The James Webb Space Telescope

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The James Webb Space Telescope (JWST) is a large, infrared-optimized space telescope. JWST's primary science goal is to detect and characterize the first galaxies. It will also study the assembly of galaxies, star formation, and the formation of evolution of planetary systems. The observatory has a large primary mirror 6.5 meter in diameter, designed to deliver high angular resolution in the infrared, combined with a large collecting area. The telescope optics are designed and fabricated to operate at the cryogenic temperatures (~40 k) required for an IR optimized telescope. The primary mirror is also a segmented mirror architecture. The observatory is designed to achieve cryogenic operating temperature via passive cooling, facilitated by a five-layer sunshield which keeps the telescope in the sun's shadow. Since the observatory dimensions exceed the Ariane 5 fairing size, the observatory has to be stowed for launch and deployed following launch. The observatory will be launched into an L2 orbit that provides continuous science operations and a benign thermal environment for optical stability.

JWST has four science instruments designed to provide a full complement of imaging and spectroscopic capabilities over the 0.6 micron to 29 micron wavelength range. The Near-Infrared Camera (NIRCam) is a deep wide field imager, design to conduct first light imaging surveys. NIRCam is also used to make the measurements necessary to phase the optical train, and to conduct high-contrast coronagraphy. The Near-Infrared Spectrograph (NIRSpec) is multi-object spectrograph built by the European Space Agency. NIRSpec features a unique micro-shutter array of spectroscopic slits built by the Goddard Space Flight Center (GSFC) that permits selection of up to 100 objects in the field of field. The ability to conduct spectroscopic follow-up of

~100 objects simultaneously yields significant efficiency gains. The Mid-Infrared Imager (MIRI) is an imaging camera that combines deep imaging with high contrast coronagraphy, and an integral field unit spectrograph. MIRI is built by a European Consortium in collaboration with the Jet Propulsion Laboratory. Finally, the Fine Guidance Sensor (FGS) and Tunable Filter Imager (TFI) are built by the Canadian Space Agency (CSA). The FGS monitors image jitter and provides signals to the telescope's fine steering mirror to correct for the jitter. Packaged with the FGS is the TFI, an imaging camera which employs a tunable filter to provide R~100 narrowband imaging.