

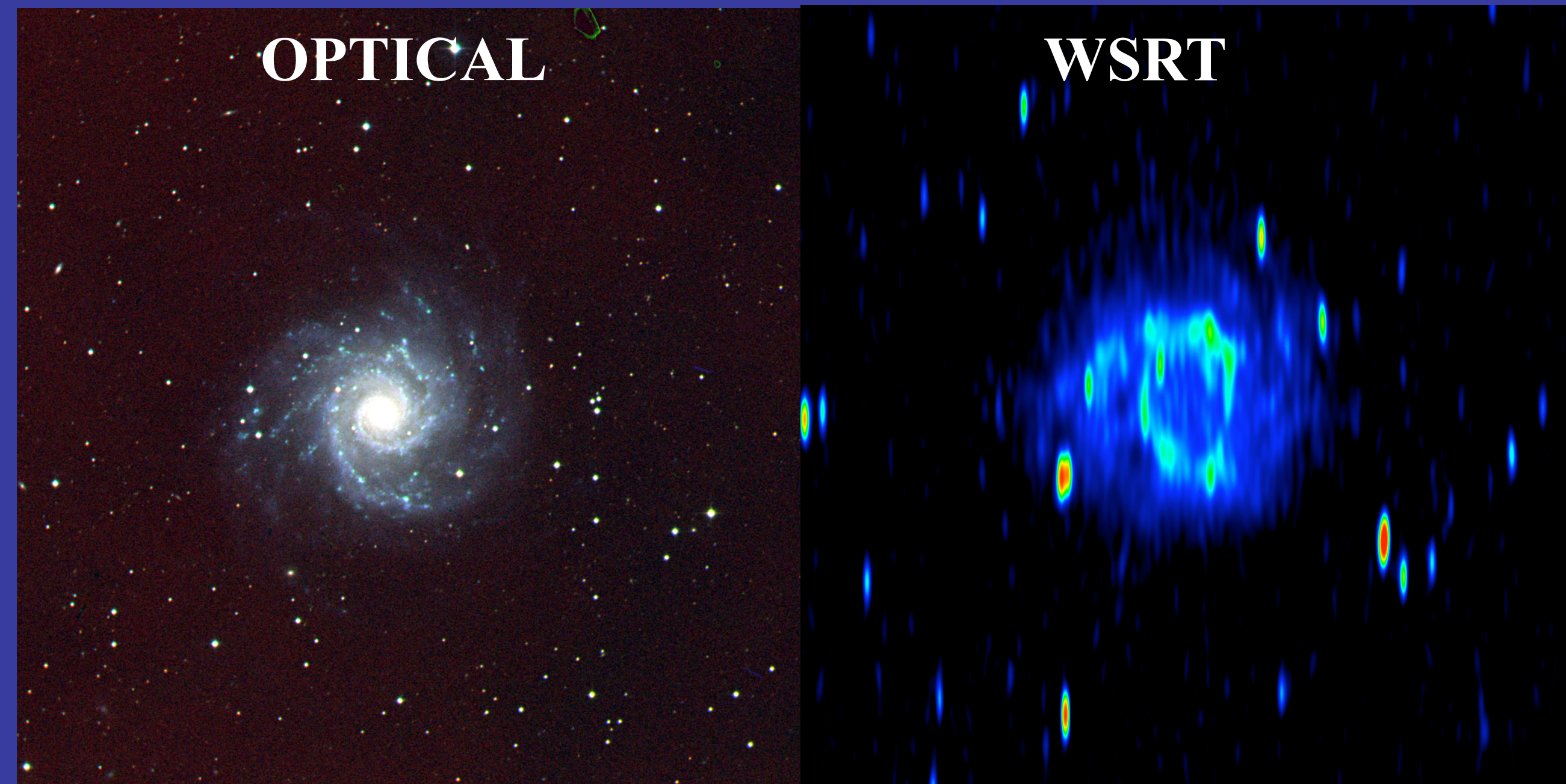
# Astronomy with the WSRT

## The Westerbork SINGS Survey

One of the biggest unanswered questions in astronomy is how stars form in galaxies. To make progress toward answering this question, data in many different wavelength ranges are needed, for a large number of galaxies. A large survey, called SINGS, is underway in the astronomical community. It includes observations in the optical, infrared, and radio bands. A very important subset of information comes from WSRT observations of the radio continuum, which gives us crucial information about the ongoing star formation.

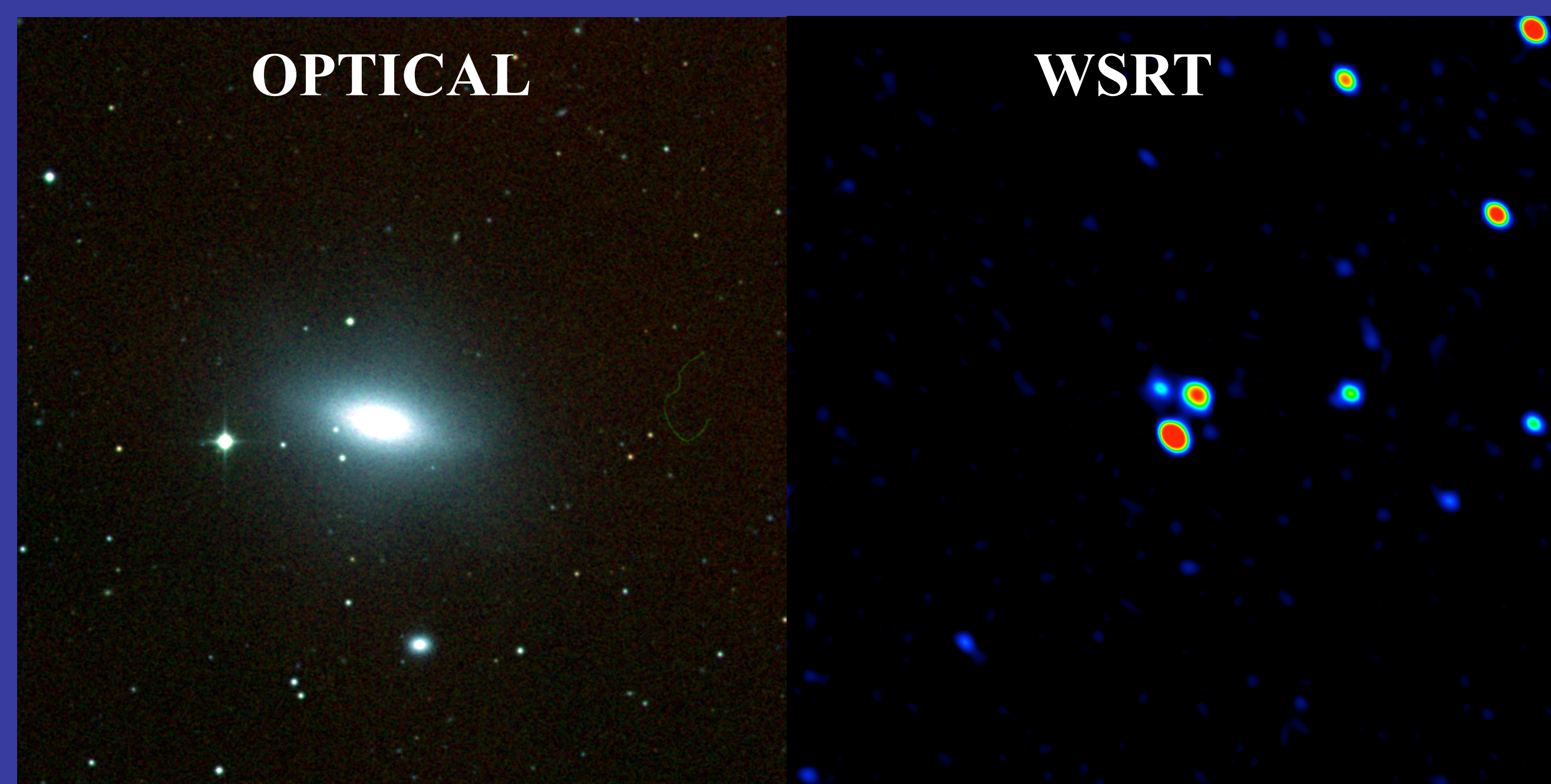
**The WSRT has been used to image 34 galaxies in the radio continuum. Five examples are shown here. Optical images are also shown for comparison.**

The WSRT observations made use of the 160 MHz broad-band IF system (8 sub-bands of 20 MHz with 64 channels in each sub-band) covering the frequency ranges 1300-1432 and 1631-1763 MHz. The data from the 1300-1432 MHz band are shown in this poster.



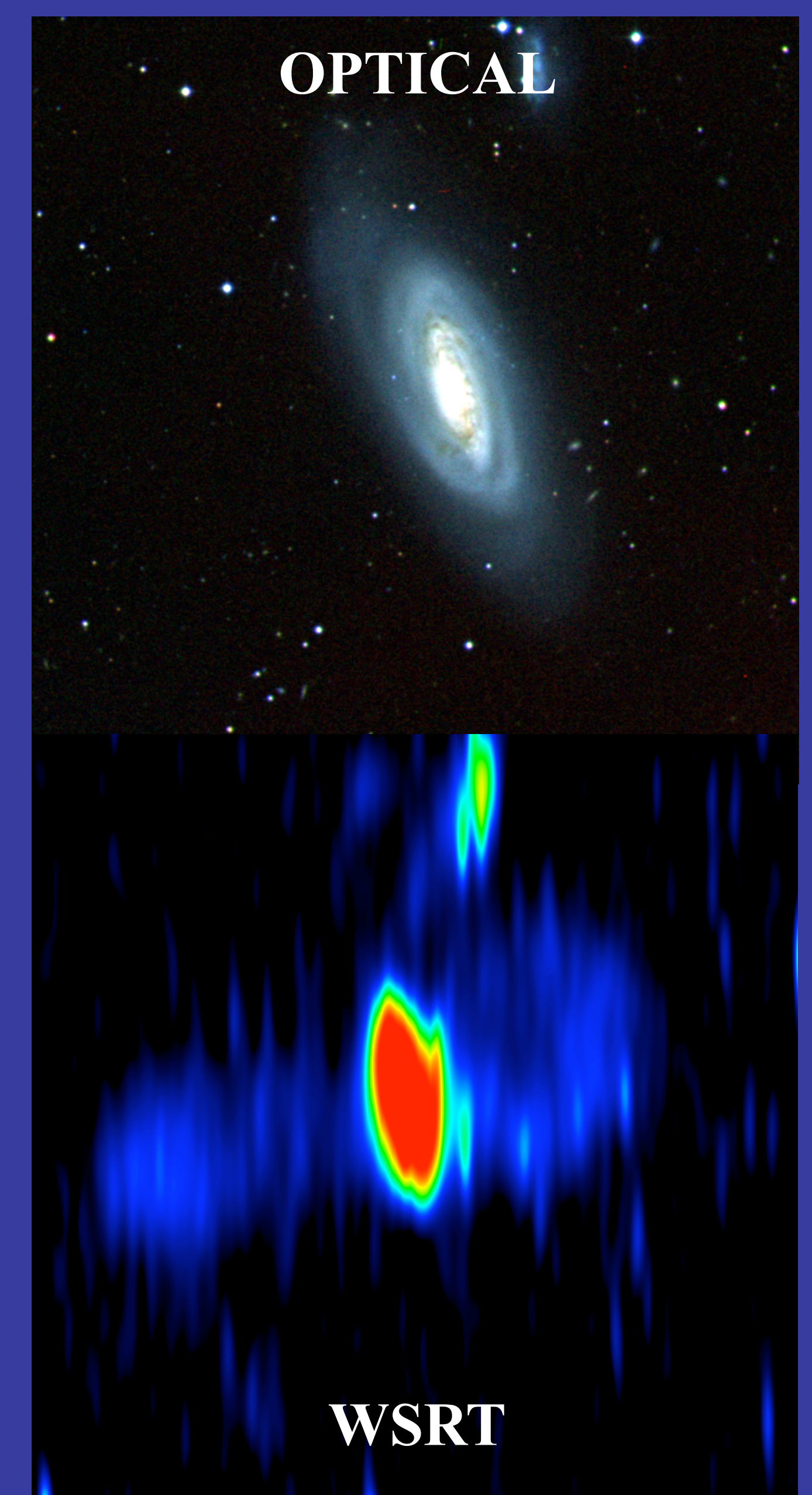
**NGC 628 (M74)**

This spiral galaxy is seen face-on, and has beautiful spiral arms in the optical. Continuum emission is detected everywhere in the disk. The brightest regions correspond to the spiral arms, where most of the star formation is happening now.



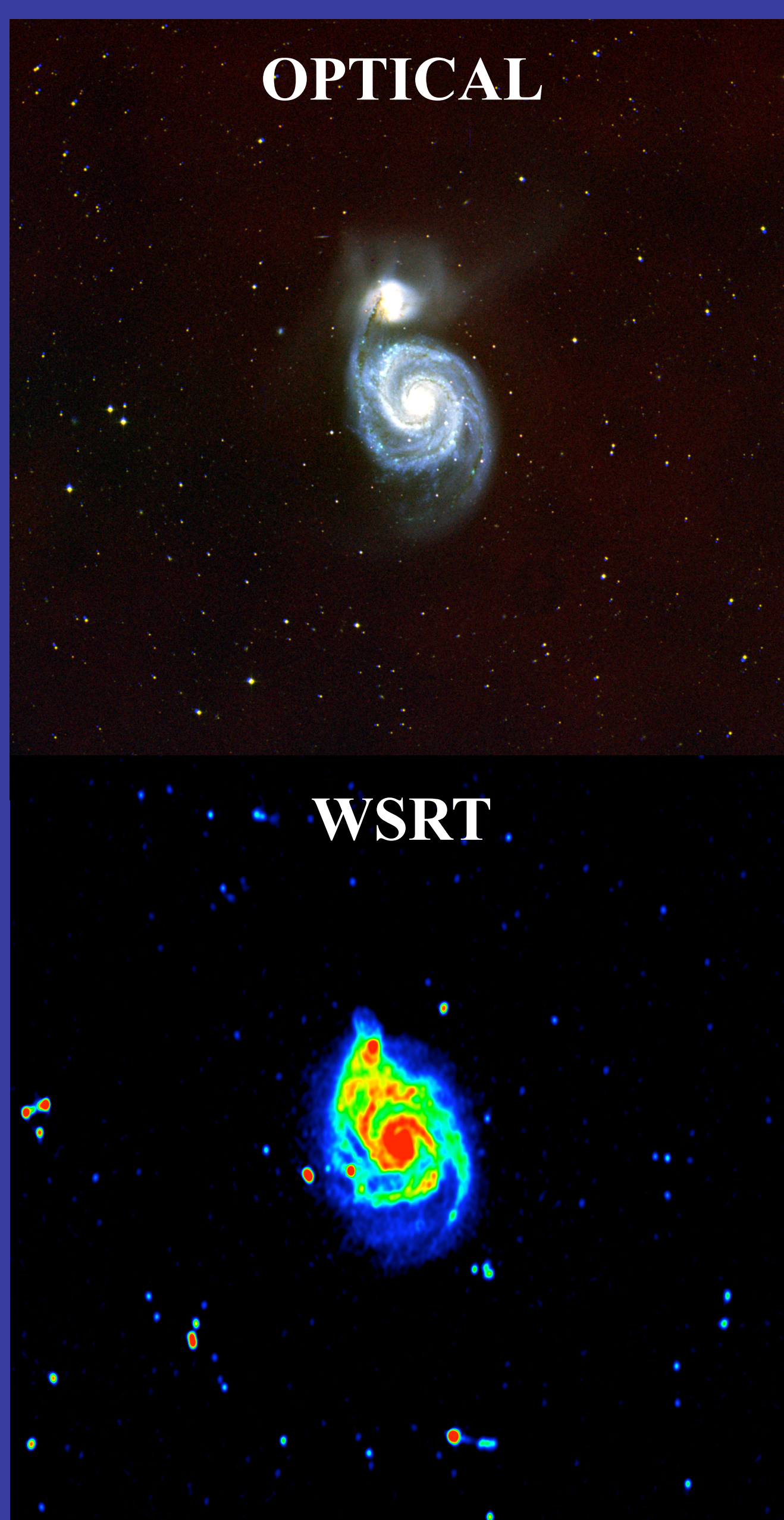
**NGC 4125**

This is an elliptical galaxy, made mostly of old stars. Because there is so little ongoing star formation, the continuum emission is not detected brightly like in the other galaxies shown in this poster. The faint dot in the middle is from the central part of NGC 4125, but the two brightest nearby spots are actually from a different, very distant, background galaxy!



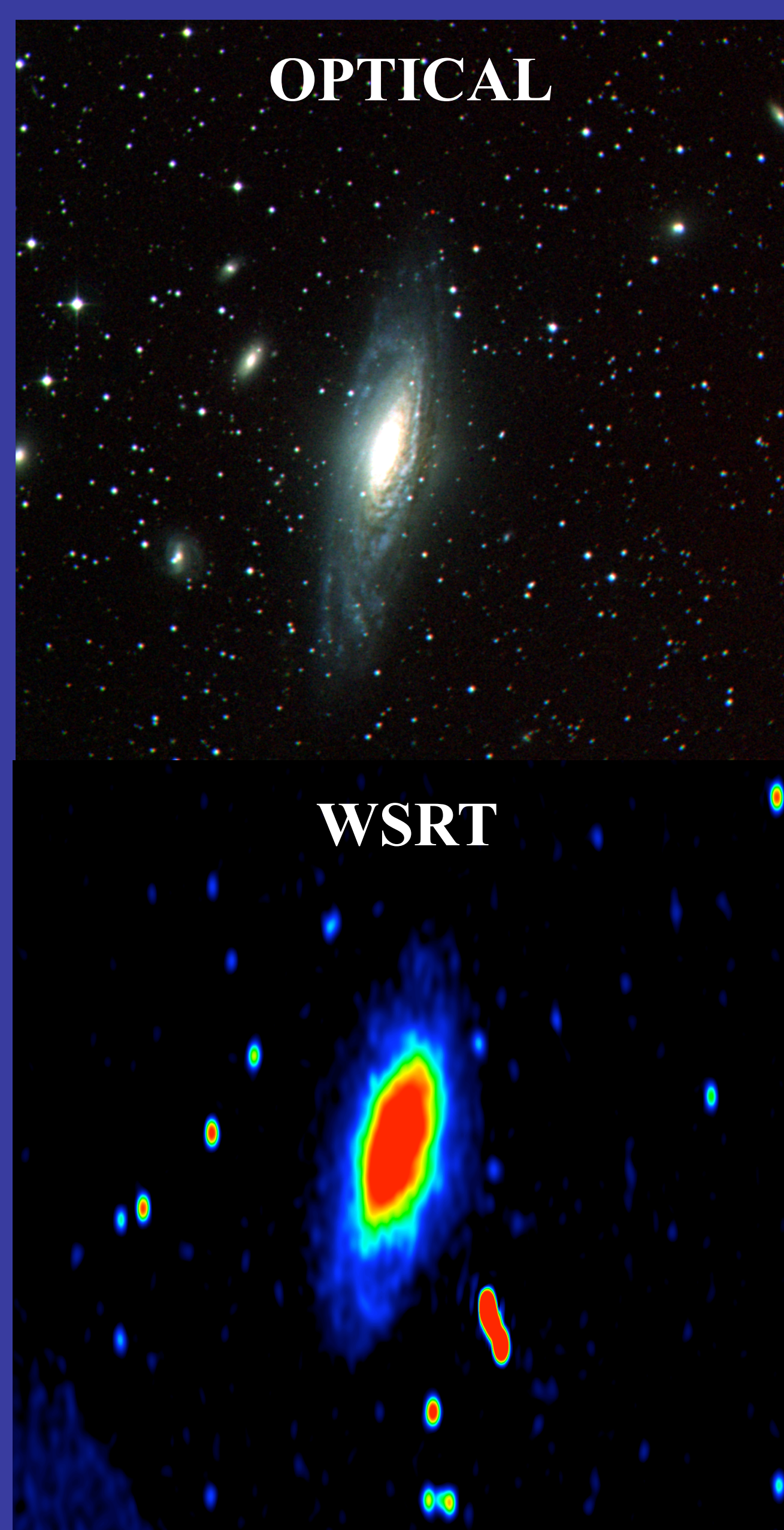
**NGC 4569 (M90)**

This galaxy shows continuum emission in the disk where the stars are forming. But this galaxy also has a surprise in store for us: two big plumes of continuum emission coming out perpendicular to the disk! The origin of this continuum emission is related to magnetic fields in the plumes. The two big plumes were probably pushed out by a huge amount of star formation in the nucleus of the galaxy. The plumes extend as much as 100,000 light years from the middle of the galaxy!



**NGC 5194 (M51)**

This famous galaxy is interacting with the smaller companion to the north. The continuum emission detected with WSRT is very bright especially in the spiral arms, but notice that the companion galaxy is not very bright!



**NGC 7331**

This galaxy shows smoothly distributed continuum emission everywhere in the disk, but it is especially bright in the inner regions. Notice all of the bright dots in the nearby area -- these are background galaxies at very large distances from the Earth.

The data shown here complement the SINGS survey, which is extremely important for better understanding star formation in galaxies. Now that 34 of these galaxies have been observed with WSRT, even more can be learned. For example, astronomers are currently using these WSRT data to investigate the relationship between radio emission and infrared emission, as well as the magnetic field structure in these galaxies.

The optical images shown in this poster are from the DSS. See [http://archive.stsci.edu/cgi-bin/dss\\_form/](http://archive.stsci.edu/cgi-bin/dss_form/) for more information.