

# Scorecard from 2018



- **Problems that will likely be solved by 2022**

- *is back reaction real and can it replace dark energy ?*
- *where do r-process elements come from?*
- *is the anomalously large CMB cold spot caused by large void?*
- *do 30  $M_{\odot}$  primordial BHs exist ?*
- *is there more than 1 type of FRB ?*

1 (faded)  
 0.5 (some from KNe)  
 1 (ruled out)  
 0 (still don't know)  
 1 (yes)

- **Problems that might be solved by 2022**

- *NS equation of state from NS merger waveforms*
- *is dark matter warm / self-interacting ? WIMP ? (XENON?)*
- *what are the seeds of the first supermassive BHs ?*
- *is the  $H_0$  discrepancy real ?*
- *TDE (tidal disruption events) or TDE (totally different explanation\*?)*
- *what is the physics of launching jets ? (M87, simulations, NS-NS)*
- *what is the SMBH mass function between  $10-10^5 M_{\odot}$ ?*
- *how do planets distort protoplanetary disks?*
- *assembly history of MW disk (GAIA)*
- *Do BHs and NSs merge?*

0 (constraints)  
 0  
 0  
 0  
 1 (some real)  
 0.5 (BH jets = BZ)  
 0  
 0  
 0.5 (SFR yes, mergers no)  
 1 (yes, LIGO)

- **Problems that will not be solved by 2022**

- **MANY !**

# Forecasts for 2026

- **Problems that will likely be solved by 2026**

- *Is the  $H_0$  tension real or due to systematics ?*
- *Is the  $\sigma_8$  tension real ?*
- *are unexpectedly massive early ( $z \sim 10$ ) galaxies really very massive?*
- *Will simulations converge on the sign of circumbinary gas torques?*
- *Will we agree on the origin of some QPEs?*
- *What is the large-scale distribution of the missing baryons in the WHIM? (kSZ)*
- *Is DM indeed missing from some galaxies?*
- *how to better engage with the public*
- *what are the progenitors of Type Ia SNe (GAIA, LSST, chemical yields)*

- **Problems that might be solved by 2026**

- *What is(are) the origin(s) of some of the LIGO BH-BH binaries ?*
- *Do BH-BH binaries cause EM emission?*
- *Do planets cause most (ALMA) gaps and rings in protoplanetary disks?*
- *What is the origin of >50% of high-energy neutrinos?*
- *sum of masses of neutrinos (DESI? but definitely by 2030)*
- *how did massive JWST galaxies at  $z > 10$  form?*
- *Will we see the interaction between dark substructure and a MW halo stream?*
- *Will we detect the stochastic GW background with PTAs ?*
- *Do we have a confirmed ellipsar?*
- *discover evidence for inflation from scalar-tensor ratio*

# Forecasts for 2026

- **Problems that will not be solved by 2026**
  - *what are the seeds of SMBHs?*
  - *what is the demography of IMBHs in low-mass galaxies?*
  - *What is the nature of dark energy*
    - *What is the nature of dark matter?*
  - *Will we measure accelerations of disk stars at high altitude to measure DM?*