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NITARP Workshop

January 9, 2011
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NITARP Scientist



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The Rest of This week



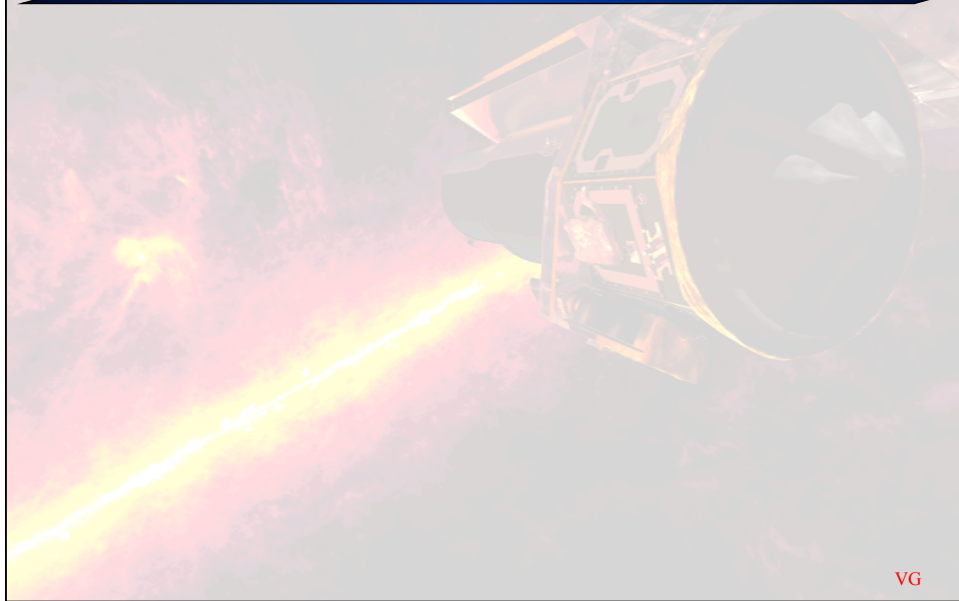
- **Meet Your Team, exchange useful info if not on sheet**
- **Pick your science (Let us know if your tem has a name)**
- **Start Writing Proposals - assign tasks**
- **Pick a date for summer visit (or range of times)**
- **Work on the AAS worksheet as individuals or groups**
- **Due date for props is in March-rewrite until acceptable**
- **The wiki has a ton of useful info**
- **Non-wiki pages are also useful: What you signed up for as part of the program, policies on student visits, thoughts on science fairs, thoughts on poster authorship and acknowledgments (for later), Stuff on RBSE journal, additional telescope options**
- **Non wiki pages also have places for your accomplishments and these do matter so please send them in**
- **Local press release information**

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End Intro



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What is an image?



- **There is nothing unique about an astronomical image**
- **All images on film or on an electronic detector are a recording of different brightnesses of light**
- **There is/has never been a color photograph. All present color images, whether taken by your digital camera or from Hubble, are a combination of several black and white images.**
- **So what is a black and white image?**

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What is a Black and White Image?



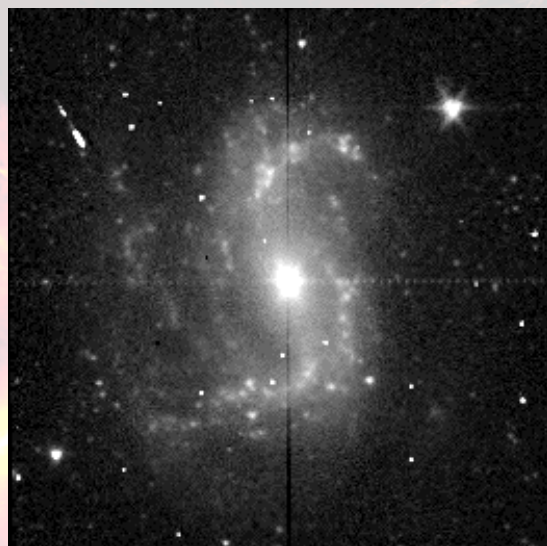
1.0	1.3	1.2	1.2	0.9
0.8	4.3	4.0	3.8	0.7
1.1	3.7	6	4.1	1.5
0.9	4.2	4.3	3.9	1.0
1.2	1.4	1.1	0.8	1.3

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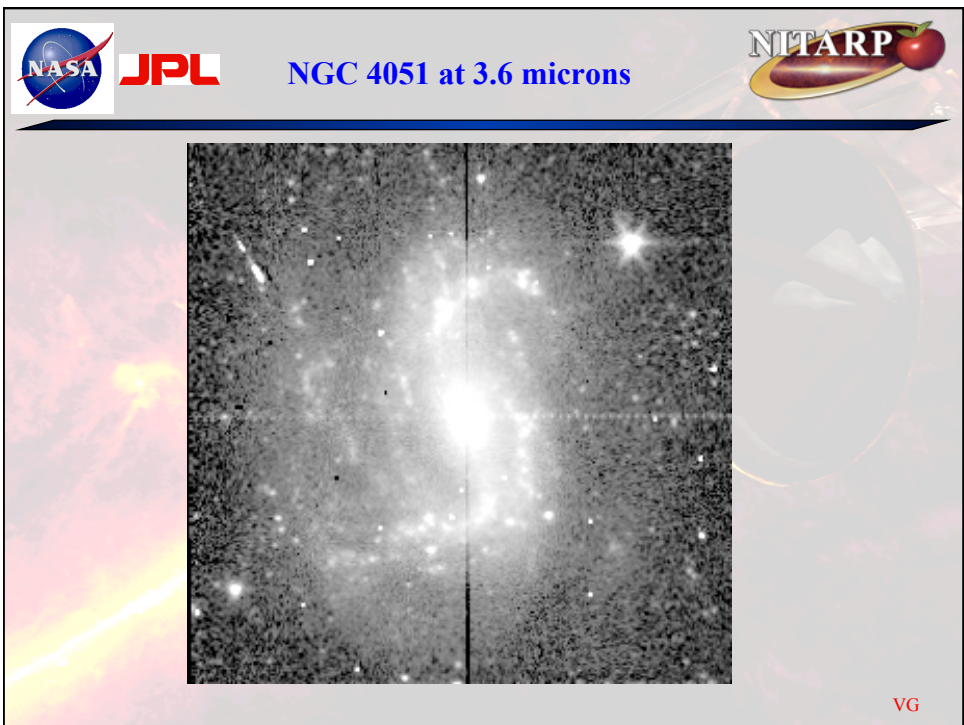
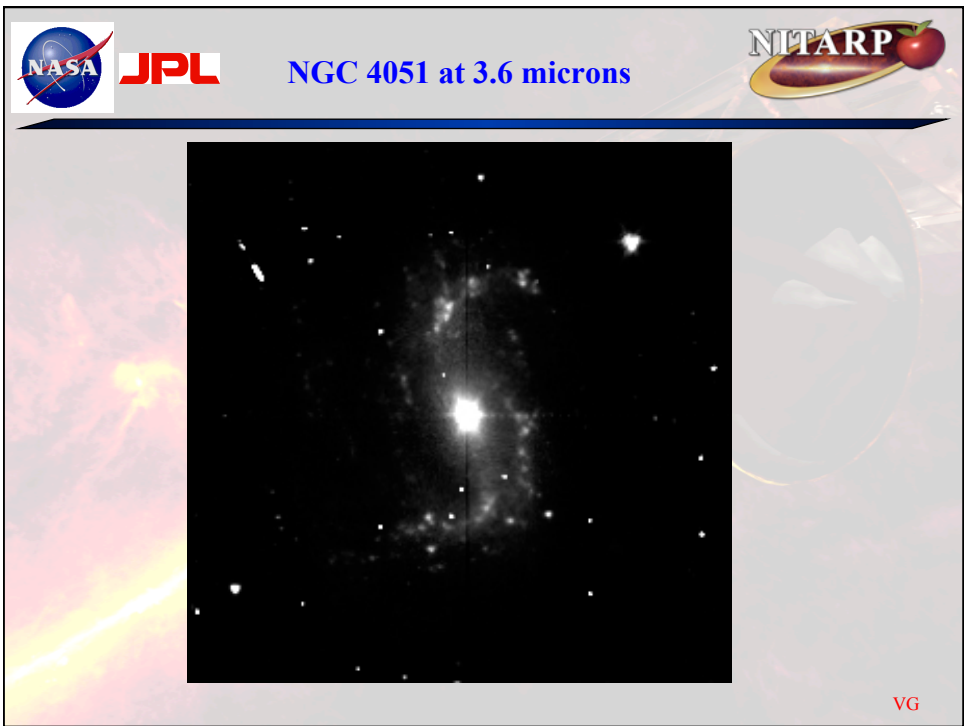


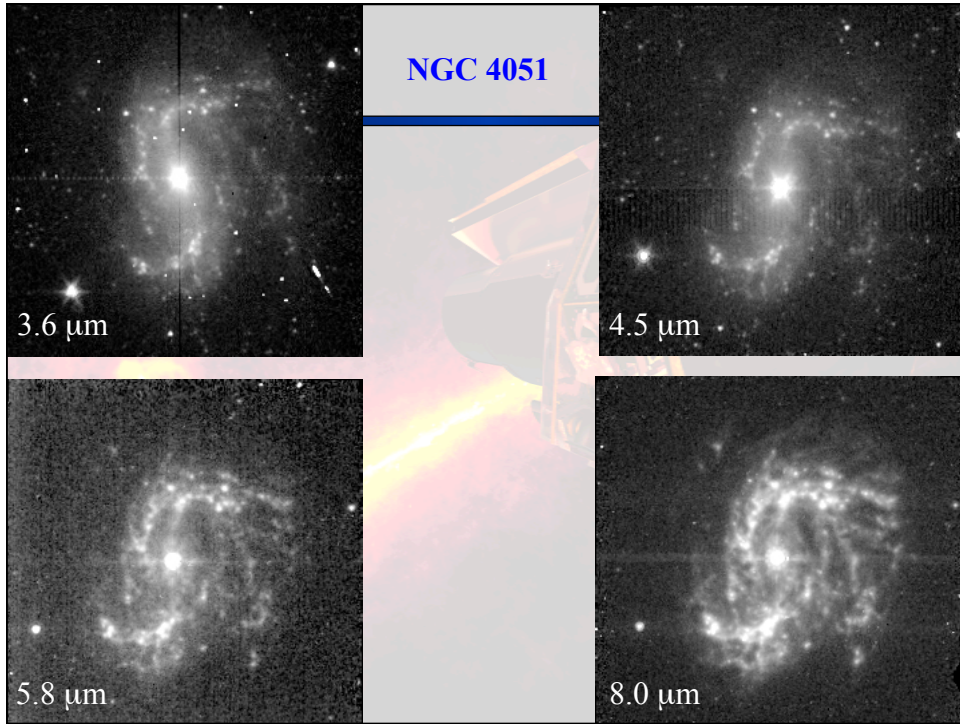
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NGC 4051 at 3.6 microns

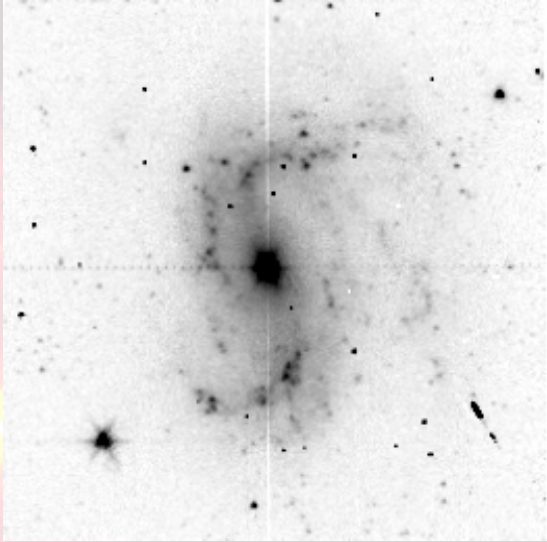


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  **NGC 4051 at 3.6 microns** 



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  **Photometry** 

- So how do we get information from these images?
- Since the electronic detectors ultimately record the amount of light as numbers, the process to measure that amount of light is just a matter of adding numbers.

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Photometry



1.0	1.3	1.2	1.2	0.9
0.8	4.3	4.0	3.8	0.7
1.1	3.7	6	4.1	1.5
0.9	4.2	4.3	3.9	1.0
1.2	1.4	1.1	0.8	1.3

So what is the brightness of the central pixel in this image?

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Photometry



1.0	1.3	1.2	1.2	0.9
0.8	4.3	4.0	3.8	0.7
1.1	3.7	6	4.1	1.5
0.9	4.2	4.3	3.9	1.0
1.2	1.4	1.1	0.8	1.3

Well the amount of light recorded made for 6 units. But is that an actual physical measurement?

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Photometry



1.0	1.3	1.2	1.2	0.9
0.8	4.3	4.0	3.8	0.7
1.1	3.7	6	4.1	1.5
0.9	4.2	4.3	3.9	1.0
1.2	1.4	1.1	0.8	1.3

Well the amount of light recorded made for 6 units. But is that an actual physical measurement? NO!

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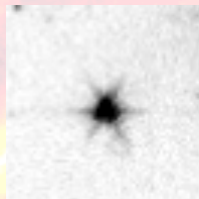


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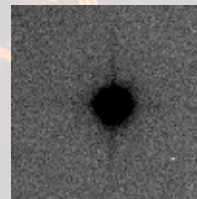
Point Spread Functions



- Any optical system has a finite limit to how small an image it can generate. That is how the optics and the atmosphere spread out the light from a point hence the name Point Spread Function or PSF.



Spitzer PSF



Typical Ground Based PSF

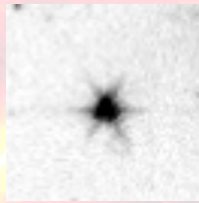
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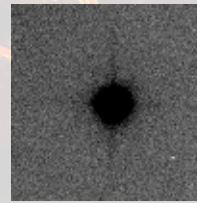
Noise and Background



- Also any image is the sum of the light from what you are imaging combined with noise from your detectors as well as light which is not from your object: sky, telescope, etc.



Spitzer PSF

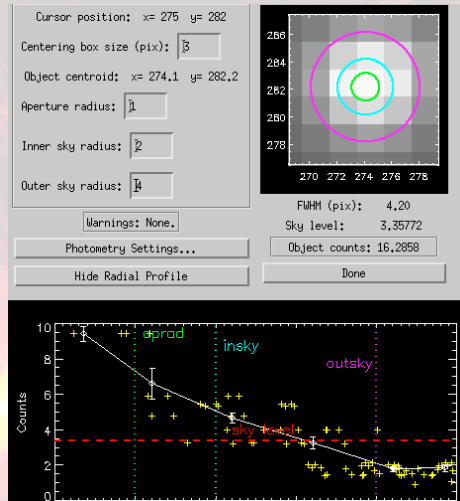


Typical Ground Based PSF

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Photometry



So in measuring the light from a point we need to measure the PSF and subtract out the noise and non-source light

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NASA JPL **Photometry** NITARP

Cursor position: x= 275 y= 282
 Centering box size (pix): 3
 Object centroid: x= 274.1 y= 282.2
 Aperture radius: 1
 Inner sky radius: 2
 Outer sky radius: 4

Warnings: None.
 FWHM (pix): 4.20
 Sky level: 3.35772
 Object counts: 16,2858

Photometry Settings... Hide Radial Profile Done

To be sure we are getting the whole PSF we need to take a radial profile

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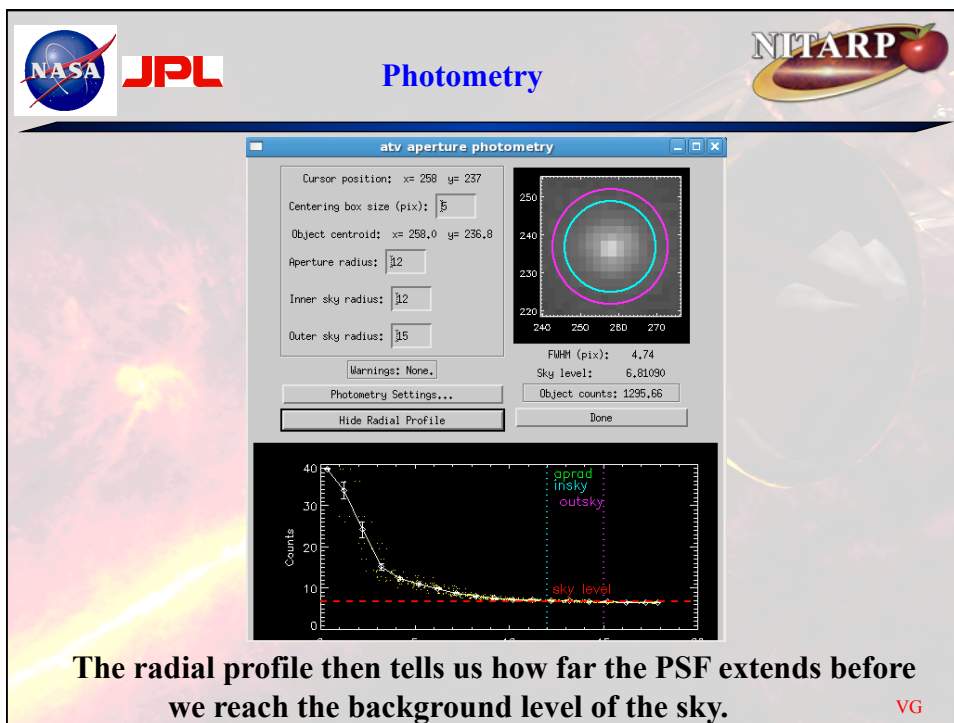
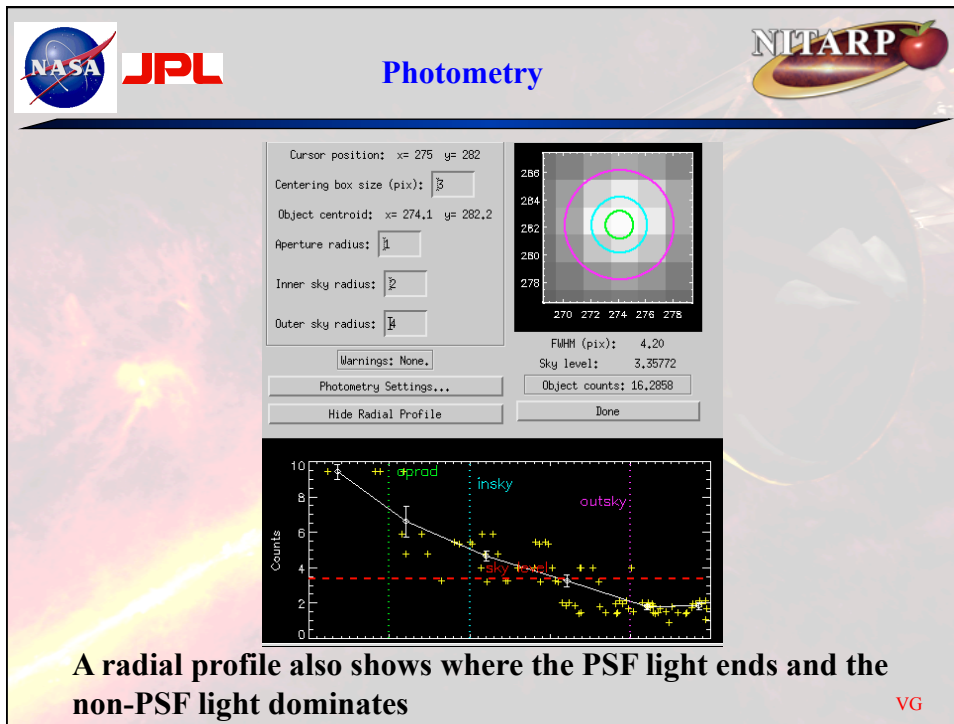
NASA JPL **Photometry** NITARP

What is a radial profile?

1.0	1.3	1.2	1.2	0.9
0.8	4.3	4.0	3.8	0.7
1.1	3.7	6	4.1	1.5
0.9	4.2	4.3	3.9	1.0
1.2	1.4	1.1	0.8	1.3

A radial profile is the circularly averaged sum at increasing radial distance from the brightest point of the image.

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Photometry



And now a live demonstration with the photometry tool developed at the *Spitzer* Science Center called:

Aperture Photometry Tool

This is a Java based tool so as long as you have Java installed on your school's computer then you should be able to install it?

If you are running a web browser you should already have it!

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End Photometry



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