

## THE 3-D UNIVERSE: ASTROPHYSICS WITH LARGE GALAXY SURVEYS

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The objective of this project is twofold: i) to consolidate our scientific work with galaxy surveys, by supporting our participation in the projects J-PAS and PFS/SuMIRe, and ii) to coordinate the fabrication of the optical fiber sub-system of the PFS/SuMIRe instrument, which will make, from the Subaru telescope, one of the most ambitious spectroscopic surveys of the next decade.

Large galaxy surveys, either spectroscopic or photometric, are the best strategy to understand one of the most profound mysteries of contemporary cosmology: the nature of dark energy, the dominant component of the Universe, responsible for the acceleration of its expansion. These surveys provide a 3-D map of the galaxy distribution, which can then be used to do cosmology (and other sciences) through statistical studies of features imprinted in this distribution. Indeed, they are also powerful tools to study from asteroids in the Solar System to our own Galaxy, from galaxy evolution to the large-scale structures of the Universe.

We are currently participating in the design of two new surveys: the Javalambre Physics of the Accelerating Universe Astrophysical Survey (JPAS) and the Prime Focus Spectrograph for the Subaru Measurement of Images and Redshifts survey (PFS/SuMIRe). JPAS is photometric, whereas PFS/SuMIRe is spectroscopic. Their potential are enormous from both the scientific and technological point of view. We already have graduate students and post-docs developing projects which have these surveys in mind, as well as technicians and engineers developing instruments for these surveys, namely, the panoramic CCD camera of JPAS, and the optical fiber sub-system for PFS/SuMIRe, called FOCCOS.

From a scientific perspective, both surveys are complementary: J-PAS will produce unique science up to  $z \sim 1.3$  and PFS/SuMIRe will focus on the cosmology of the more distant universe, as well as in galaxy evolution, and in stars of the Milky Way and Andromeda, to study how these galaxies formed and what is the structure of their dark matter halos.

The JPCam, the camera which was built for the J-PAS survey is now being commissioned at JAO and J-PAS is scheduled to begin in the second semester of 2017. The construction of the optical fiber subsystem of the PFS instrument is also well advanced, and the PFS/SuMIRe survey should start in 2019.

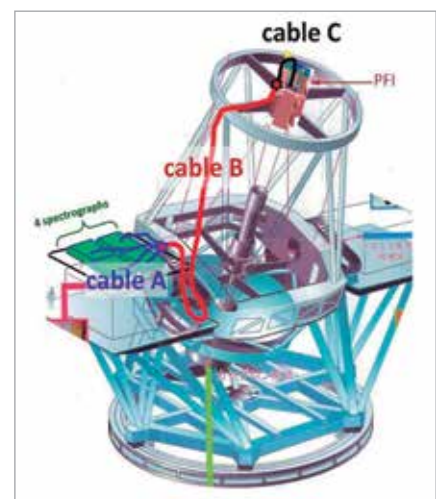


Figure 1. Illustration of the Fiber optics system in the Japanese telescope Subaru. (Source: LNA – Laboratório Nacional de Astrofísica)

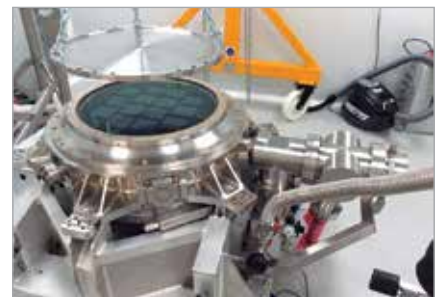


Figure 2. JPCam, showing the CCDs mosaic. (Source: CEFCA – Centro de Estudios del Cosmos de Aragón)

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