



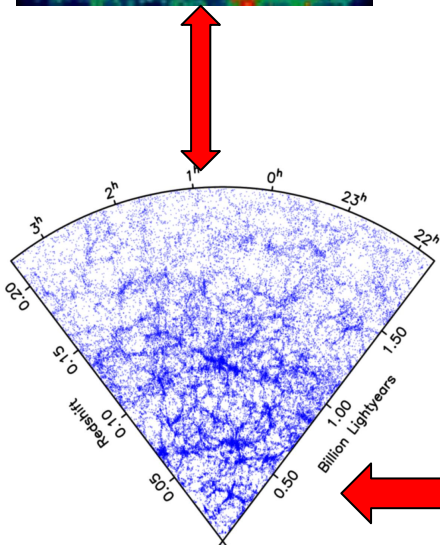
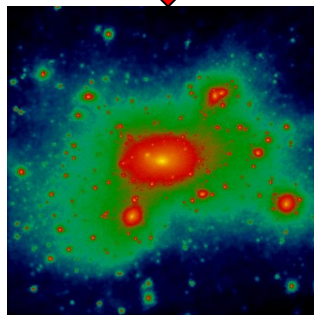
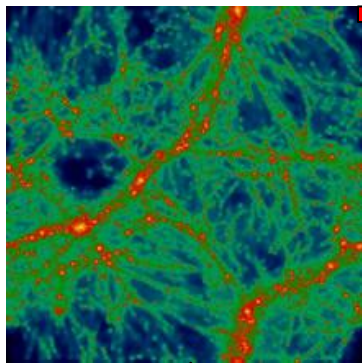
# Computational, modelling and theoretical astrophysics group

Modelling Dark Matter & Galaxy Formation

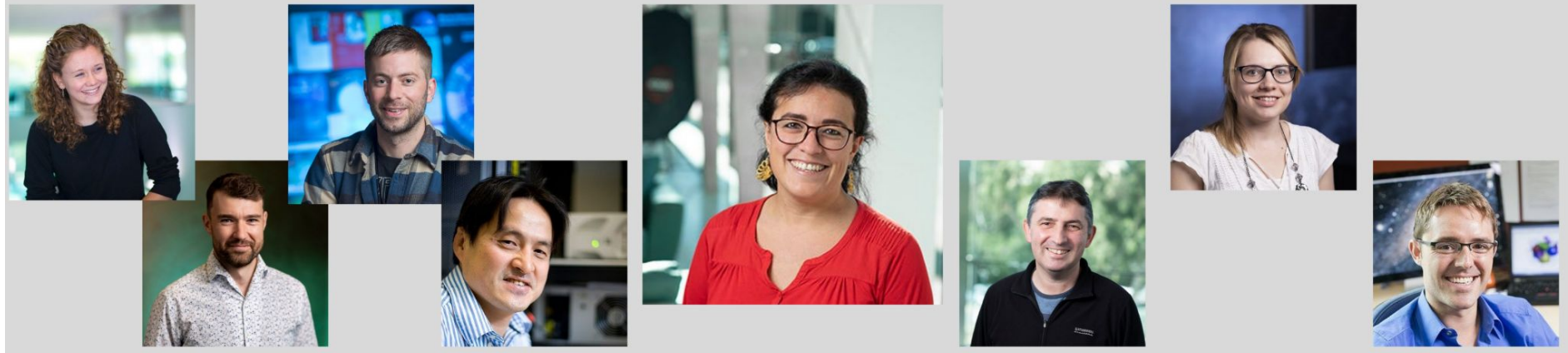
A/Prof Claudia Lagos, SU3 Group Leader



# What do we do?



- Explore theories of **cosmology, dark matter, and galaxy formation...**
- ... using state-of-the-art **supercomputer simulations** and sophisticated **theoretical models.**
- Create mock observables to test model predictions and support **galaxy survey science**
- Develop **novel algorithms** and **statistical tools** to analyse and interpret data



# SU3

## Computational, Modelling, Theory





# Problems in Galaxy Formation

**a**  
How do massive black holes  
form in ultra-compact dwarfs?

NGC 4647

M60

M60-UCD1

**Project with Kenji Bekki**

**b**

1"/80 pc

Do **super-massive black holes** grow in galaxies, or do galaxies grow around super-massive black holes?

Is **galaxy morphology** a product of nature or nurture?

**Project with Danail Obreschkow**

Hot Gas

Dark Matter

Cold Gas

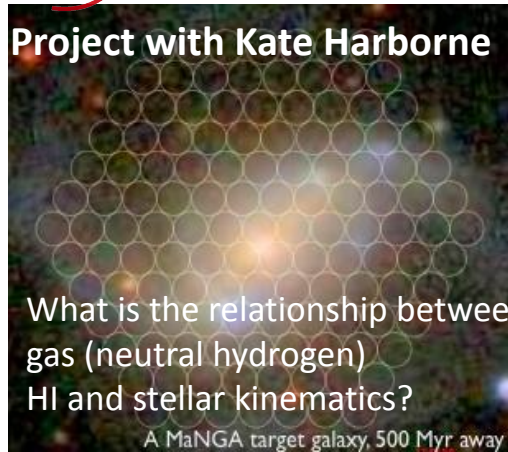
Stars

**What physical processes make galaxies spin?**



# Problems in Galaxy Evolution

## Project with Kate Harborne

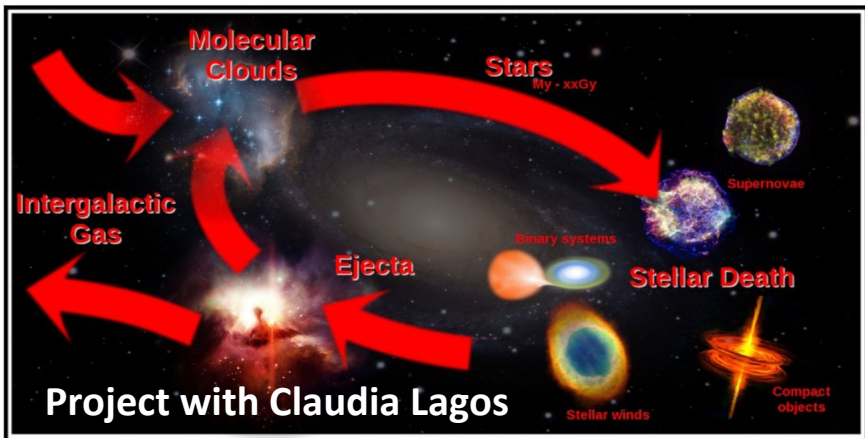


What is the relationship between gas (neutral hydrogen) HI and stellar kinematics?

A MaNGA target galaxy, 500 Myr away

What can we learn from the kinematics of star forming gas (neutral hydrogen) and stars about how a galaxy evolves?

How do the **chemical elements**, yielded by the stars that forge them in their interiors, **enrich their host galaxies**?



## Project with Claudia Lagos



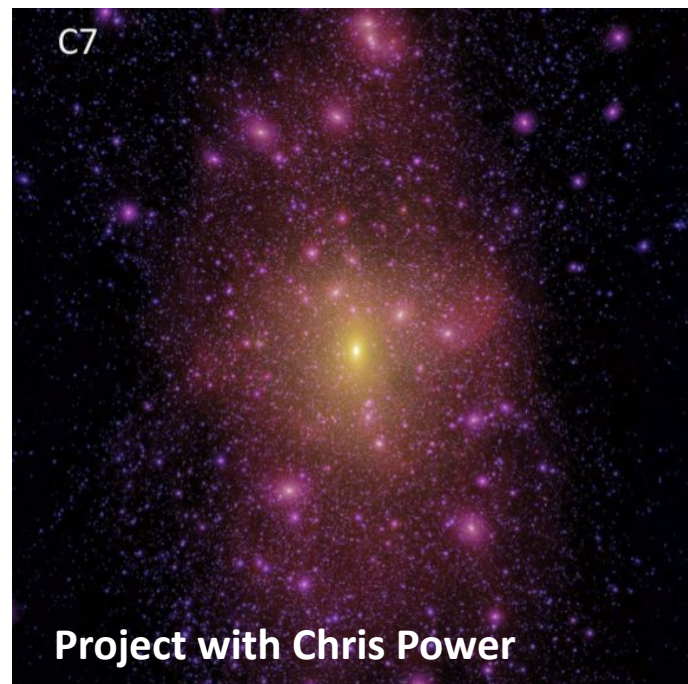
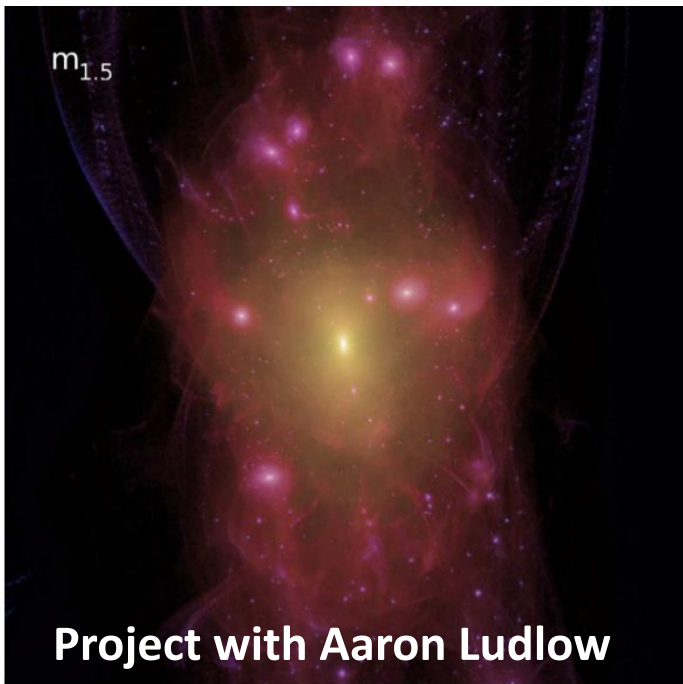
## Project with Chris Power



# Problems in Dark Matter

How does **dark matter** influence the **observable properties of galaxies**?

Can we use the stars around galaxies to **test our theories of dark matter**?

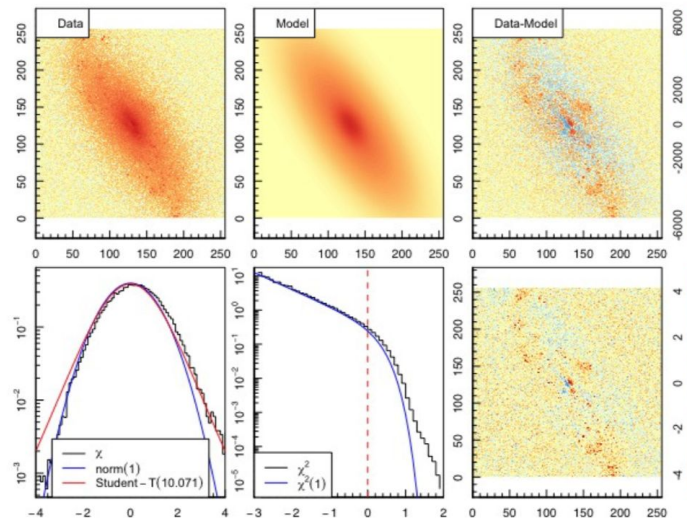




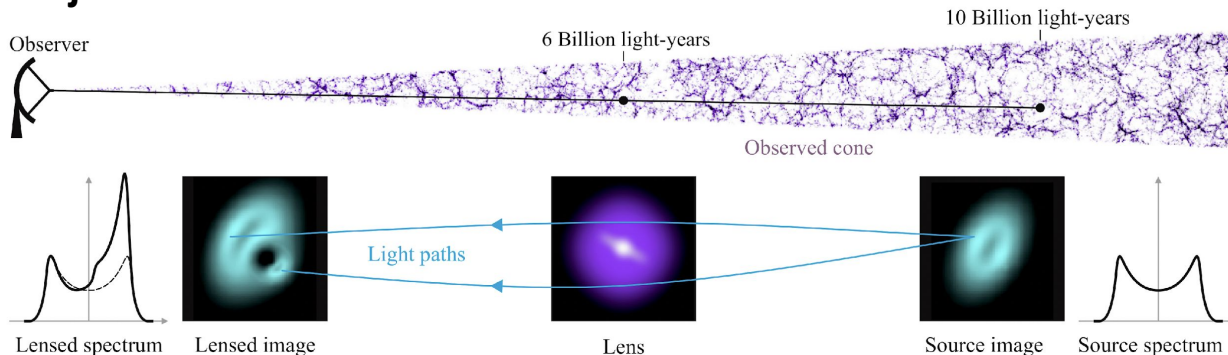
# Problems in Modelling

Project with Claudia Lagos & Aaron Robotham

What can **galaxy structure** tell us about the **physics of galaxy formation**?



Project with Danail Obreschkow



How can we explore **dark matter** and **distant galaxies** through **gravitationally lensed radio signals**?