

CONCLUDING REMARKS

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ANOTHER FESTIVAL OF PHYSICS

- So many reminders of the enduring power of a few powerful ideas
- Timescale separation
- Oscillators and resonant coupling
- Signal and noise
- So many possibilities
- Fermions, axions, bosonic fields – has DM been seen (2.6 sigma)?

AXIONS

- QCD axions should exist
- They may not dominate DM but we should find them
- The meV range should be our focus for 4 reasons (Malte Buschmann)
- Please will someone please introduce an analytic way to proceed to real string diameter!

EARLY YEARS SEEN THROUGH JWST

(DAVID ELBAZ)

- Unexpectedly luminous, massive objects <0.5 Gyr from the BB
- Remember it's a freak show!
- But surely time to free our minds of White & Rees
- Yes now most baryons are in the warm/hot medium
- Yes the enduring DF in the MW is fed by cooling
- But baryons remained cool until $z \sim 2$ and so much had happened by then

ARE LRDS POP III STARS?

- Cooling of H/He plasma changes fundamentally when $[\text{Fe}/\text{H}]$ reaches ~ -5
- Abundance of UV prevents formation of H_2
 - So cloud doesn't fragment and 'stars' don't form
- BHs bound then to form
- Fangzhou Jiang made an interesting case for SIDM
- $\tau_{\text{ff}} \sim \rho^{-1/2}$ $\tau_{\text{cool}} \sim \rho^{-1}$

OSCILLATORS

- Atoms are resonant cavities for Dirac field
 - Frequency ratios can be measured with exquisite precision (Cedric Delaunay)
 - They can't be computed nearly as precisely
 - But we can study how they change when we carry a clock up a hill or change its isotope
- A 10 sigma discrepancy in He can be resolved by ϕ coupled to Dirac!
- Nuclear clocks feasible! (pity about decay of Th)
- Detect axions with emag cavities – scan with a heterodyne (Francesco D'Erramo)

DETECTING GRAVITATIONAL NOISE

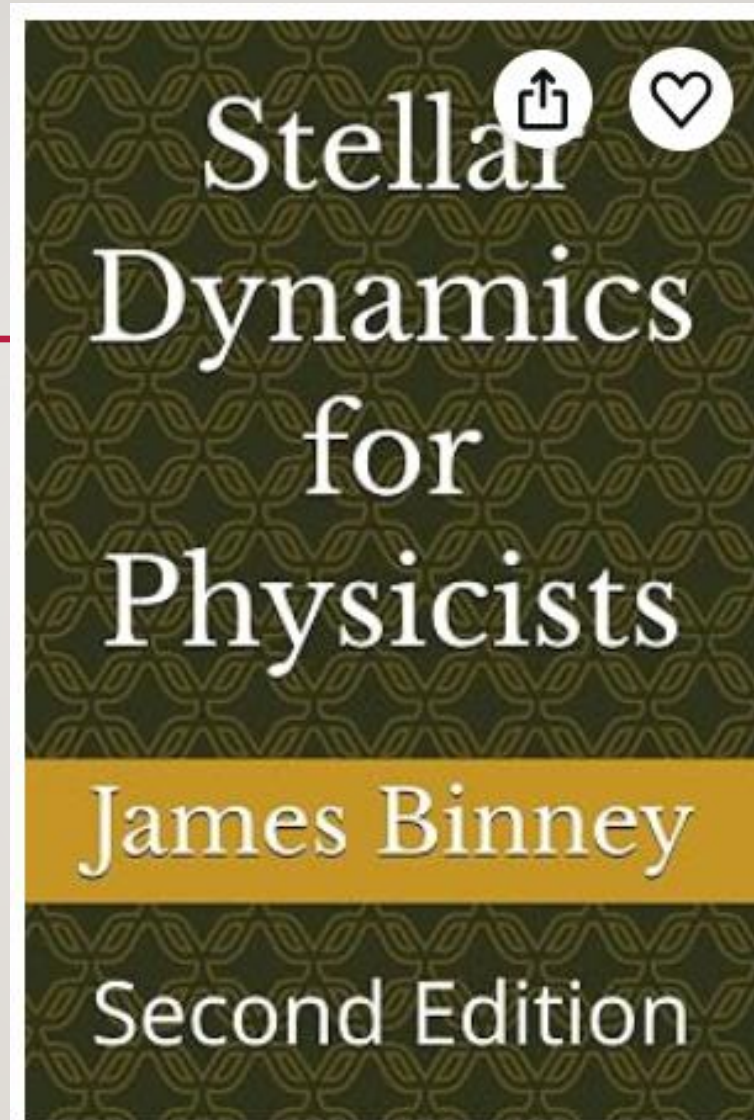
- Mini halos, bosonic condensates, BHs, SNe all create gravitational noise
- Gravitational noise changes discs & clusters (Jorge Pennarubia, Raffael Errani)
- Gaia dramatically improves cluster data (also dSph)
- Our understanding of sources & effects of gravitational noise is still inadequate
- Look for chromatic effects in G Waves with LISA (Shinichiro Ando)

DATA ANALYSIS

- Payel Das touched on a key issue: data fitting
- From Gaia, MUSE etc we have data of SPECTACULAR quality
- Hard work is needed to extract science from these data
 - It would be reasonable to spend ~20% of cost of Gaia + MUE +... on analysis!
 - Large-scale computing required: CPU-hour balance with simulation?

JUST OUT

- 460 pp
 - \$22
 - €19
 - £17



THANK YOU!

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- Julien, Patrick & other organisers