HUBBLE CONSTANT
BUILDING A BETTER DISTANCE LADDER

10% Error
Key Project & Historic SNe Ia
1990s

Measure:
Hubble flow with Recent SNe Ia (D to 400 Mpc)
Tully-Fisher & Other Galaxy-based Distance Indicators (D to 100 Mpc)

Supernova Change:
Photographic to CCD Zero-points

Measure:
Cepheids
Nearby Galaxies (D < 20 Mpc)
Tully-Fisher, Ground
Historic, Photographic SNe Ia, Ground

Cepheid Change:
Ground to HST / NFPC2 Zero-points

Measure:
Cepheids
LMC
Ground, Optical
Short Period
Metal-Poor

Measure:
Cepheids
LMC
Metal-Poor
Ground, Optical

Measure:
Cepheids
Milky Way-
HST-Parallax (D < 0.5 Kpc)
Spitzer-FIR
Short Period
Metal-Rich

3% Error
Supernovae & NIR Cepheids
2000s

Measure:
Hubble flow with Recent SNe Ia, Optical (D to 3 Gpc)

Measure:
Cepheids in SNe Ia Hosts, Half-a-dozen (D < 40 Mpc)
Recent SNe Ia, Optical, Ground

Cepheid Change:
Short Period to Long Period, Optical

Measure:
Cepheids
LMC
Ground, Optical
Short Period
Metal-Poor

Measure:
Cepheids
LMC
Metal-Poor
Ground, Optical

Measure:
Cepheids in
NGC-4258 (Maser Host)
HST ACS/NIC/WFC3
Long Period
Metal-Rich
NIR

~1% Error
Precision Astrometry
2010s

Measure:
Hubble flow with Recent SNe Ia, NIR (D to 6 Gpc)

Measure:
Cepheids in SNe Ia Hosts, Complete Sample (D < 40 Mpc)
Recent SNe Ia, NIR, Ground

Cepheid Change:
Metal-Poor to Metal-Rich, Optical

Measure:
Cepheids
LMC
Ground, Optical
Short Period
Metal-Poor

Measure:
Cepheids
HST WFC3
GAIA Milky Way Parallax (D < 10 Kpc)
JWST FIR
HST Milky Way Parallax (1 < D < 3 Kpc)
Long Period
Metal-Rich

& Milky Way,
Cepheid HST-Parallax (D < 0.5 Kpc)