly relying on technologies that have already been tested, and we know they are robust. For the integral field spectrograph (IFS), given that the spectrograph cameras will be very fast and numerous, any innovations that help simplify the design will be especially valuable.

For example, by using curved detectors and rethinking image slicers to facilitate and speed up their production.

Tell us more about your work.

What are your daily tasks?

At the moment, I am working on the trade-offs of the spectrograph, which means that I am simulating different setups to find the appropriate technical solutions. I have different design options (camera design, sensors and sampling) and I look at what performance the different combinations would have together, that is, what these combinations achieve on different metrics such as the total number of spectrographs, spectral resolution, grating size, throughput, instrument sensitivity, total spectrograph volume, and cost.

What are the advantages of working on such a long-term project for a young researcher?

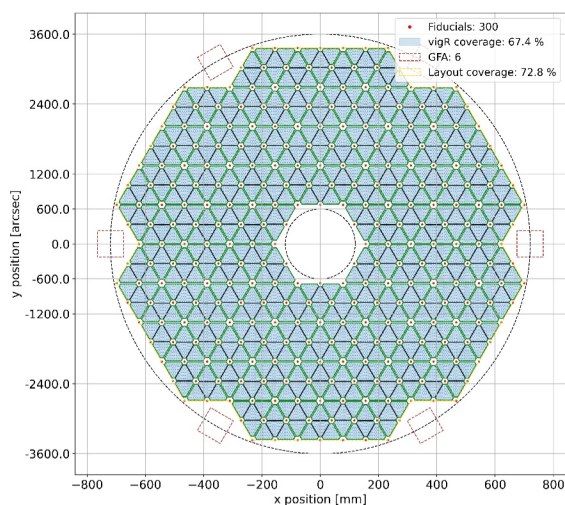
I think one of the biggest advantages is that you have more time for your project and less pressure on your work. I have room to make mistakes, learn from them and correct them, which wouldn't necessarily be the case if I was constantly in a rush. Of course, on the other side, there is a bit more uncertainty on the future, as the project is still in the proposal stage, competing with other very interesting facilities.

What do you like most about your job?

Mostly the fact that I'm learning a lot about many of the technical aspects of the telescope. It is very stimulating. Also, since I'm working on several parts of the telescope, I'm working with many people, both within the consortium and at CRAL. ■

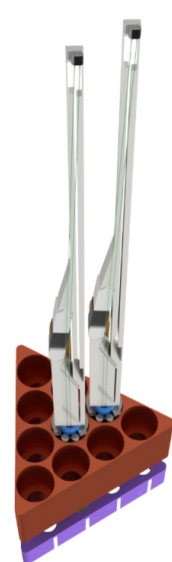
THE INSTRUMENTS

In this first article about the instruments for the WST, we will introduce the nine instrumentation and technology work packages, the organisations involved, the team leaders, and summarise the ongoing design activity.



Concept for the MOS focal plane layout developed by EPFL. Each of the 528 triangles is a module containing 63 fibre positioners. Multiplex is 33,264.

Positioners – The telescope’s focal plane will contain 30,000 robotic positioners, each one providing accurate alignment of an optical fibre onto the object. The fibre positioner work package is being led by Sébastien Pernecker at EPFL and includes teams at AAO Macquarie, AIP, EPFL, and UKATC. The teams are developing three different types of fibre positioner technology and studying how the positioners can be arranged in the focal surface to provide the most efficient sky coverage.



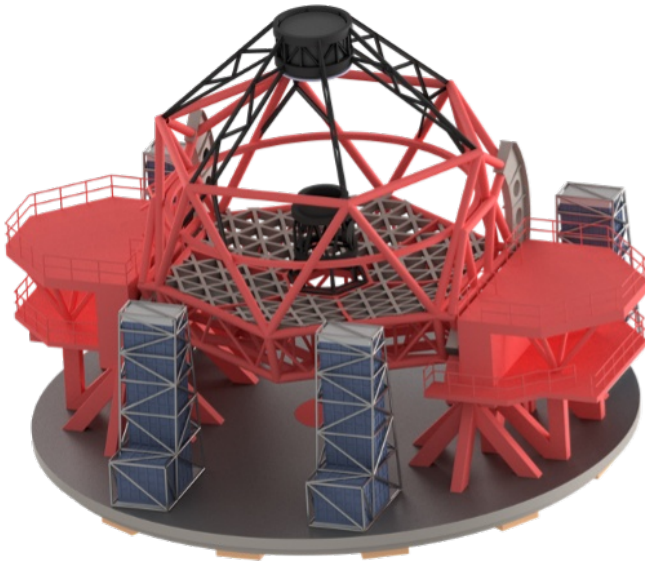
Picture of the two-axis, R-theta, flexure-based positioner design being developed at the UKATC.

Fibres – Light from the telescope’s focal plane is transmitted to the multi-object spectrographs via the optical fibres, the design of which is being led by Andreas Kelz at AIP. This work will define the complex fibre routing from the telescope’s focal surface, through the telescope structure, to the multiple-object spectrographs. The optimum choice of fibre geometry will be studied, for example, is using a bundle of seven small fibres better than using one large fibre for some science applications?

LRMOS – The low-resolution multi-object spectrographs will provide 30,000 spectra at a resolution of 3,000 over the wavelength range 370 nm – 970 nm. The design is being led by Kjetil Dohlen at LAM.

IFS – The integral field spectrograph is situated in the basement of the observatory building and receives light from the centre of the telescope focal plane via a series of relay mirrors. The IFS uses image slicer optics to split the 3' × 3' field of view, in two stages, to eventually form the entrance slit to a series of 144 spectrographs, with $R > 3,000$. The IFS design is being led by Alexandre Jeanneau at CNRS CRAL.

Initial work on both the LRMOS and IFS has concentrated on a technology review of existing spectrograph designs and definition of the performance metrics that will be used for the instrument trade-off study. For example, various spectrograph camera design options are being explored including dioptric (uses only lenses), catadioptric (lenses and mirrors), and an innovative solid Schmidt camera.



The **High-Resolution Multi-Object Spectrograph** work package is being led by Andrea Tozzi at OAArcetri-INAF. The team are developing spectrograph designs to meet the challenging requirement of $R=40,000$ for 2,000 objects. One spectrograph design uses metre-class optics resulting in a spectrograph that is 10 m in length, and 8 m in height, as shown in the picture on the left. Smaller designs are also being explored with about 10 spectrographs needed instead of 4.

Detectors & Dispersers - The detectors and dispersers work package is being led by Andrea Bianco at OABrera-INAF. The dispersers team at INAF have an on-going activity to open a new laboratory in 2026 to manufacture large, 450 mm \times 600 mm, volume phase holographic gratings. The detectors team at ESO are studying two key trade-off areas for the choice of detector: CCD or CMOS and curved or flat sensors. A sample CMOS detector has already been ordered by ESO for future testing. CEA Saclay will design the detector cryogenic cooling system.

Calibration - The design of the calibration system is being led by David Lee at UKRI-STFC-UKATC. The calibration system will be able to illuminate the WST, potentially via a large dome screen or similar, with a variety of light sources to provide wavelength, fibre flat-field and throughput calibration. Instruments will also be fitted with on-board calibration sources for detector flat-field calibration.

Future development

This work package is being led by Julia Bryant at the University of Sydney and will explore new technology that could be used for future upgrades to the WST. Enhancements being investigated include high performance fibre connectors, addition of near-infrared spectroscopy capability, and implementation of multiple fibre-fed integral field units.

Meet us!

The Wide-field Spectroscopic Telescope is an innovative 12-m class wide-field spectroscopic telescope with simultaneous operation of a large field-of-view (3 sq. degree) and high multiplex (30,000) multi-object spectrograph facility with both medium and high resolution modes (MOS), and a giant panoramic (3×3 sq. arcmin) integral field spectrograph (IFS).

We will be present at the following events:

EAS 2025 (SS7)	23–27 June 2025	Cork, Ireland
Science Detector workshop	6–10 October 2025	Canberra, Australia
Chilean WST Workshop	15–16 December 2025	Santiago, Chile
French WST Workshop	25–27 March 2026	Nice, France
EAS 2026	29 June – 3 July 2026	EPFL, Switzerland
SPIE 2026	5–10 June 2026	Copenhagen, Denmark

Come and meet us!

If you want to join the Science Team, please fill in the form at www.wstetlescope.com/for-scientists/participate (see p. 6)

Job openings



Time-domain astrophysics with the Wide-field Spectroscopic Telescope

EPFL
Richard Anderson

Deadline: 30 June
<https://careers.epfl.ch/job/Lausanne-Time-domain-astrophysics-with-the-Wide-field-Spectroscopic-Telescope-%28Postdoc%29/940945674/>

Postdoctoral Fellow on Time-domain science with WST

ESO
Paula Sánchez Sáez

Deadline: 20 June
https://recruitment.eso.org/jobs/2025_0033



Instrumental Researcher in Multi-Object Spectroscopy

Marseille, France
CNRS

Deadline: 9 July
<https://emploi.cnrs.fr/Offres/CDD/UMR7326-ANAMEK-110/Default.aspx?lang=EN>

