



International
Centre for
Radio
Astronomy
Research

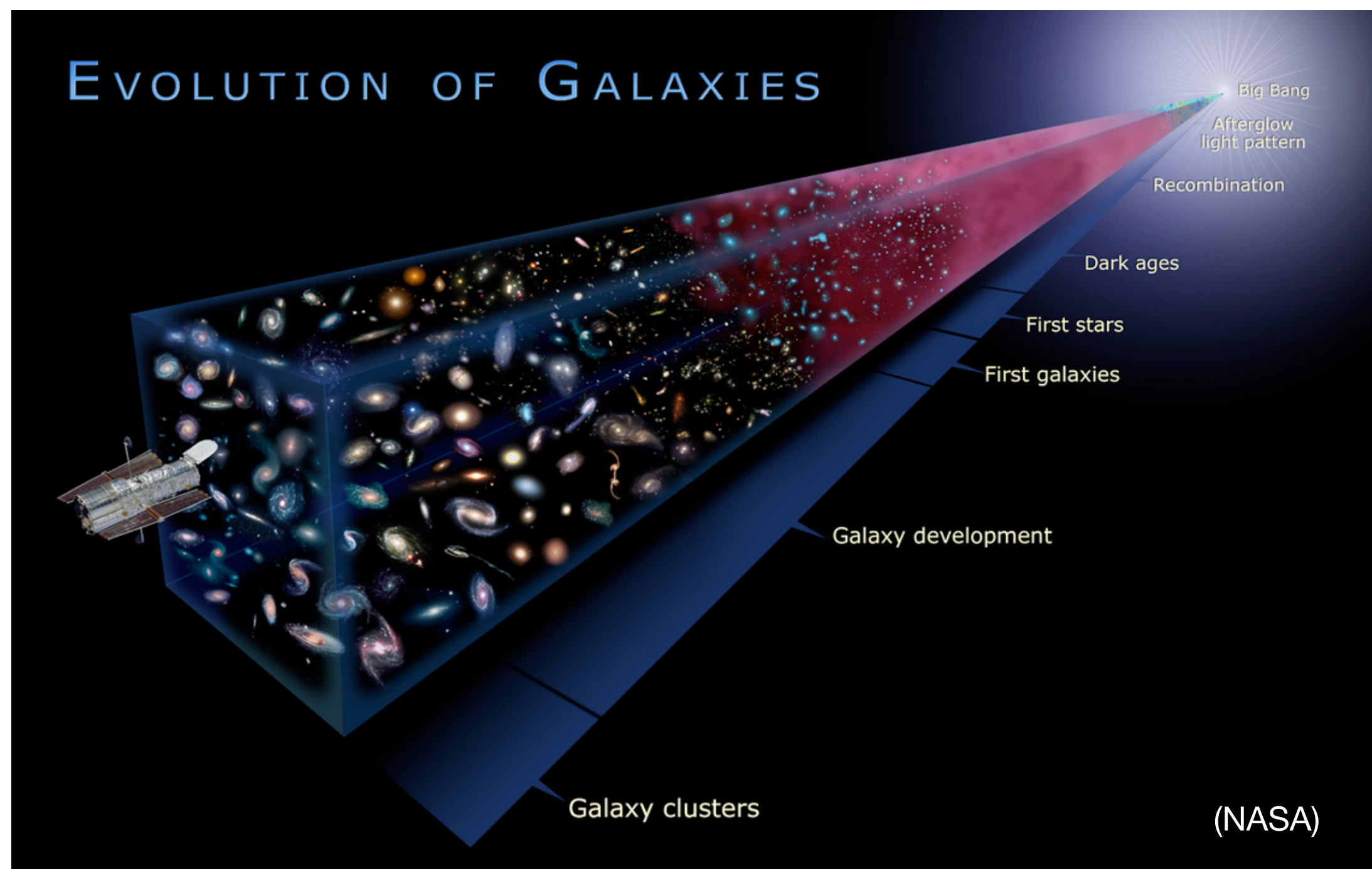


The gas cycle of galaxies in the local Universe

A/Prof Barbara Catinella (ICRAR/UWA)

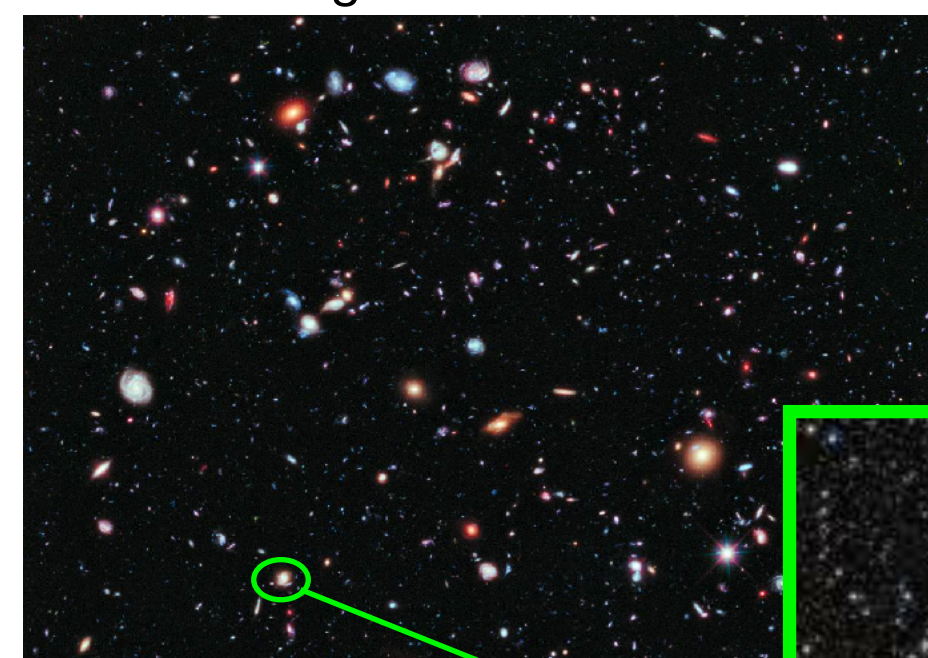
barbara.catinella@uwa.edu.au





The gas cycle of galaxies in the local Universe

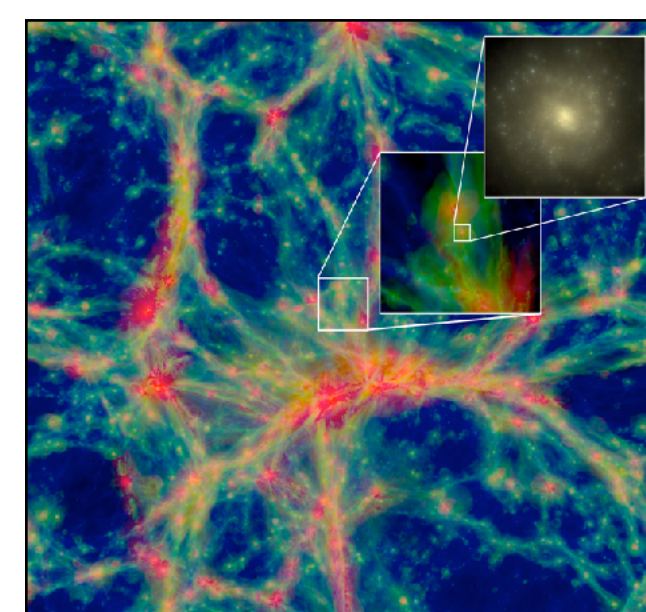
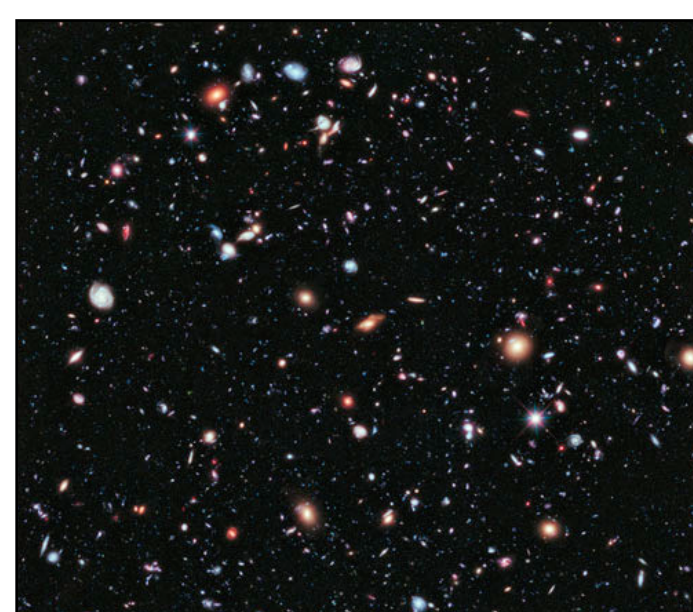
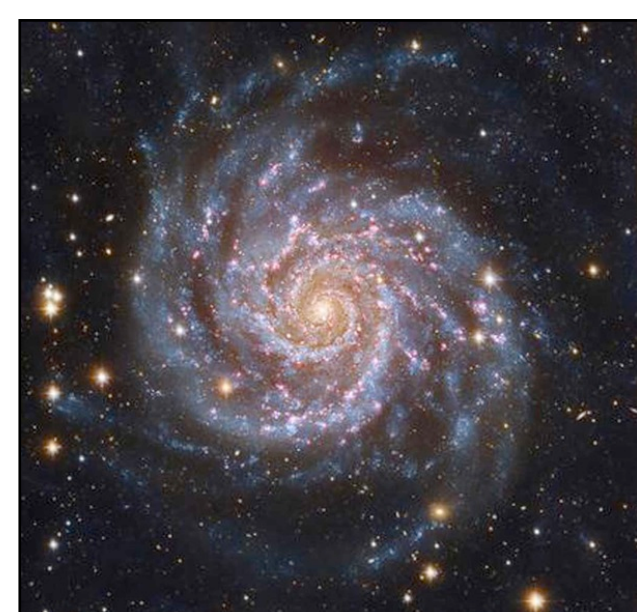
Billions of galaxies in the Universe



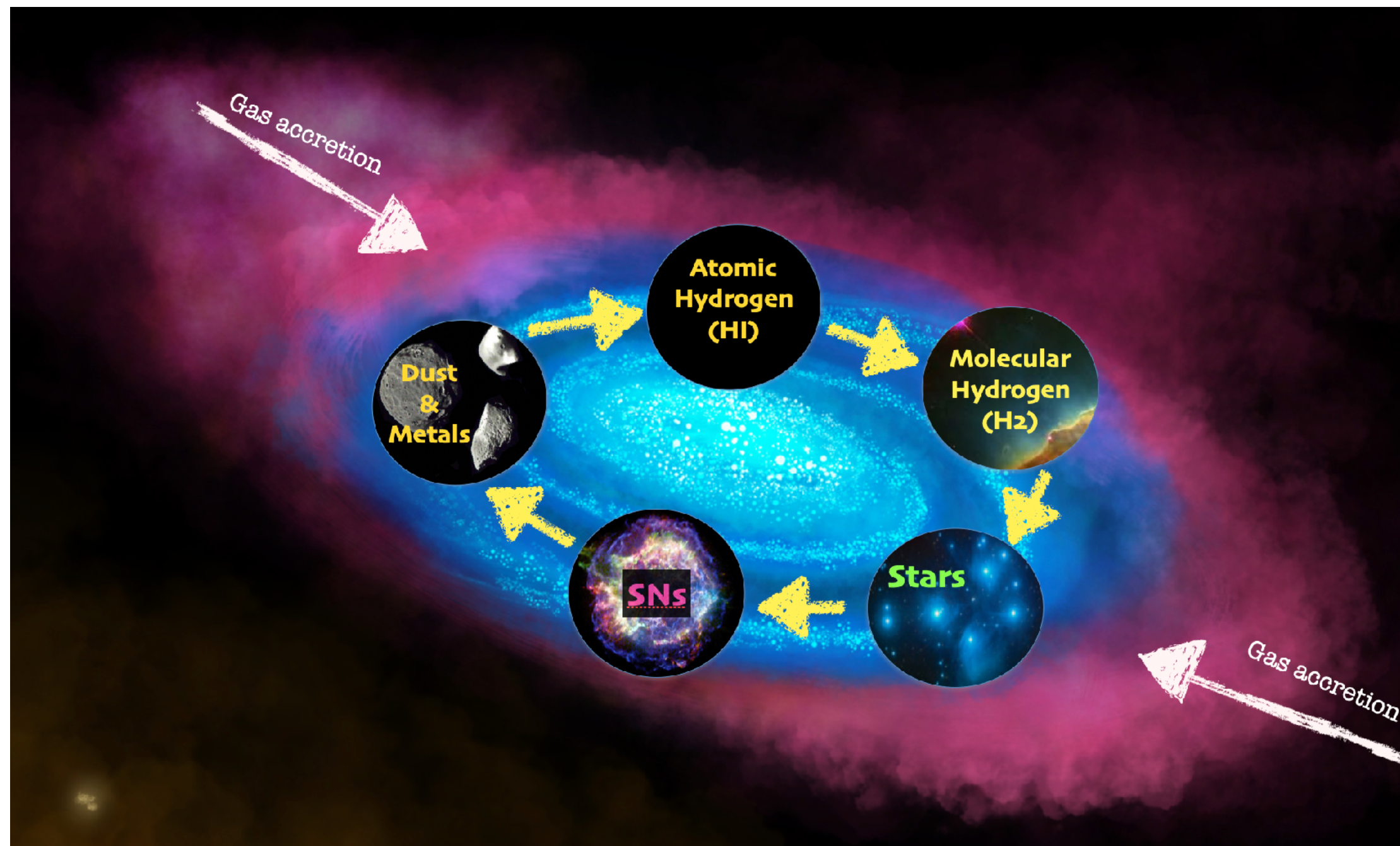
A galaxy like our Milky Way



A stellar "nursery"



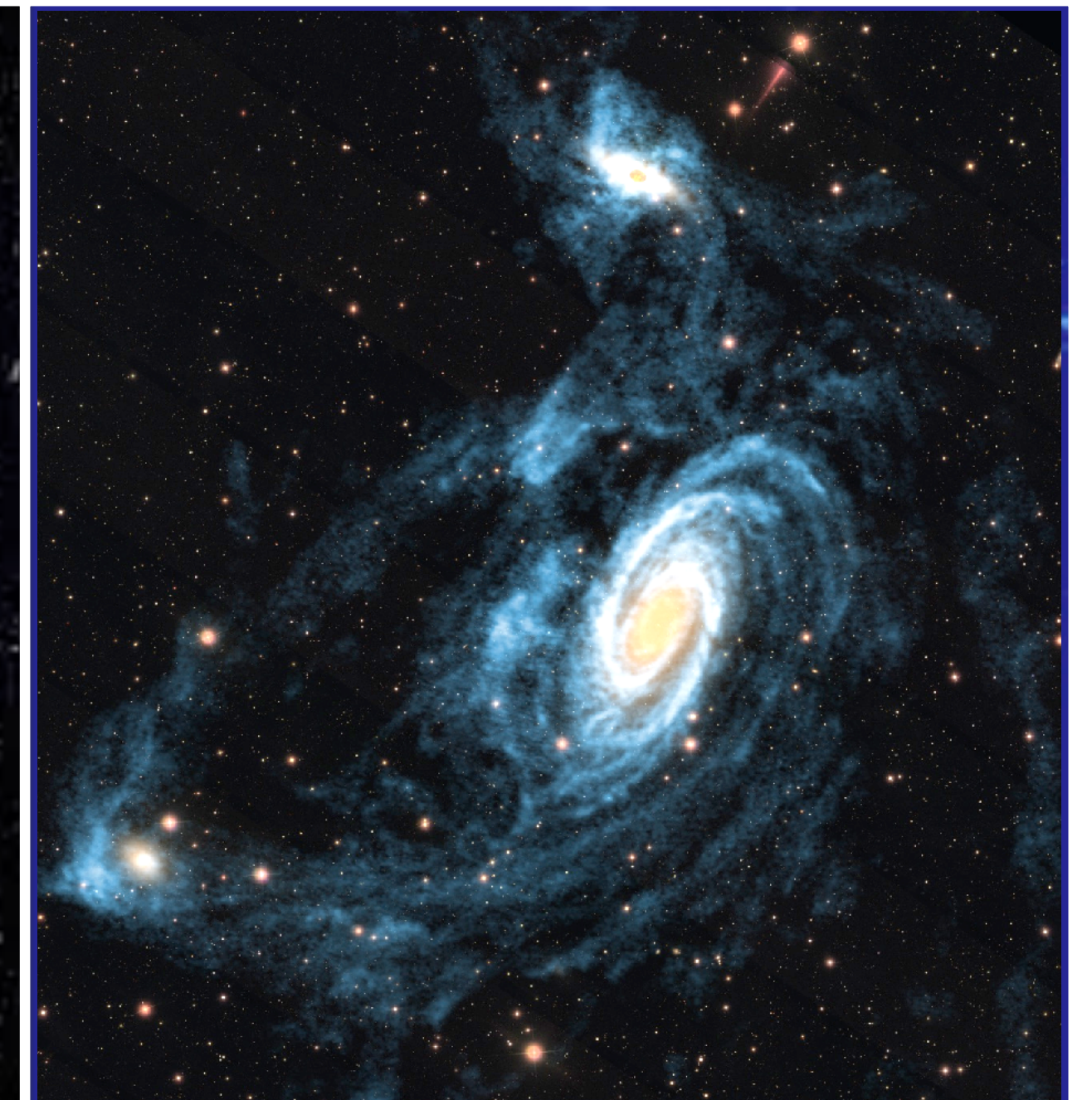
- ◆ We use the **best telescopes in the world** to study how galaxies use their gas to form stars, and what physical processes determine their properties
- ◆ This requires **multi-wavelength observations** to trace all baryonic components (atomic and molecular gas, stars, dust...) and comparison with models/theory



OPTICAL IMAGE (stars)



RADIO IMAGE (atomic gas)



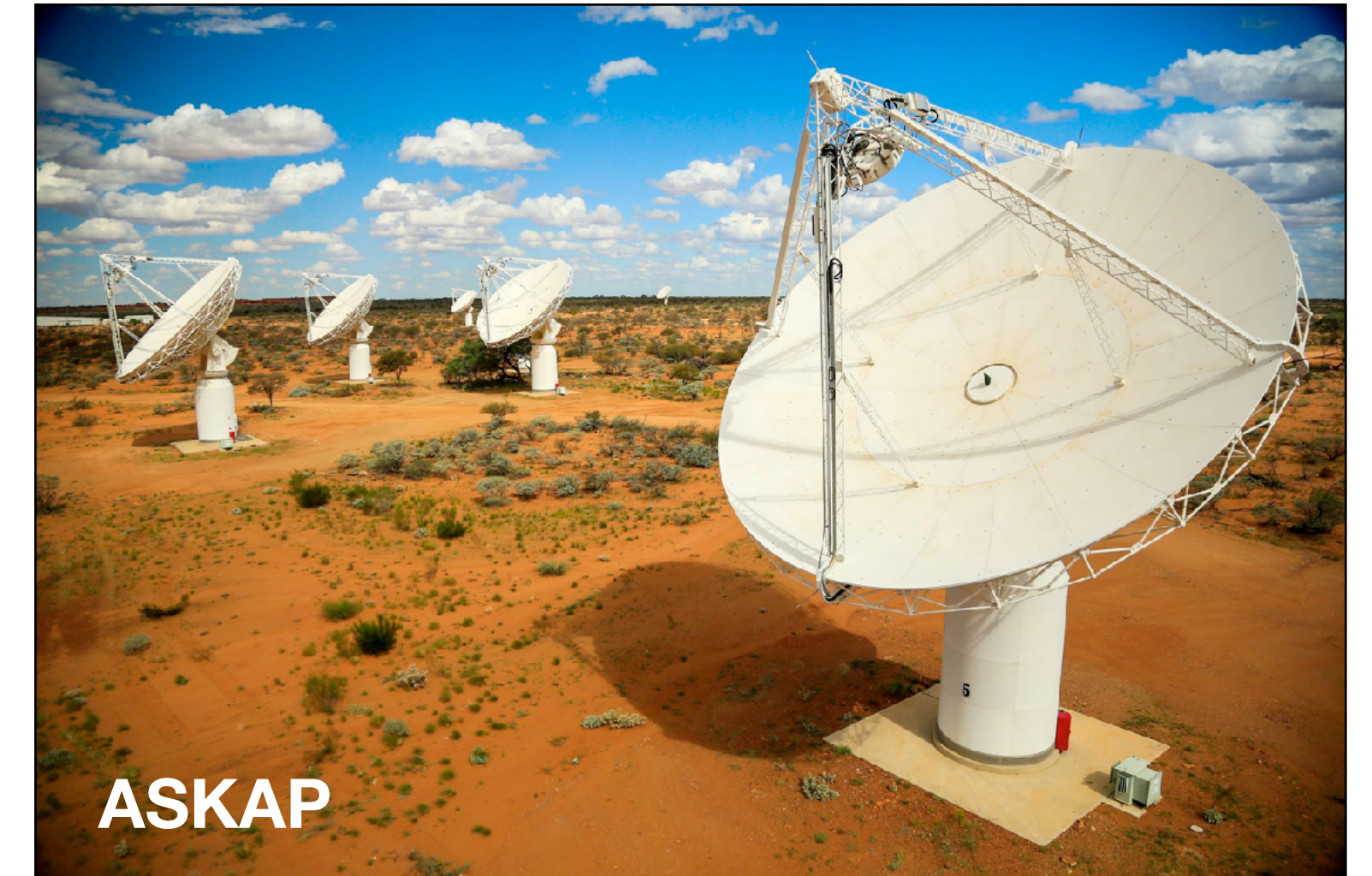
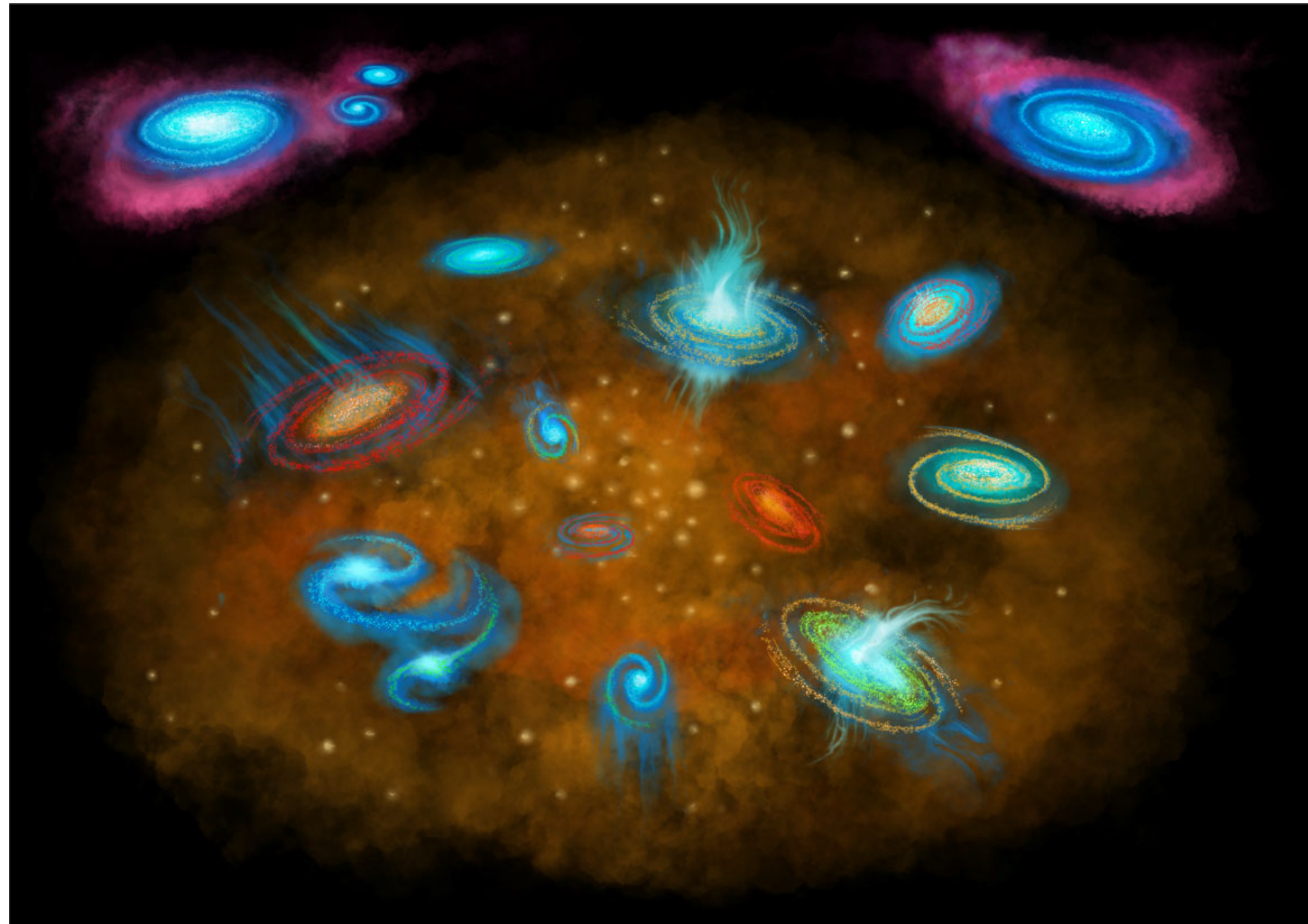
- ◆ Cold gas is the **fuel for star formation** >> central role in evolution of galaxies
- ◆ Cold gas is easily affected by galaxy interactions >> **unique probe of environmental effects** on galaxies
- ◆ Radio data carry information on the kinematics of the gas >> **dark matter** content of galaxies



Discovering galaxies with radio (and other) telescopes

We lead **cutting-edge radio surveys** to find answers to key open questions:

- ◆ How efficiently is gas used to make new stars in different galaxies?
- ◆ How does environment affect galaxy properties?
- ◆ How does gas accrete onto galaxies?
- ◆ Why are some galaxies running out of gas?





Our group and expertise at ICRAR



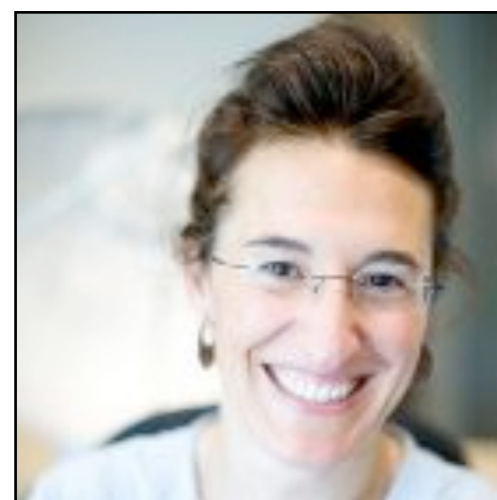
Barbara **Catinella**
(SU1 lead)



Brent **Groves**



Gerhardt **Meurer**



Maria **Rioja**



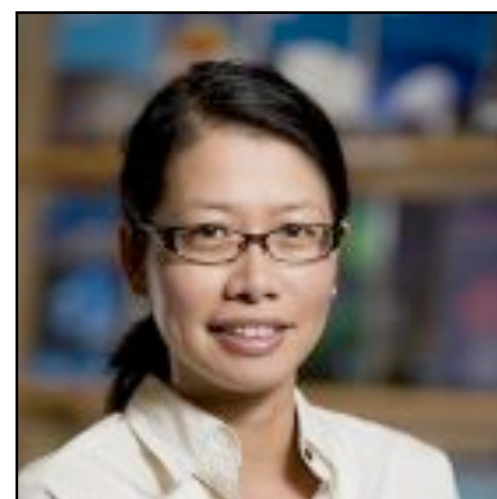
Lister **Staveley-Smith**



Tessa **Vernstrom**



Tobias **Westmeier**



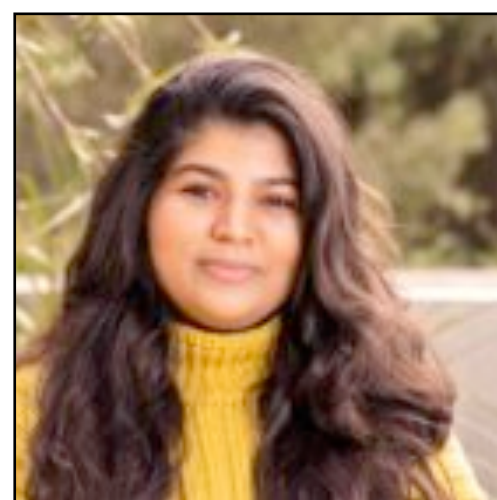
Ivy **Wong** (affiliate)



Bi-Qing **For**



Seona **Lee**



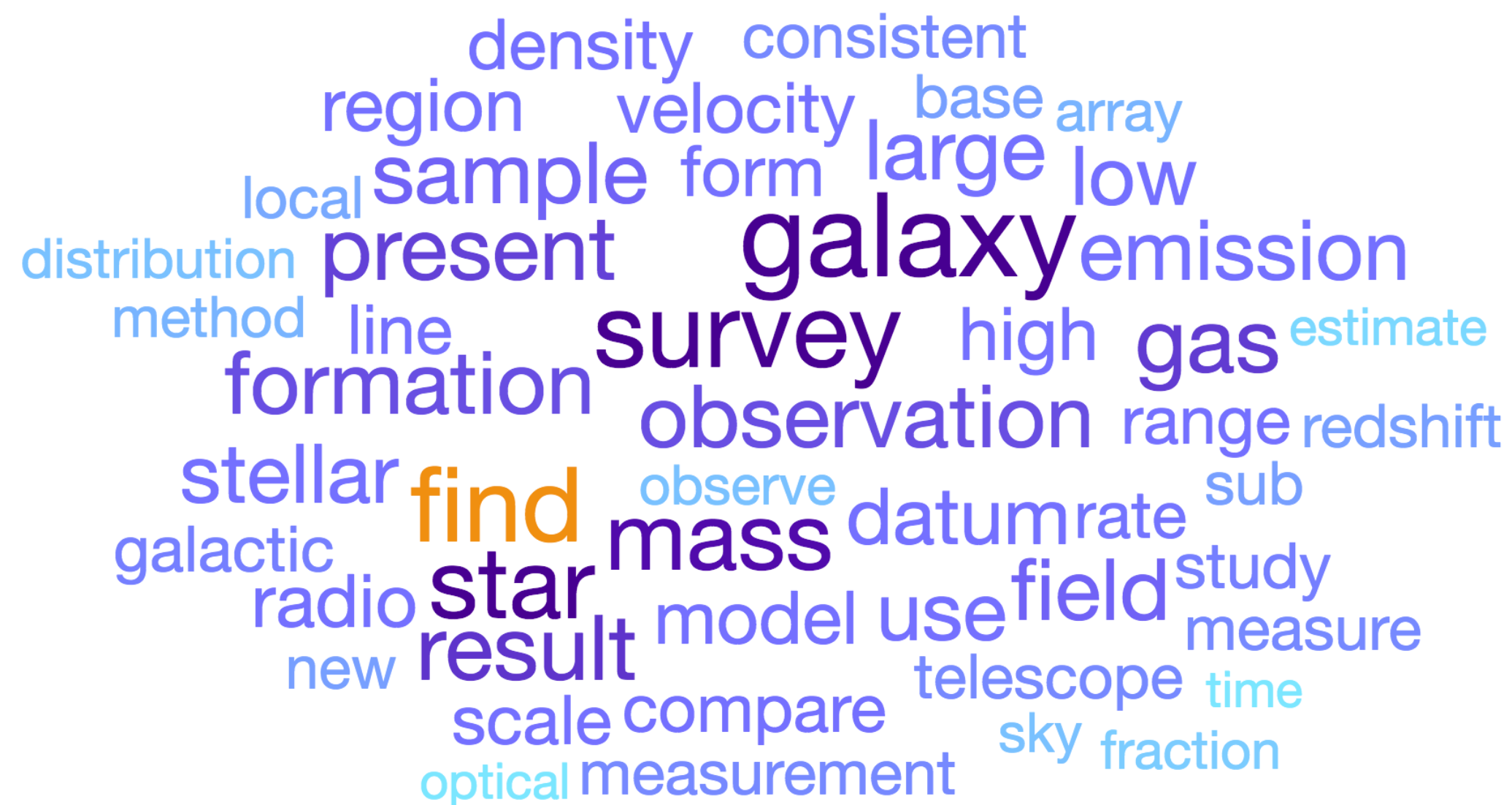
Manasvee **Saraf**



Amy **Attwater**



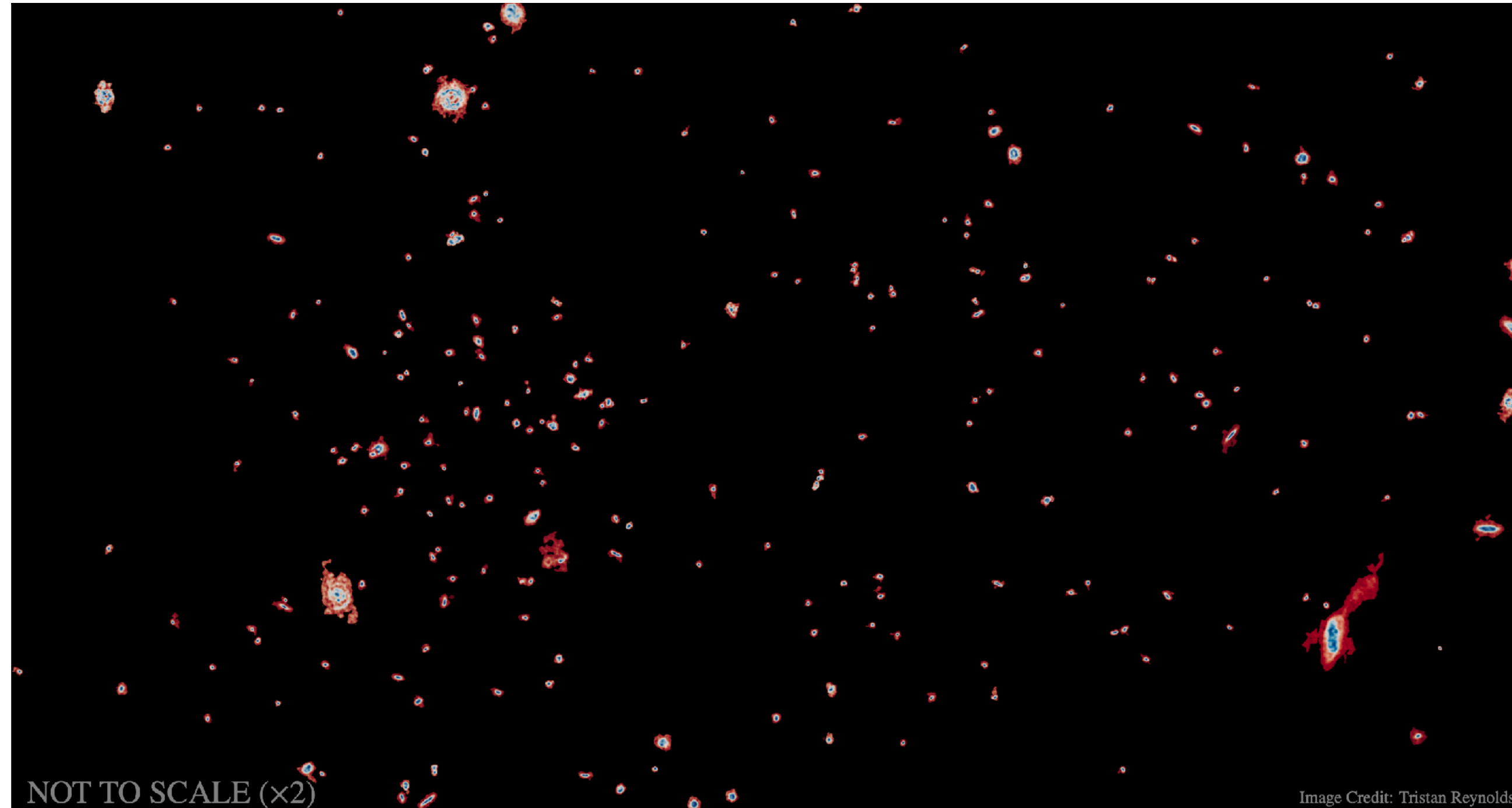
Tamsyn **O'Beirne**



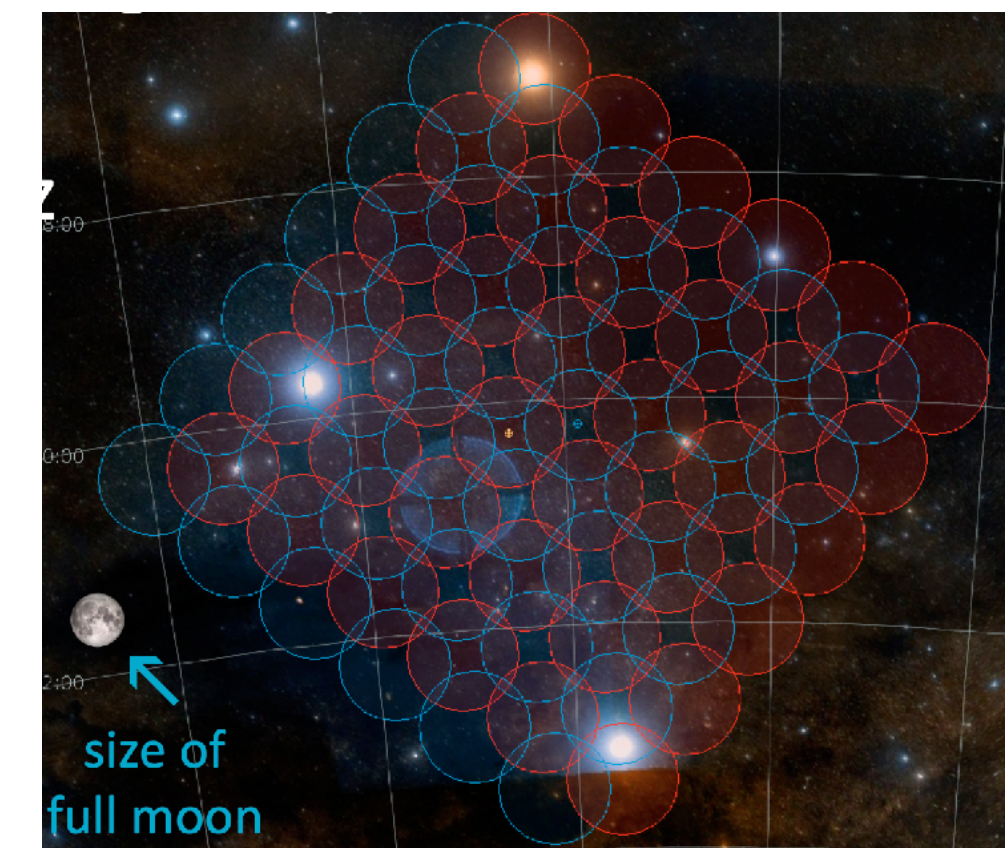
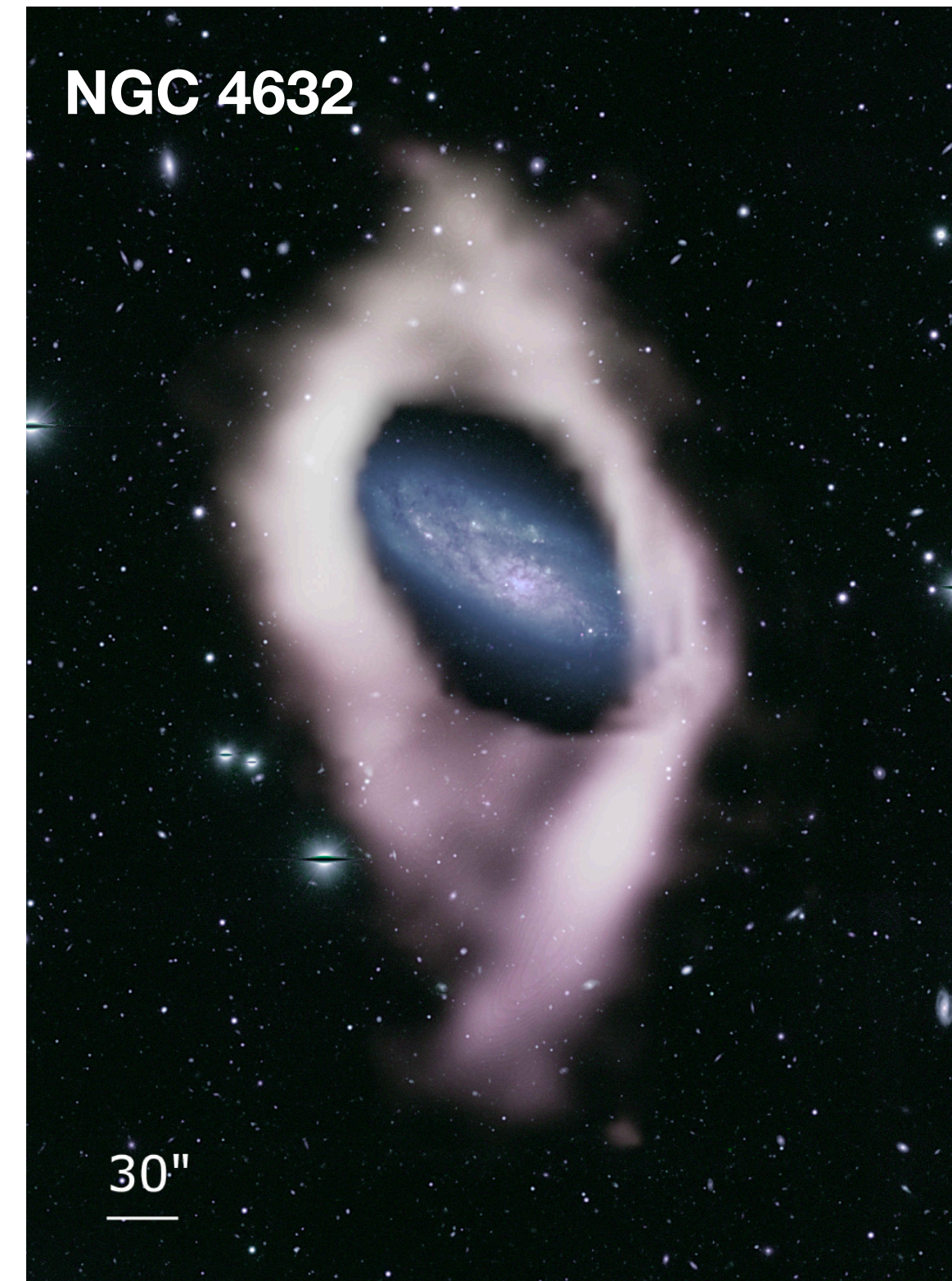


WALLABY: the HI all-sky survey on the Australian SKA Pathfinder

Hydra cluster field: 60 deg², ~270 HI detections!



Anomalous HI gas (Deg+ 2023)



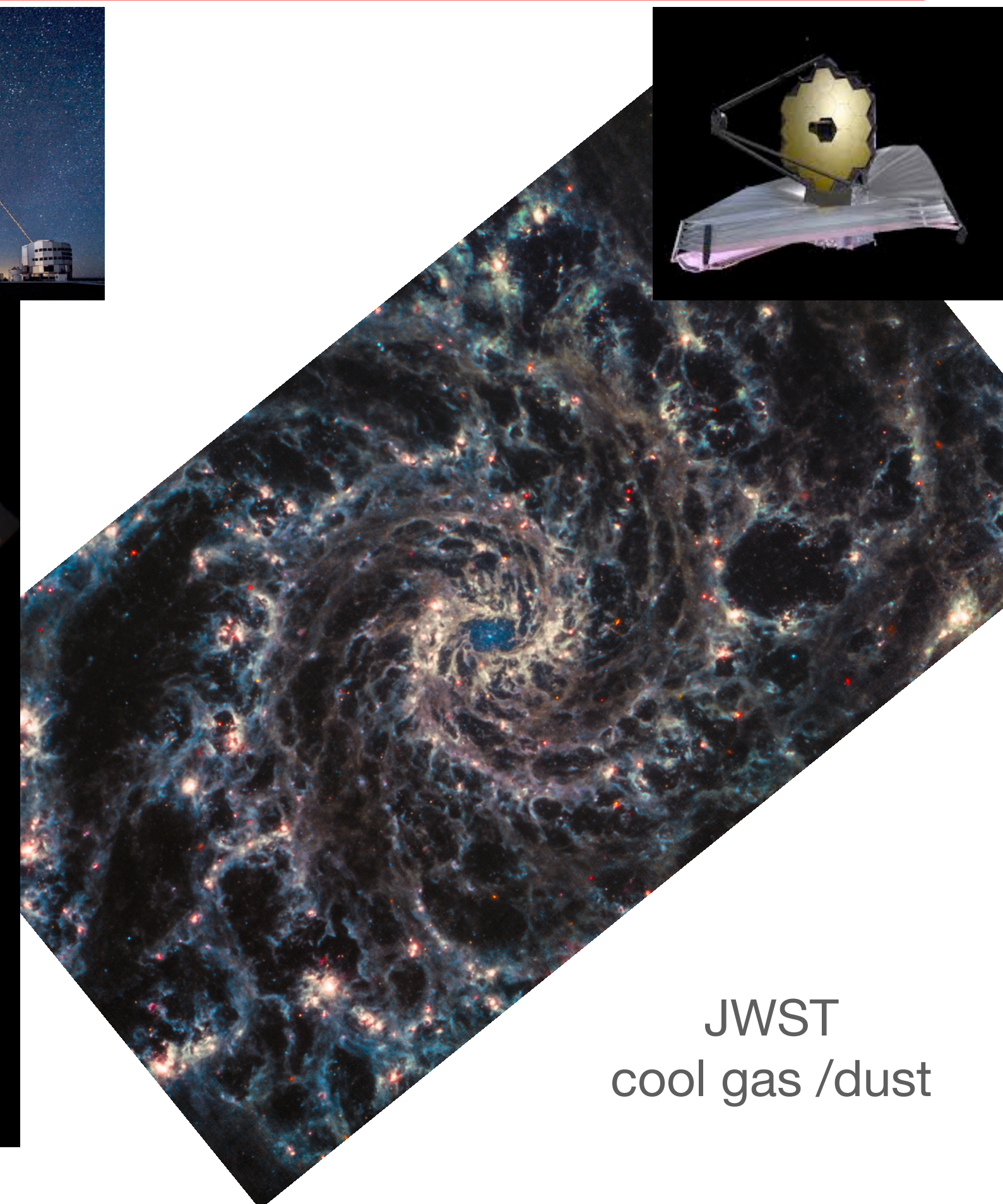
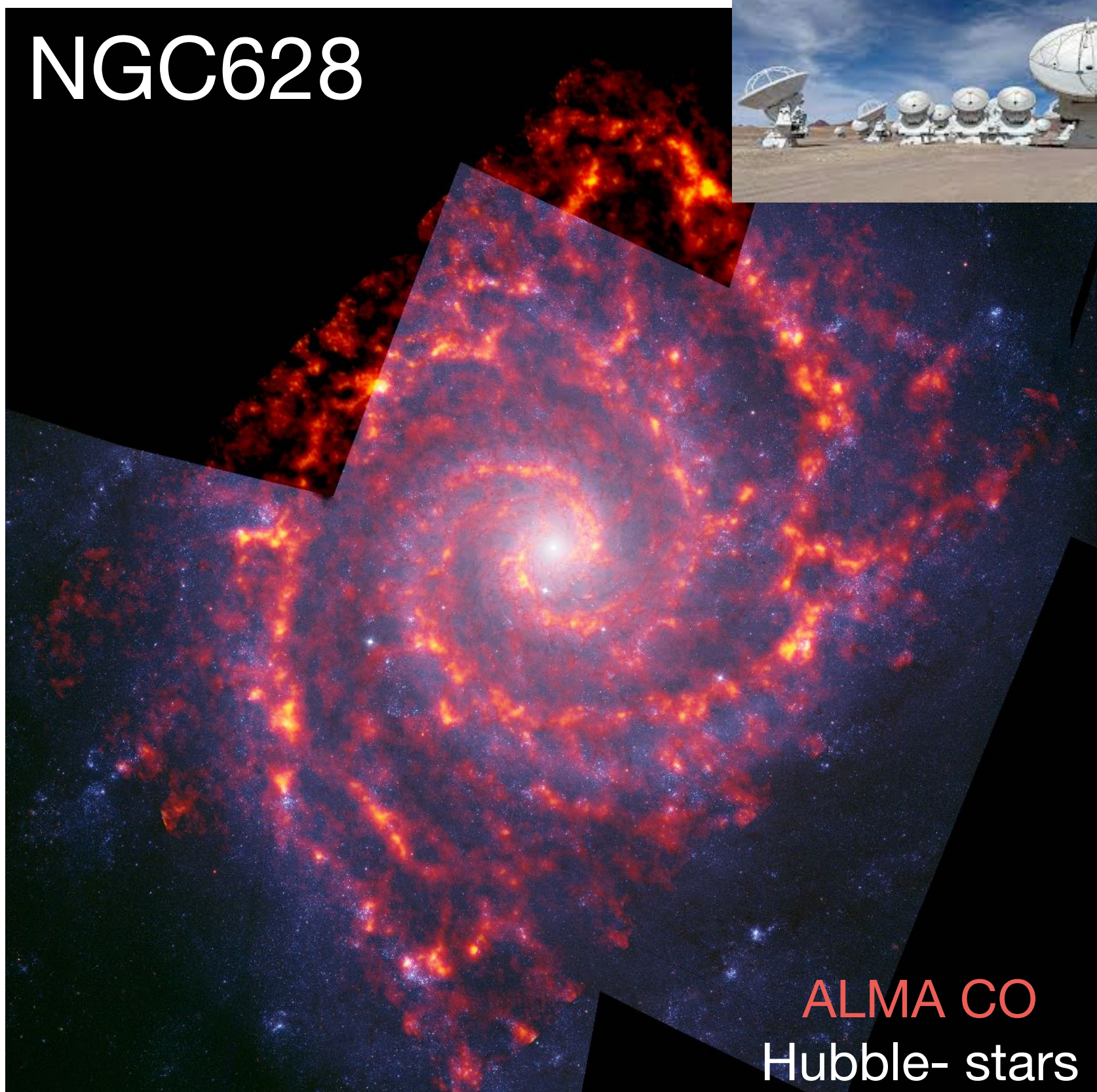
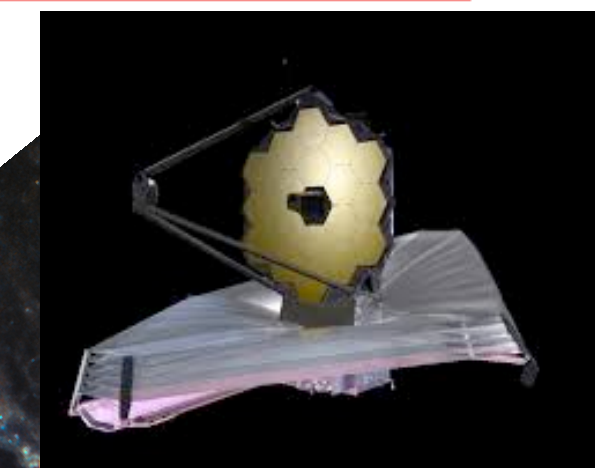
- ◆ Unprecedented statistics: **largest census of atomic hydrogen ever done**
- ◆ **>200,000 galaxies** out to $z=0.1$ (~1.3 Gyr look-back time), **thousands well resolved** (maps)

Australian SKA Pathfinder

- ★ 36 telescopes in radio quiet site in midwest WA
- ★ 30 deg² field of view → **a survey machine!**

Star formation in nearby galaxies with exquisite detail

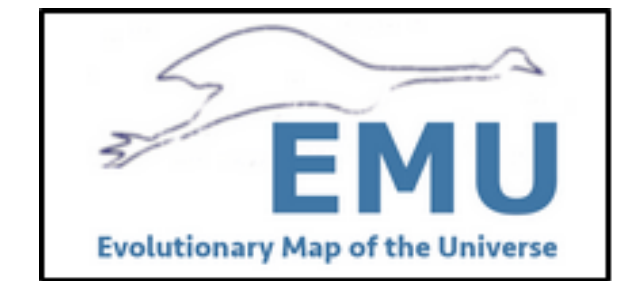
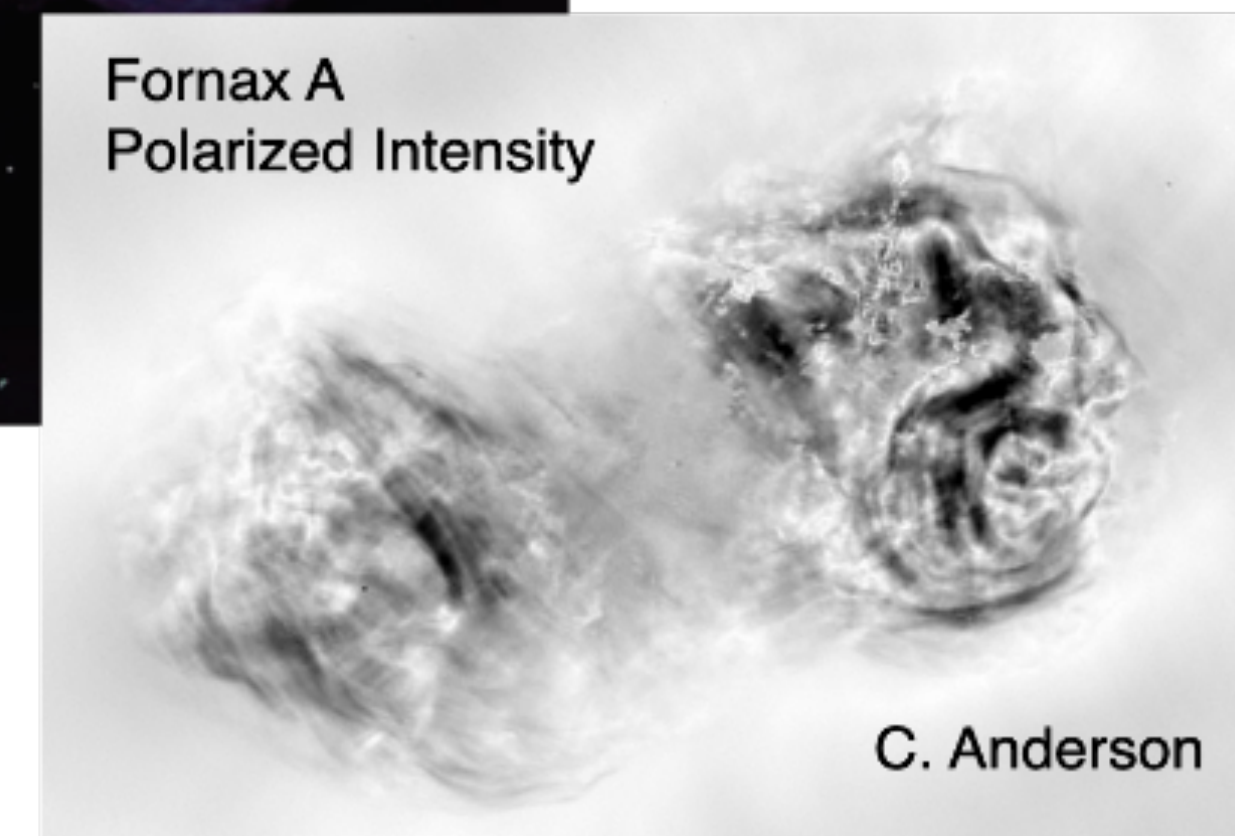
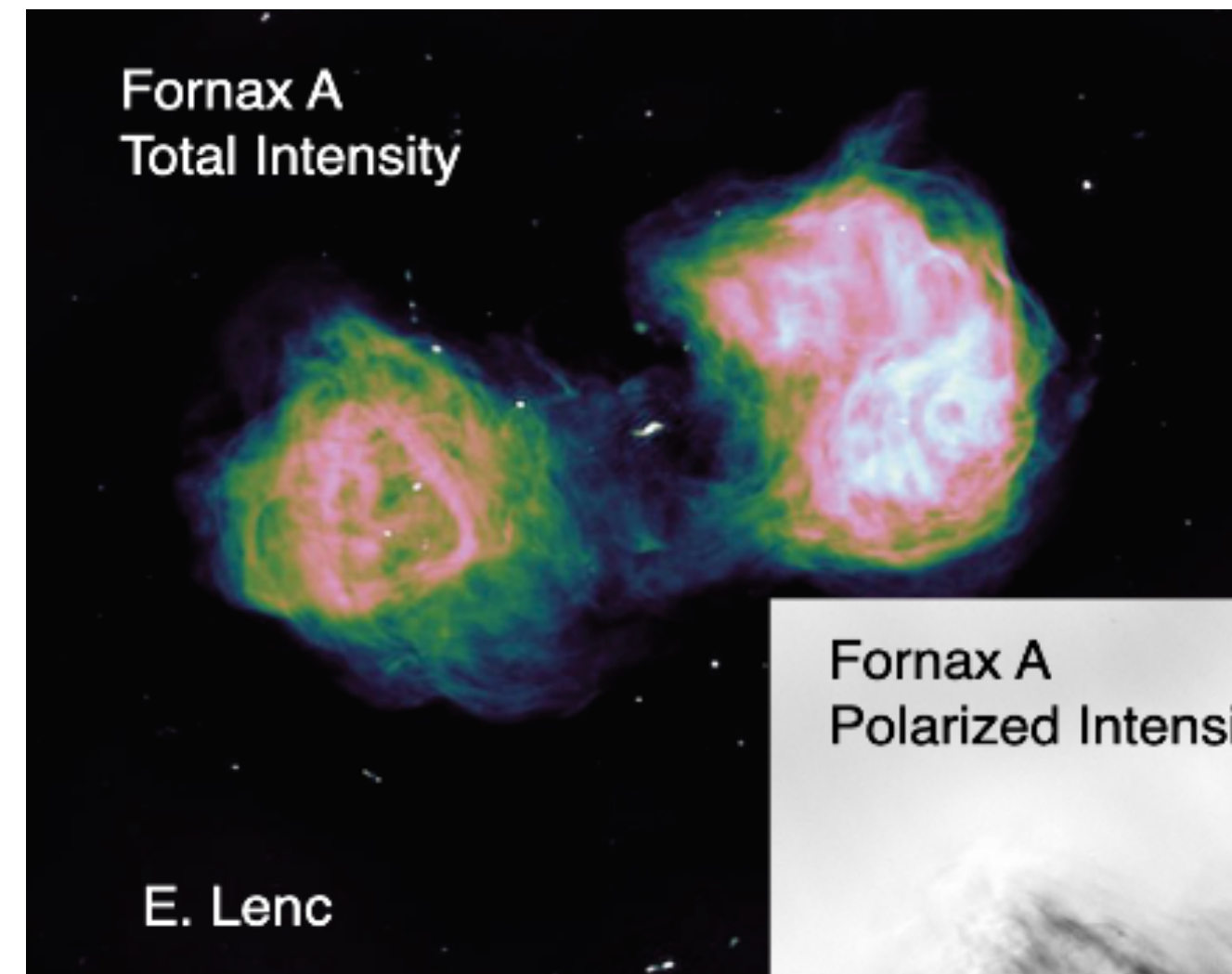
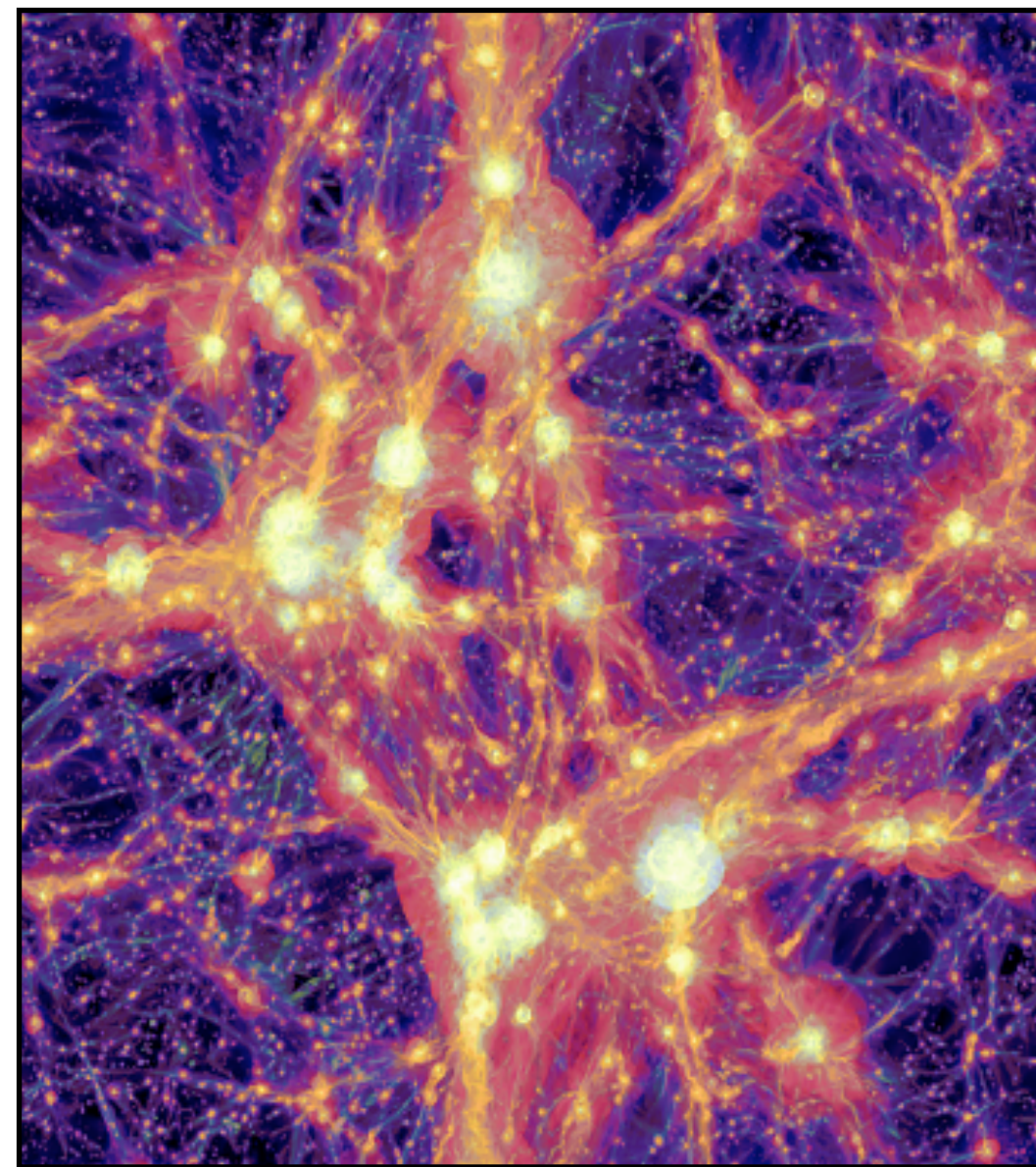
NGC628



- ◆ What regulates star formation in nearby galaxies?
- ◆ Why are some galaxies actively forming stars, and others not at all?

Evolutionary Map of the Universe (EMU) & Polarization Sky Survey of the Universe's Magnetism (POSSUM)

- Fully Commensal: EMU (Continuum) and POSSUM (Polarisation)
- Will survey the entire Southern sky extending as far North as +30 deg in declination.



- ◆ What are the properties of large-scale magnetic fields?
- ◆ How do magnetic fields affect star formation and galaxy evolution?
- ◆ How does nuclear activity affect galaxy evolution?



Why should you join us?

- ◆ **Exciting science** — we lead some of the most cutting-edge galaxy surveys in the world
- ◆ Learn how to take/process/understand **data from the best telescopes out there**
- ◆ Acquire **strong problem solving and analytic skills**
- ◆ Develop your **computational skills**
- ◆ **Become a leader** in Square Kilometre Array and galaxy evolution science
- ◆ Join a **fantastic and supportive working environment!**

