



PRESS RELEASE – PARIS – 12 DECEMBER 2022

## First light for the next-generation spectrograph WEAVE

- WEAVE has carried out its first-light observations on Stephan's Quintet, a group of five galaxies, some of which are undergoing collision.
- They provide a demonstration of its exceptional capabilities and hold out the promise of major discoveries.

**WEAVE, a new spectrograph on the William Herschel Telescope (Canary Islands, Spain), has successfully carried out first-light observations of a group of five galaxies called Stephan's Quintet, thus demonstrating its unprecedented capabilities and providing the astronomical community with the promise of many new discoveries. In France, WEAVE was supported by the CNRS, the Paris Observatory-PSL and the Côte d'Azur Observatory.**

The powerful new WEAVE spectrograph mounted on the William Herschel telescope at the *Roque de los Muchachos* Observatory provides astronomers with observations almost a hundred times faster than with previous instruments, as it demonstrated when it captured its first-light images of Stephan's Quintet, a group of five galaxies of which some are undergoing collision.

The scientists of the *Isaac Newton Group of Telescopes* (ING)<sup>1</sup> focused specifically on two of them, NGC 7318a and NGC 7318b. The spectra reveal the presence of gas well outside the galactic discs: hydrogen gas clouds are being pushed out of their orbits by the intrusion at very high speeds, approaching 3 million km/h, of the galaxy NGC 7318b, which is moving directly towards us through the centre of Stephan's Quintet (see images).

The observations were made with one of the three WEAVE fibre systems, in which 547 very closely packed optical fibres transmit light from a hexagonal area of the sky to the spectrograph, where it is analysed and recorded. WEAVE's first-light observations show not only that it works, but also that it produces high-quality data that hold out the promise of major discoveries in the years to come.

In France, the construction of WEAVE was funded by the CNRS, the Paris Observatory-PSL, and the Île-de-France<sup>2</sup> and Bourgogne-Franche-Comté regions. It also benefited from the expertise of the 'Galaxies, Étoiles, Physique, Instrumentation' (Observatoire de Paris-PSL/CNRS) and Lagrange (CNRS/Observatoire de la Côte d'Azur/Université Côte d'Azur) laboratories, with the support of the Observatoire des Sciences de l'Univers 'Terre Homme Environnement Temps Astronomie' (CNRS/Université Bourgogne Franche-Comté) and the Institut 'Univers, Temps-fréquence, Interfaces, Nanostructures, Atmosphère et Environnement, Molécules' (CNRS/Université Bourgogne Franche-Comté). These French laboratories will participate alongside others<sup>3</sup> in future observation programmes.

**For more information**, see [our previous press release](#) and [ING's press release](#).



## Footnotes

1 - The ING comprises two telescopes located at the *Roque de los Muchachos* Observatory. In 2016, the ING partner countries (the UK, Spain and the Netherlands), joined by France and Italy, signed an agreement to design and build WEAVE, with each country contributing to the major components, and ING providing auxiliary systems and overall project management.

2 - The WEAVE project was funded under the Major Area of Interest 'Astrophysics and conditions for the emergence of life' 2012-2016 of the Île-de-France region (France).

3 - The Laboratoire d'Astrophysique de Marseille (CNRS/Aix-Marseille Université/CNES), the Laboratoire d'Astrophysique de Bordeaux (CNRS/Université de Bordeaux), the Institut de Planétologie et d'Astrophysique de Grenoble (CNRS/Université Grenoble Alpes) and the Observatoire Astronomique de Strasbourg (CNRS/Université de Strasbourg).



**WEAVE pointed at Stephan's Quintet for the first-light observation.** In this observation mode, it collects light from 547 points in the sky for analysis by the spectrograph. The observation provides physical information from each distinct region of each galaxy as well as from the space in between.

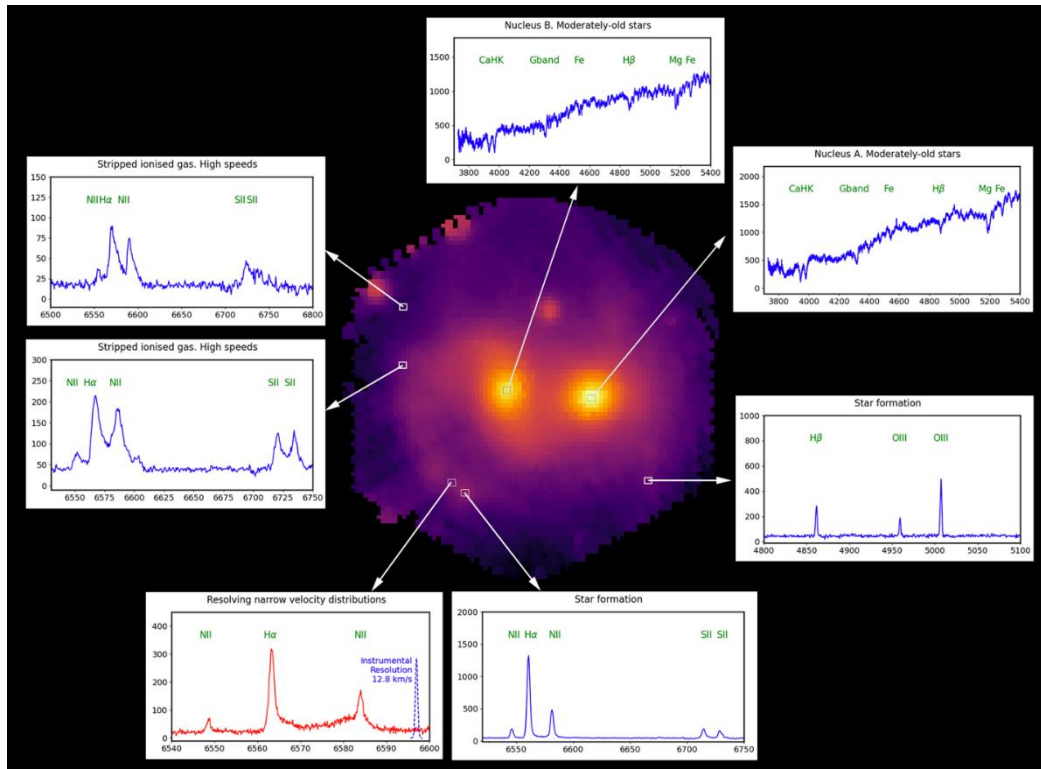
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**Velocities derived from the WEAVE spectra (in blue, green and red) overlaid on a composite image of Stephan's Quintet.** The velocities indicate that the centre-left galaxy NGC 7318b (in blue) is a late intruder, entering the group from behind and moving past NGC 7318a (in red) at 800 km/s (nearly 3,000,000 km/h) through the centre of Stephan's Quintet. This high-speed collision is causing havoc in NGC 7318b, particularly with respect to its reserves of hydrogen gas, which are being stripped off. It is likely that the formation of new stars in this galaxy will be greatly slowed down since it is principally hydrogen that fuels this process.

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In this observation mode, WEAVE produces spectra of regions in and around the galaxies in just two hours. At the two galaxy nuclei (top right), the spectra indicate moderately old stars (one billion years old) and no on-going star formation. The narrow, peaked spectra at the bottom right are typical of gases (hydrogen, oxygen, nitrogen, sulfur) heated to over 10,000 degrees by very young stars, while the broad, asymmetrical peaks in the spectra shown on the left indicate turbulent shocks between gas clouds. WEAVE is particularly accurate at measuring velocities. The red spectrum, obtained with the highest spectral resolution of the instrument in this mode, enables velocities to be measured to the nearest 12.5 km/s.  
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