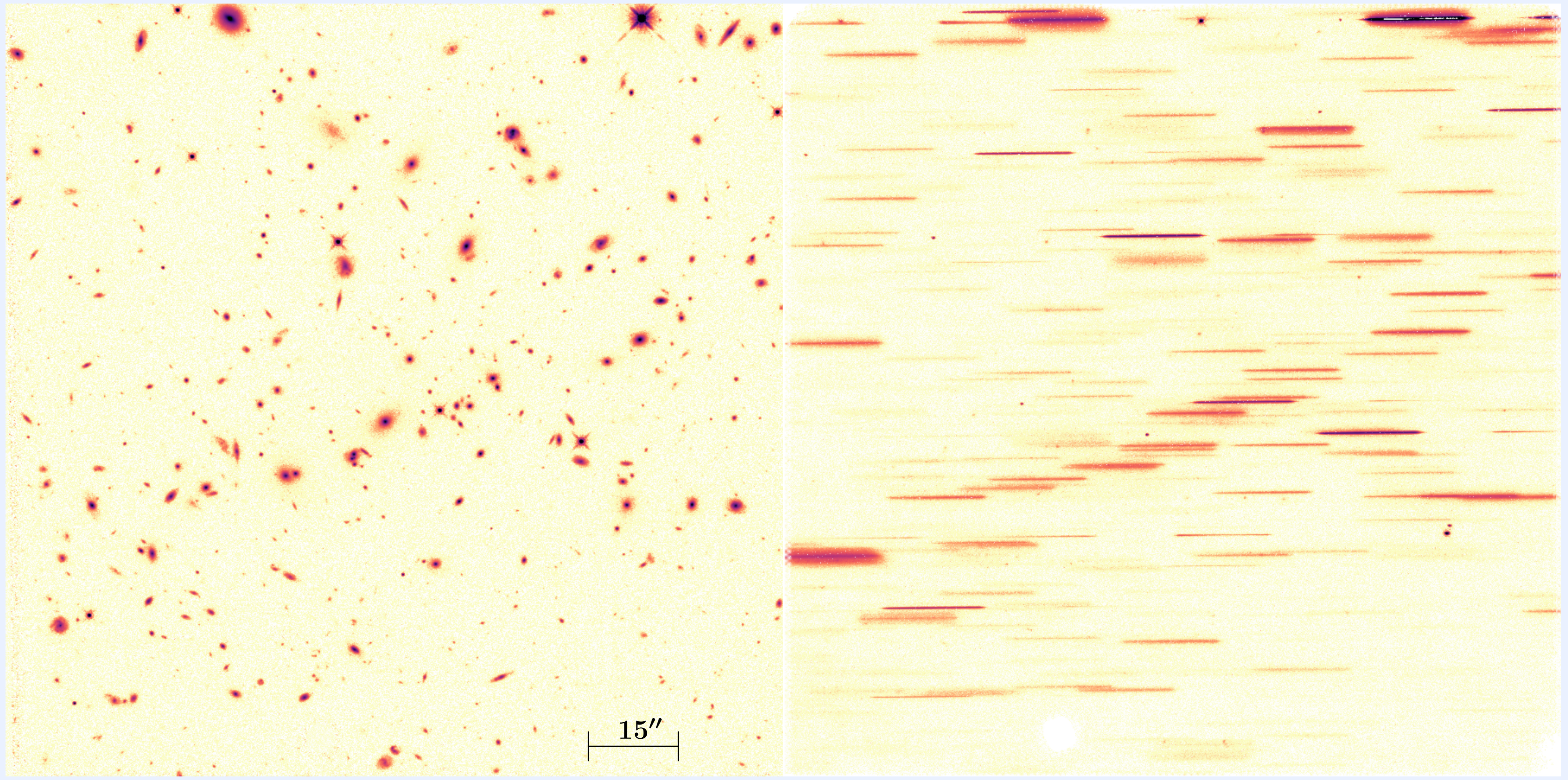
Direct image of Galaxy Cluster | Grism image of Galaxy Cluster



Slitless spectroscopy uses the combination of a diffraction grating and prism (a "grism") to create an image of a galaxy at every wavelength within some range. The image above on the left is an image of a Galaxy Cluster taken using the *Hubble Space Telescope* using a single filter. You can think of this as an image of the Galaxy Cluster at some fixed wavelength of light. The image to its right shows the grism spectra for the same Galaxy Cluster also obtained using the *Hubble Space Telescope*. You can see that grism spectra look like horizontal streaks. Each streak is actually images of the same galaxy at different wavelengths, very close together side-by-side with some overlap.

The biggest advantage of grism spectroscopy is that an Astronomer can obtain a spectrum of every galaxy in the field-of-view. However, this comes at a cost. As you can see, many of the grism spectra run into one another, or are almost on top of each other. Unlike conventional spectroscopy with slits, grism spectroscopy comes with high levels of contamination. This contamination is removed using sophisticated software developed specifically to process such images.

In my PhD, I found that when space-based grism spectroscopy is combined with a sufficiently large amount of imaging using different coloured filters, it is almost as successful as conventional spectroscopy in identifying galaxies that are members of a cluster. Usually, cluster members are identified using conventional spectroscopy which can be expensive to obtain. This result is best seen by the tight clustering of green crosses (secure cluster members) in the second column compared to the first column (no spectroscopy) of the plot to the right. Click the link below to find out more about this work.