



# INTRODUCTION TO PHYSICS RESEARCH: ASTRONOMICAL SPECTROSCOPY

[University of Adelaide, 24.10.2003]

*by Ronny Geisler*

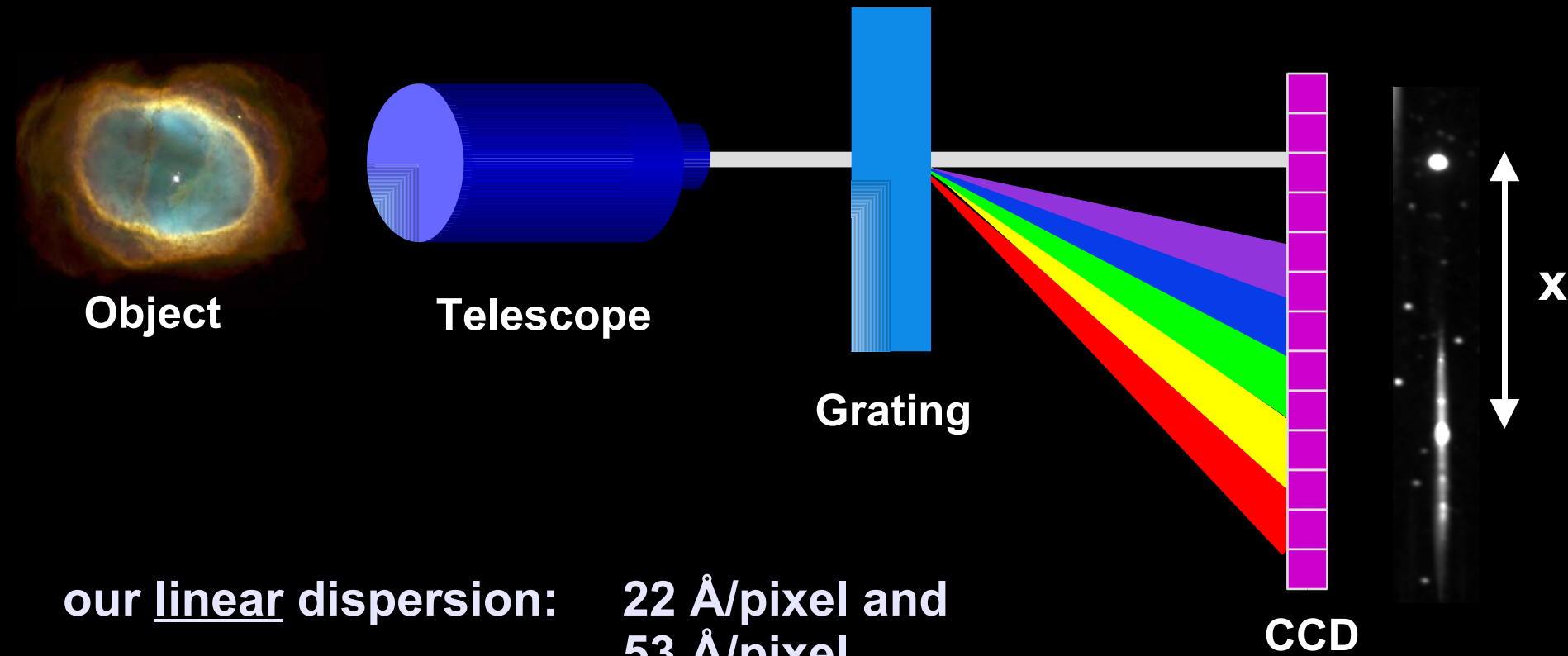
*Supervisor: Paddy McGee*

# CONTENTS

How do we get a spectrum from  
the raw image?

1. take exposures
2. extract spectra
3. correct spectra
4. redshift of the quasar

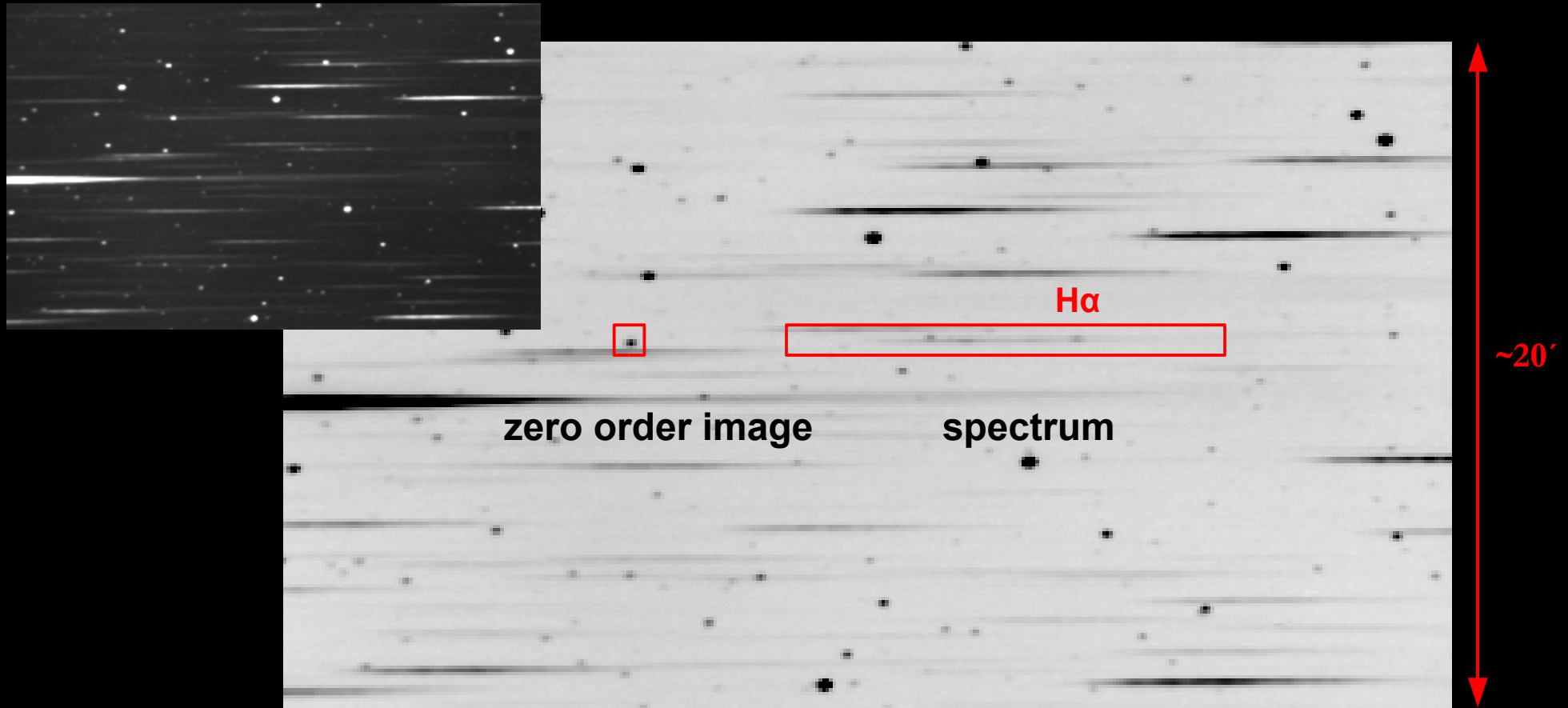
# DISPERSION



our linear dispersion: 22 Å/pixel and 53 Å/pixel

brightness is proportional to pixel value

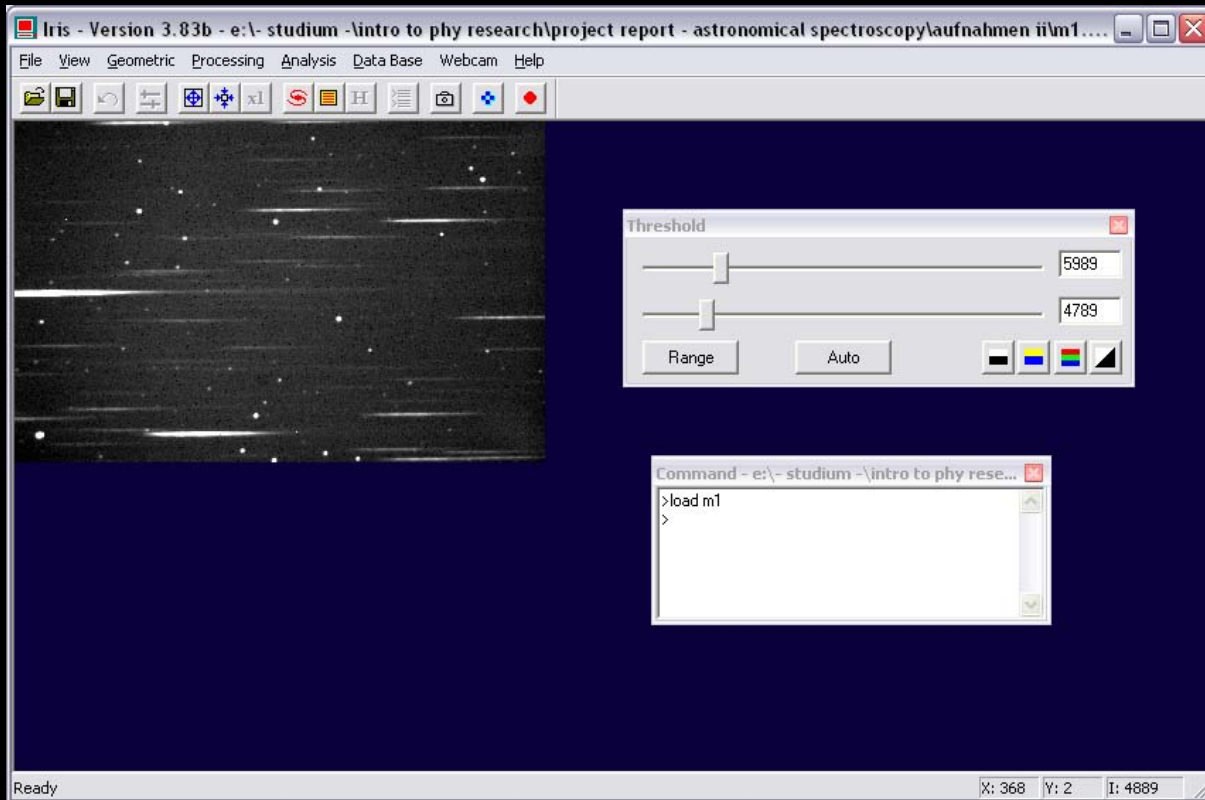
# RAW IMAGE



raw image of Markarian 509 region

fits-file: every coordinate is associated with one pixel, every pixel has a specific value

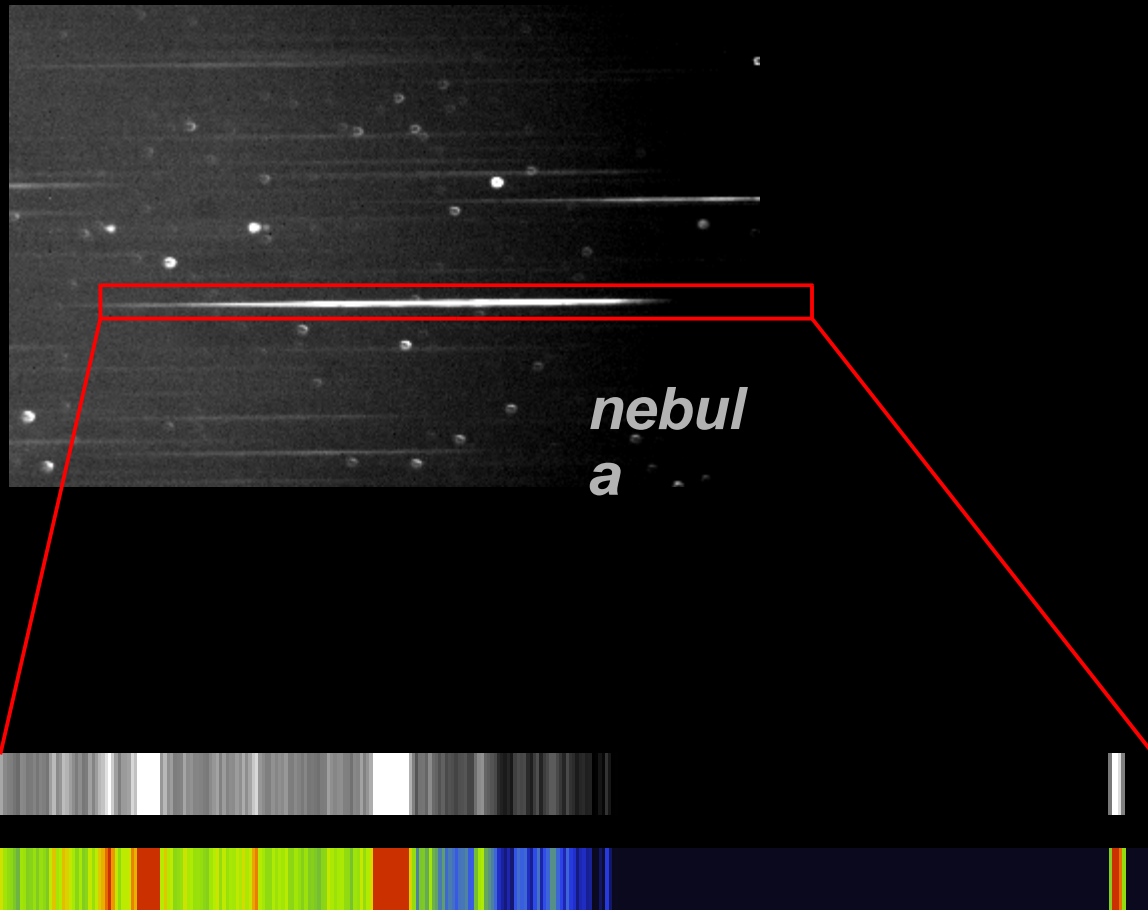
# IRIS



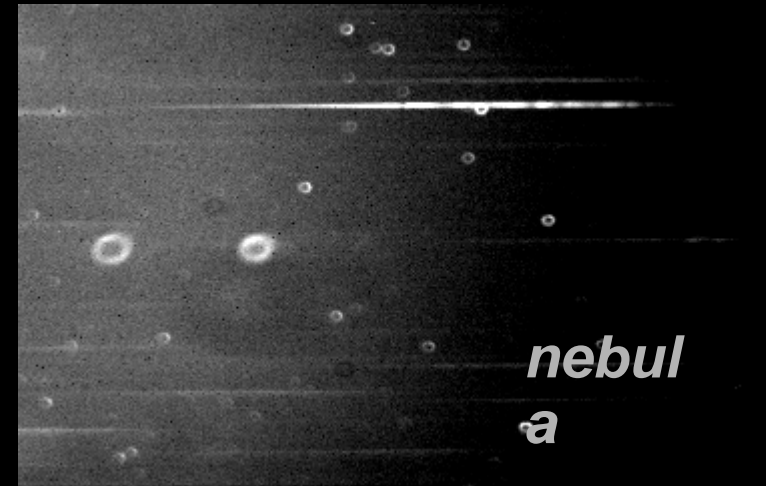
prepare raw images:

- flatfield correction (correct pixel variations)
- rotate
- translate
- add

# EXTRACTION



*nebul  
a*



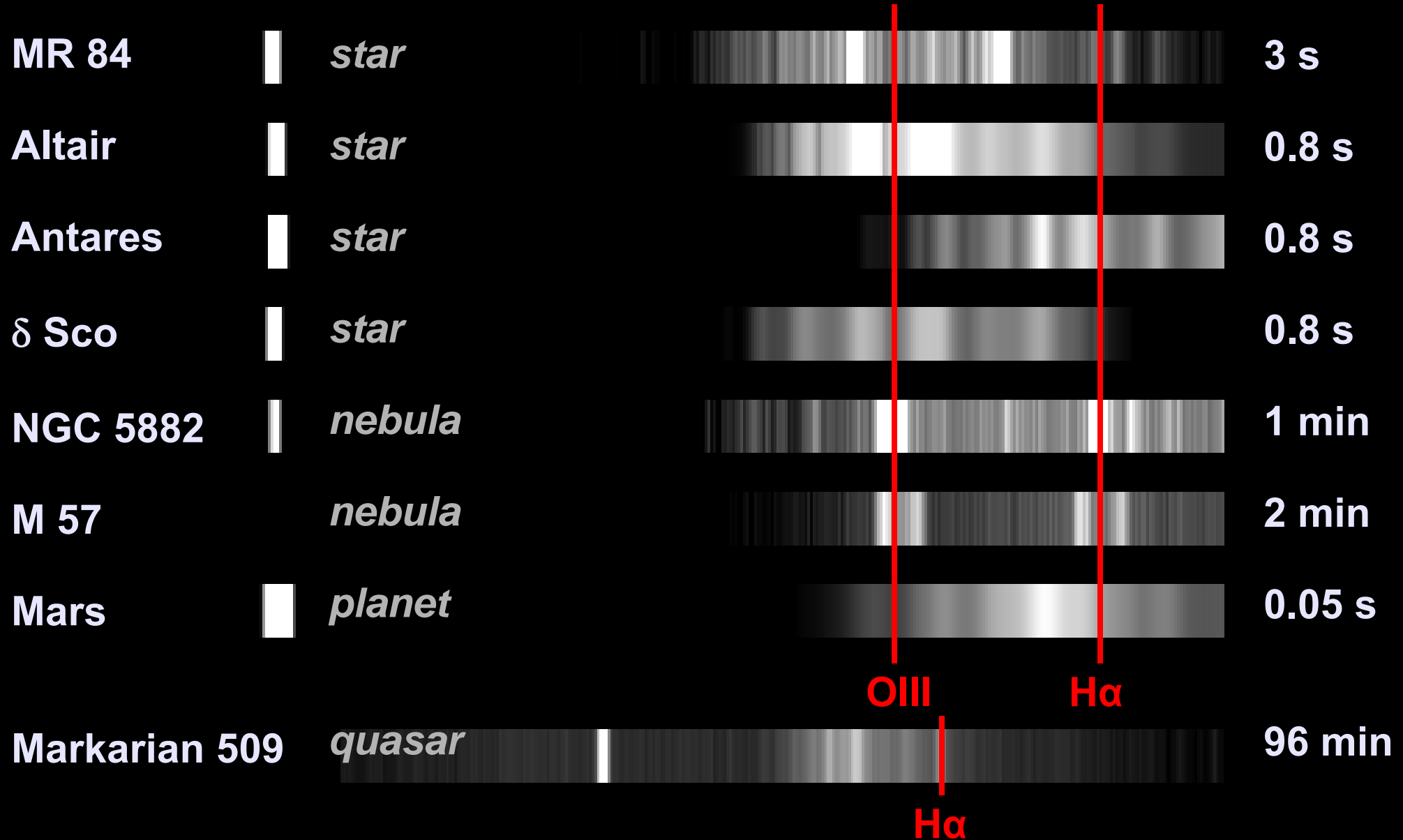
*nebul  
a*



*star*

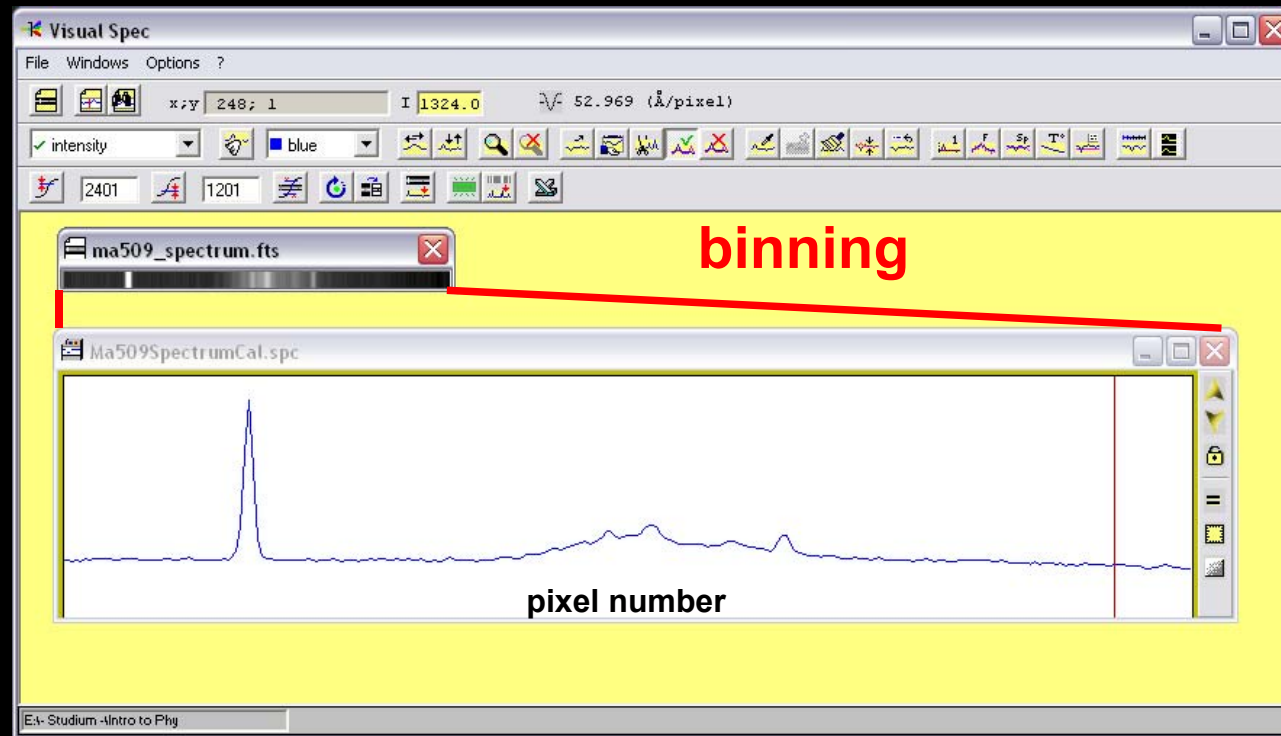
**you see emission (and absorption)  
lines in this stripe of spectrum**

# SPECTRA



# VSpec

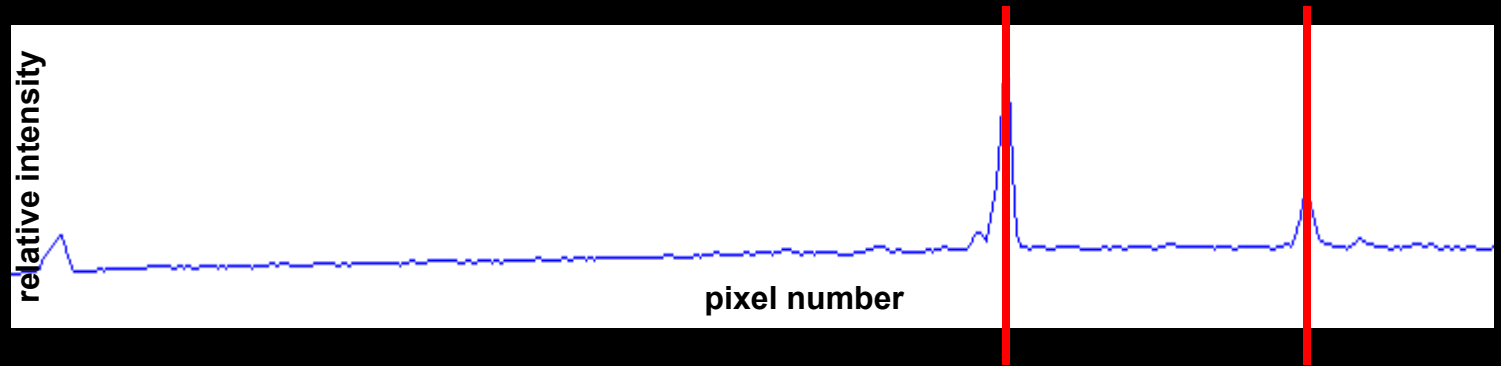
visualisation  
of the  
spectra:



calibrate and correct profile:

- wavelength calibration: use NGC 5882
- correct spectral profile: use  $\delta$  Sco

# WAVELENGTHS CALIBRATION



OIII

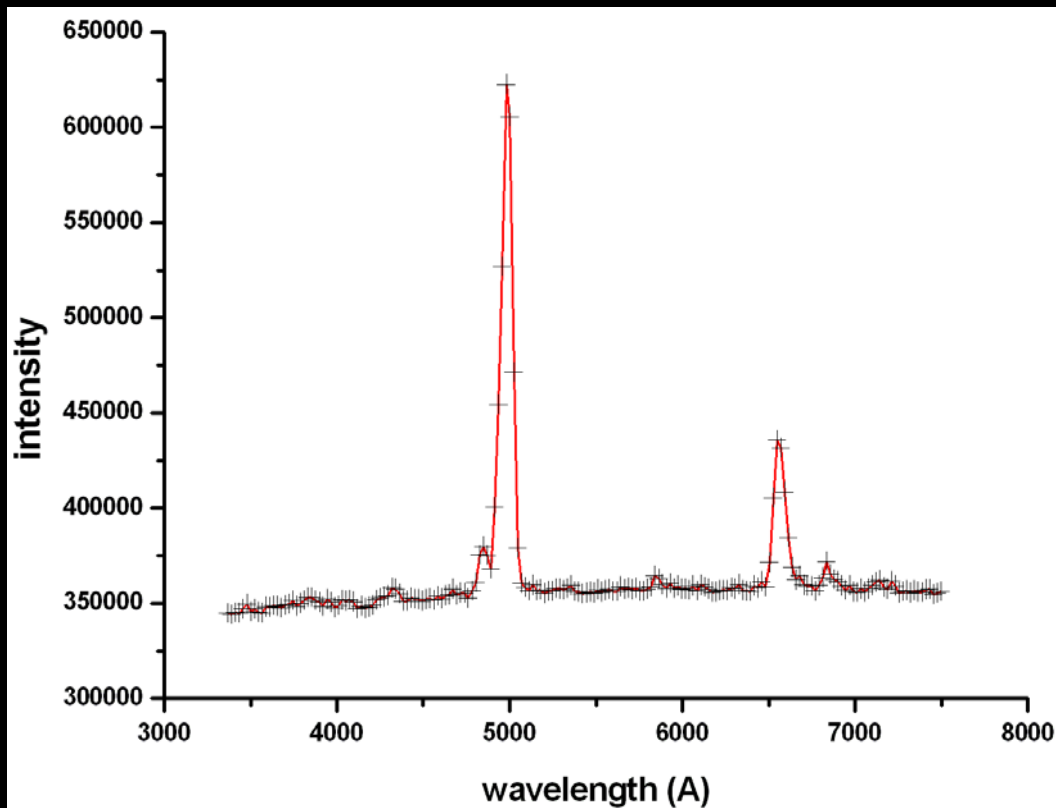
H $\alpha$

we know the emission lines  
from NGC 5882:

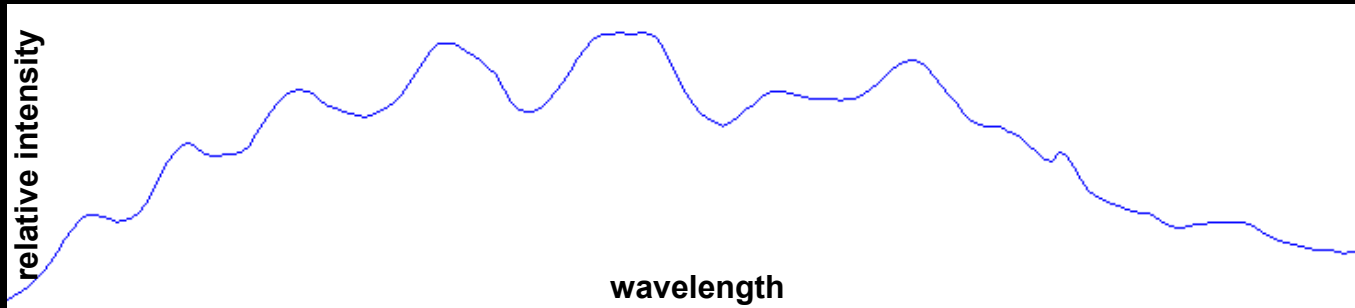
OIII: 4982 Å

H $\alpha$ : 6563 Å

we can calibrate all spectra

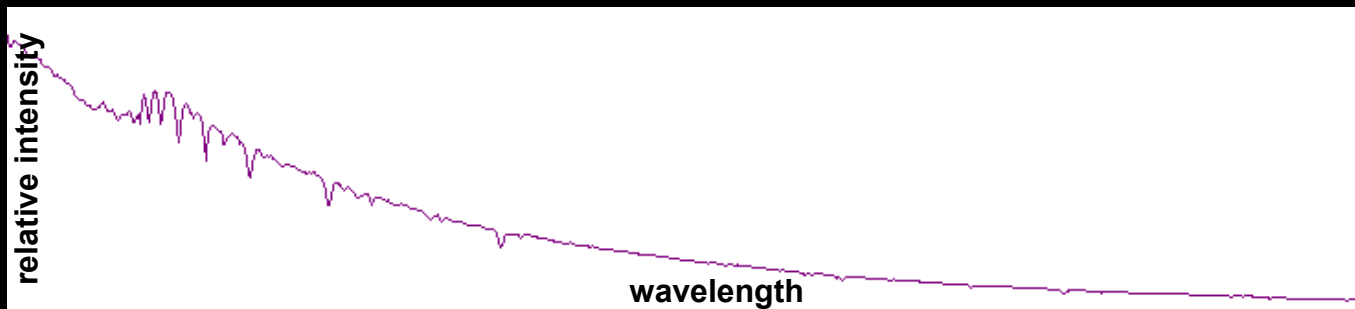


# INSTRUMENTAL RESPONSE



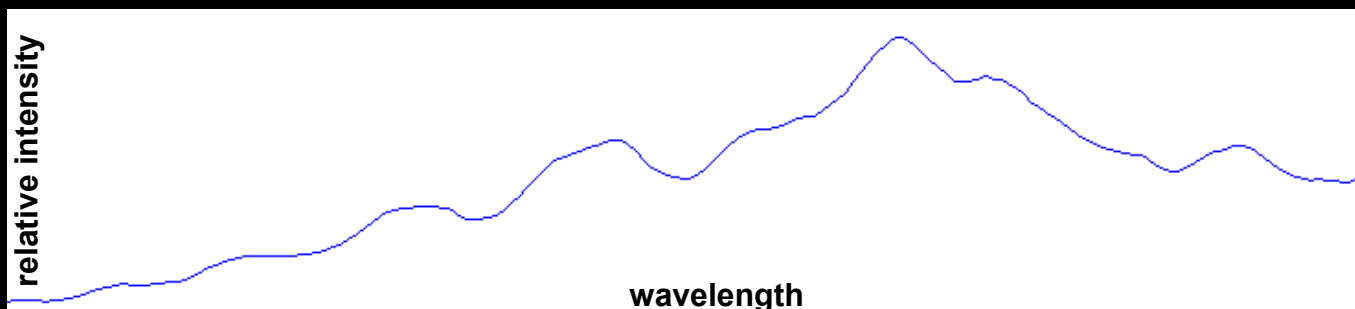
**cropped observed  
spectrum  
of  $\delta$  Sco**

**divide by**



**theoretical spectrum  
(Planck spectrum  
associated with its  
temperature)**

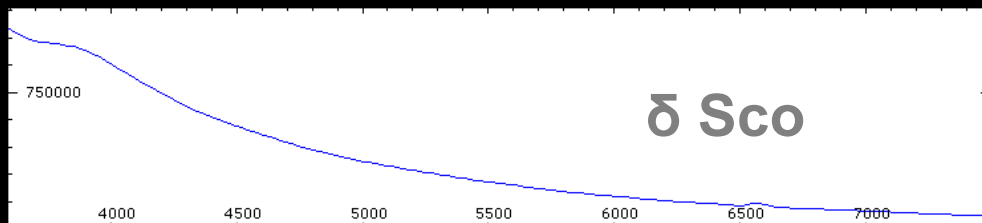
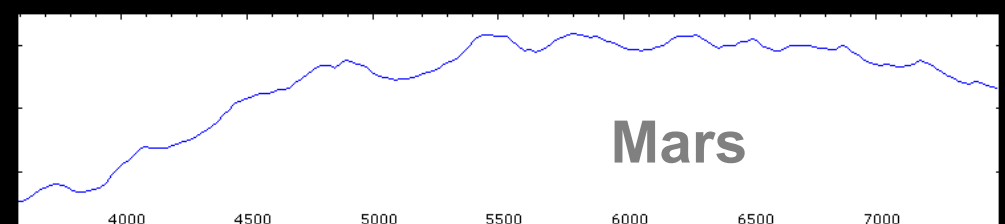
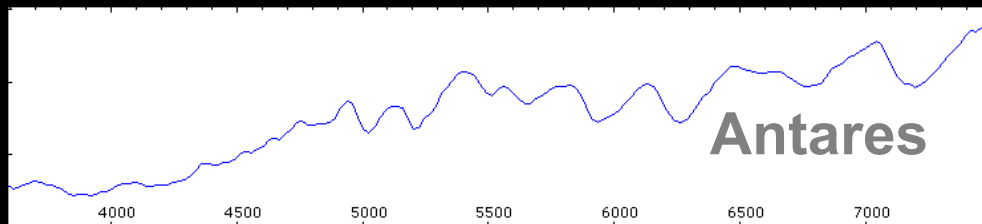
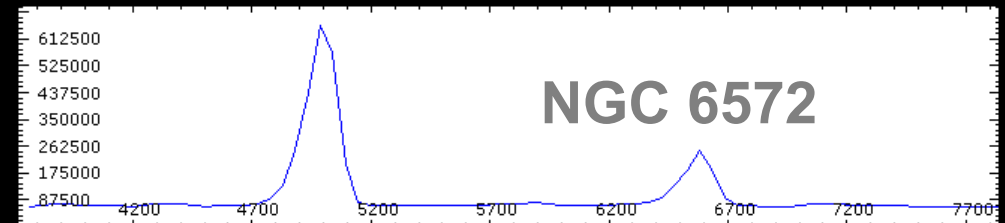
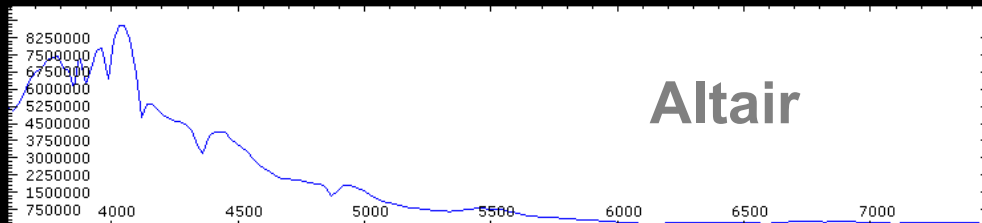
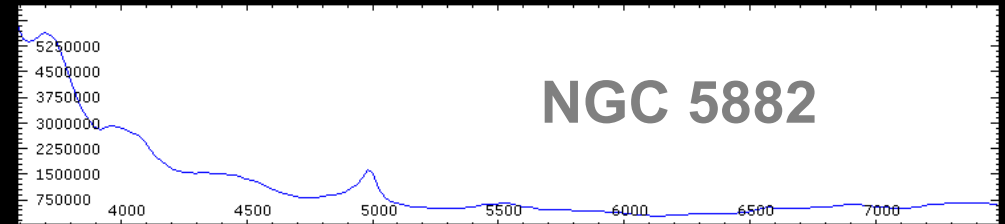
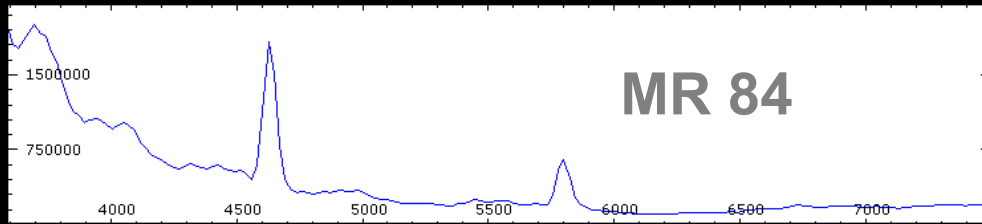
**=**



**smoothed  
instrumental  
response profile**

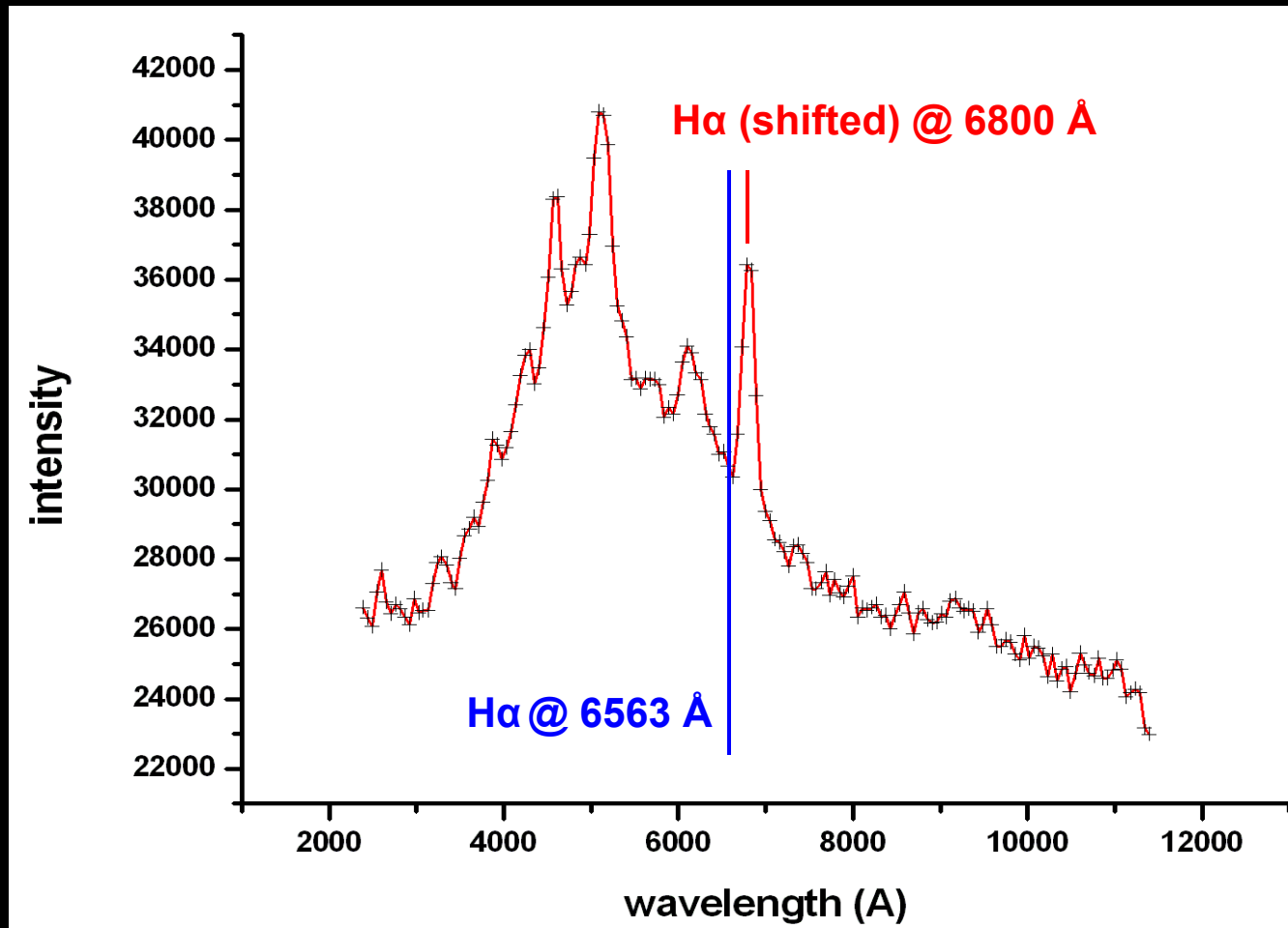
# FINAL SPECTRA

wavelength-calibrated and instrumental-response-corrected spectra:



# MARKARIAN 509

same procedure for the quasar;  
32 x 3 min (very faint, to avoid saturation)



we measured  
a redshift of  
about 0.036

this galaxy is  
relatively far  
away