

Summary

Masamune Oguri

(RESCEU/Physics/Kavli IPMU, Univ. of Tokyo)

Main cosmological applications

- measuring H_0 (and other cosmo. parameters)

Panel Discussion 1 (Treu)

- constraining dark matter from small-scale observations (WIMP? ALP? PBH? MG? ...)

Panel Discussion 2 (Inoue)

H₀ from time delays

- largely a question of *prior*



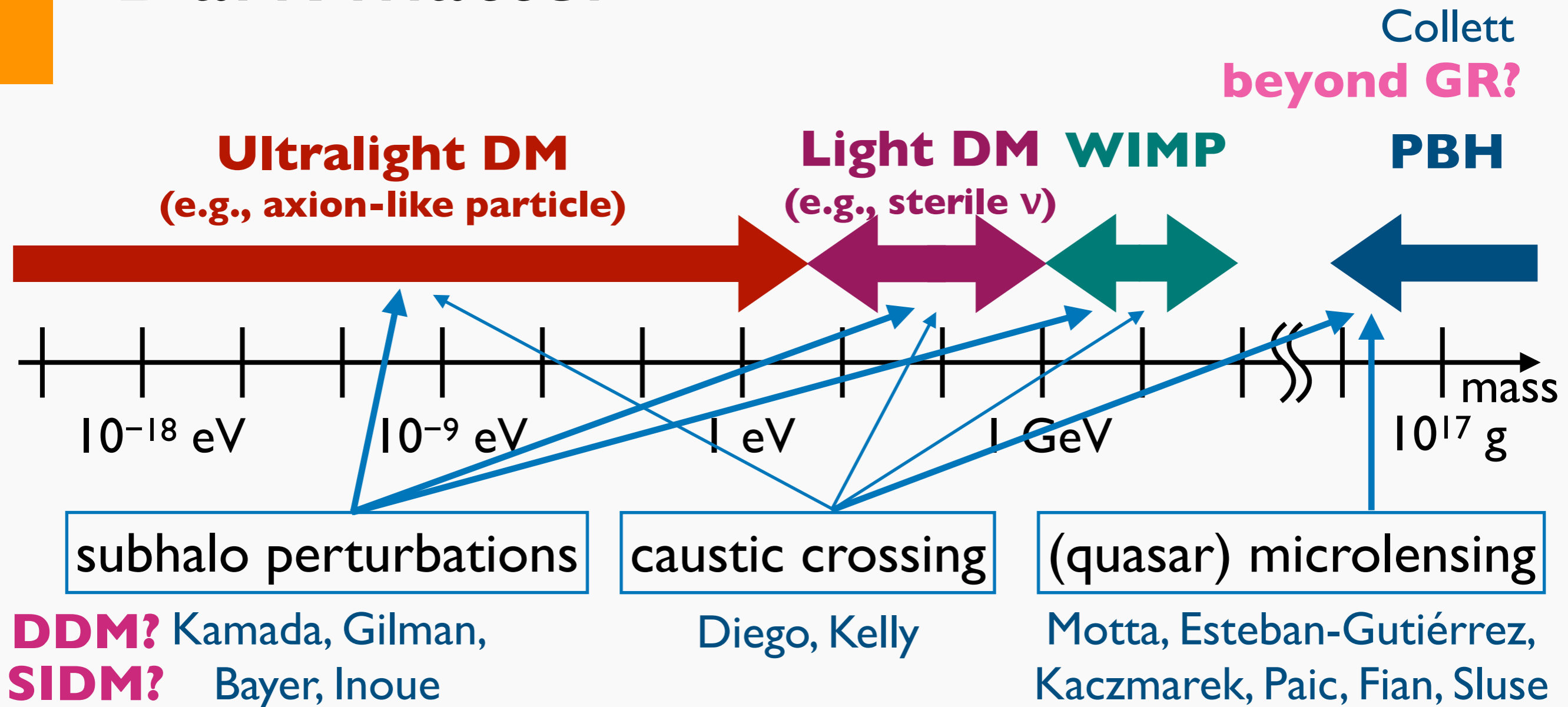
free-form lopsidedness (/boxiness/...) +halo(MST) power-law SIE
Williams Van de Vyvere Birrer Wagner

???

- kinematics Gomer
- simulations Xu, Ding, Li
- magnifications (SNIa)
- ...

which prior? how can we convince ourselves?

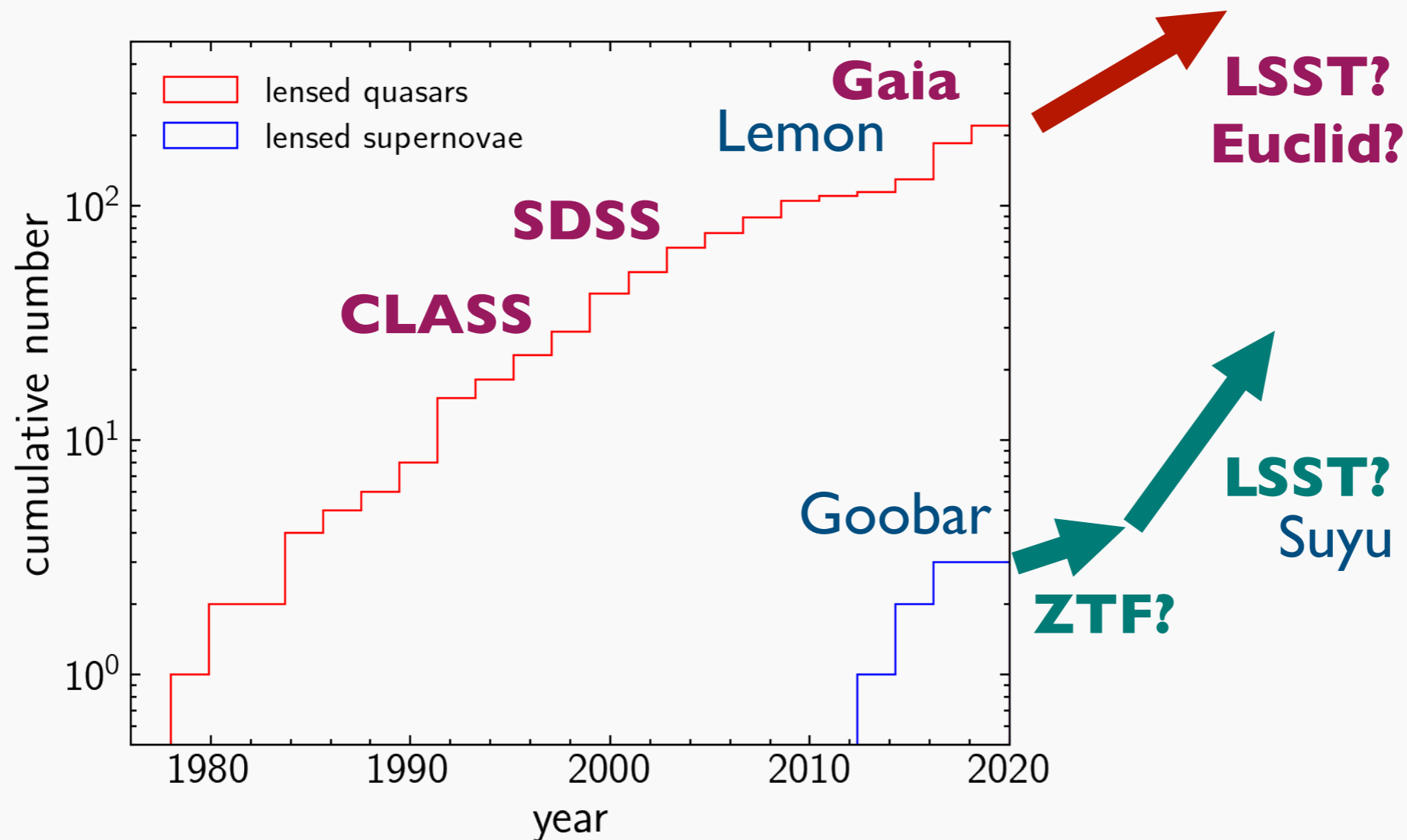
Dark matter



how can we overcome (distinguish from) baryonic effects?

- cleaner probe? (smaller mass halos?)
- learn from local galaxies? (used for mocks)
- statistical inference?
- ...

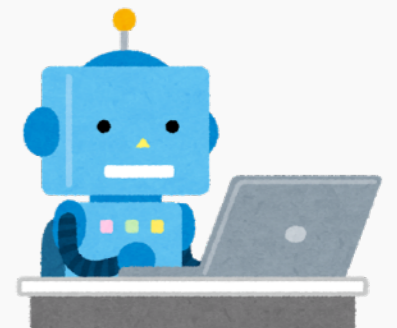
More lenses!



also need
time delays
Millon

- large samples call for new approaches:
machine learning, hierarchical modeling, ...

Maresca, Park, Schuldt



New kind

- gamma-ray bursts

More

- fast radio bursts

Zitrin

- gravitational waves

Takahashi, Dai, Mishra

what can we do with:

**super-precise
time delays** (≈ 1 sec)

wave optics effects

???

[see also: M. Oguri, Rep. Prog. Phys. 82, 126901 (2019)]

Communication/cooperation

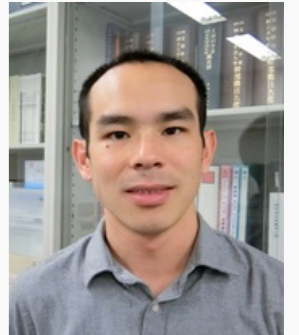
- follow-up resources
- up-to-date database
- communication with non-experts



our homework!

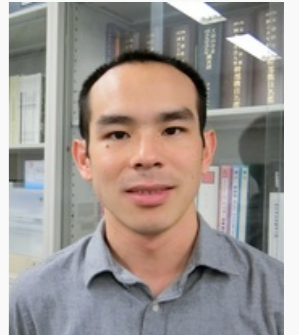
Special thanks to

- **Kenneth Wong** (who did almost all the work!)
- Kaiki Inoue
- Anupreeta More
- Nao Suzuki
- Edi Rusu, Eri Shinoda & other IPMU staff



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**... and all the participants
who made this workshop happen!**

hope to be able to see you in person soon!