

Physics 343 Lecture # 8:
Green Bank trip; lab # 4; interferometry

This week's schedule (and beyond)

Wednesday 11:59pm: report for lab # 3 due by email (PDF please)

Monday – Thursday: “hands on” lab session for lab # 4, using Difmap to analyze CO observations of an ultraluminous infrared galaxy (ULIRG)

Monday (Baker) & Thursday (Wu): regular office hours

(before) Friday: email your preferences re Green Bank trip

for Monday: start thinking about topics for last lecture!

Next week: “on call” office hours for lab 4. (All previous classes have found it **very** useful to attend and work with instructor for this particular lab...)

Trip to Green Bank: 4/17-19

Friday, 4/17:

drive NJ → GB

Saturday, 4/18:

**tours, observing
session(s)**

Sunday, 4/19:

drive GB → NJ



Observing at Green Bank: 40 ft telescope

Compared to SRT:

**$D = 12\text{m}$, so area
larger by factor 28.**

**Located in radio quiet
zone, so less RFI.**

Transit telescope: doesn't track.

Data acquisition less automated.

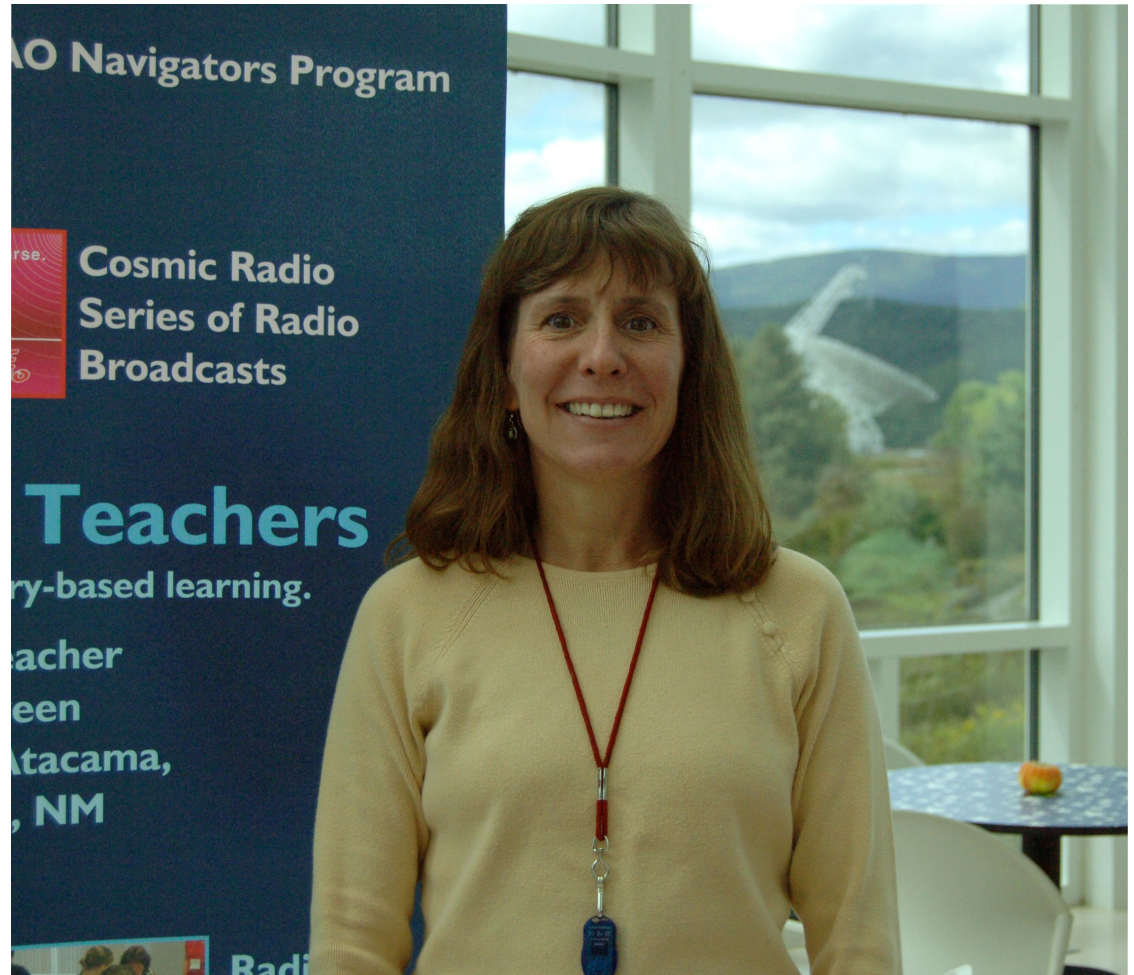


Observing at Green Bank: instructor

Sue Ann Heatherly

**Education Officer,
National Radio
Astronomy Observatory**

**PI of a \$892,000 grant
from the National
Science Foundation
to involve teachers and
students in the discovery of new pulsars.**

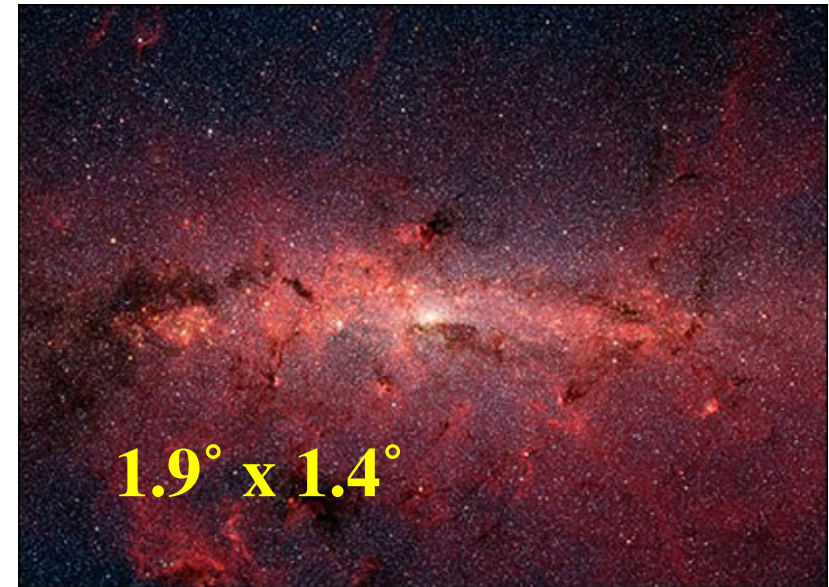
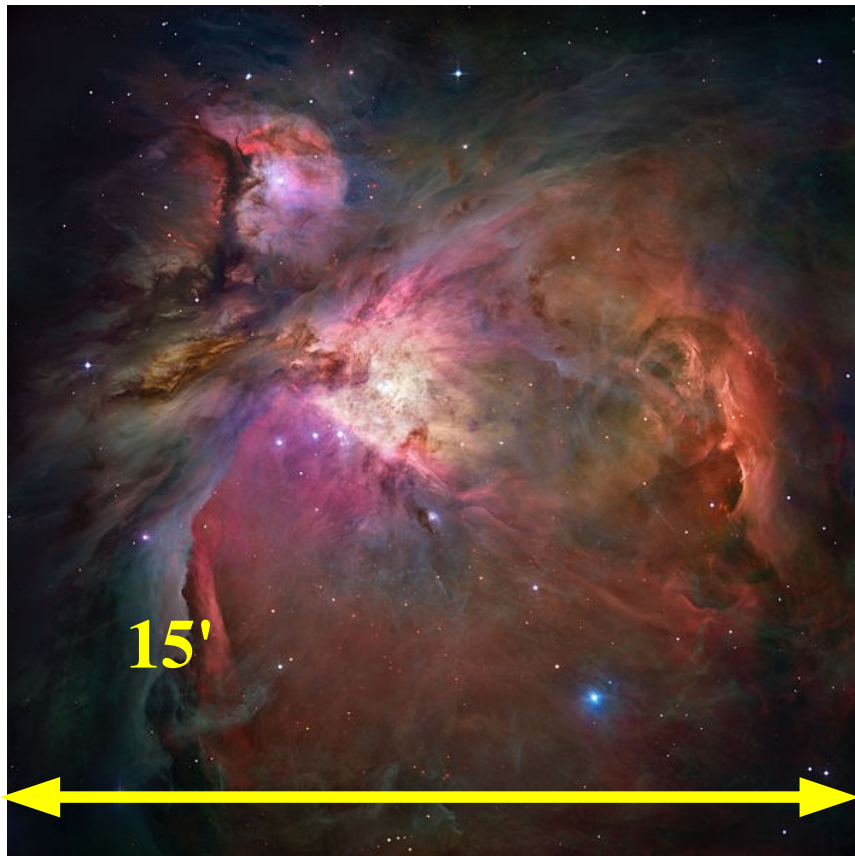


Observing at Green Bank: target(s)

~4pm EDT: Orion Nebula (500 pc)

optional:

~5am EDT: Galactic Center (8 kpc)



Hubble Space Telescope (optical)

Spitzer Space Telescope (infrared)

Staying at Green Bank: instructors



two “chaperone” rooms

Staying at Green Bank: students



**bunks in the two bunkrooms have hard plastic mattresses:
bring pillows + sheets or sleeping bags + alarm clocks...**

Staying at Green Bank: students



...and bring towels.

Staying at Green Bank: common area



For doing homework, lab analysis, etc. (internet access tricky: no wireless on the Green Bank site, and no cell phone service...).

What I need from you via email by Friday

- (1) Do you plan to come on the trip?**
- (2) Do you need me to write a letter to a boss or teacher so that you will be able to participate?**
- (3) How early can you leave campus on Friday, and how late can you return on Sunday?**
- (4) Can you drive your own car (if necessary), and how many passengers can you comfortably fit if so?**
- (5) Do you have any special dietary constraints?**

Introduction to Lab # 4

This will be an introduction to interferometric data.

You will be working with archival data from the IRAM Plateau de Bure Interferometer (located in the Alps outside Grenoble, France).

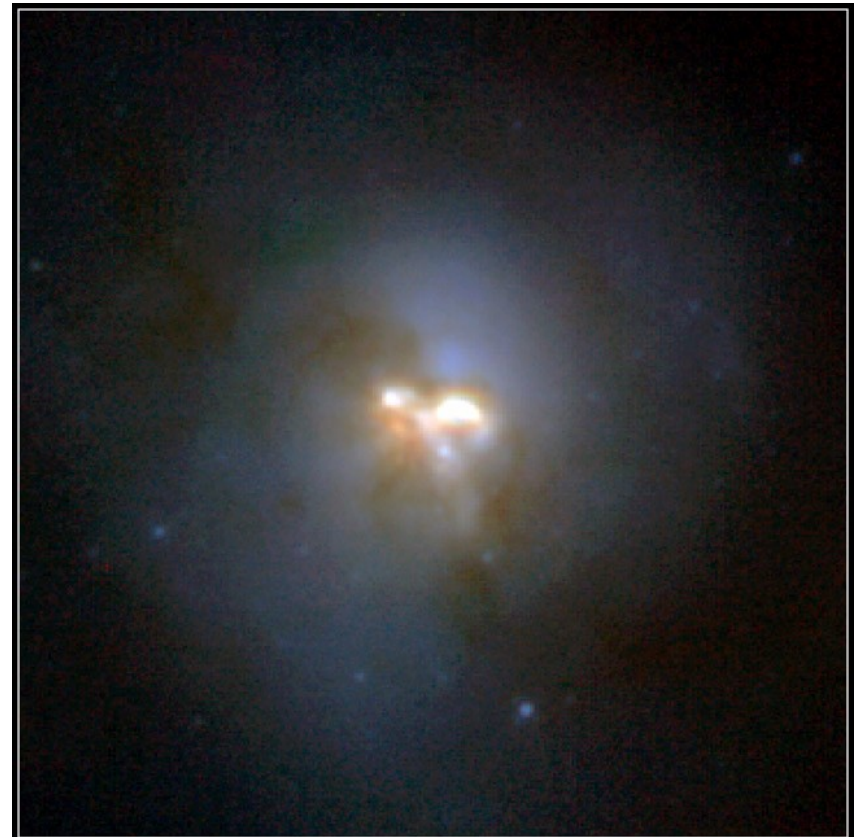
This facility has recently been approved for expansion into the Northern Extended Millimeter Array (NOEMA).



Lab # 4: “observations”

These observations have been obtained in the CO($J = 1 \rightarrow 0$) rotational transition, whose rest frequency is 115.271204 GHz.

The target is an ultraluminous infrared galaxy (ULIRG), in which the **merger of two progenitor galaxies** (e.g., at right) has triggered an intense starburst within the large gas mass that has coalesced at the system's center of mass.



Ultraluminous Infrared Galaxy Arp 220 HST • NICMOS
PRC97-17 • ST ScI OPO • June 9, 1997
R. Thompson (University of Arizona),
N. Scoville (California Institute of Technology) and NASA

Lab # 4: data analysis

The data have already been calibrated (i.e., corrected for changes in the instrument response with time and frequency).

You will be taking the calibrated data (i.e., in the Fourier plane) at each frequency and making maps from them. This will require that you use the **Difmap** package for **deconvolution**.

Class handout = Difmap cookbook; useful website = <http://www.astro.caltech.edu/~tjp/citvlb/>

Lab # 4: hints on Linux

You will again be using astrolab, which runs Linux. As a reminder of some helpful commands:

cd	changes current working directory
cp	copies existing file to a new name or location
gs	view a PostScript file
ls	lists contents of current directory
mkdir	creates a new directory
mv	moves a file to a new name or location
ps2pdf	convert a PostScript file to a PDF file
rm	removes a file
rmdir	removes a directory

Lab # 4: preparation for lab

Before you come to lab this week, if possible:

- (1) Add relevant commands to your .bashrc file on astrolab so that you can run Difmap.**
- (2) Read through the instructions for lab # 4 and be prepared to ask questions about anything that's not clear.**
- (3) Skim sections 1-7 of the “Difmap cookbook” (skipping section 4.2, which is not relevant). You should focus on the main commands you will need to use for this lab:**
observe select device uvplot radplot vplot
mapunit mapsize uvweight mapplot clean

Lab # 4: hints on Difmap devices

The trickiest part of using Difmap is (re)setting the output device.

(1) to screen:

“device /xwin”

(2) to hardcopy (an example that produces an output PS file):

“device output.ps/vcps”

[for **v**ertical, **c**olor]

“maplot cln”

[creates the plot you want]

“device /xwin”

[resets the device to screen!]

Greetings from last week's guests!

Dear students of the radio astronomy class,

Thank you for allowing us to use your classroom (and projector).

Tobias Westmeier
(ICRAR, Perth, Australia)

Paolo Serra (ATNF, Sydney, Australia)

Thijs van der Gulst
(Kapteyn Institute,
Groningen, NL)

Nadine (Kapteyn Institute)

<https://github.com/SoFiA-Admin/SoFiA>