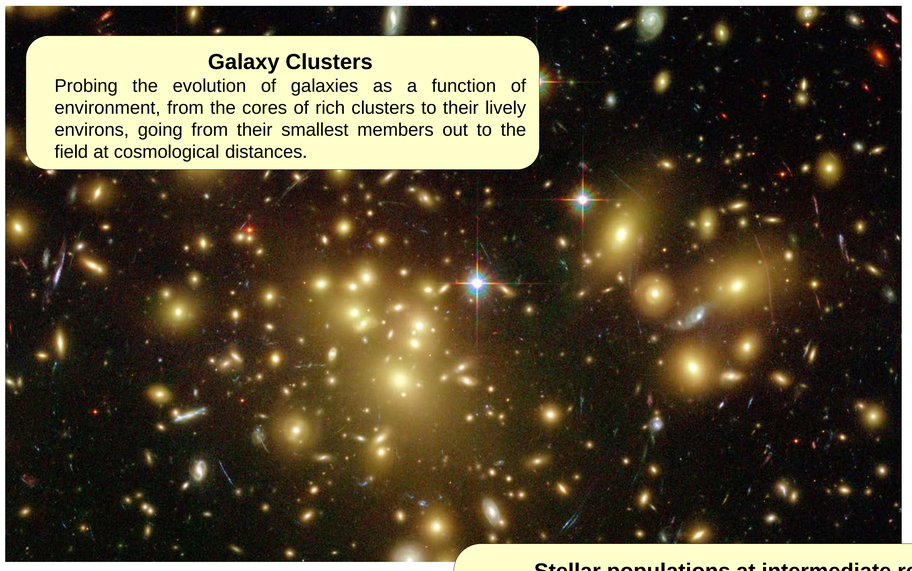
A Wide-Field Multi-Object Spectrograph for the William Herschel Telescope



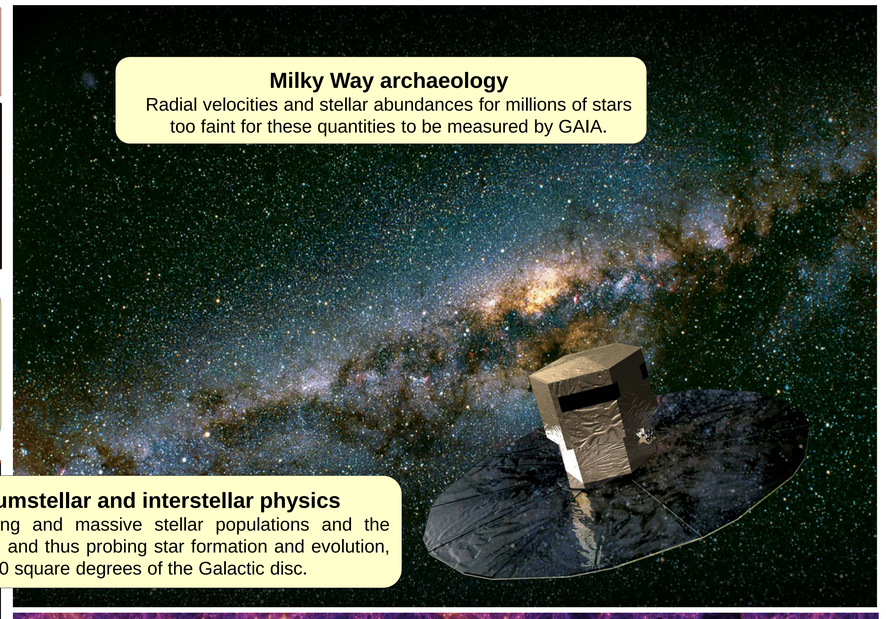
Galaxy Clusters
Probing the evolution of galaxies as a function of environment, from the cores of rich clusters to their lively environs, going from their smallest members out to the field at cosmological distances.

WEAVE science

The science time is for 8 dedicated surveys ('The WEAVE Survey') and for open-time proposals. The WEAVE Survey receives 2/3 of the time over at least 5 years, generating ~30 million spectra of ~10 million objects. The remainder of the time (~500 hours per semester) is for the Open-Time Programme which includes the international time or ITP proposals, selected competitively from those proposed by astronomers in the ING partner countries and CCI countries.

The WEAVE Survey

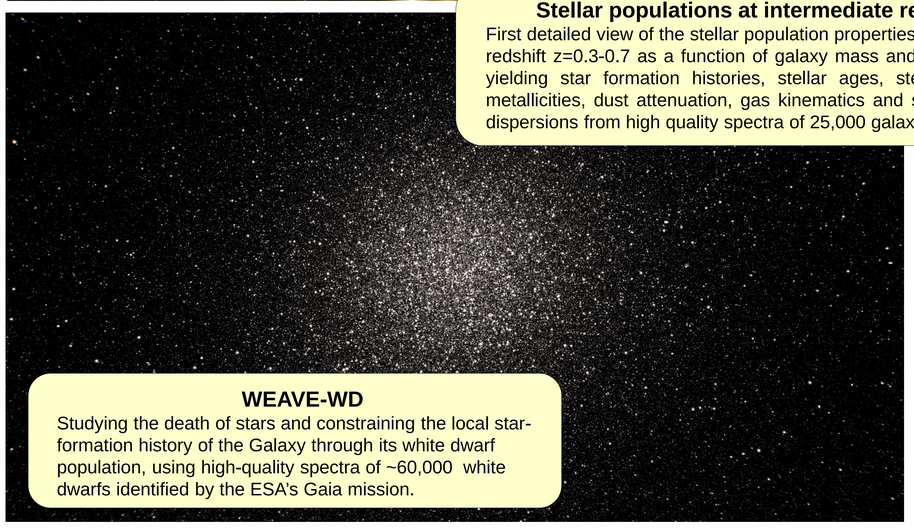
How did our Galaxy form and the stars within it evolve?
How were other galaxies assembled?
What are dark matter and dark energy?



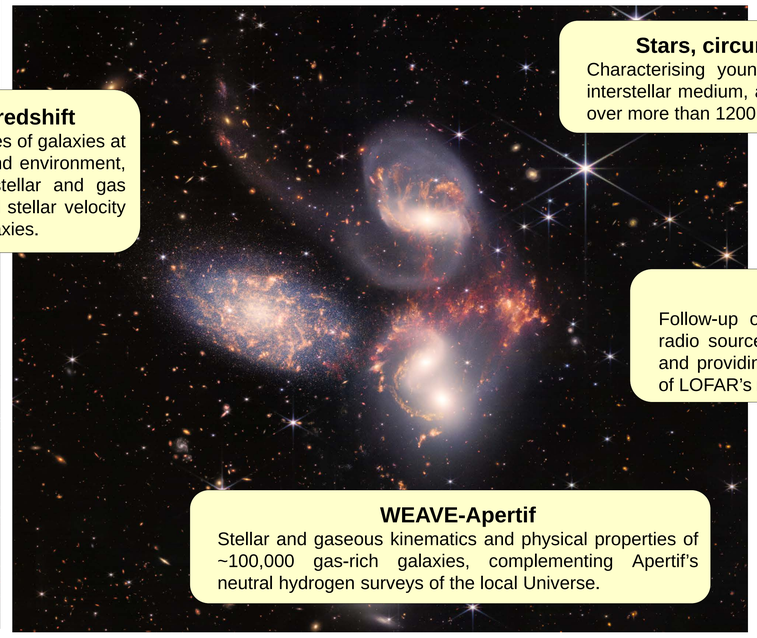
Milky Way archaeology
Radial velocities and stellar abundances for millions of stars too faint for these quantities to be measured by GAIA.

Stars, circumstellar and interstellar physics
Characterising young and massive stellar populations and the interstellar medium, and thus probing star formation and evolution, over more than 1200 square degrees of the Galactic disc.

Stellar populations at intermediate redshift
First detailed view of the stellar population properties of galaxies at redshift z=0.3-0.7 as a function of galaxy mass and environment, yielding star formation histories, stellar ages, stellar and gas metallicities, dust attenuation, gas kinematics and stellar velocity dispersions from high quality spectra of 25,000 galaxies.

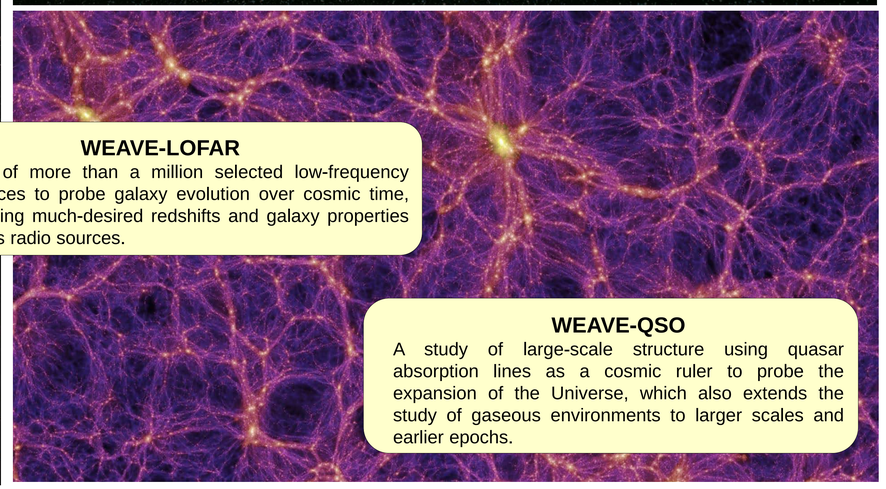


WEAVE-WD
Studying the death of stars and constraining the local star-formation history of the Galaxy through its white dwarf population, using high-quality spectra of ~60,000 white dwarfs identified by the ESA's Gaia mission.



WEAVE-Apertif
Stellar and gaseous kinematics and physical properties of ~100,000 gas-rich galaxies, complementing Apertif's neutral hydrogen surveys of the local Universe.

WEAVE-LOFAR
Follow-up of more than a million selected low-frequency radio sources to probe galaxy evolution over cosmic time, and providing much-desired redshifts and galaxy properties of LOFAR's radio sources.

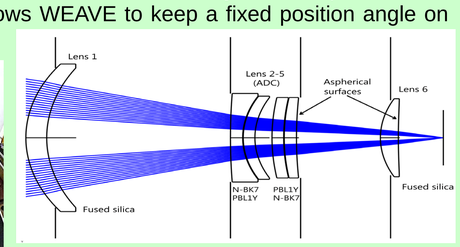


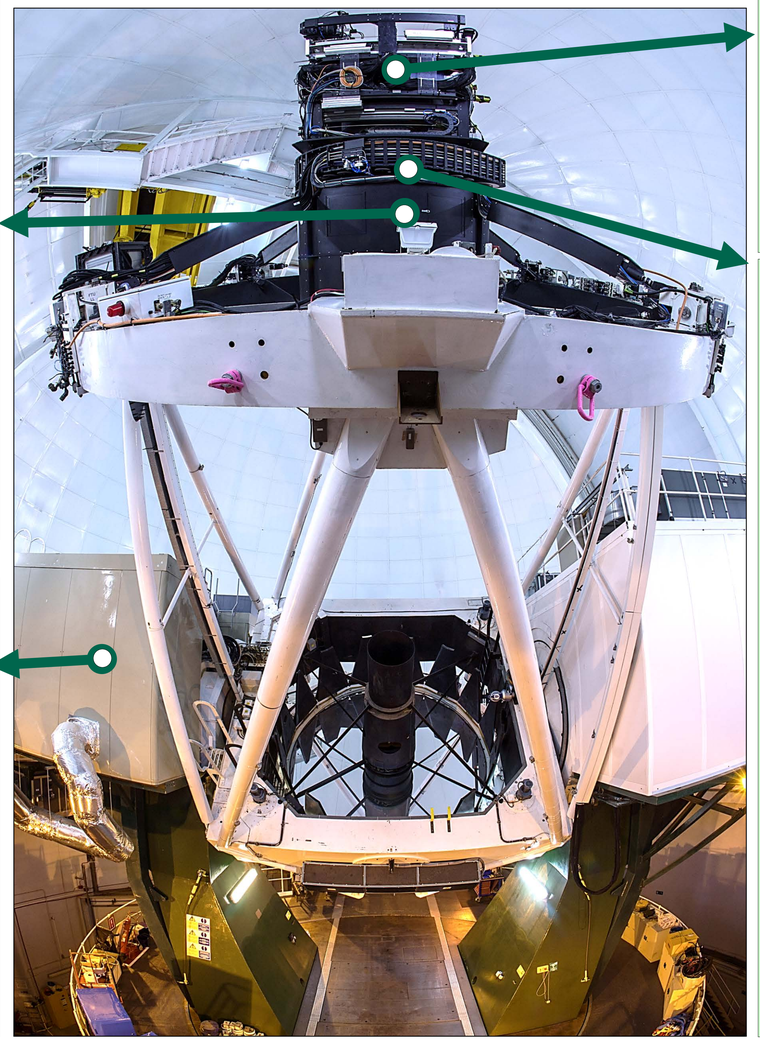
WEAVE-QSO
A study of large-scale structure using quasar absorption lines as a cosmic ruler to probe the expansion of the Universe, which also extends the study of gaseous environments to larger scales and earlier epochs.

WEAVE instrument

A new prime-focus unit

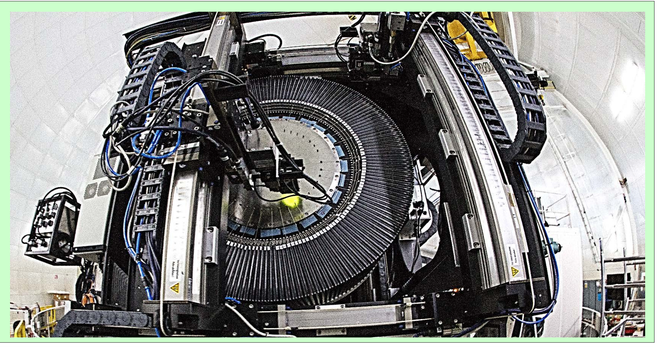
A new atmospheric dispersion and field corrector comprising 6 lenses which provides good image quality over a 2-degree field of view. It mounts directly on the top end of the telescope structure. A new field rotator allows WEAVE to keep a fixed position angle on sky while tracking.





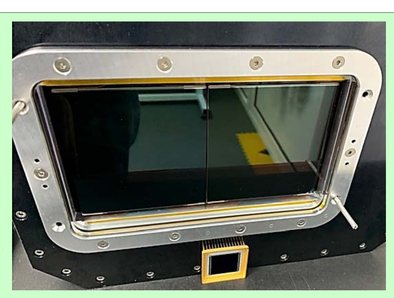
Fibre positioner

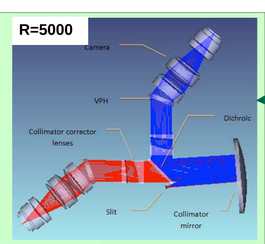
A two robot configuration to arrange fibres on one plate in 1 hour. Then a tumbler is rotated by 180 degrees so that plates A and B swap positions.

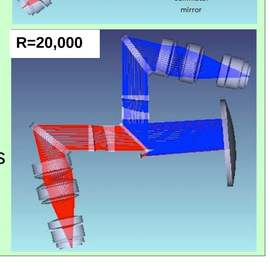


Spectrograph

Placed in Nasmyth enclosure (in the refurbished GHRIL laboratory). Two-arm concept (blue – red) and a two-CCD detector (right) on each arm (12,000 x 12,000 pixels). Dispersion is effected by inserting one of three VPH gratings in the blue arm, and one of two in the red arm, giving five spectroscopic modes: LR-R, LR-B, HR-B, HR-G, HR-R, providing resolution R ~ 5000. In MOS and mIFU modes R~20000 over wavelength ranges 404-465nm, 473-545nm and 595-685nm. In LIFU mode the spectroscopic resolutions are a factor of two lower (i.e. R ~2500, 10000).

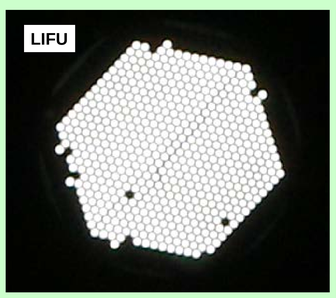


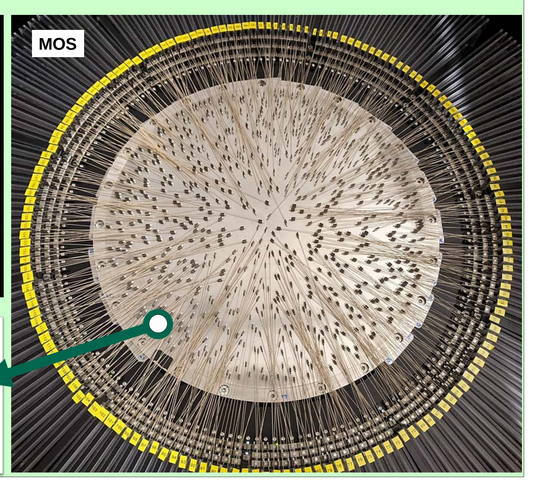




Focal-plane modes

MOS (multi-object spectroscopy). Individual fibres can be positioned anywhere within the field of view, with each fibre intercepting a circular area of sky of diameter 1.3 arcsec. Two sets of MOS fibres, one for each of two focal-plane plates: plate A (960 fibres) and plate B (940 fibres).
mIFU (mini integral-field units). 20 fibre bundles (each consisting of 37 fibres covering 11x12 arcsec^2 on the sky) which can be positioned anywhere within the field of view, on plate B.
LIFU (large integral-field unit). A single IFU is positioned at the centre of the field of view at tumbler position 90 degrees. The array of 547 fibres provides a (hexagonal) field of view of 78 x 90 arcsec^2. The fibres have circular cross-section with diameter 2.6 arcsec on the sky.





mIFU