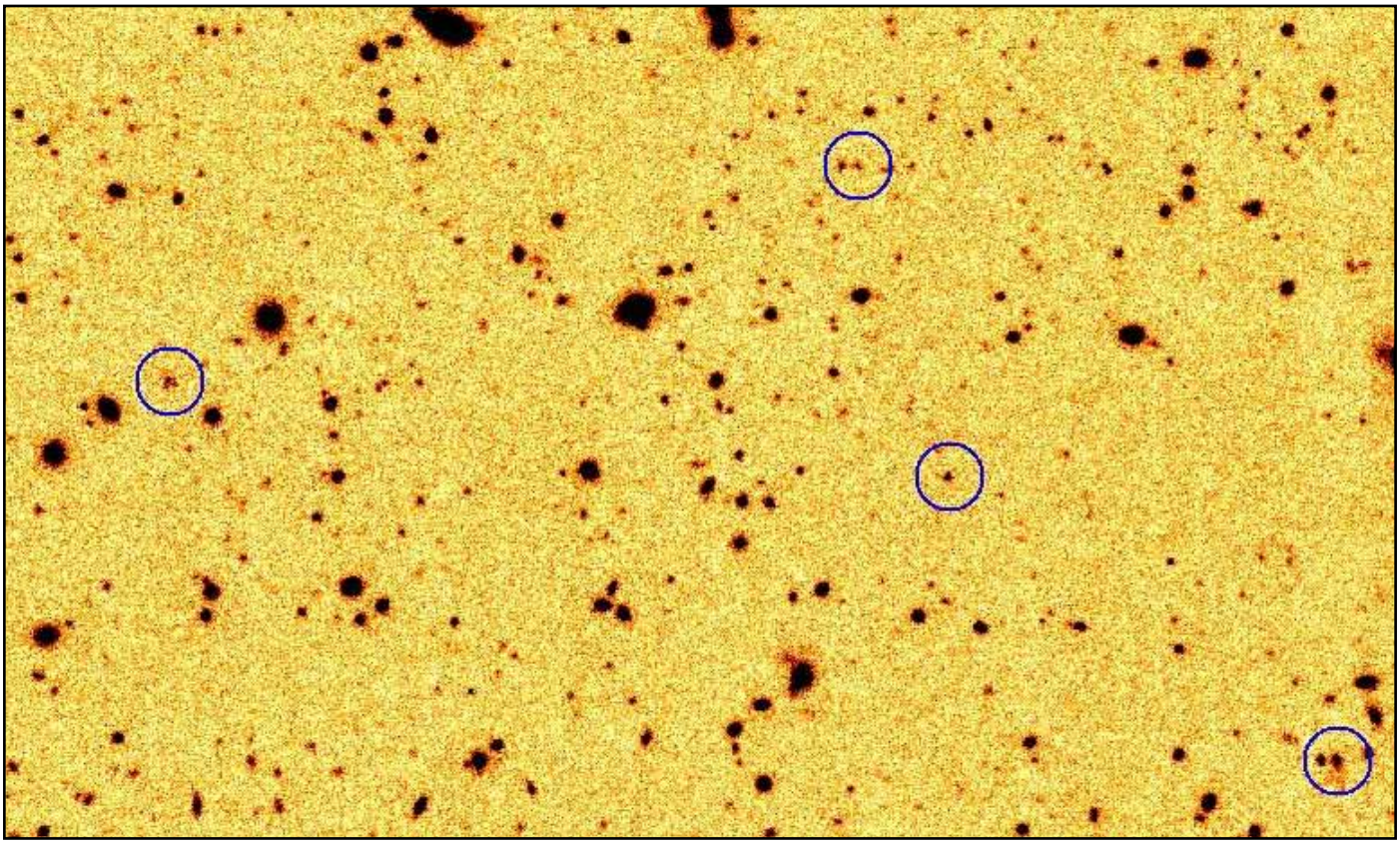
The Leverhulme Trust

Awards in Focus

Galaxy buildup over the first half of cosmic time



One of the most important questions of modern astronomy is how galaxies, including our own, have formed and evolved to constitute the Universe we see today. My research consists in studying the early stages of galaxy evolution, when the Universe was only a fraction of its present age. For this, I analyse some of the deepest images taken in space and ground-based observatories with, for example, the Spitzer Space Telescope, the UK Infrared Telescope (UKIRT), and the new European VISTA telescope. My studies are also useful to help planning the observations of very faint galaxies in the early Universe to be made with the future James Webb Space Telescope (JWST), which will be launched in 2014.

Current cosmological theories predict that massive galaxies form through the merging of smaller units, usually triggering new star formation. Thus, finding the building blocks of present-day massive galaxies in the early Universe is fundamental to test this scenario. To learn how galaxies were in the past, I look for very distant objects in deep maps of the sky at different wavelengths. The use of infrared images is particularly important in my analysis, as infrared wavelengths are sensitive to the stellar light emitted by distant galaxies without being too affected by interstellar dust extinction. With the complementary multi-wavelength follow up, I am able to understand the evolution of these galaxy populations, as well as quantify the amount of star formation and growth of stellar mass with cosmic time.

The Leverhulme Trust supports my research on galaxy evolution in the early Universe, as well as my current work for the Mid-Infrared Imager (MIRI) that will be on-board the JWST. As a member of the European MIRI Consortium, I work in the instrumental testing and scientific planning of MIRI observations. The much greater sensitivity and better spatial resolution of MIRI at infrared wavelengths will allow me to extend my galaxy evolution studies to smaller and more distant galaxies. This is particularly exciting, as I will be able to probe the physical conditions of galaxy formation in the first instances of cosmic time, when the Universe was less than a billion (1,000,000,000) years old.

Dr Karina Caputi
University of Edinburgh

Karina was awarded an Early Career Fellowship grant in 2009, providing £58000 over 24 months.

Deep infrared image of a region of the sky. The blue circles highlight massive distant galaxies in the field. The light we receive from these galaxies today was emitted when the Universe was around 15% of its present age.