Ground-based astronomy in Belgium
ESO and the E-ELT

ESO Industry Day
Belspo
June 15, 2011
ESO, E-ELT

- ESO is for European astronomers what CERN is for European particle physicists.
- With La Silla and in particular Paranal (VLT), Europe has taken the lead in astronomy.
- Current project: ALMA.
- E-ELT is a logical next step: can be done, makes much sense.
Astronomy now

• 20\textsuperscript{th} century discovers:
  – Evolution of cosmos
  – Evolution of stars
  – Evolution of planetary systems

• 21\textsuperscript{st} century issues:
  – Origin of the Universe
  – Origin of galaxies
  – Origin of stars
  – Origin of planetary systems
  – Origin of Life
Progress in astronomy

• Heavily relying on technology:
  – Opening new spectral windows (space)
  – Increasing telescope size
  – Improving detectors and instruments

• Role of E-ELT: ultimate step in
  – Angular resolution (planet formation)
  – Sensitivity (deep universe)
  – ...
  – Ready for the unexpected.
Belgium and ESO

• Belgium is one of the six founding members of ESO, which now has 14 and soon 15 or more.

• Our climate and low country has prevented us from investing in local facilities.

• Access to the best research infrastructure in the world, in a competitive European context, enables diverse forefront research in our universities and research institutes.
Belgium and ESO
Ground-based astronomy and Belgium

- Scientific return from ESO is excellent, and all research fields are well covered.
- National coordination in BNEC.
- For specific time-consuming programmes (monitoring of stars, transits of exoplanets, deep surveys) we have constructed dedicated smaller telescopes (Mercator, TRAPPIST; ILMT).
TRAPPIST: TRansiting Planets and Planets\(\right\) Small Telescope

- Aperture = 60cm, F/8, Ritchey-Chretien
- Fully robotic
- High-quality CCD camera
- 75% dedicated to exoplanet photometry
- ESO La Silla Observatory, Chile
- Funding: FNS (80%) – SNSF (20%)

Transits: observing the shadow of exoplanets

Amplitude \(= (r_p/R_p)\)
\(~ 1\%\) for Jupiter in front of the Sun
\(~ 0.1\%\) for Neptune
\(< 0.01\%\) for Earth
\(~ 0.5\%\) for Earth + Sun

TRAPPIST is dedicated: a galore of transits!

WASP-23b: 3 transits (550 ppm/2min)
GL1214b: 3 transits (600 ppm/2min)
WASP-19b: 7 transits (500 ppm/2min)
WASP-23b: 15 transits (400 ppm/2min)

We reach the sub-ppm/ppm regime with a few transits

Full potential will be reached when a few technical problems will be fixed: dome, focus, small software issues, fast read-out mode, etc.
Mercator (La Palma)
Ground-based versus space

- There is (maybe) only one Universe.
- Space and Ground are complementary.
- In our country, the communities are the same.
- Our present structures allow us to benefit plainly from the complementarities.
- The industrial boundary conditions may differ somewhat.
Ground versus Space
Ground versus space
Ground versus Space
Science return from ESA has benefited enormously from the possibility to contribute to instruments with Prodex.

Why not the same for ESO??
E-ELT, ESO, and B

• E-ELT is essential in ESO’s strategic plans:
  – The role of the organisation is to prepare the future, and to develop projects at a level no member state can do it alone.
  – Consolidating and building on frontline expertise, ahead of the others.
  – A next quantum step is still within reach for astronomy.

• The national situation:
  – Strong emphasis on ESO + a few dedicated other small projects.
  – Science return is OK; ESO driver for astronomy in B.
  – It could be better still if we contribute to instruments.
  – E-ELT science meets (and influences) our science goals.
  – ESO offers challenges in technology development.
  – Example of synergy of federal and regional levels.