The world's biggest telescopes and where we build them

(Why isn't there an 8m telescope in Birmingham?)

Keelia Scott
What wavelength?

- The distance through the atmosphere that light can travel depends on the wavelength of light.
- Optical and Radio wavelengths penetrate all the way to the ground.
- To other wavelengths the atmosphere is opaque requiring us to put our instruments at higher altitudes or in space.
My Observing

- AstroSoc
- Gemini South Observatory
- Herschel Space Observatory
- 16” telescope at the University Observatory
- Demonstrating 3rd Year lab on new 0.5m telescope
Big Telescope Design

- Refractor telescopes
- Yerkes Observatory
  40 inch / 102cm
Big Telescope Design

- Reflecting telescopes
- GTC 10.4m telescope
Is bigger always better?

- A single large mirror (>8m) will distort under its own weight.
- Use multiple segments or multiple telescopes to achieve the same result.
Biggest Telescopes in the world
What limits where we can put a telescope?

- Light pollution
- Cloud cover
- Atmospheric extinction
- Seeing
Twinkle Twinkle Little Star....

Turbulence in the atmosphere either from rising heat or strong winds high in the atmosphere

- Small islands and coastal regions make ideal low seeing locations
Location, Location, Location

- High
- Dry
- Clear skies
- No light pollution
Gemini South

- 8.1m Optical Telescope
- Summit of Cerro Pachon - Chile
- 2722m / 8930ft
- Instruments
  - GMOS, multi object spectroscopy
  - T-ReCS, mid infrared 5-27µm
The Journey
The Journey
The Journey
Base Camp
Trip up the Mountain
Trip up the Mountain
Trip up the Mountain
Trip up the Mountain
The Telescope and Instruments
The Telescope and Instruments
The Telescope and Instruments
The Telescope and Instruments
Astronomy!
The Future: Extremely Large Telescopes

- **EELT**
  - 39.3m
  - Cerro Armazones, Chile
  - 798 segments
  - Planned completion 2022

- **30m telescope**
  - Mauna Kea Hawaii
  - 492 segments
  - $970 million to $1.4 billion
  - Planned completion 2020
Telescope resolution

- Angular resolution – smallest angle on the sky that can be resolved
- Depends on the wavelength of light and diameter of the telescope.
  - \( R = 0.02 \lambda / D \)