



Contribution ID: 40

Type: **Oral contribution**

Expectations from ELT facilities (invited talk)

Friday 27 March 2026 10:00 (20 minutes)

In 2029, the European Extremely Large Telescope (ELT) will shine its first light on the sky. The high angular resolution and large collecting capacity, combined with the extreme sensitivity and versatility of the ELT's instruments, will allow unprecedented observations of worlds orbiting stars other than the Sun. It will provide a unique opportunity to address fundamental questions related to our understanding of the processes of planetary formation, the origin of our own Solar System, and the emergence of life in the Universe. The ELT will directly probe and characterise the stellar environment at unprecedented physical scales, from the inner regions of proto-planetary disks, through the chemistry of planet-forming zones, to the characterisation of recently formed giant planets in their birth environments. It will also come at a time when thousands of new planetary systems in the solar neighbourhood will have been discovered and characterised by a large number of instruments or space missions. The ELT will therefore provide an excellent machinery for the detailed exploration and characterisation of known planetary systems, the study of their populations of giant and rocky planets, including their internal structures and those of their atmospheres, which is directly related to the ultimate search for life on the horizon 2040. In this talk, I will briefly summarise the main characteristics, modes and synergies of the various generations of ELT instruments, their main scientific drivers in the field of exoplanets and planetary formation, and the status of their predicted performances, yields and expected breakthroughs.

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Session Classification: Future prospects and instruments