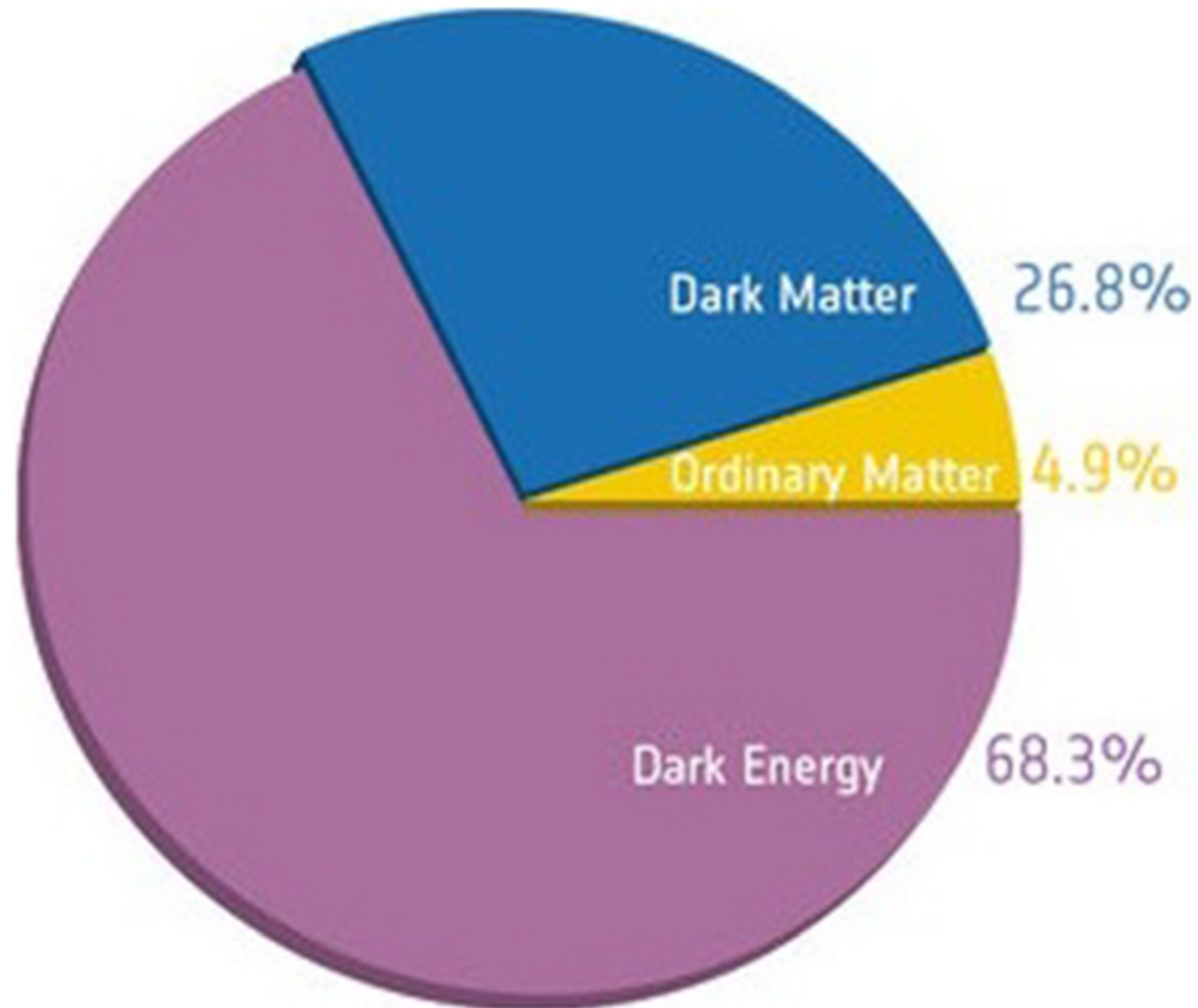


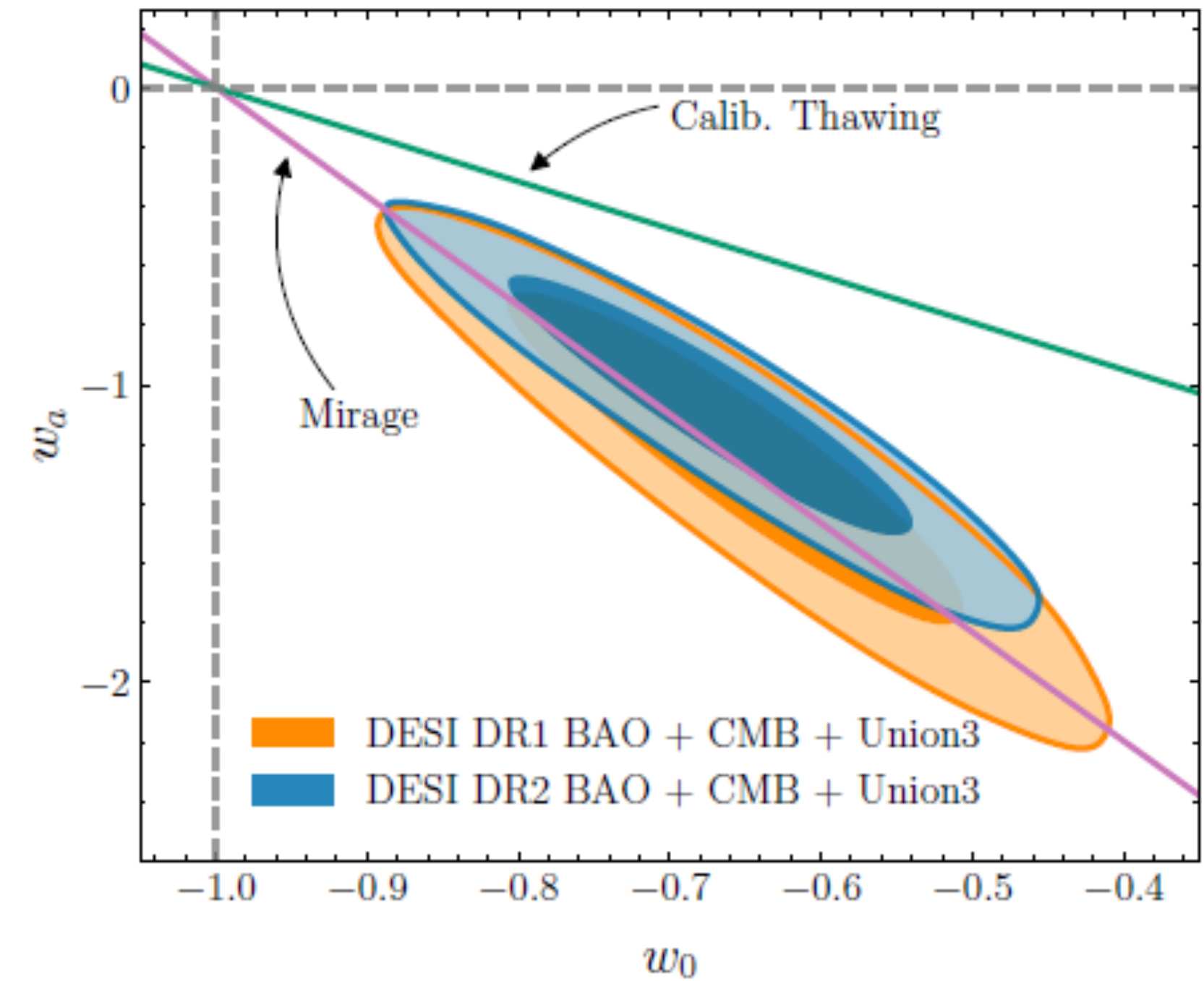
# Discussion – Lessons, Connections, Constraints

The views of Anne and Thomas!

The Dark Universe;  
(Embarrassing)



DESI



## Interaction theorists-observational cosmologists?

Useful on the condition we are sufficiently pedagogical and willing to be big picture, and communicate *beyond our own papers*.

Are theorists/model builders brave enough in their communication to observationalists?

→ Historical note **on early universe**. *BICEP should have been string theory's first observational victory! We missed a huge opportunity because of being not brave enough,.... or too brave?*

→ Current fact about **dark energy&strings** : **after 27 years of work we still do not have a single dS solution we can trust even a bit**. KKLT&LVS have shown fatal errors for dS uplifts. Our community ignores it a bit too much. *Should we say string theory does not predict constant positive vacuum energy? Are we not brave enough?*

## Connections

String Theory — includes GR and could be a theory of quantum gravity. It contains a scalar field, the dilaton. The dilaton couples to all other fields, ie it couples to matter. There are also axion fields.

Could the axion be dark matter? Various searches

Could the dilaton be dark energy?

Both are contained within string theory



**Sometimes being  
open-minded  
and out-of-the-  
box means being  
conservative**

Yes, the problem of dark energy (cc problem) is a QUANTUM GRAVITY problem. Excellent opportunity for strings vs cosmology

BUT

Are we sure we should connect Hubble tension, DESI results,...to the cc problem? Theorists love doing what they are good at: model building, swampland, landscape,... But what if the tensions are mundane?

→ A breakdown of the cosmological priors of homogeneity and isotropy? Computations with the FLRW metric are simple and makes us lazy for looking beyond.

Example: Non-equilibrium matter can lead to an effective non-symmetric energy-momentum tensor.



The real elephant in the room might not be the cc, but the cosmological principle?



Cosmological Constant

Vacuum Energy

The Elephant

**Is this our Aether?**