Identifying and Massing Galaxies

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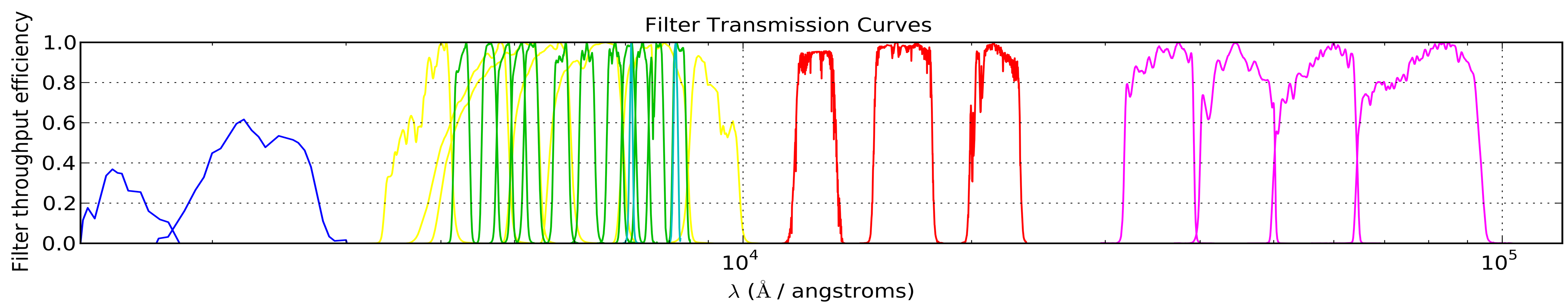
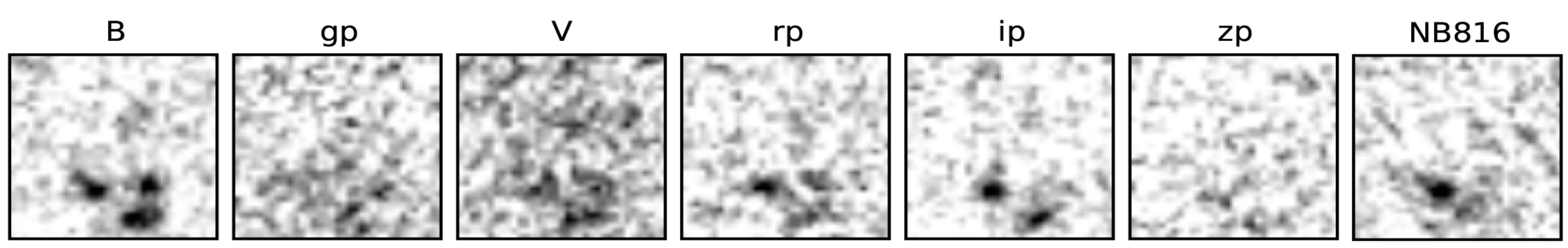
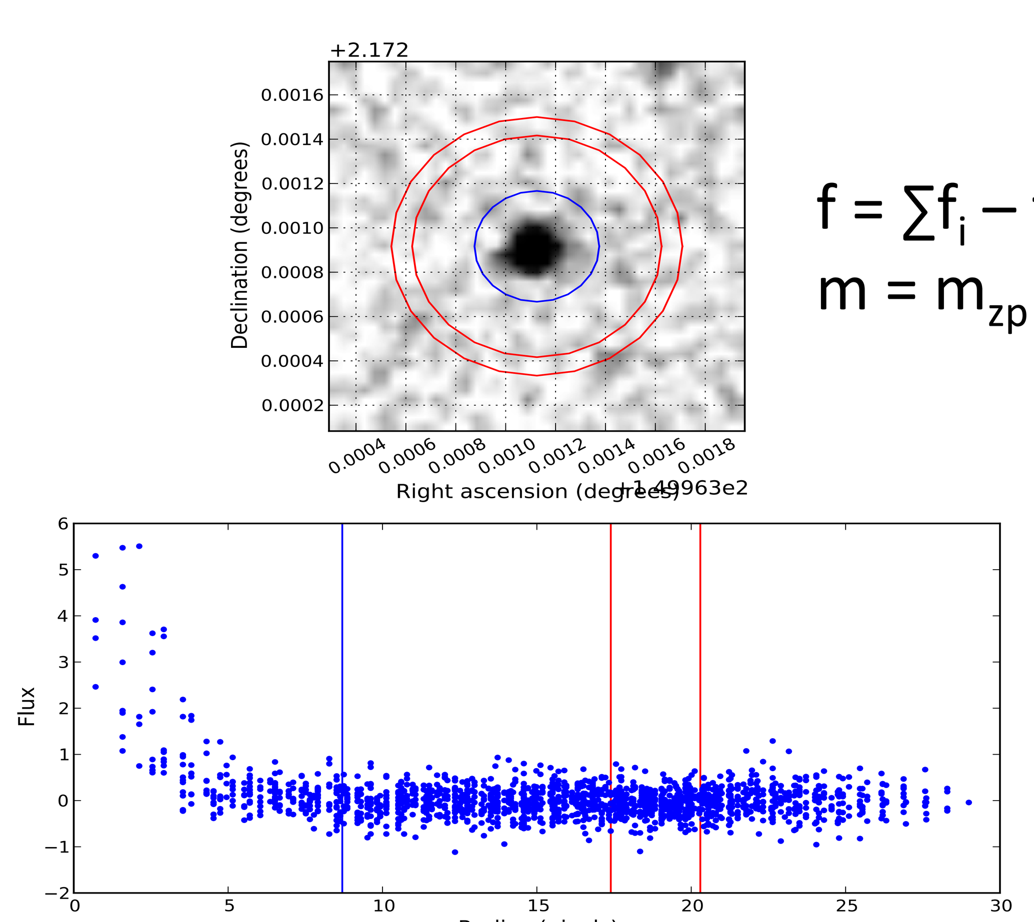
Previous Work

The objects we are looking have already been identified using spectroscopy, a technique which can be used to determine the emitted spectrum of an object very precisely, but does not give a good idea of where it is physically. In particular, many of the objects identified using spectroscopy don't have clear counterparts in existing object catalogs. The aim of this project is to determine what exactly these objects are and to measure some properties about them.





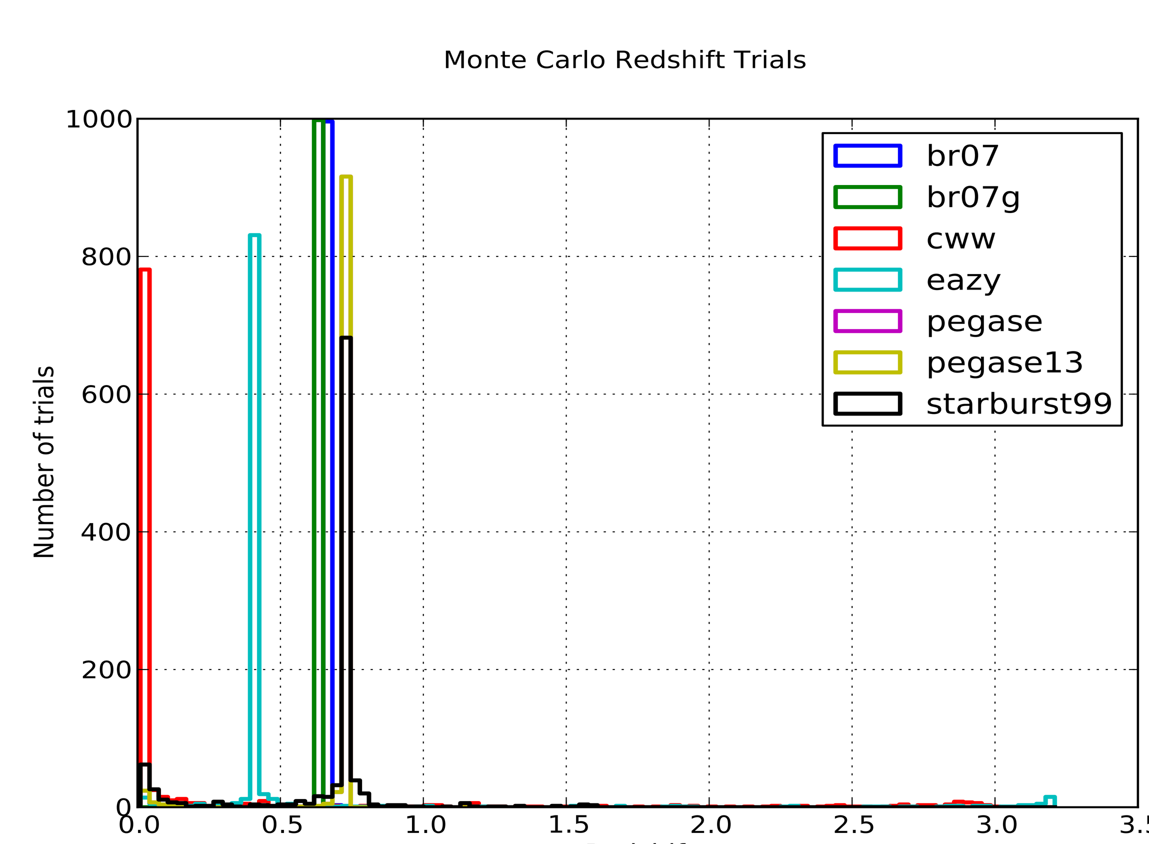
Looking through a telescope does not reveal a full spectrum, but only transmission through certain light filters. We can attempt to recreate the spectrum in areas where the filters are dense (mainly the visual to near infrared range), but for the most part we must work with very limited data. In the top plot, each of curves represents the transmission of one filter. Each of the images below represents the same 5 arcsecond by 5 arcsecond patch of sky as seen through a different filter (1 degree = 3600 arcseconds).



$$f = \sum f_i - f_m * a$$

$$m = m_{zp} - 2.5 \log f$$

To compute the magnitude of an object in a particular filter band, we add up the flux of all of the flux in a circle around the object (blue circle), and subtract the median sky pixel (in the red annulus) multiplied by the area of the blue circle to get the total flux. Magnitude is a logarithmic scale of the total flux scaled to a zero point given in each image. This can then be compared with other bands and other telescopes.



$$z = \frac{\lambda_{\text{obsv}} - \lambda_{\text{emit}}}{\lambda_{\text{emit}}}$$

Once we have each magnitude, we can use a photo-z fitting code which fits the observed data points to templates of what galaxies should look like to find an optimal redshift parameter, which is related to an object's distance based on the cosmological expansion of the universe. Objects farther away will have their light more redshifted. We are interested in determining if the objects identified using spectroscopy are galaxies at the target redshift (approximately 0.65)

Mass and oxygen

By looking in the near infrared and visible ranges of emitted light, we can determine the mass of all of the stars in a galaxy. While this is only a portion of the galaxy's actual mass, it will allow important research to be conducted in the future, such as studying the relationship between a galaxy's mass and it's metal content, a subject of significant interest. We can also identify oxygen emission lines in these galaxies, which tell us the oxygen content of the matter between stars. Accurate measurements of this are an important factor in forming theoretical models about the formation of galaxies

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