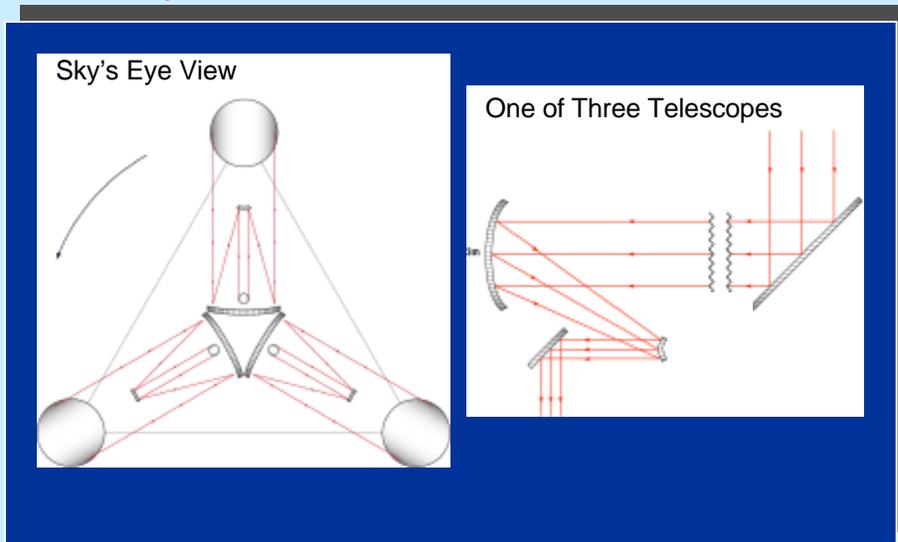


# Submillimeter Probe of the Evolution of Cosmic Structure



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**Objectives:** Hubble sensitivity and angular resolution in the far IR (40-500  $\mu\text{m}$ ), to see formation of the first stars and galaxies, evolution of galaxies and structures, history of nucleosynthesis, and penetrate circumstellar disks to see stars and planets forming.

**Instrument:** spatial and spectral Michelson interferometer, with 3 telescopes separated up to 1 km

**Technologies:**

- Photon counting far IR detectors
- Formation flying spacecraft
- Cold (4 K), lightweight mirrors
- Active coolers

[www.gsfc.nasa.gov/astro/specs](http://www.gsfc.nasa.gov/astro/specs)

**Schedule**

FY

98

Formulate

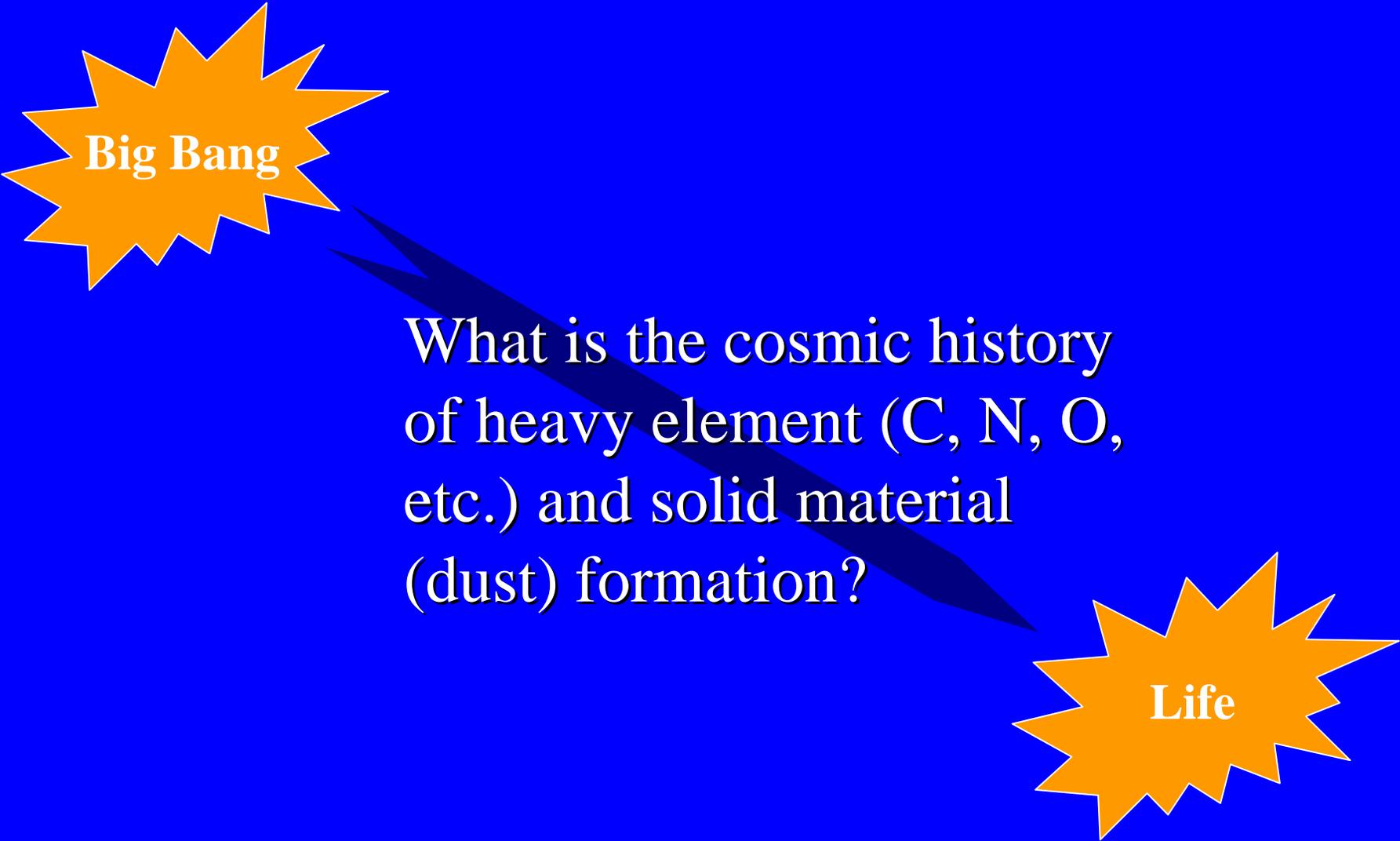
10

Implement

15

Operate

20

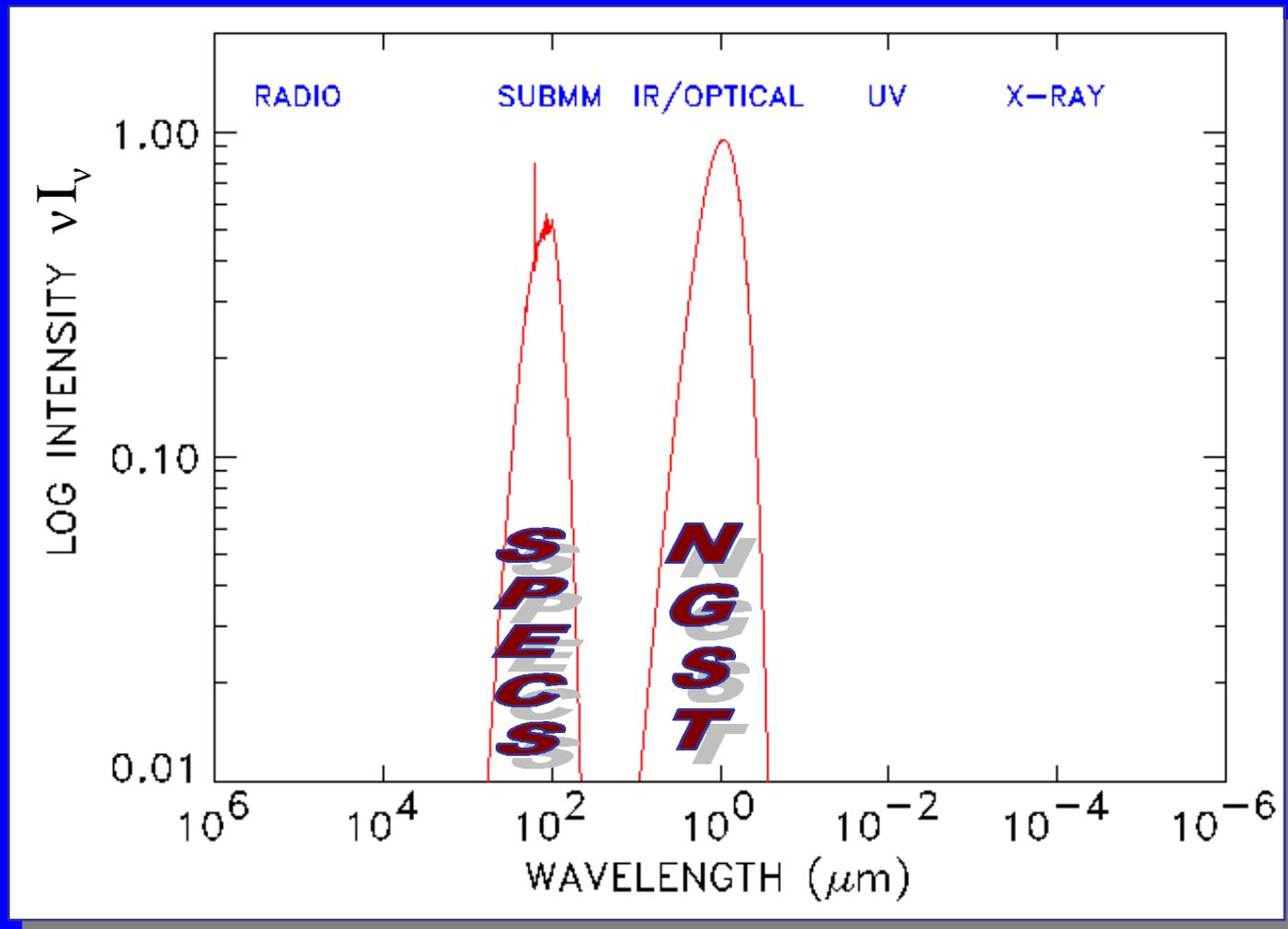


**Big Bang**

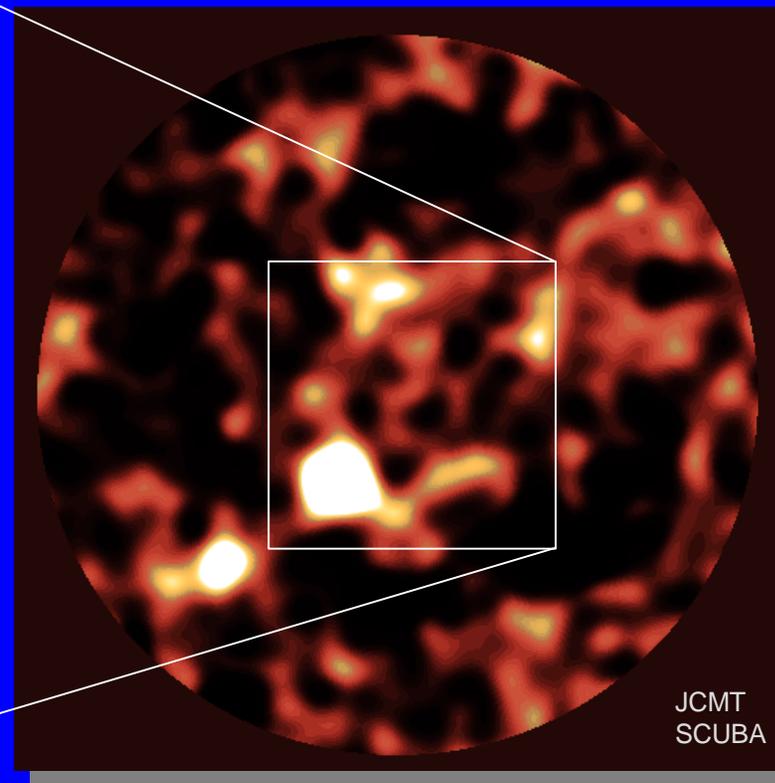
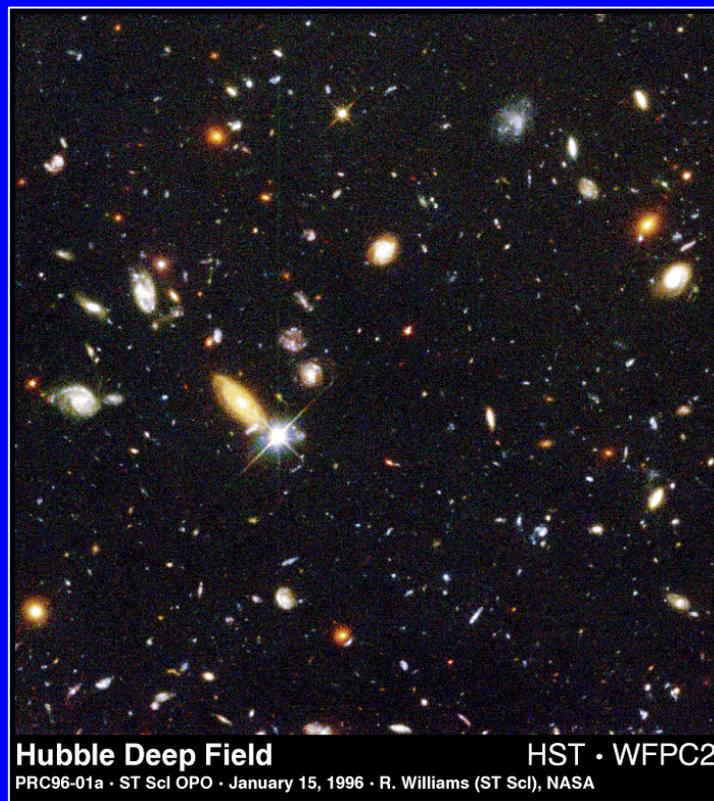
What is the cosmic history  
of heavy element (C, N, O,  
etc.) and solid material  
(dust) formation?

**Life**

Half of the luminosity and most of the photons in the post-Big Bang Universe are in the far-infrared and submillimeter



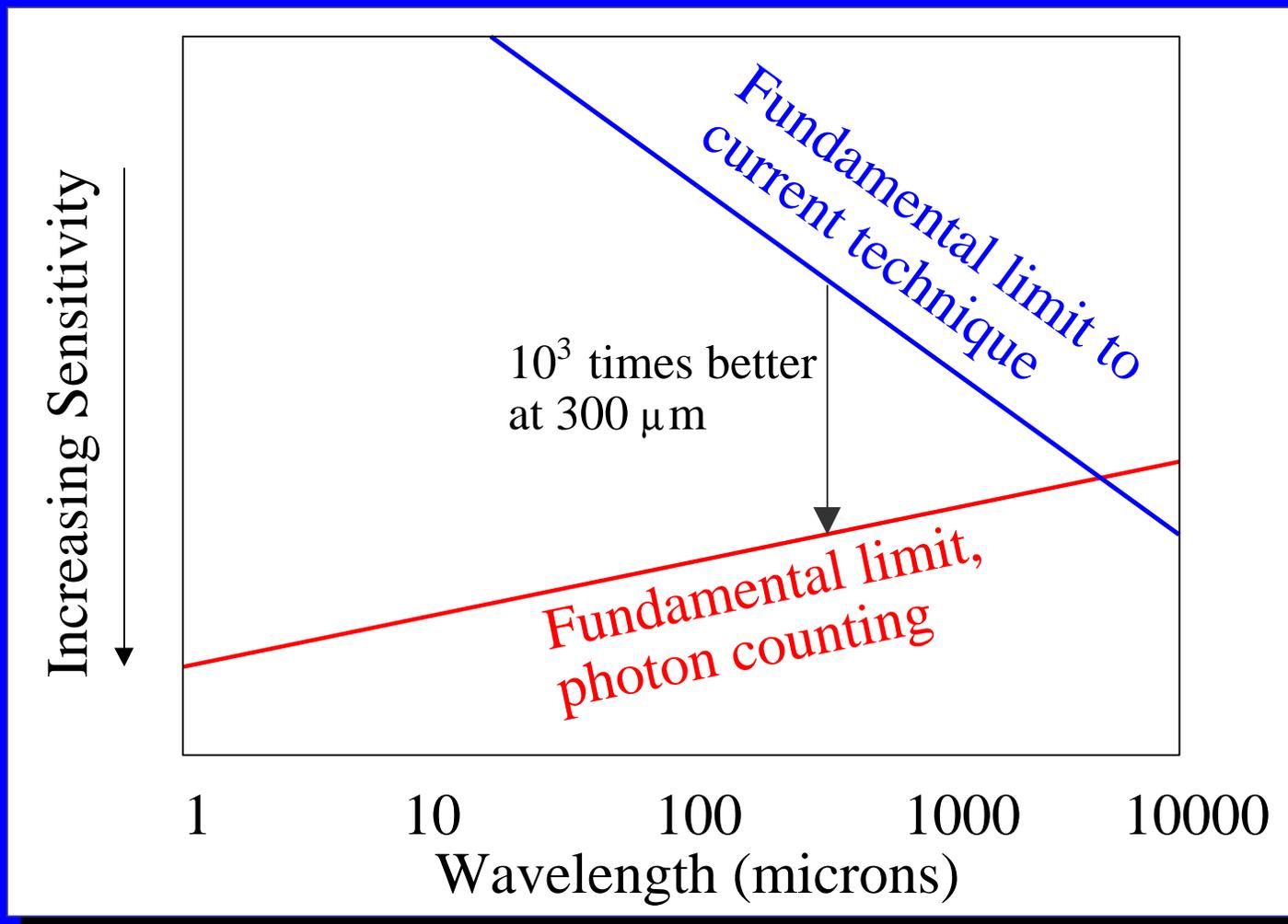
Our present view of the Universe in  
the submillimeter, instead of looking  
like this, looks like this



- To get adequate spatial resolution a large aperture ( $\sim 1$  km) is needed
- With next-generation detectors, since far-infrared photons are plentiful, the aperture need not be filled

The first galaxies can be seen with an interferometer using arrays of photon-counting FIR/SMM detectors, maybe a spin-stabilized formation of cold, lightweight mirrors

# Large arrays of photon-counting detectors will be needed



# Space Science Drives New Technology

New technology enables  
revolutionary science

Photon-counting FIR  
detector arrays

Spin-stabilized  
tethered formation

Active coolers

Deployable optical  
components

