

## **The science of EChO**

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It is now accepted that exoplanets are ubiquitous in our Galaxy. The planetary parameters mass, radius and temperature alone do not explain the origin of the diversity revealed by current observations. The chemical composition of these planets is needed to trace back their formation history and evolution.

Pioneering results were obtained through transit spectroscopy with Hubble, Spitzer and groundbased facilities, enabling the detection of a few, most abundant ionic, atomic and molecular species and to constrain the planet's thermal structure. If launched in the next decade, EChO will address the following fundamental questions:

- Why are exoplanets as they are?
- What are the causes for the observed diversity?
- Can their formation history be traced back from their current composition and evolution?

Spectroscopic observations from the visible to Mid-IR of a large, select sample of exoplanets, will allow us to use the chemical composition as a powerful diagnostics of the history, formation mechanisms and evolution of gaseous and rocky exoplanets. Our strategy is to balance the statistical information, obtainable through a chemical survey of a large and diverse sample of objects, with deep, repeated observations of a more restricted, select sample of planets – a strategy that will enable the kind of science that has been accomplished for Solar System planets