John C. Mather
Senior Project Scientist (1995-2023), James Webb Space Telescope

TITLE: What did we find with the James Webb Space Telescope, and what's next?

The James Webb Space Telescope was launched on Dec. 25, 2021, and commissioning was completed in early July 2022. With its 6.5 m golden eye, and cameras and spectrometers covering 0.6 to 28 μm, Webb is already producing magnificent images of galaxies, active galactic nuclei, star-forming regions, and planets. Scientists are hunting for some of the first objects that formed after the Big Bang, the first black holes (primordial or formed in galaxies), and beginning to observe the growth of galaxies, the formation of stars and planetary systems, individual exoplanets through coronography and transit spectroscopy, and all objects in the Solar System from Mars on out. Plasma processes control the growth of stars, planets, and black holes, and the release of rotational energy through jets from protostars and active galactic nuclei (accreting black holes). I will show how we built the Webb and what we have learned so far. The greatest surprise, still not explained, is that the first galaxies grew faster, hotter, larger, brighter, and more massive than we had predicted. After Webb, we have ambitions for even more powerful telescopes. Webb is a joint project of NASA with the European and Canadian space agencies.

Bio

Dr. John C. Mather is a Senior Astrophysicist and is the Senior Project Scientist for the James Webb Space Telescope (JWST) at NASA's Goddard Space Flight Center. Since the project start in 1995 until 2023, he has led the JWST science teams. As a postdoctoral fellow at NASA's Goddard Institute for Space Studies he led the proposal efforts for the Cosmic Background Explorer (74-76), and came to GSFC to be the Study Scientist (76-88), Project Scientist (88-98), and the Principal Investigator for the Far IR Absolute Spectrophotometer (FIRAS) on COBE. With the COBE team, he showed that the cosmic microwave background radiation has a blackbody spectrum within 50 parts per million, confirming the expanding universe model to extraordinary accuracy. The COBE team also made the first map of the hot and cold spots in the background radiation (anisotropy). Dr. Mather received the Nobel Prize in Physics (2006) with George Smoot, for the COBE work.