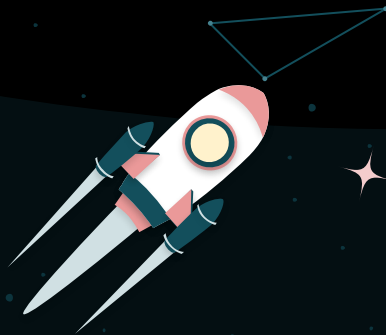


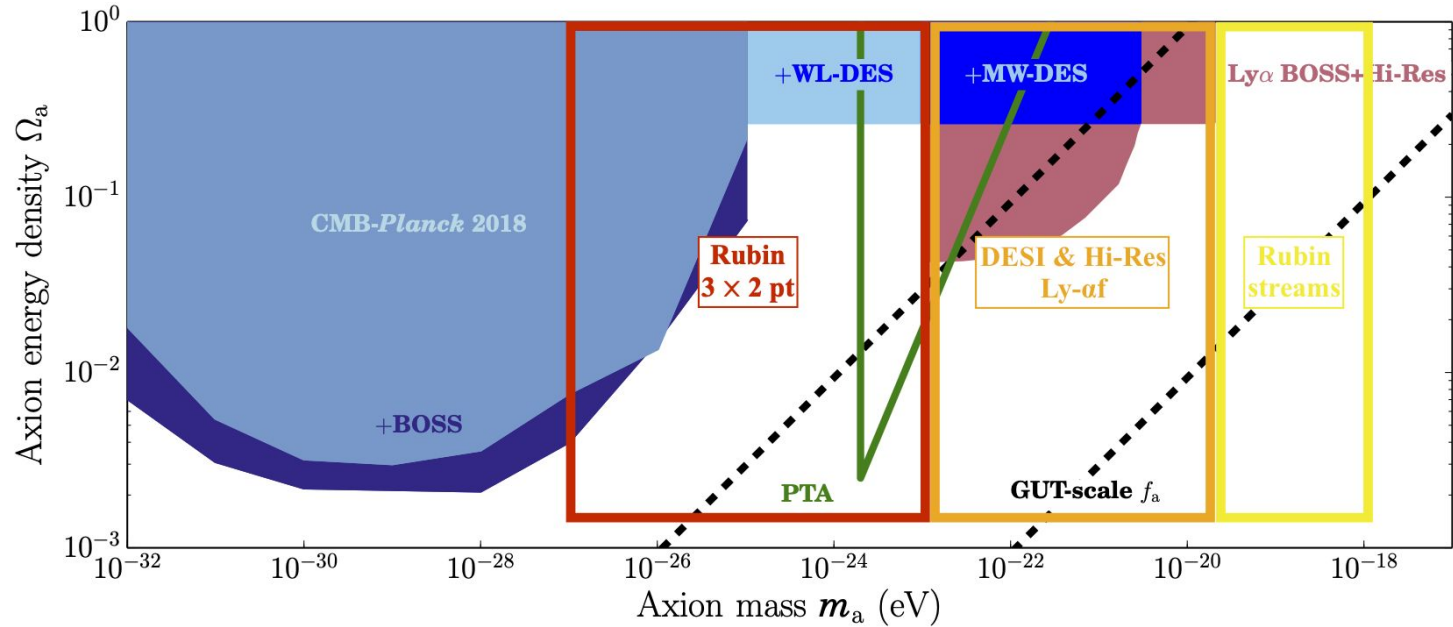
# Hnauts research update



**Renée Hlozek**

Margaret Ikape, Victor Chan, Harrison  
Winch, Bo Lin Fan, Simran Nerval, Danielle  
Dineen, Keir Rogers, Yilun Guan, Ishika  
Bangari, Alexander Spencer London, plus  
many more previous Hnauts members!

## Searching for the nature of dark matter (e.g., axions) in the cosmic web



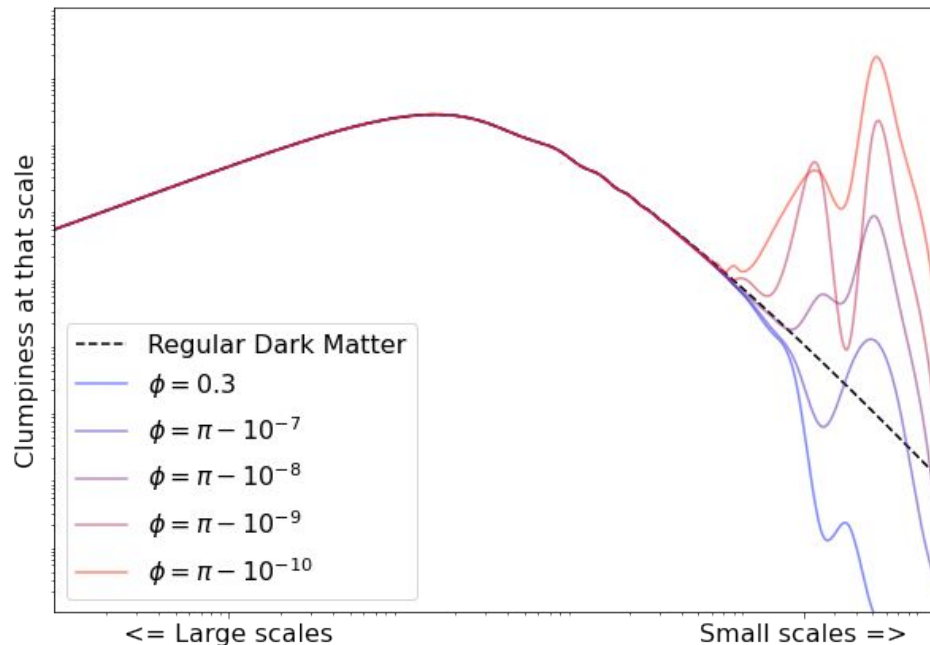
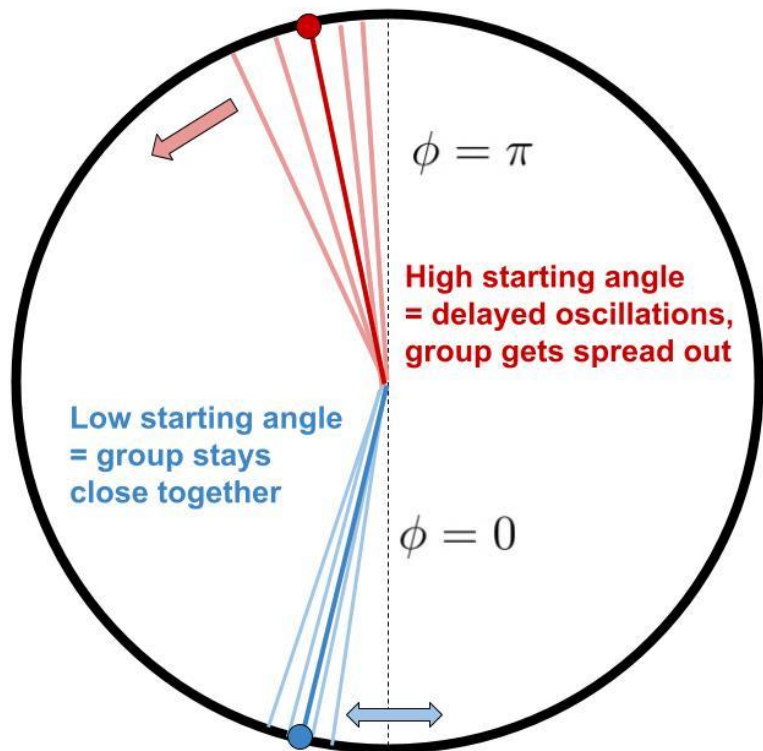
Getting ready for Rubin! Modelling, systematics, ML methods

# Harrison Winch - Extreme Axion Dynamics in the Early Universe

Office: AB230



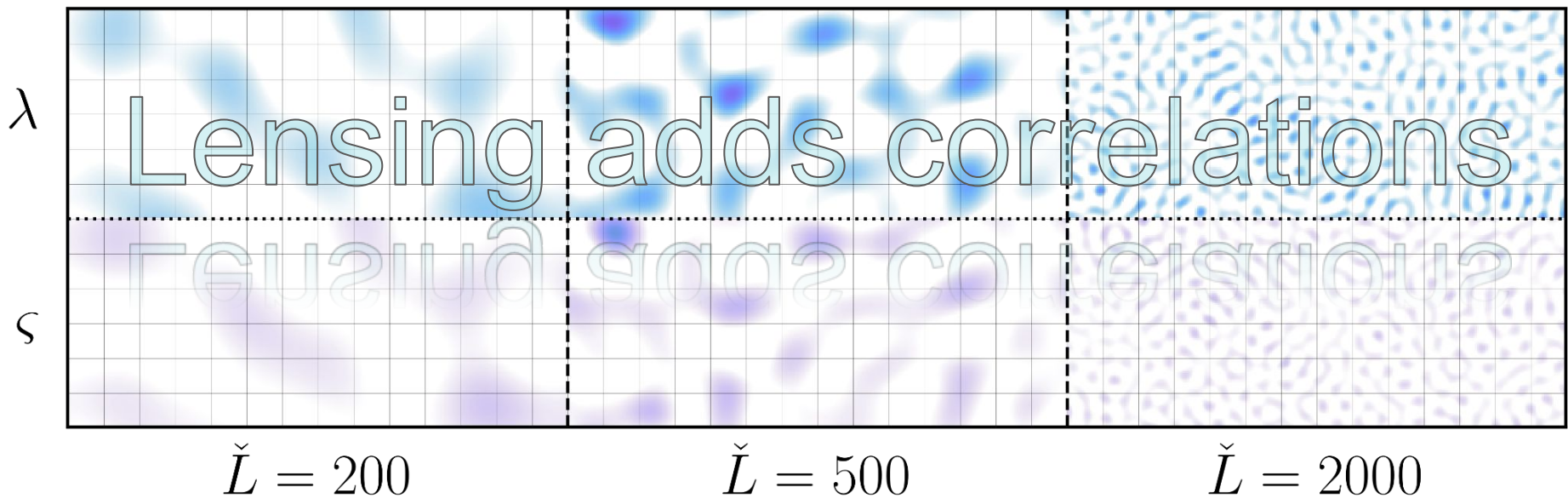
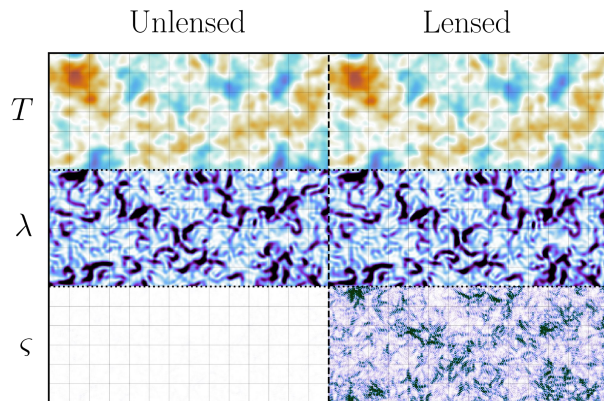
Axions act like a bunch of tiny pendulums everywhere in space



# Victor Carl Chan (he/him)

## AB203 - Thesis recovery this week

Sorry, I'm not there! Enjoy some pretty figures from my recent paper about CMB lensing, and I'm happy to talk to whomever and whenever.





# Simran Nerval (she/her)

## Inflationary Constraints with ACT, SO, and LiteBIRD

3rd year PhD Candidate

AB212

[simran.nerval@mail.utoronto.ca](mailto:simran.nerval@mail.utoronto.ca)

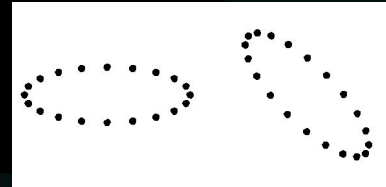


What types of signals could be produced by inflation?

- Are there other fields around during inflation?
- Do these fields oscillate during inflation?
- Is there any particle production during inflation?

How well can inflationary models be constrained?

- CMB pipeline development
- Accounting for systematics, i.e. crosstalk
- Using ACT data to constrain models
- Forecasting constraints for SO and LiteBIRD



B-modes



E-modes



Credit: MOPL on Wikipedia/LIGO India

Credit: APS/Michael Schirber

# Danielle Dineen

1st year PhD

MP 1318c

danielle.dineen@mail.utoronto.ca



MPhil Physics, University of Cambridge

**Supervisor:** Dr. Will Handley

**Project:** Israel matching conditions for primordial scalar perturbations



Dunlap Institute for  
Astronomy & Astrophysics  
UNIVERSITY OF TORONTO

1st year PhD (4-year track) University of Toronto



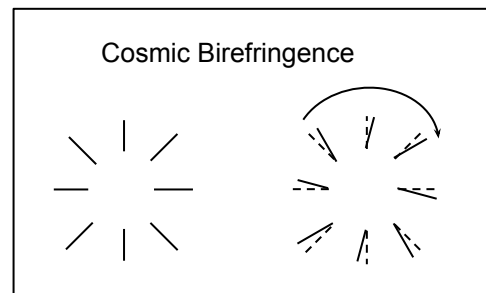
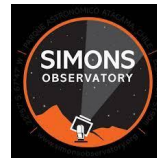
**Supervisors:** Dick Bond and Renée Hložek

**Interests:** Early universe cosmology, theory and observation

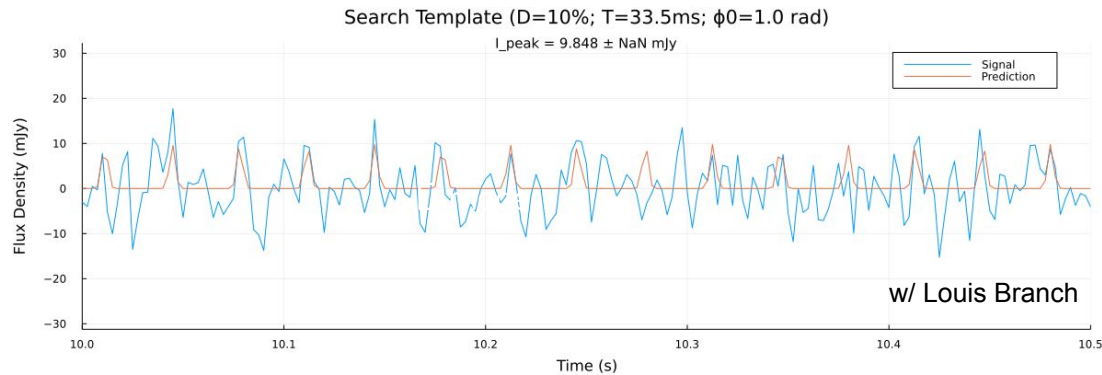
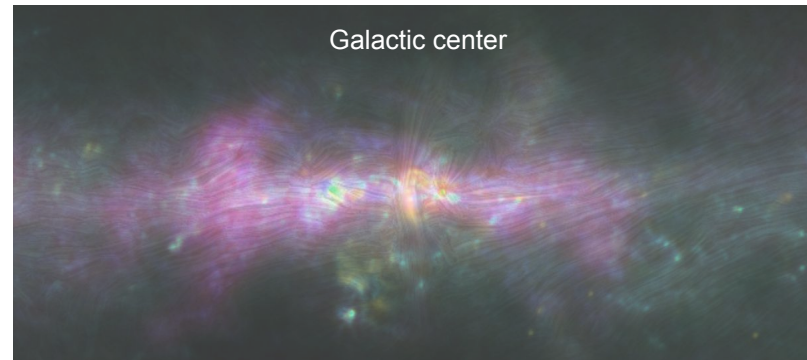


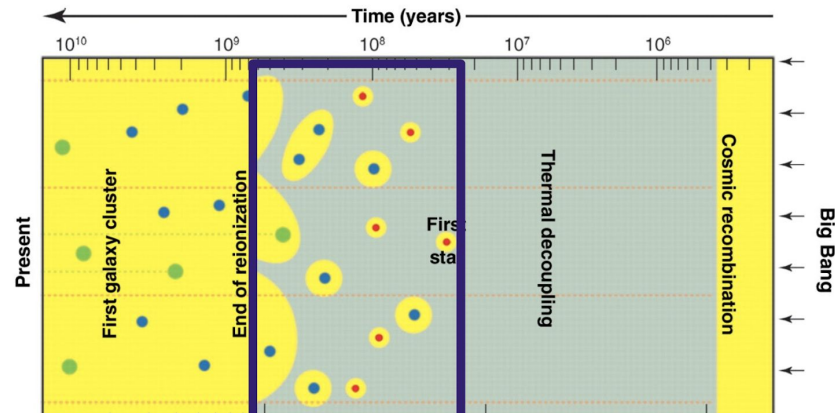


**Yilun Guan**  
Postdoc at Dunlap  
AB 122

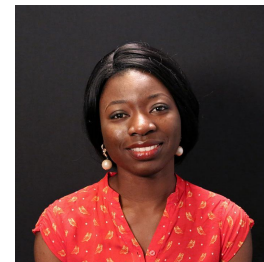


- Pipeline development for ACT and Simons Observatory
- Higher-order statistics of the CMB
  - Cosmic birefringence?
  - CMB lensing
- CMB data for astrophysics
  - Galactic science
  - Galaxy clusters (tSZ, kSZ)
  - Transient

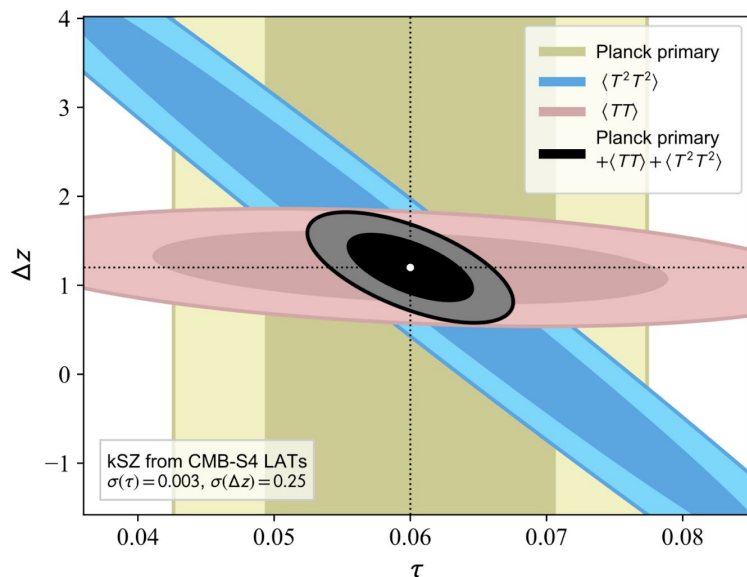




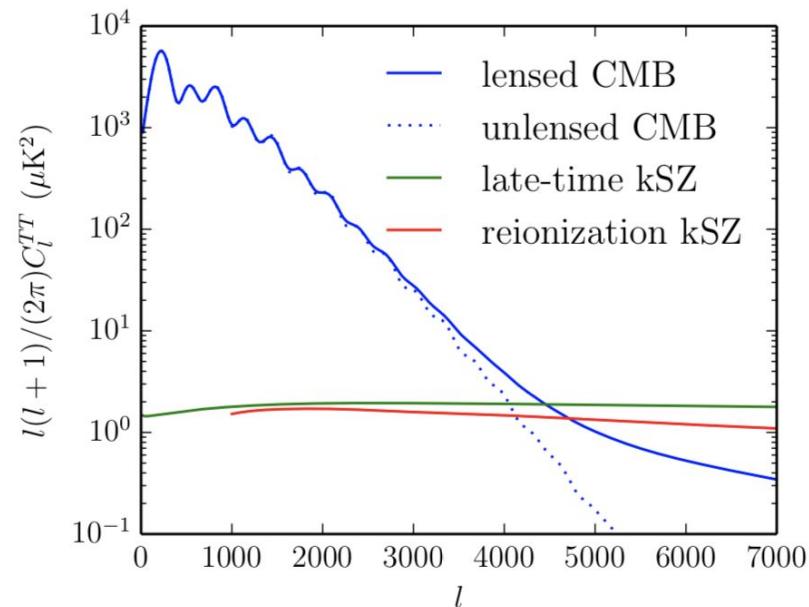
# Probing the Epoch of Reionization with the Simons Observatory, CMB-S4, ACT



**Margaret Ikape**  
**AB 212**



Alvarez ++ 2020: 2006.06594



Smith and Ferraro 2016: 1607.01769



# Renée Hlozek

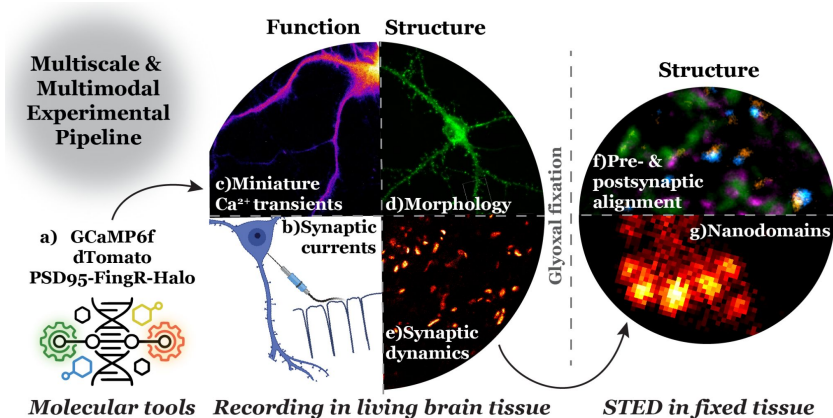
## AB 222



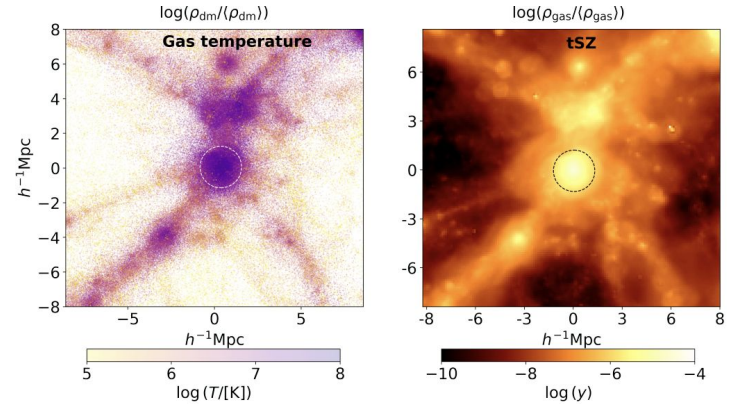
### Novel applications of astro methods beyond astronomy:

*How can we test models of learning using simulations?*

*How can we find flashes of light in the brain and use it to test for ALS or Parkinsons?*



With previous Hnauts member Martine Lokken



### Cosmology beyond the standard picture:

*How can we constrain dark matter models with cosmology observations?*

*How can we use statistics to make the most of our data?*

*How did the early universe progress?*

*How does dark energy behave in cosmic time?*