STATUS/PROSPECT OF DIRECT DETECTION BY IMAGING

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KNOWN PLANETS

Direct imaging: long ... to very long periods

![Graph showing known planets with mass and semi-major axis data](graph.png)
we have:
- detection / astrometry
- photometry (SED)
- very limited spectroscopy
CURRENT

Massive & Young Giants

b Pic b: Bonnefoy et al. 2013

HR8799 bc: Konopacky et al. 2013

HR8799 bcde: Oppenheimer et al. 2013
Planet Finders: ground based, XAO, coronagraphy, diff. imaging
$\lambda = 1 - 2.5 \, \mu m$

space based, coronagraphy, diff. imaging
$\lambda = 2.5 - 28 \, \mu m$

still young Giants...
Near Future

Observables:
- photometry: 1 - 2.5 μm  
2.5 - 28 μm  
- spectroscopy (R=30 -300):
  1 - 2.5 μm  
  5 - 28 μm (SPICA)

Parameter space:
- mass > 1 M\textsubscript{Jupiter}  
- separation > 5 AU  
- age < ~200 Myr  
- temperature > 300 - 400 K

EXTREMELY LARGE TELESCOPES

Push towards:
- old giants
- super Earths

European-ELT plan
- first light: 2022
- general instruments:
  IR imageur + IR spectrograph + mid IR
  => contribution to exoplanets (still young!)
- exoplanet imageur (PCS):
  decision point in 2022 to start
  => on sky 2022+10/12 yr
  > 2030 (in phase with L3)

Feasibility is debated...
- detection at $10^9 / 10^{10}$
- spectroscopy?
WHAT TO EXPECT FOR L2/L3

- **define a science baseline**
  - a class of object unaccessible from the ground
  - significant gap «in science» with respect to ground projects
  - build on previous missions in the context of ESA roadmap
  - targets available
  - define the covered parameter space/science potential in perspective to ELT (complementarity ?)
  - identify technology
  - feasibility within expectation of L2/L3 (>TRL 5)

- **define a science goal**
  - a class of object (more challenging / ambitious)
  - targets not necessarily available
  - same technology (single mission)
  - feasibility more challenging
WHAT TO EXPECT FOR L2/L3

- define a science baseline
  - class: mature giants (ice giants?)
  - spectroscopy of atmosphere
  - census in volume
  - connection to disks (formation, signpost, ...)
  - targets availability: GAIA, RV from ground
  - technology: high contrast imaging, small telescope (>2m), λ visible, intensity + polarimetry

- define a science goal
  - class: (ice giants?) / telluric planets
  - spectroscopy of atmosphere, surface, habitability
  - census / targets availability: ?
  - technology: push contrast, polarimetry ?