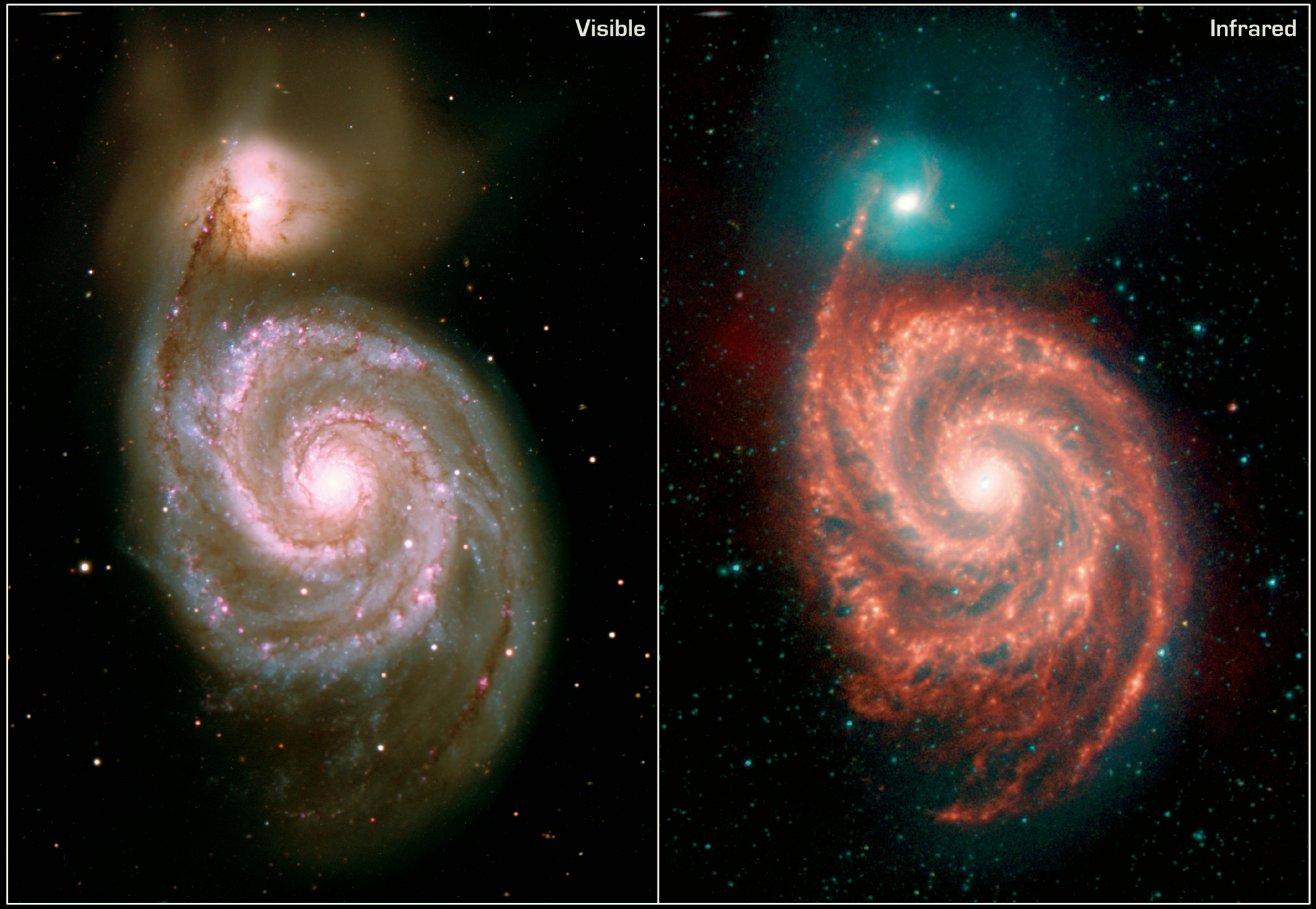

Spiral Galaxy M51 ("Whirlpool Galaxy")

NASA / JPL-Caltech /
R. Kennicutt (Univ. of Arizona)

SPITZER SPACE TELESCOPE

The Whirlpool Galaxy in Visible and Infrared

New Take on an Old Favorite

The Whirlpool Galaxy, located approximately 30 million light-years away in the constellation Canes Venatici, has long been a favorite target for professional and amateur astronomers alike. The spectacular whirlpool structure that gives this object its name is thought to be caused by an ongoing collision between two galaxies. Now, NASA's Spitzer Space Telescope is showing us a brand-new view of this old favorite.

Spitzer captured this infrared image of the Whirlpool Galaxy (also known as M51), revealing strange structures bridging the gaps between the dust-rich spiral arms, and tracing the dust, gas, and stellar populations in both the bright spiral galaxy and its companion. The Spitzer image is a four-color composite of infrared light, showing emission from wavelengths of 3.6 microns (blue), 4.5 microns (green), 5.8 microns (orange) and 8.0 microns (red). These wavelengths are roughly 10 times longer than those of the visible light that can be seen by the human eye. A micron is one-millionth of a meter; a human hair is about 100 microns thick.

The visible-light image comes from the Kitt Peak National Observatory 2.1-m telescope, and has the same orientation and size as the Spitzer infrared image, measuring 9.9 by 13.7 arcminutes (north is up). Also a four-color composite, the visible light image shows emissions from 0.4 to 0.7 microns, including the H-alpha nebular feature (red in the image).

A comparison of the Whirlpool Galaxy in visible and infrared light clearly demonstrates the unique observational abilities of the Spitzer Space Telescope, which allows us to dissect galaxies into their various constituent parts. At shorter wavelengths (in the visible-light spectrum and in the infrared from 3.6 to 4.5 microns), the light comes mainly from stars. This starlight fades at longer wavelengths (5.8 to 8.0 microns), where we see the glow from clouds of interstellar dust. This dust consists mainly of a variety of carbon-based organic molecules known collectively as polycyclic aromatic hydrocarbons. Wherever these compounds are found, there will also be dust granules and gas, which provide a reservoir of raw materials for future star formation. Polycyclic aromatic hydrocarbons are also found on Earth, on burnt toast and in car exhaust, among other places.

Astronomers are particularly puzzled by the large number of thin filaments of red emission seen in the infrared image between the arms of the large spiral galaxy. In contrast to the beady nature of the dust emission seen in the arms themselves, these spoke-like features are thin and regular, and prevalent in the gaps all over the face of the galaxy.

The distribution of gas and dust between the spiral and its faint companion also interests astronomers greatly. While the spiral galaxy is bright at the longer infrared wavelengths – indicating that it is rich in dust and actively forming new stars – its smaller, blue companion shows little infrared emission and hosts an older stellar population. Star formation in M51 is thought to be triggered by the ongoing collision between the two galaxies. One of the goals of these observations is to understand the impact the interaction of galaxies has on star formation.

The Spitzer observations of M51 are part of a large, 500-hour science project known as the Spitzer Infrared Nearby Galaxy Survey, which will comprehensively study 75 nearby galaxies. From the data collected by this survey, astronomers will probe the physical processes connecting star formation to the properties of galaxies. This information will provide a vital foundation of data, diagnostic tools, and astrophysical inputs for understanding the distant universe, ultraluminous galaxies, and the formation and evolution of galaxies.

NASA's Jet Propulsion Laboratory manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington, D.C. JPL is a division of Caltech. For more information about Spitzer visit http://www.spitzer.caltech.edu