AGN Polarimetry on Life Support

Robert Antonucci
University of California, Santa Barbara
Physics Department

AGN Polarimetry on Life Support

Suggested projects

1. Many more high SNR Type 2 objects needed; necessity of isotropically-selected samples.
2. Repeating the great on/off nuclear study of NGC1068 on a big telescope; trying it on other objects. Comparison with X-ray point or resolved spectroscopy.
3. Electron-scattered extended optical and X-rays emission, and possibly the quick collapse of some very massive galaxies at $1 \lesssim z \lesssim 4$
4. Infrared galaxies' giant dust-scattered halos; quasar hosts with Nature's coronagraph
5. Quasar SEDs with host, atomic and dust emission all shaved off !
6. Polarization reverberation mapping
7. Conclusion: why everyone should be doing polarimetry

Suggested projects

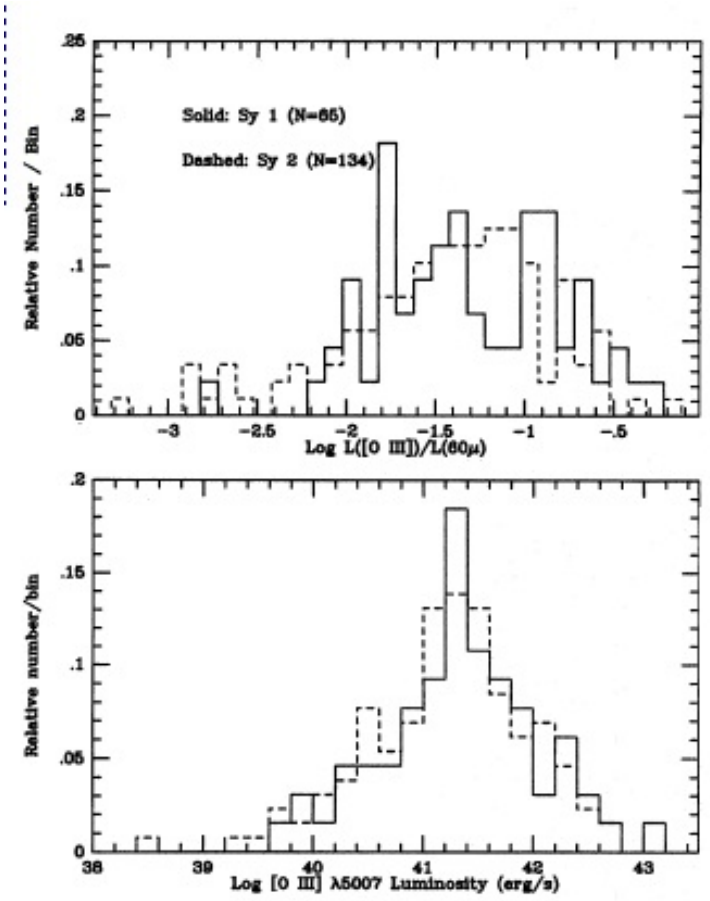
1. Many more objects needed, and some should have excellent SNR.

Electrons or dust? Flow velocities?

Incidence/luminosity of scattered light?

Samples should be studied which have been selected isotropically.

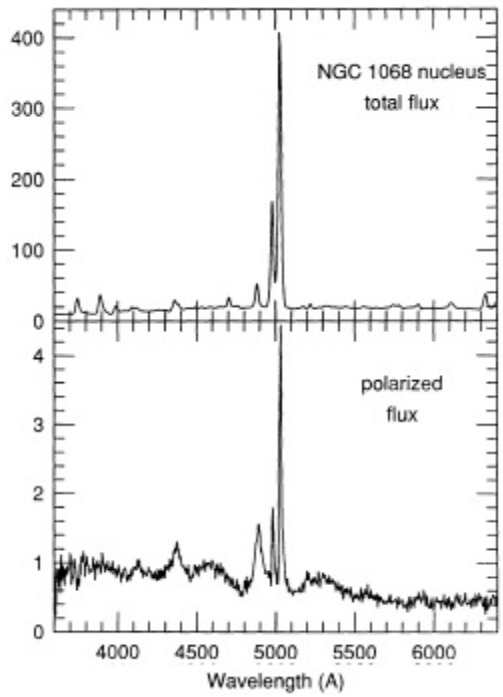
This is what happens when you use isotropic samples.

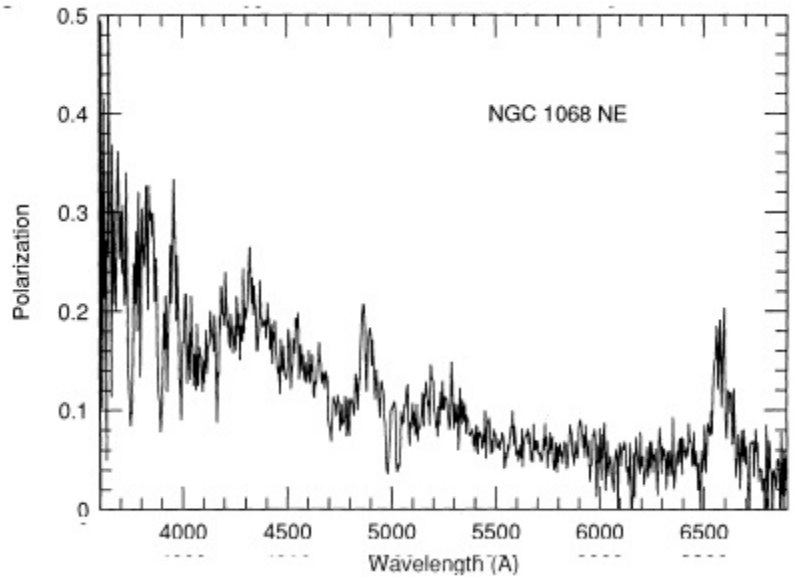


Keel et al 1994

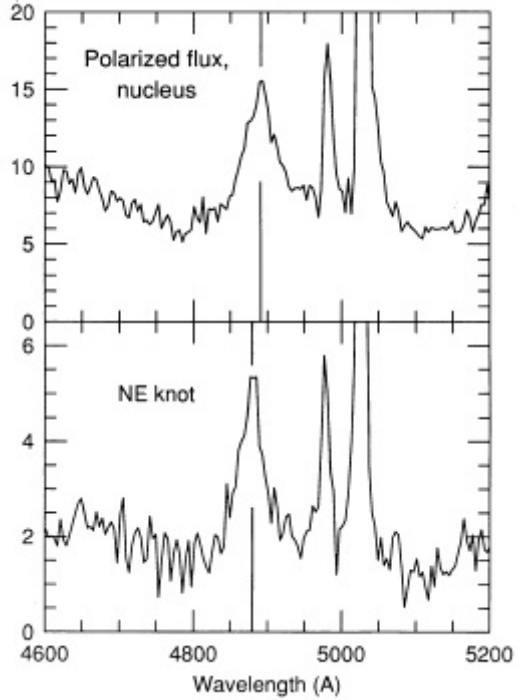
2. The ONE detailed study of nuclear (electron-scattered) and off-nuclear (dust-scattered) light, in NGC 1068 (Miller, Goodrich and Mathews 1991) was done with a 3m telescope. It was spectacular.

It's never been repeated with a modern telescope, and no similar work has been reported for any other object.





Miller, Goodrich and Mathews 1991

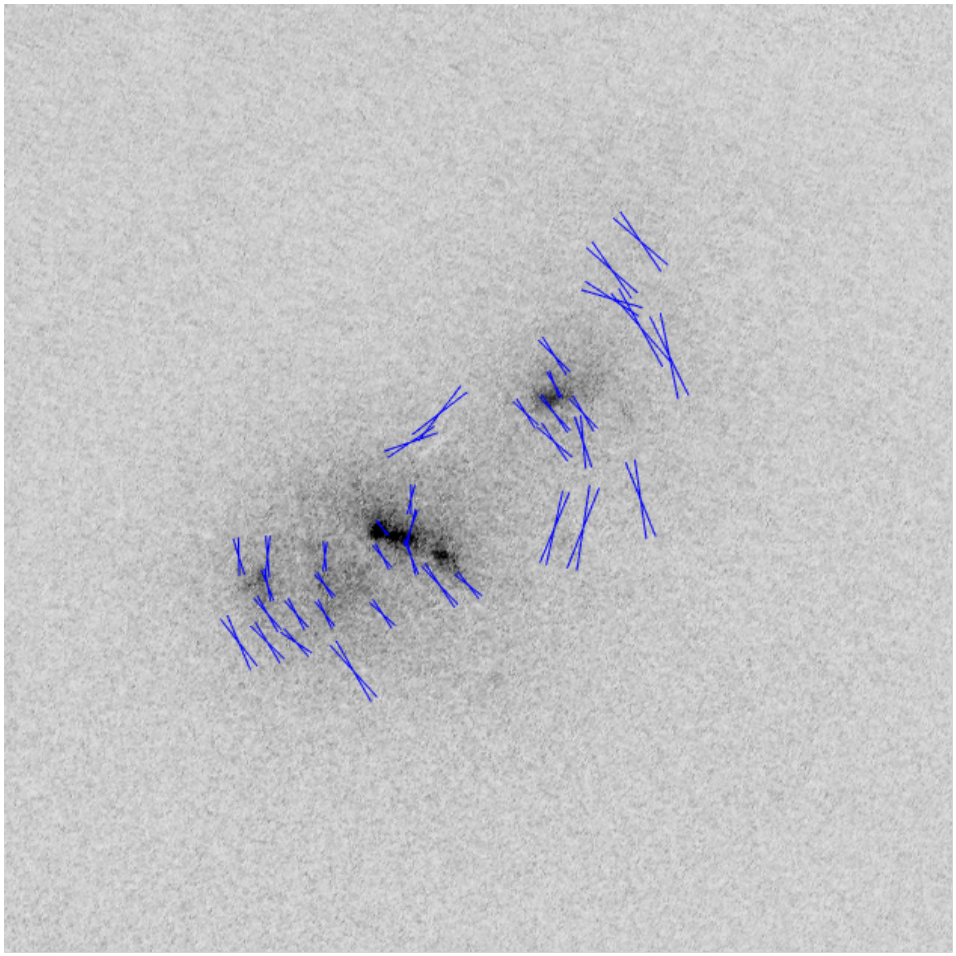


Miller, Goodrich and Mathews 1991

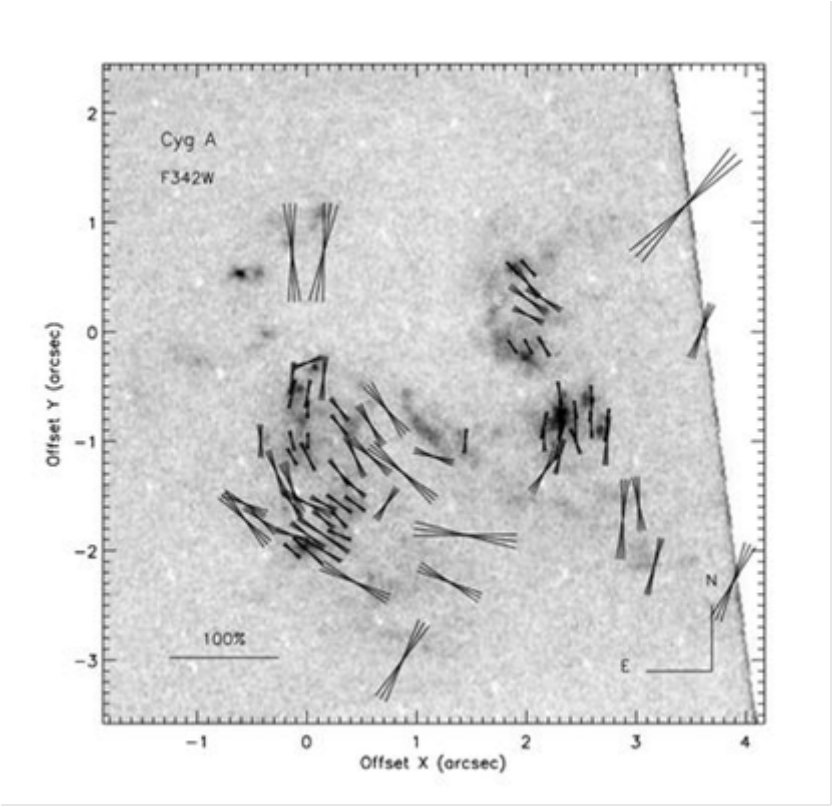
3. Extended electron scattering regions;

monolithic collapse of some of the most massive galaxies?

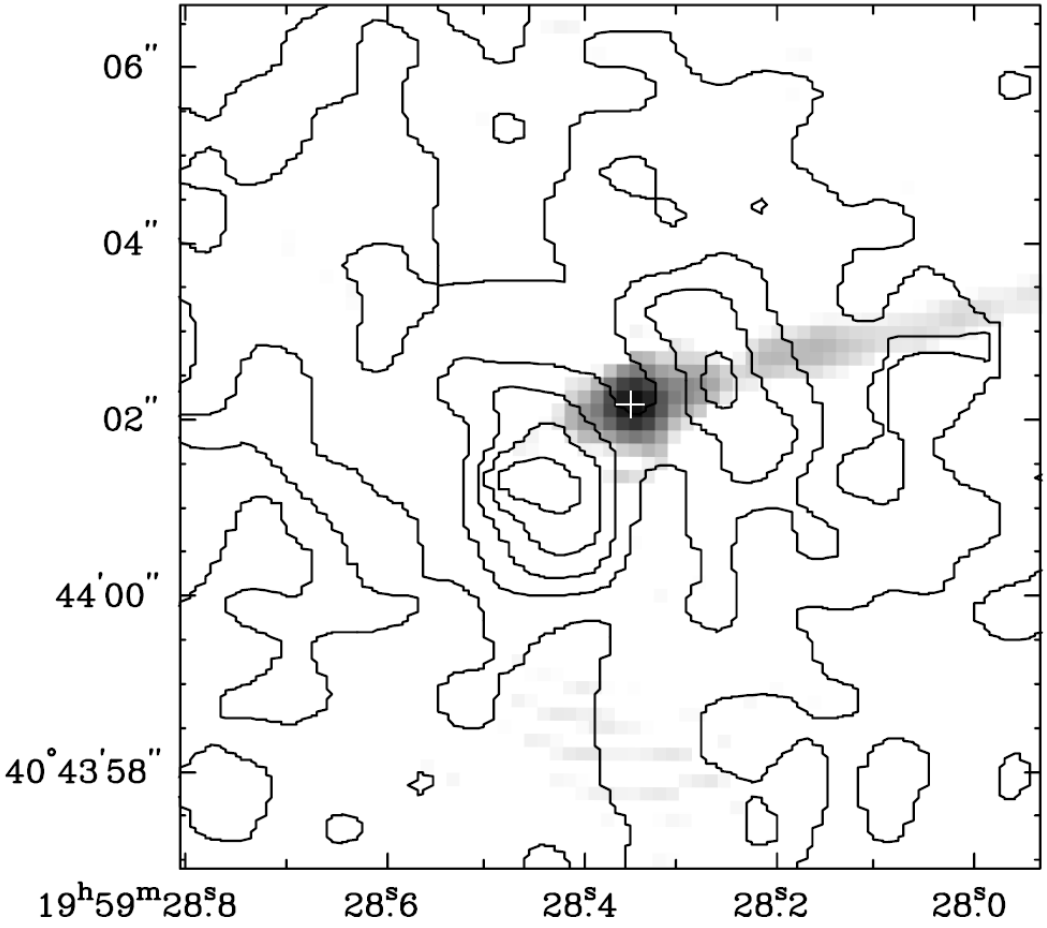
Near-UV Polarization Image of Radio Galaxy 3C321



Near-UV HST polarization image of Cygnus A

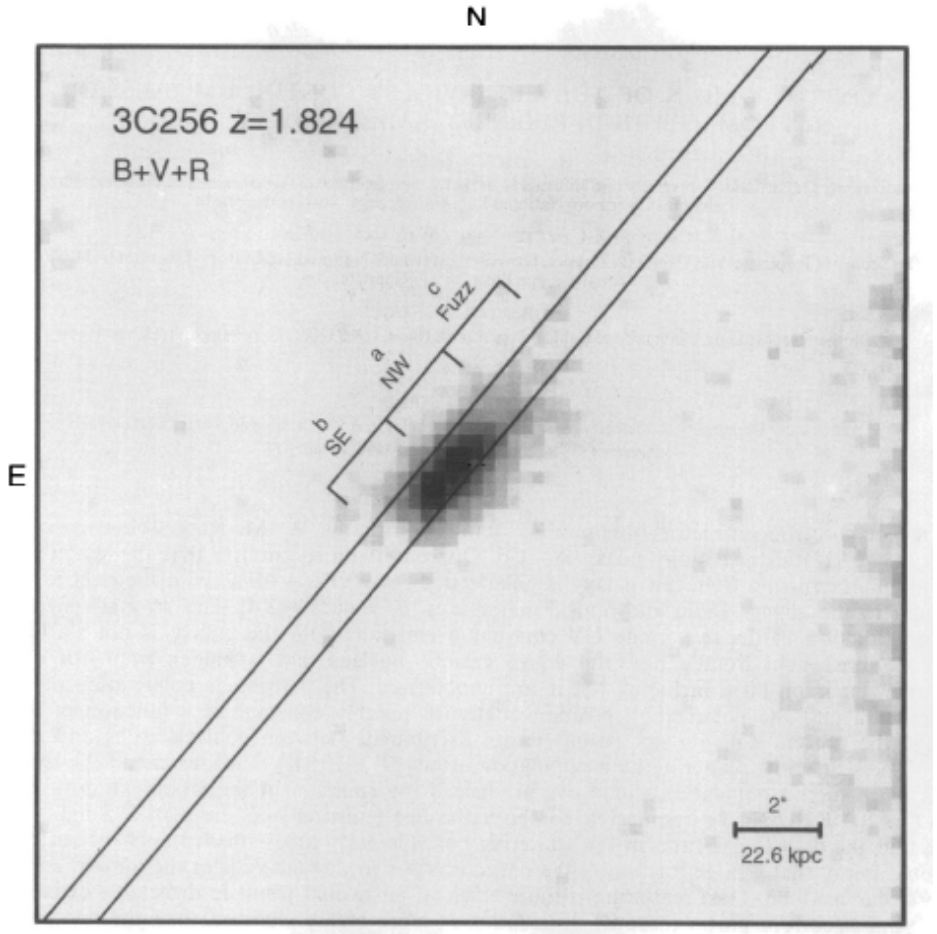


Chandra image of Cygnus A



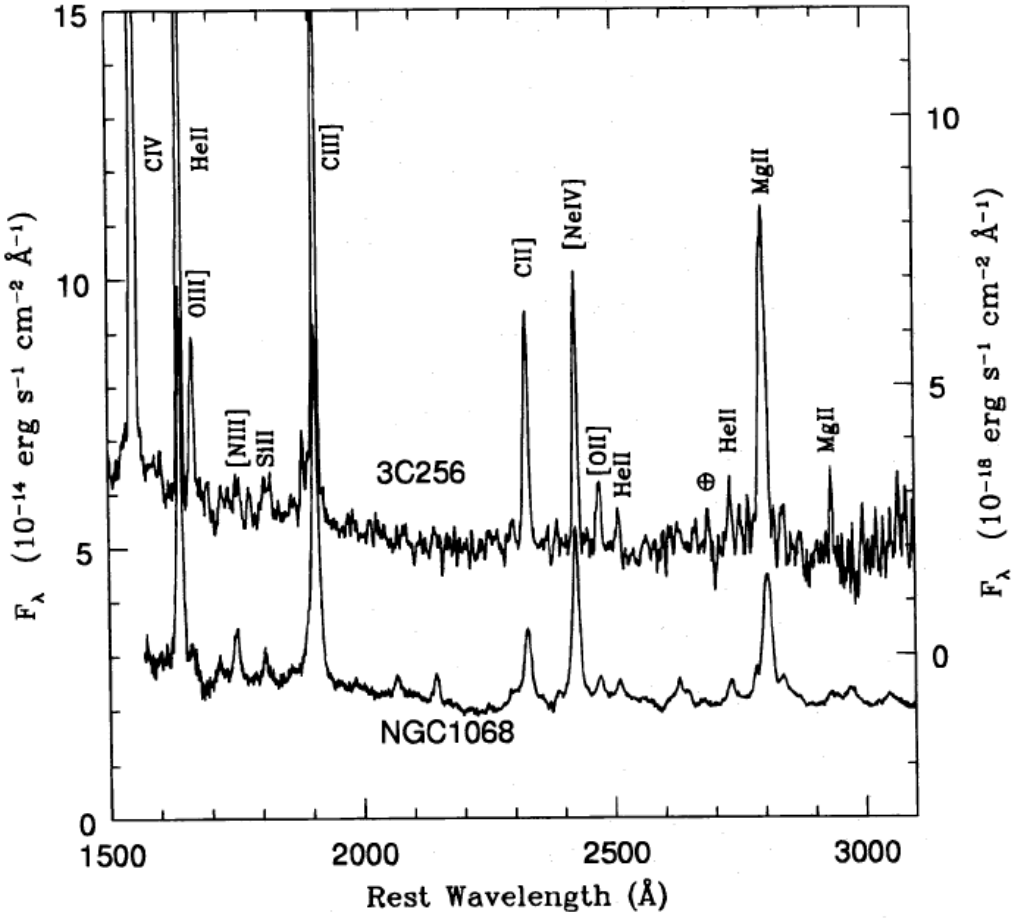
Young et al 2002

Aligned optical light in radio galaxy 3C256



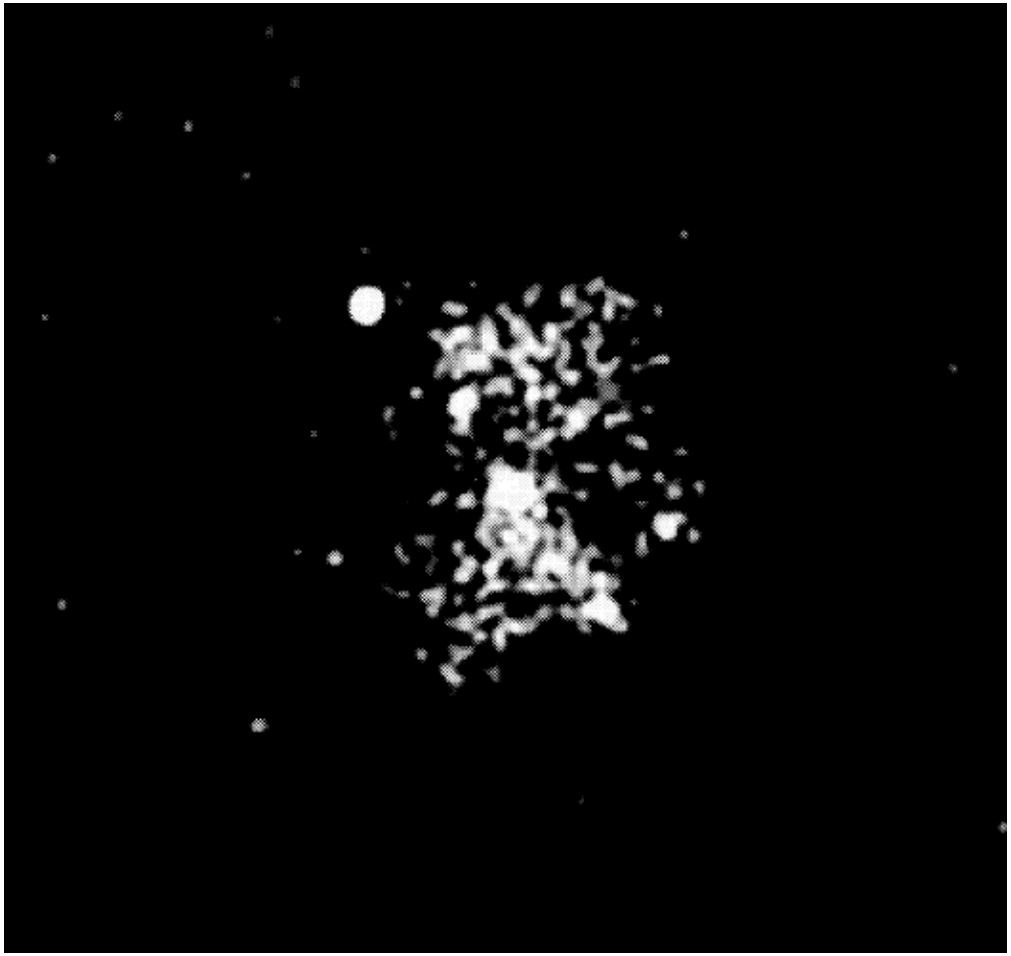
Dey et al 1996

Electron scattering in 3C256



Dey et al 1996

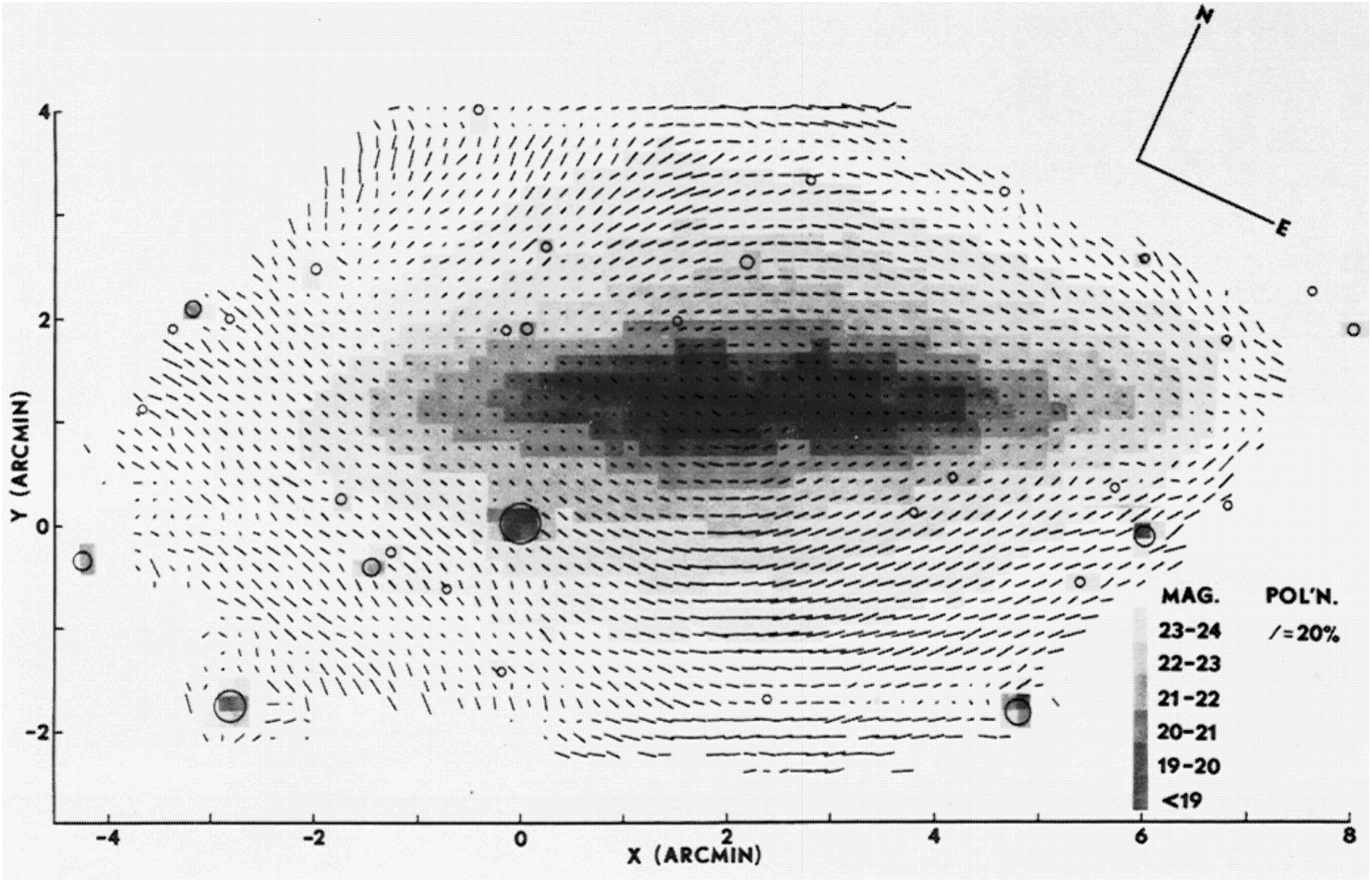
Chandra image of Radio Galaxy 3C294



Fabian et al 2003

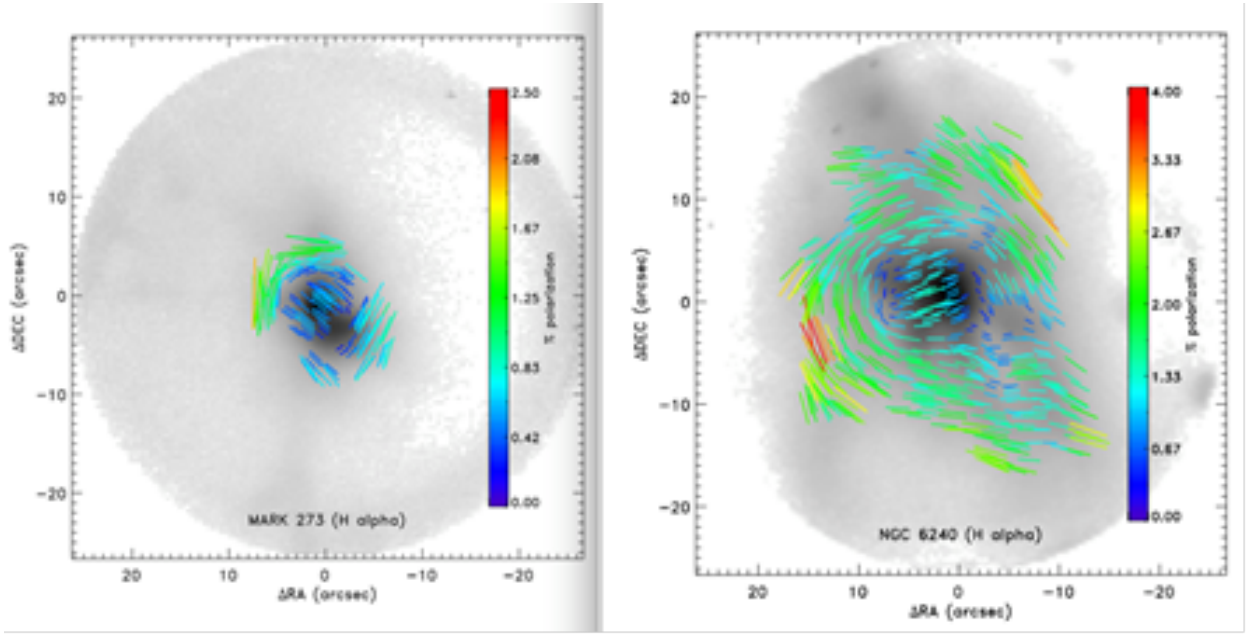
4. Infrared galaxies; Nature's coronagraph for quasar hosts

Scattering halo in M82



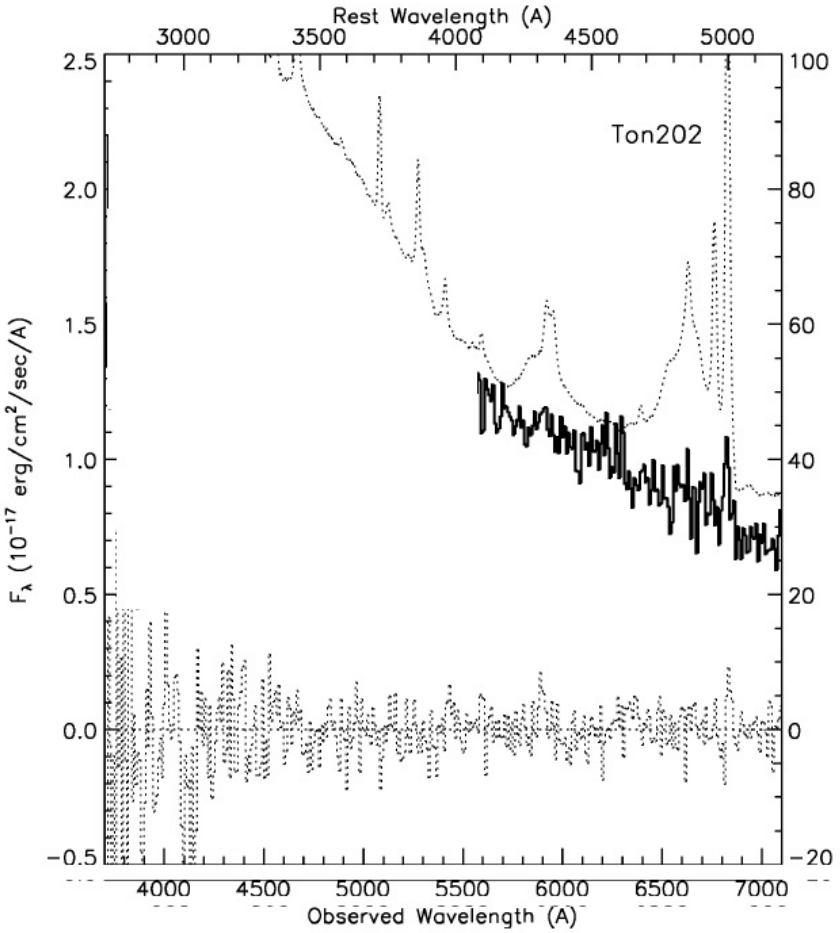
G Schmidt et al 1976

Recent polarization images of infrared galaxies by Hoenig et al.



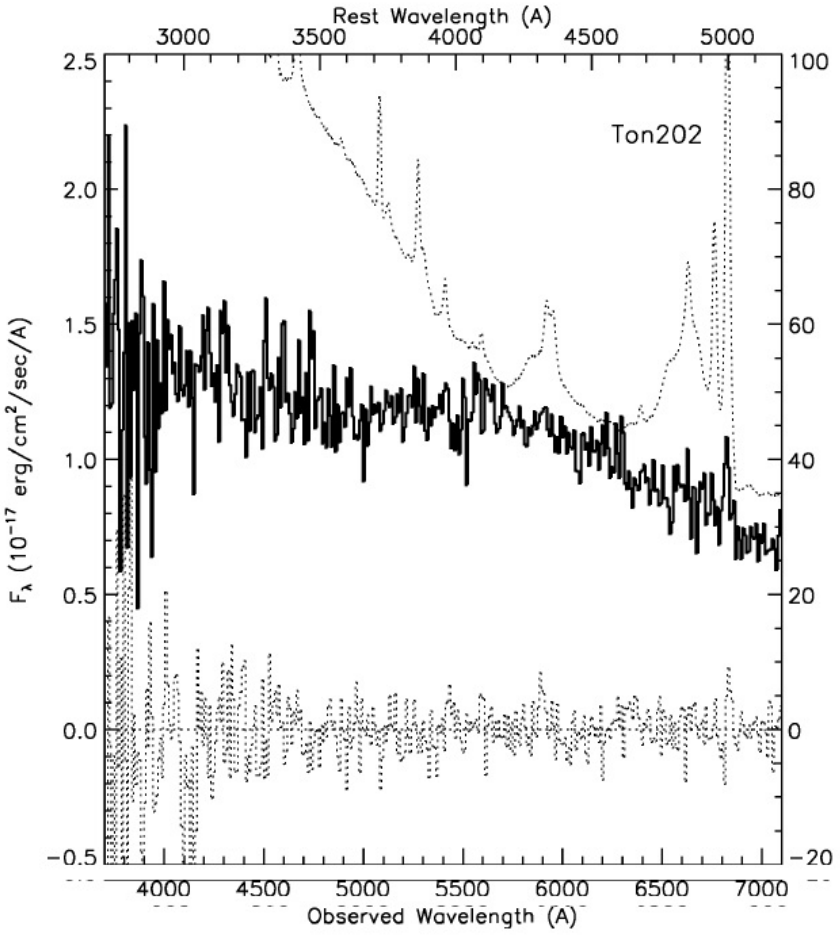
Hoenig et al., in prep.

5. The polarized flux shaves off the atomic emission



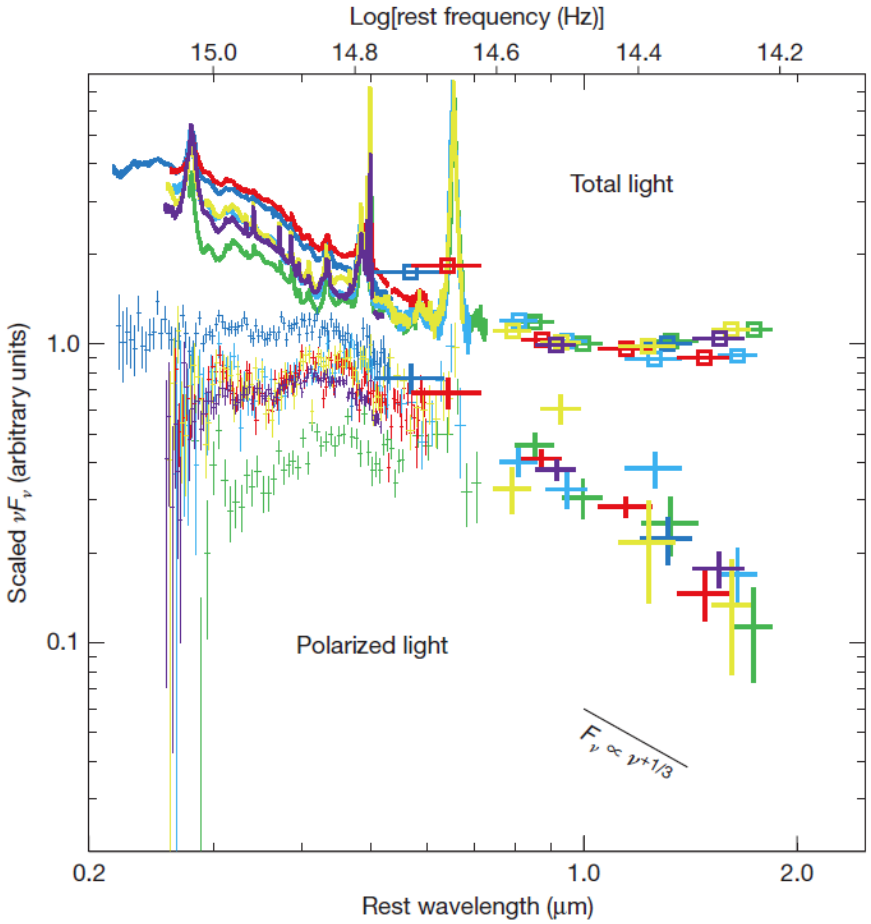
Adapted from Kishimoto et al 2003

The true central engine spectrum



Kishimoto et al 2003

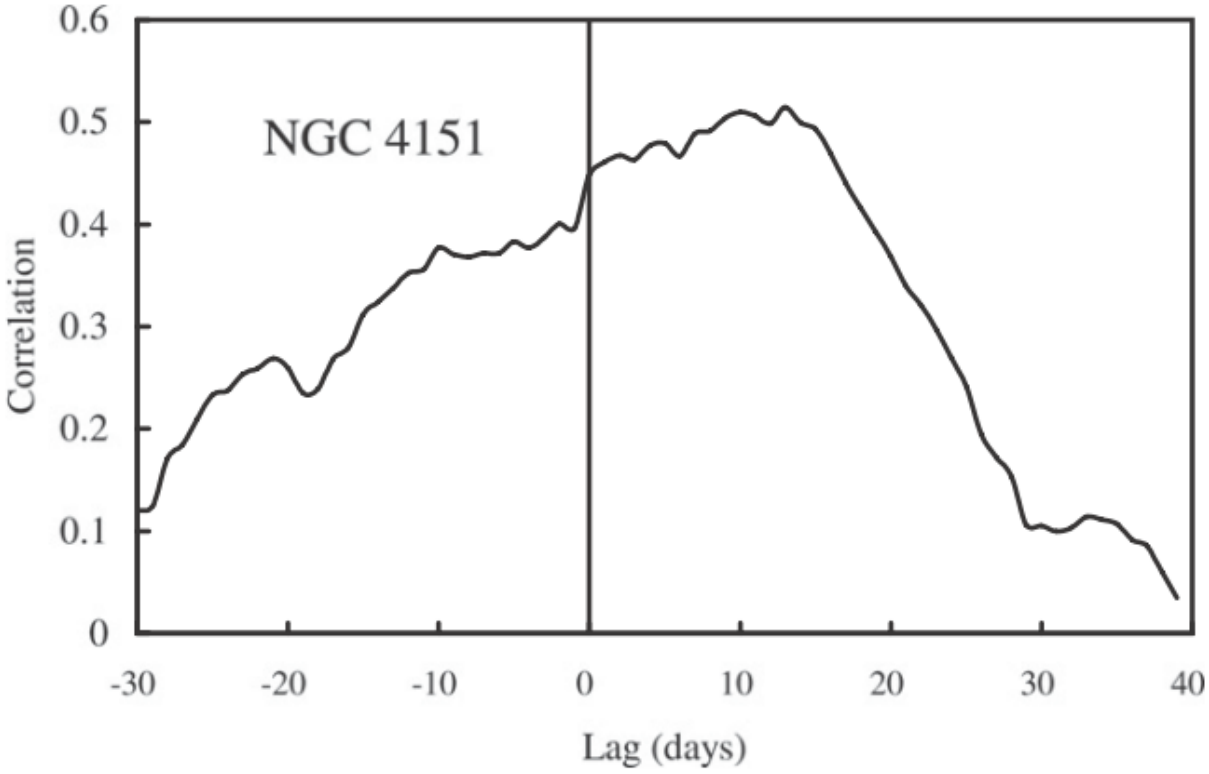
True spectra extended into the near infrared



Kishimoto et al 2008

6. Polarization reverberation mapping gives an additional constraint on the location of the scattering region

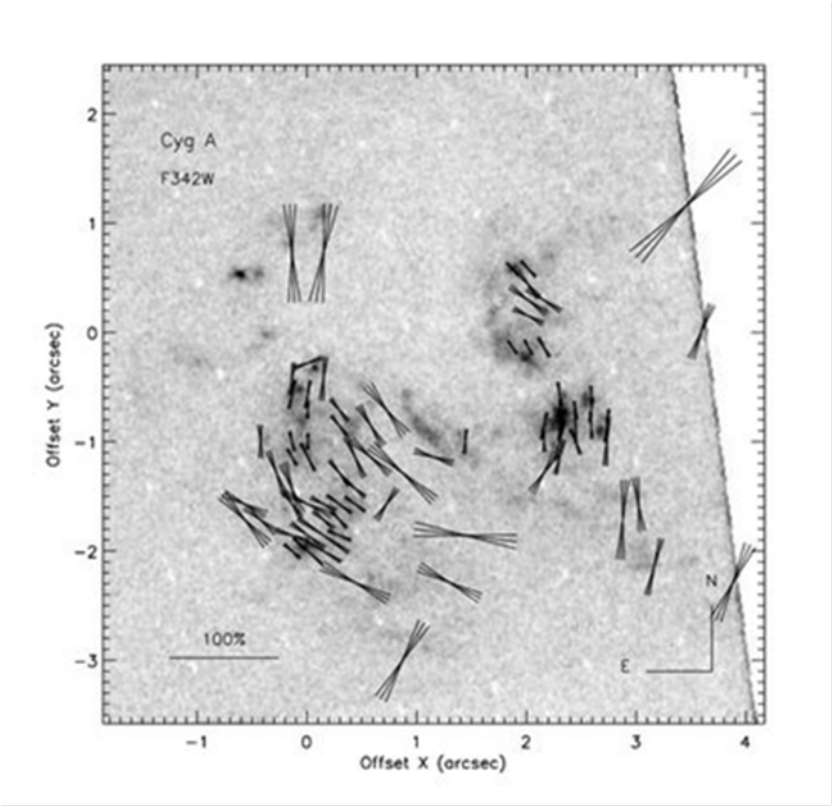
Polarized flux lags total flux by about the size of the BLR.



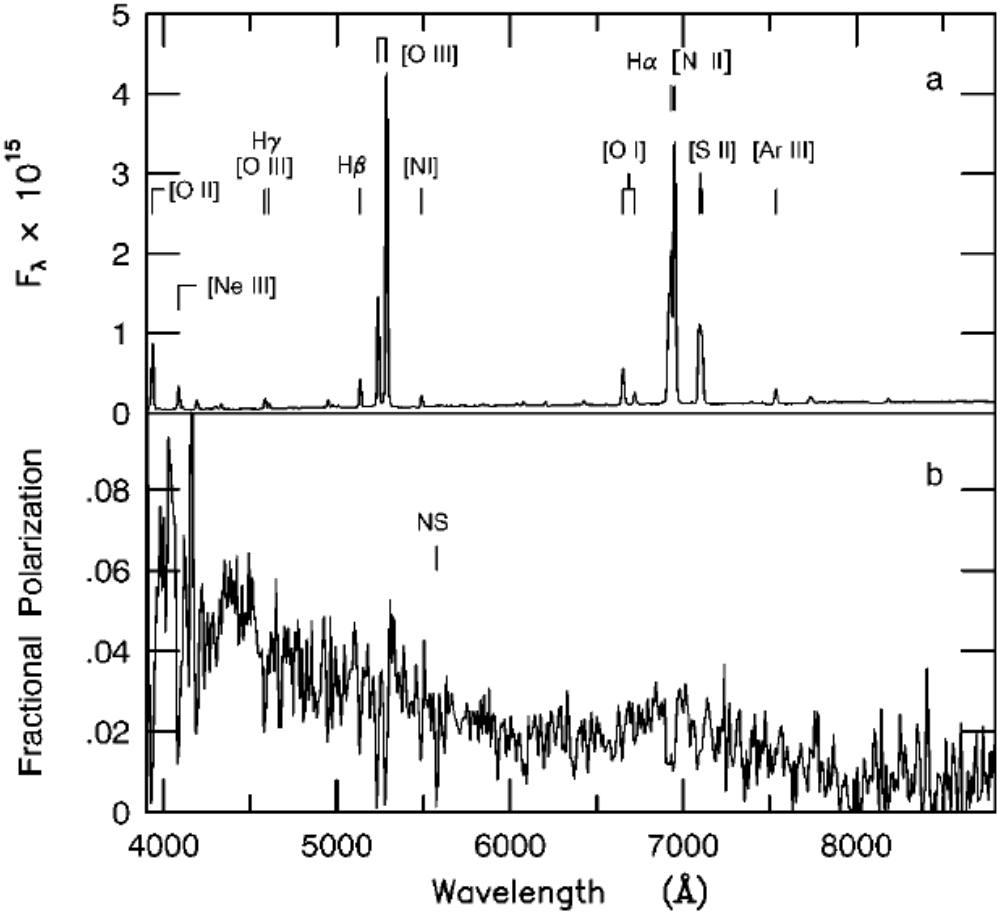
Gaskell et al. 2003

7. Why everyone should be doing polarimetry

Near-UV HST polarization image of Cygnus A

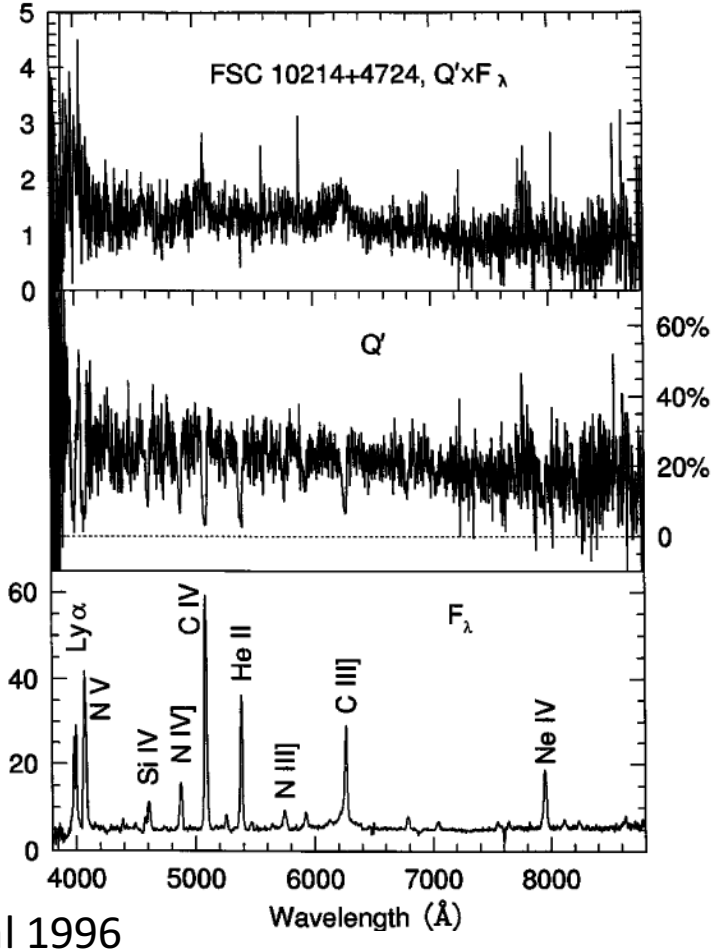


The Cygnus A polarized spectrum shows extremely broad scattered Hα



Ogle et al 1997

A hidden quasar in the first hyperluminous infrared galaxy



R Goodrich et al 1996