SUPA Physics Scotland

SUPA IAC Meeting – 30th May 2019

Theme: Astronomy & Space Physics

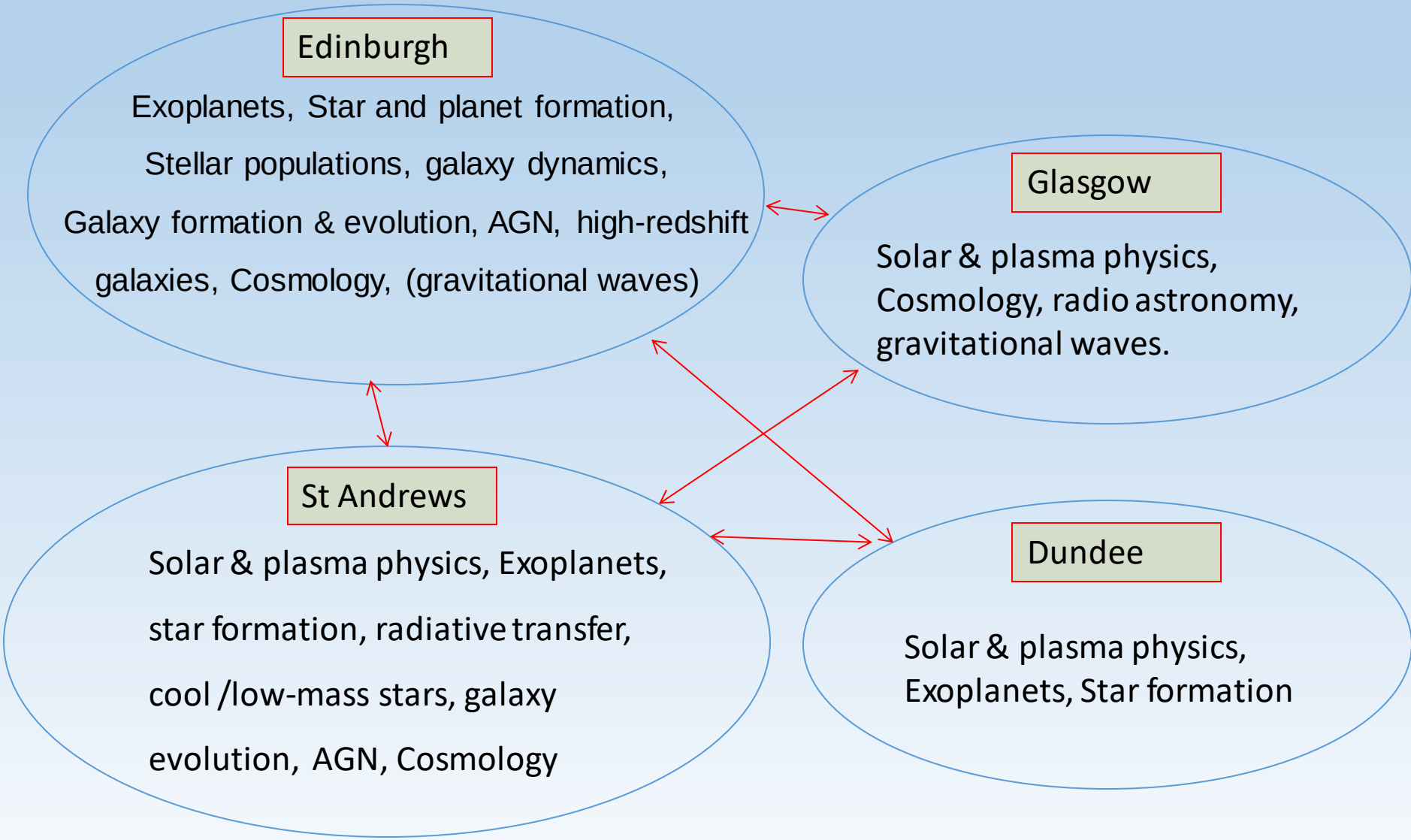
Theme Leader/speaker: Rita Tojeiro (University of St Andrews)

Edinburgh (IfA + UKATC)
St Andrews (Astronomy + Solar Physics)
Glasgow (IGR + Astronomy & Astrophysics Group)
Dundee (Astronomy + Solar Physics)

~ 50 Academic staff
> 60 PDRAs and Research Fellows
~ 100 PhD students

Funding: Mainly STFC, but a lot of ERC success, some Leverhulme.

Current Scope of Theme



TESS and HARPS-N

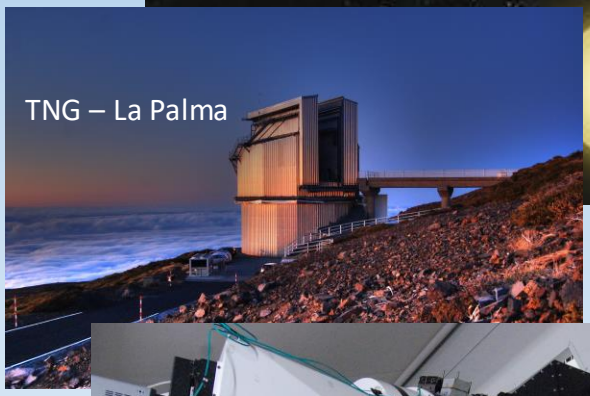
NASA's Transitting Exoplanet Survey Satellite (**TESS**)

✧Launched 18 April 2018

✧Will survey ~200000 stars for transiting exoplanets

- ❖ Transits give planet radius.

✧Expected to detect hundreds of planets with radii < 2 Earth radii around bright stars.

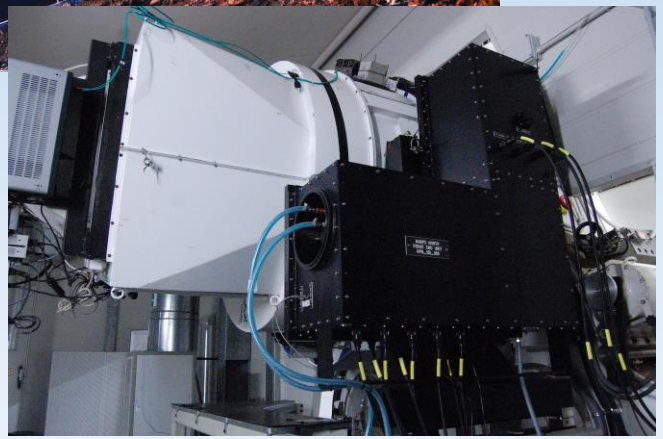


High-Accuracy Radial velocity Planet Searcher – North (**HARPS-N**)

✧Collaboration including Edinburgh and St Andrews, part built by UKATC.

✧Located on 3.6m TNG – La Palma.

✧Currently, the most accurate radial velocity spectrometer (~1 m/s)



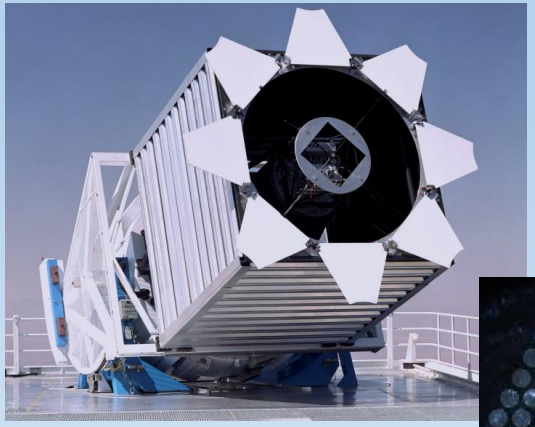
SUPAScopes: network of 1-m robotic telescopes

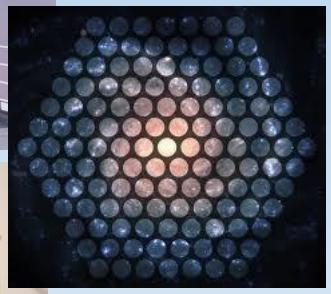
✧HARPS-N and SUPAScopes play a key role in following-up TESS planets

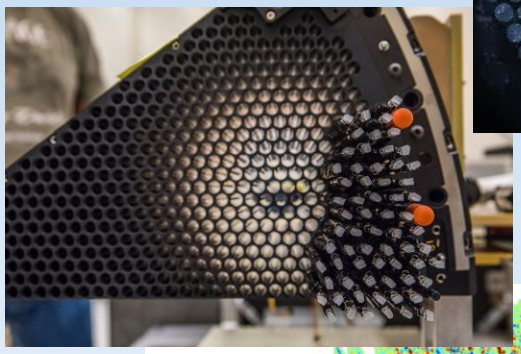
- ❖ Radial velocity measurements give mass – mass + radius -> composition.
- ❖ Can characterise small, rocky planets.

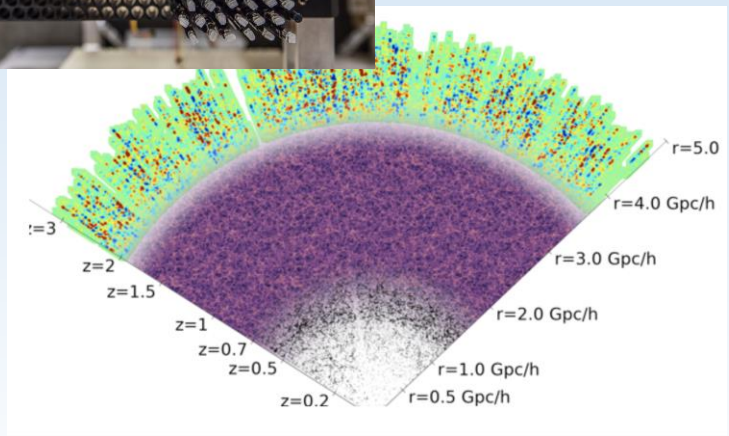
- **St Andrews and Edinburgh Centres for Exoplanet Science**

DESI and SDSS







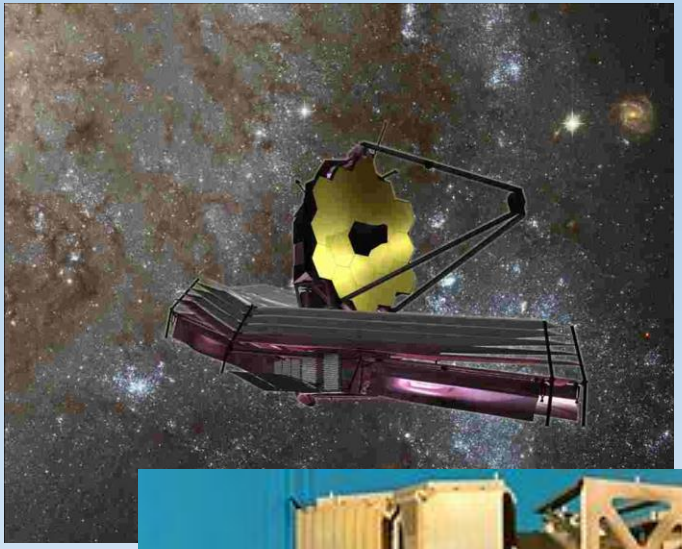


✧**Sloan Digital Sky Survey IV (2014-2020)**
(leaderships from Edinburgh, St Andrews)
✧Final year of SDSS-IV:
- ✧ MaNGA: integral field spectroscopy of 10000 galaxies
- ✧ eBOSS: mapping the expansion rate of the Universe, a pilot for DESI. Observations are complete.

✧Final BOSS+eBOSS analysis underway setting the state of the art in galaxy/quasar clustering.
✧Final MaNGA sample available in 2020.

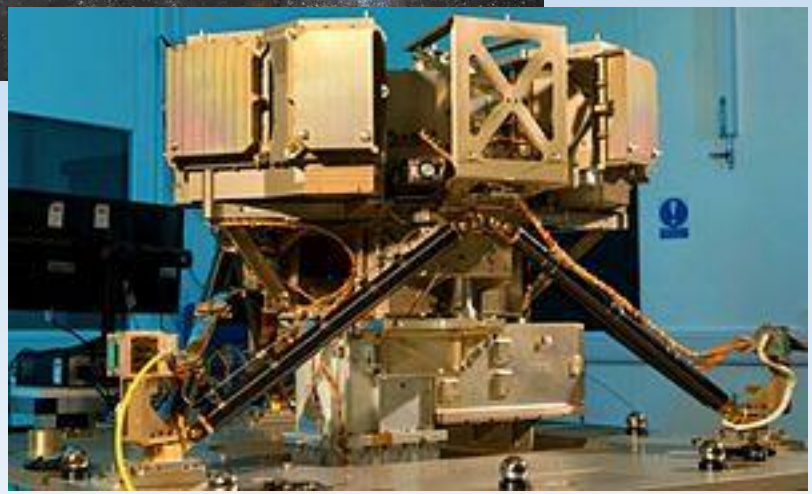
✧**Dark Energy Spectroscopic Survey (DESI**
✧Commissioning this Summer/Autumn.
✧Optical imaging and spectroscopy (5000 robotic fibres) over the largest volume every surveyed: dark energy, galaxy evolution, neutrino mass, etc.
✧Leadership positions from St Andrews and Edinburgh (Rita Tojeiro, John Peacock).

JWST and MIRI



James Webb Space Telescope (JWST)

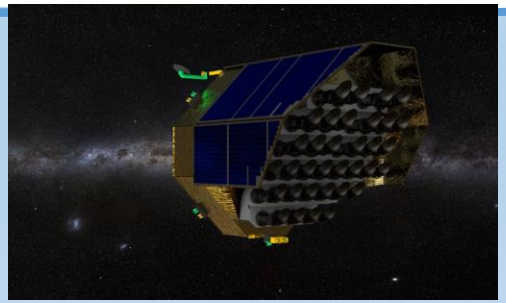
✧Launch date – March 2021 (delayed from 2020).
✧6.2 m primary mirror, going to L2.
✧Primarily observing in the infra-red.

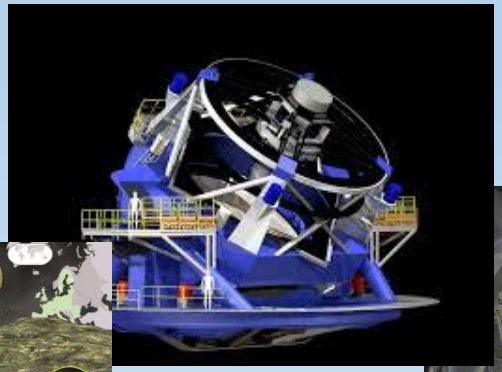


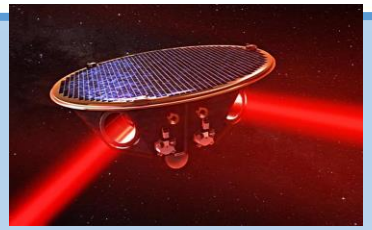
Mid-Infrared Instrument (MIRI)
✧Gillian Wright (UKATC) – European PI,
Alistair Glasse (UKATC) – project scientist
✧Already have PhD students working on simulating MIRI observation.

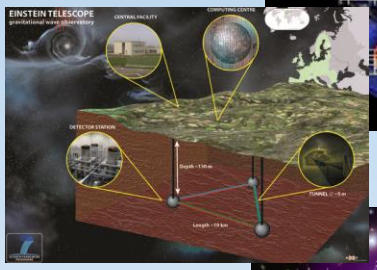
- Will play a key role in characterising planetary atmospheres and high-redshift galaxies.
- UKATC has access to Guaranteed Time.
- Beth Biller: Co-PI of an Early Release Science project.

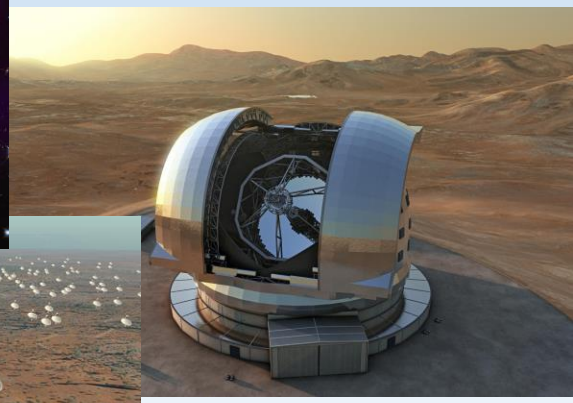
The medium/long-term future

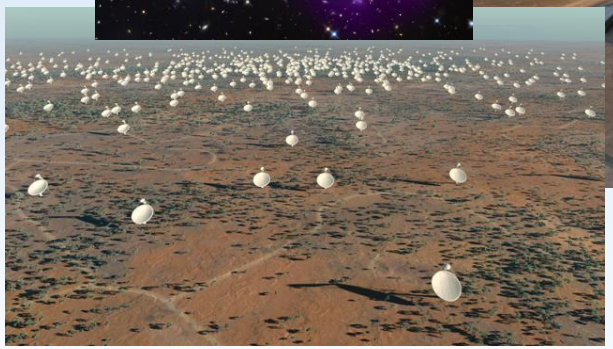












- eLISA, Einstein telescope
- PLATO (ESA)
- Daniel K. Inouye Solar Telescope
- EUCLID (ESA)
- Large Synoptic Survey Telescope (LSST)
- Wide Field Astronomy Unit (WFAU) will be involved in data management for EUCLID and LSST.
- UKATC
  - SKA (operations)
  - MOONS, ERIS (VLT).
  - HARMONI, METIS (E-ELT).

Education and outreach

Excellent momentum in Astronomy public engagement across SUPA institutions:

- STFC Leadership Fellow in Public Engagement appointed in St Andrews (Anne-Marie Weijmans).
- Ogden Trust Physics Outreach Officer award will allow the appointment of full-time outreach officer in St Andrews, joining appointment in Edinburgh. Glasgow to hire soon.
- Continued activities across all institutions.
- Highlights:
  - Exhibit at the Royal Society Summer Science Exhibition 2019 – "A message from afar" (Martin Dominik).
  - JWST Cosmic Mining: involving pupils in cutting-edge research. (led from ROE Visitor Centre, strong involvement from ATC, launched September 2018).
  - Plates for Education Scotland: a nation-wide project to bring SDSS data and classroom resources to Primary and Secondary teachers (led from St Andrews, support from Edinburgh)

Concluding Remarks

- Vibrant, active community engaged in many exciting and world-leading research and education programmes/projects.
- Already active in many of the future major astronomy and space science projects
  - Scientifically (JWST, DESI, EUCLID, LSST, TESS, LISA, EINSTEIN TELESCOPE,….)
  - Data management (EUCLID, LSST, ….)
  - Instrumentation development (VLT, E-ELT, JWST, LISA, EINSTEIN TELESCOPE,….)
- Good momentum in Education and Outreach activities, with nation-wide impact.

Things to continue thinking about:

- Funding for International/EU PhD students and Research funding post-Brexit?
- Environment
  - **Maintaining** critical mass in key areas and providing the right environment to prosper.