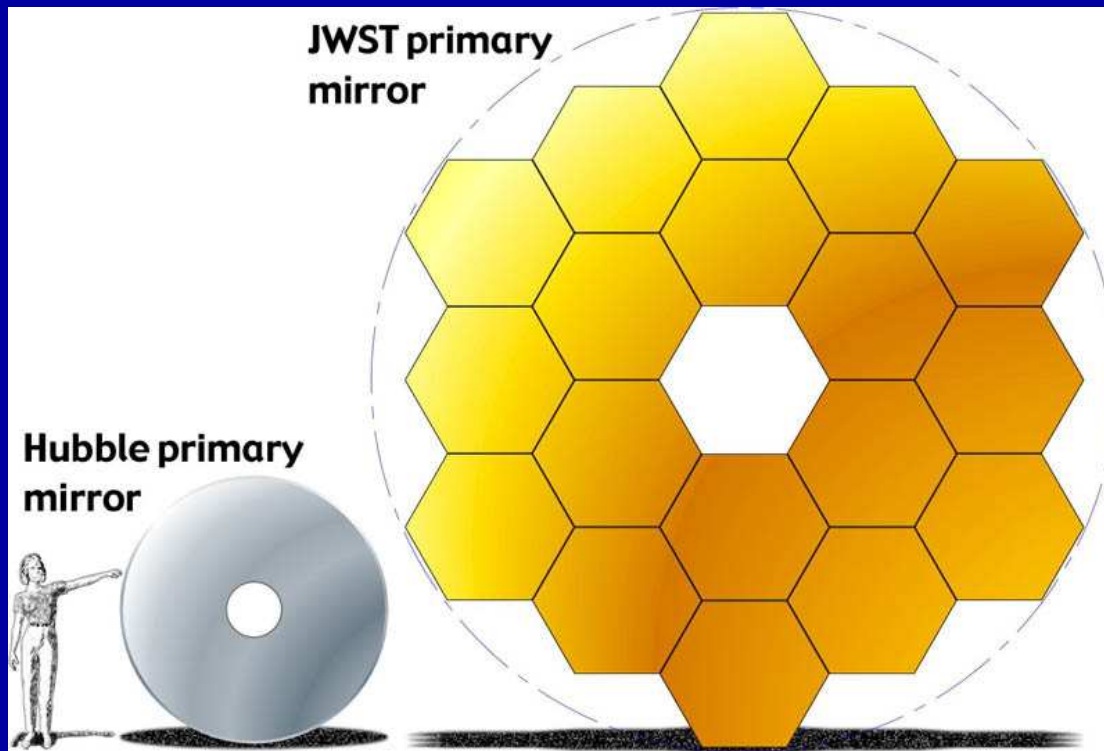


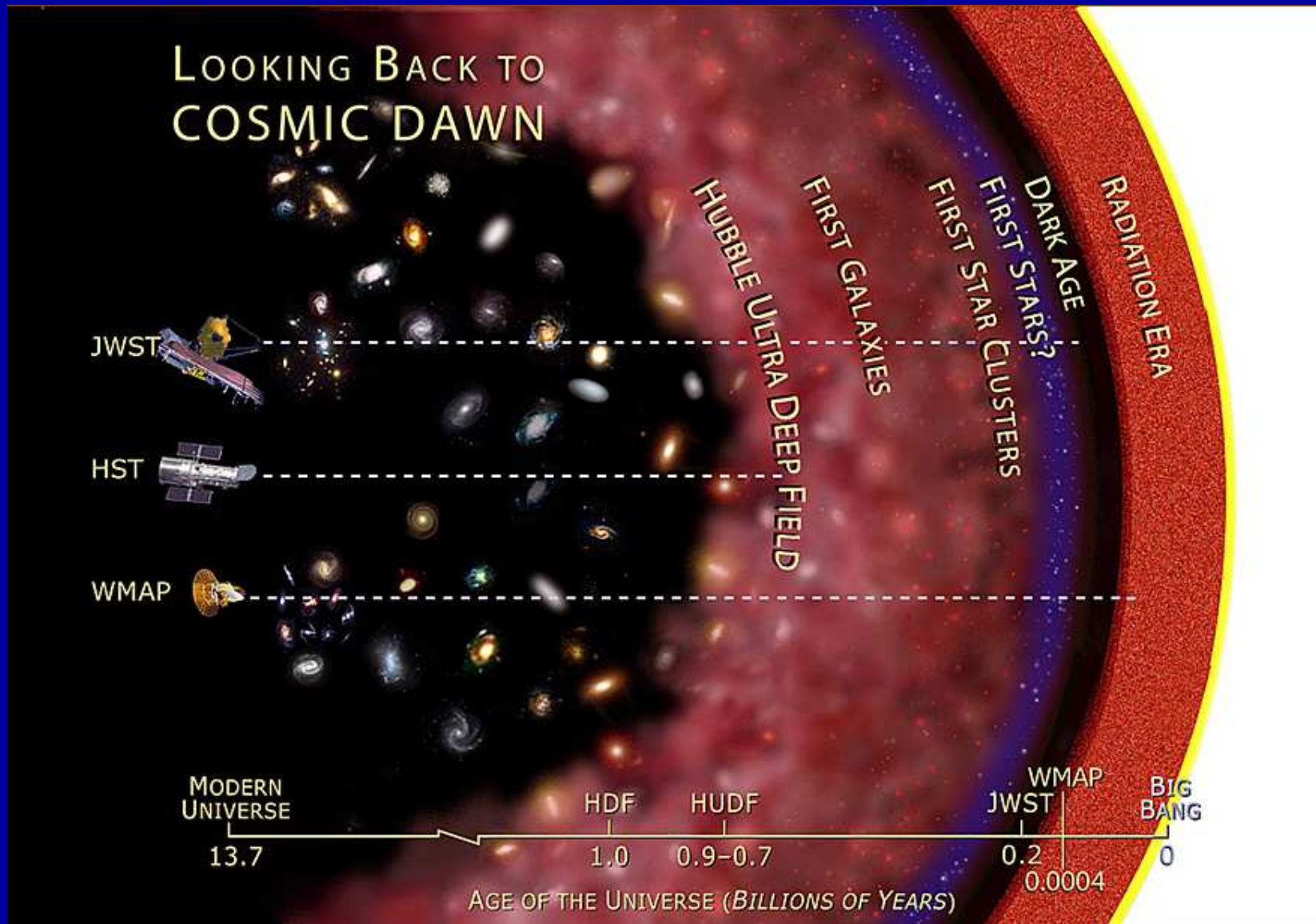
The James Webb Space Telescope and its Promise: What JWST will do on First Light, Reionization, and Galaxy Assembly after Hubble: when $1+1 \gg 2$.

Rogier Windhorst (ASU) — JWST Interdisciplinary Scientist



Presentation at the ASU Origins Workshop, Cave Creek, AZ, Saturday, April 4, 2009

NASA Missions measuring Recombination, First Light & Galaxy Assembly

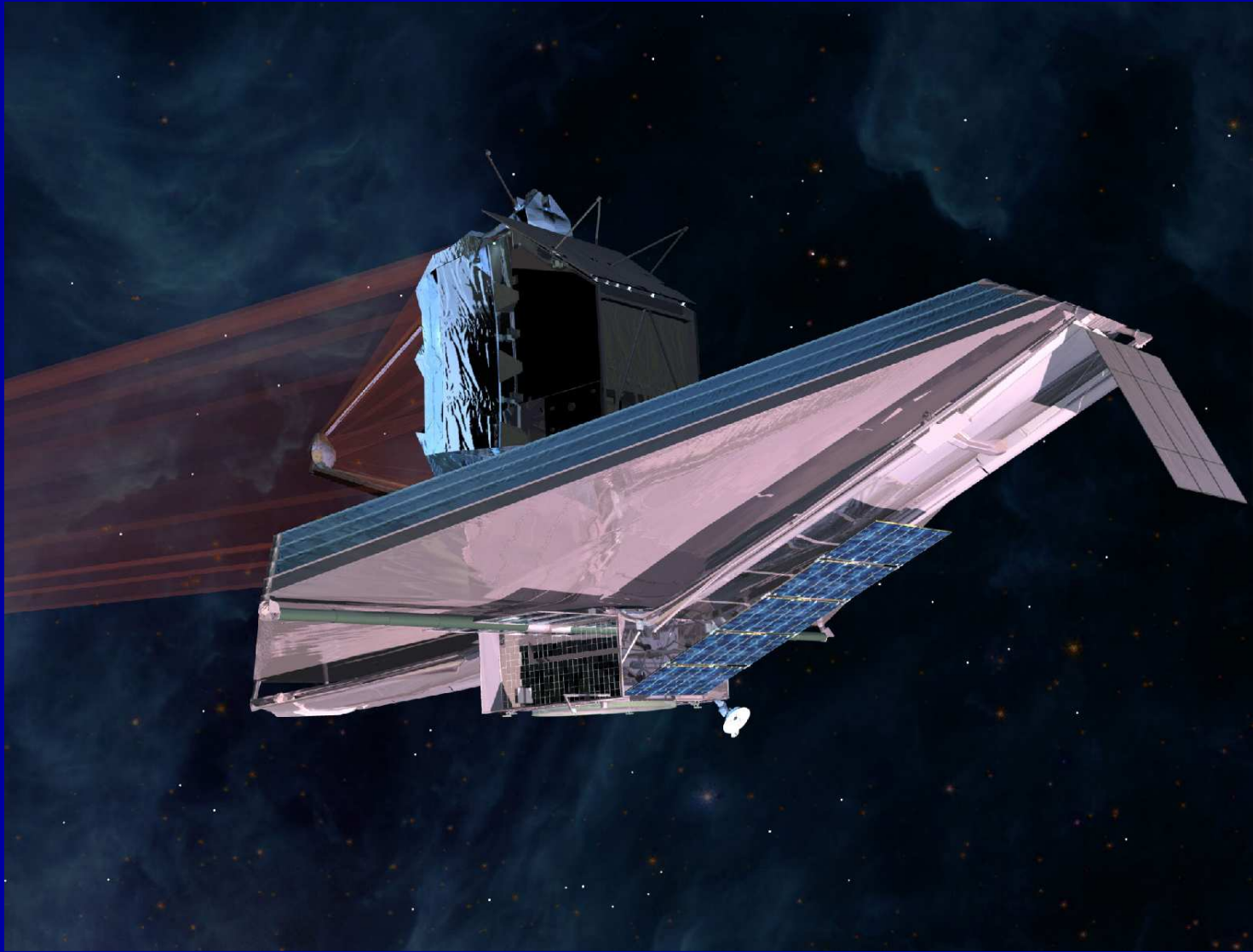


HST (+WFC3): Hubble sequence & galaxy assembly from $z \simeq 0$ to $z \lesssim 7-8$.

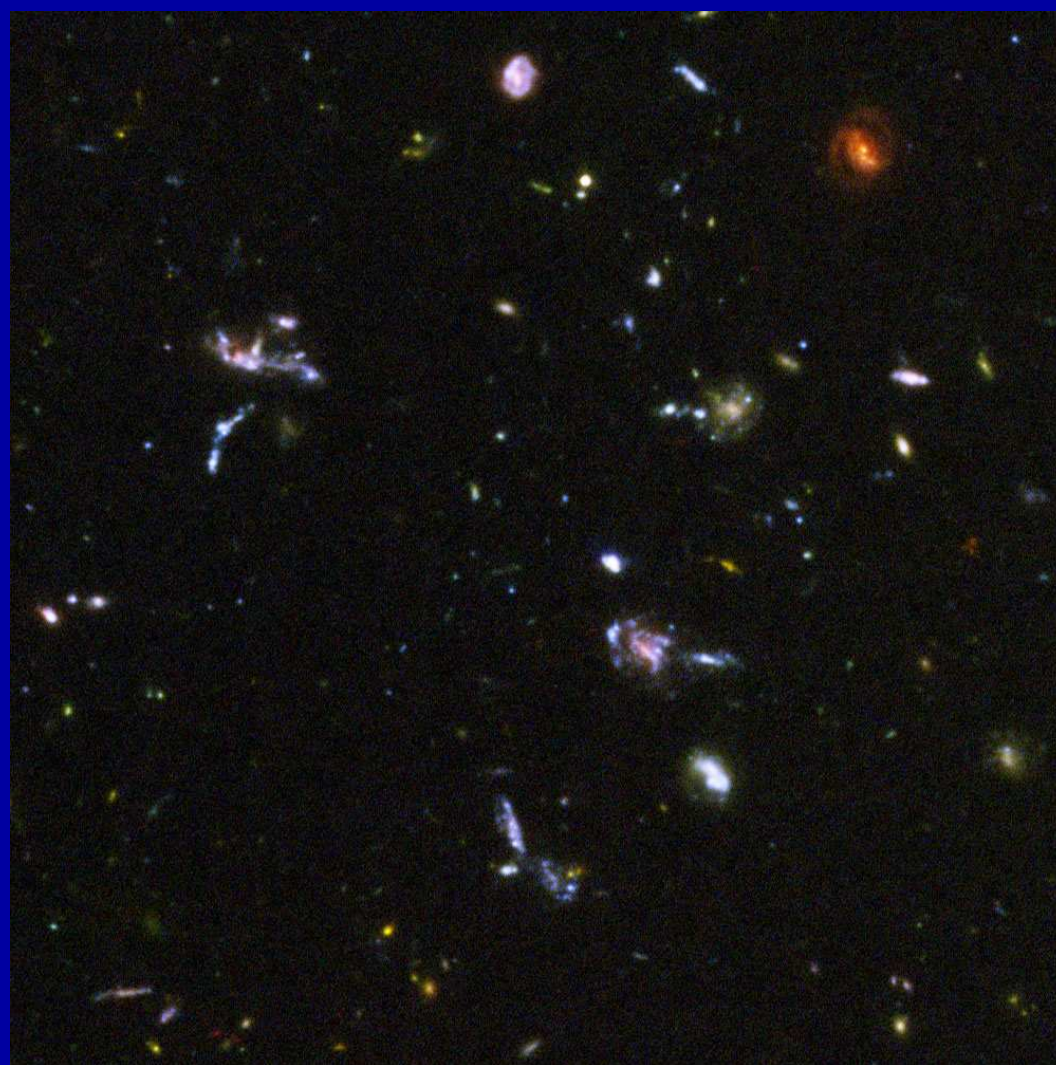
JWST: First Light, Reionization, & (dwarf) galaxy assembly at $z \lesssim 6-20$.

WMAP: Hydrogen Recombination at $z = 1091 \pm 1$ (age = 383,000 yrs).

How will JWST measure First Light, Reionization & Galaxy Assembly?



- A fully deployable 6.5 meter (25 m^2) segmented Infrared telescope for imaging and spectroscopy from 0.6 to $28 \mu\text{m}$, to be launched in $\gtrsim 2013$.
- Nested array of sun-shields to keep its ambient temperature at $35\text{-}45 \text{ K}$, allowing faint imaging ($AB \lesssim 31.5$) and spectroscopy ($AB \lesssim 29 \text{ mag}$).



Who (when)	Cosmic Epoch	Ellipticals	Spirals	Irr's/mergers
Hubble (1920's)	$z=0$ (13.73 Gyr)	$\sim 40\%$	$\gtrsim 50\%$	$\lesssim 10\%$
HST ($\gtrsim 1990$'s)	$z \simeq 2 \rightarrow 1$ (3–6 Gyr)	$\lesssim 15\%$	$\sim 30\%$	$\gtrsim 55\% !$
JWST ($\gtrsim 2013$)	$z \simeq 20-6$ (0.2–1 Gyr)	$\lesssim ??\%$	$??\%$	$\gtrsim ??\%$

Summary and Conclusions

JWST passed major mission milestones in 2008. After 2013, it will map the epochs of First Light, Reionization, and Galaxy Assembly in detail:

- Formation and evolution of Pop III star-clusters in the first 0.5 Gyr.
- (How) did dwarf galaxies finish Cosmic Reionization after 1 Gyr?
- Origin of the Hubble sequence in hierarchical formation scenarios.
- How did the epoch dependent galaxy merger rate affect the process of Galaxy Assembly and Super-Massive Black-Hole (SMBH) growth?
- Measure the role of Dark Matter and Dark Energy in Galaxy Assembly and the growth of Active Galactic Nuclei (AGN).

References and other materials:

<http://www.asu.edu/clas/hst/www/jwst/> [Talk, Deploy-Movie]

www.asu.edu/clas/hst/www/ahah/ [Hubble at Hyperspeed Java-tool]

http://wwwgrapes.dyndns.org/udf_map/index.html [Clickable HUDF map]

<http://www.jwst.nasa.gov/> and <http://www.stsci.edu/jwst/>