Abstracts

- Everyone present theirs…

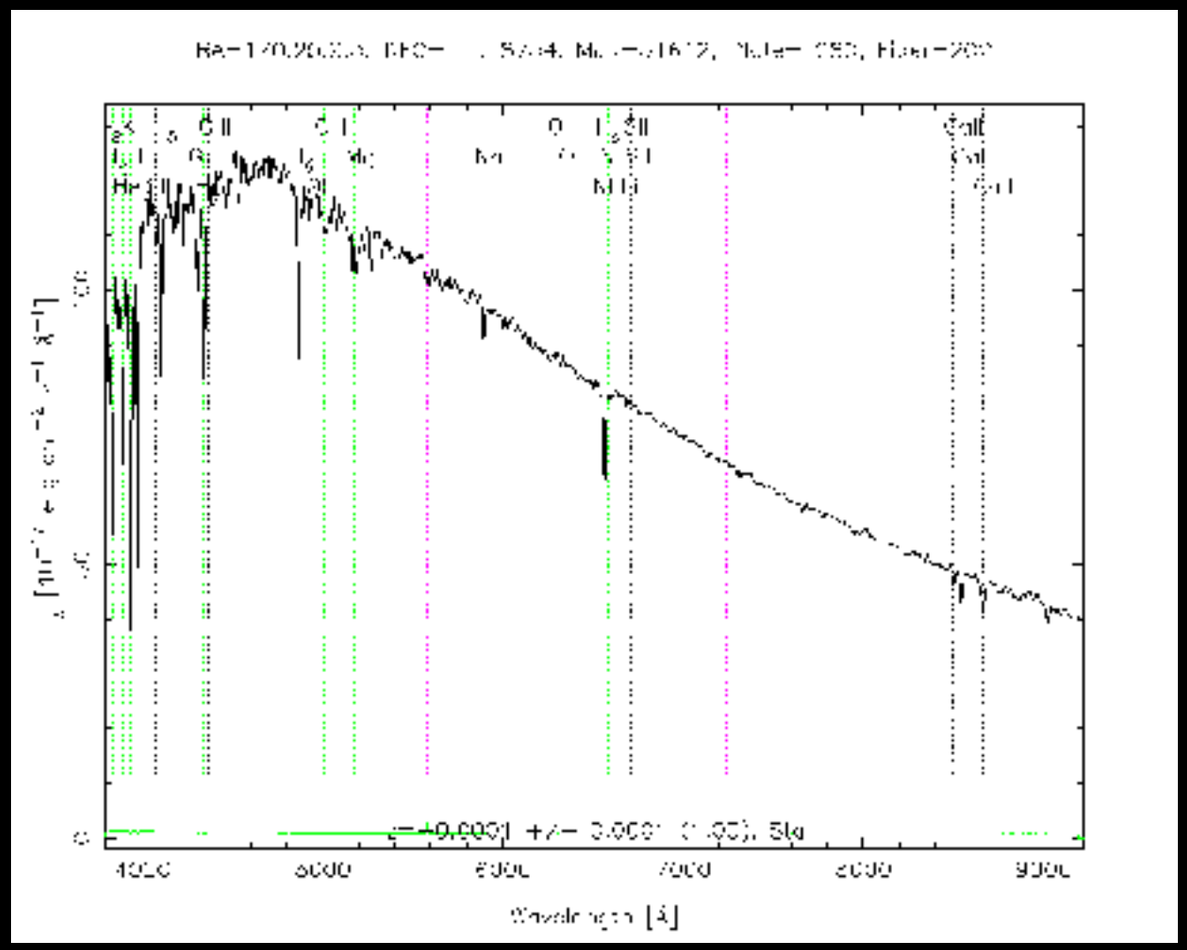
Combining Images w/ Different PSFs

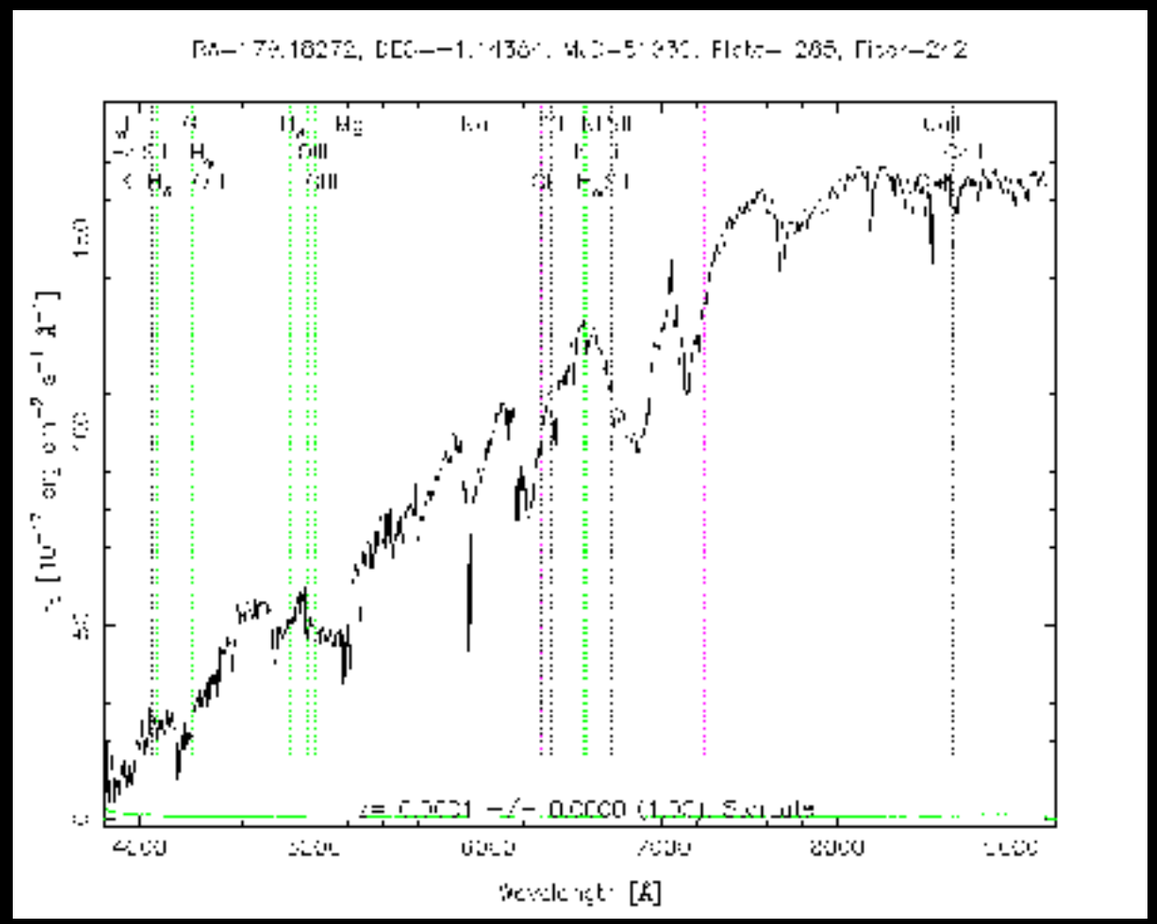
- Images may have different PSFs
- How would we combine them?

Let’s Combine Images

- $\chi=(d-Am)^{T}N^{-1}(d-Am)$

Spectroscopy





- Two different stellar spectra. Left hot star, right is cool star w/ molecular bands.

Gratings

- If every point on a wavefront acts like a source, why don't we see radiation everywhere in space?
- off-axis, phases add up sometimes with positive phase, sometimes with negative phase
- What would happen if we blocked everywhere radiation added up out-of-phase?
- This is a diffraction grating

Reflection Grating/Blaze

- If we blocked half the light, that would make us sad
- Gratings in general have many sidelobes, called “orders”. Light in other orders also makes us sad
- Instead, can etch lines in a mirror, reflect off that
- More efficient, puts signal (mostly) in one order. Surface figure (the “blaze”) distributes how power goes into orders.

Spectral Resolution

- Say I use CCD to measure spectrum. What is the narrowest line I can see?
- Usually refered to as R, spectral resolution, $\lambda/\delta\lambda$
- How would you want spectrograph to behave if you had a 4k chip?

Spectral Resolution

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    - As usual, want to Nyquist sample. For fixed spectrograph, if seeing gets worse, star image will get fuzzier. Limit would be ~2k resolution elements.

High Resolution

- If I want to measure radial velocity from a planet, what R would I need?

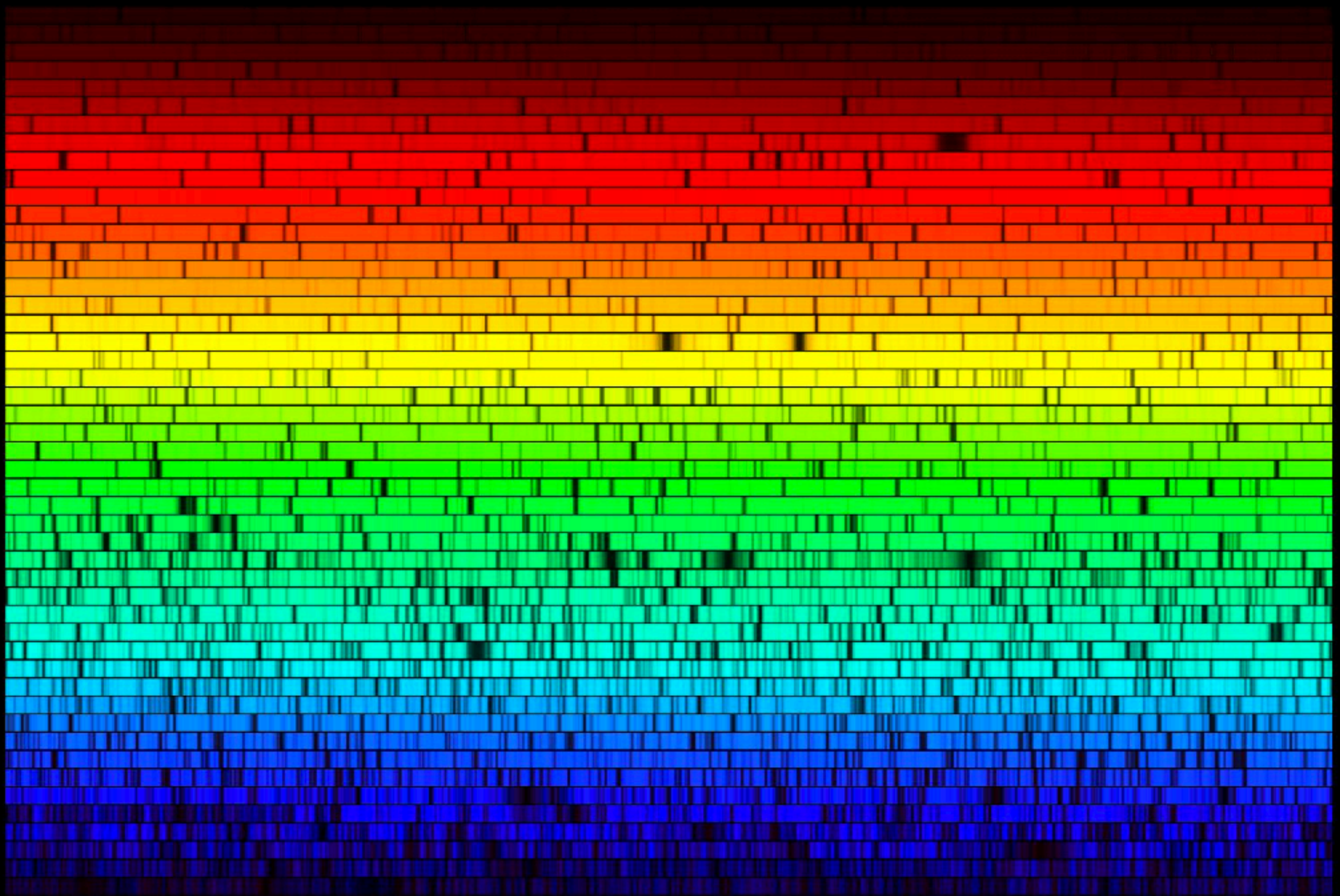
- Take hot jupiter - M=1e-3 solar masses, R=0.4 AU

- Typical scale 10s of m/s. Lower for habitable planet

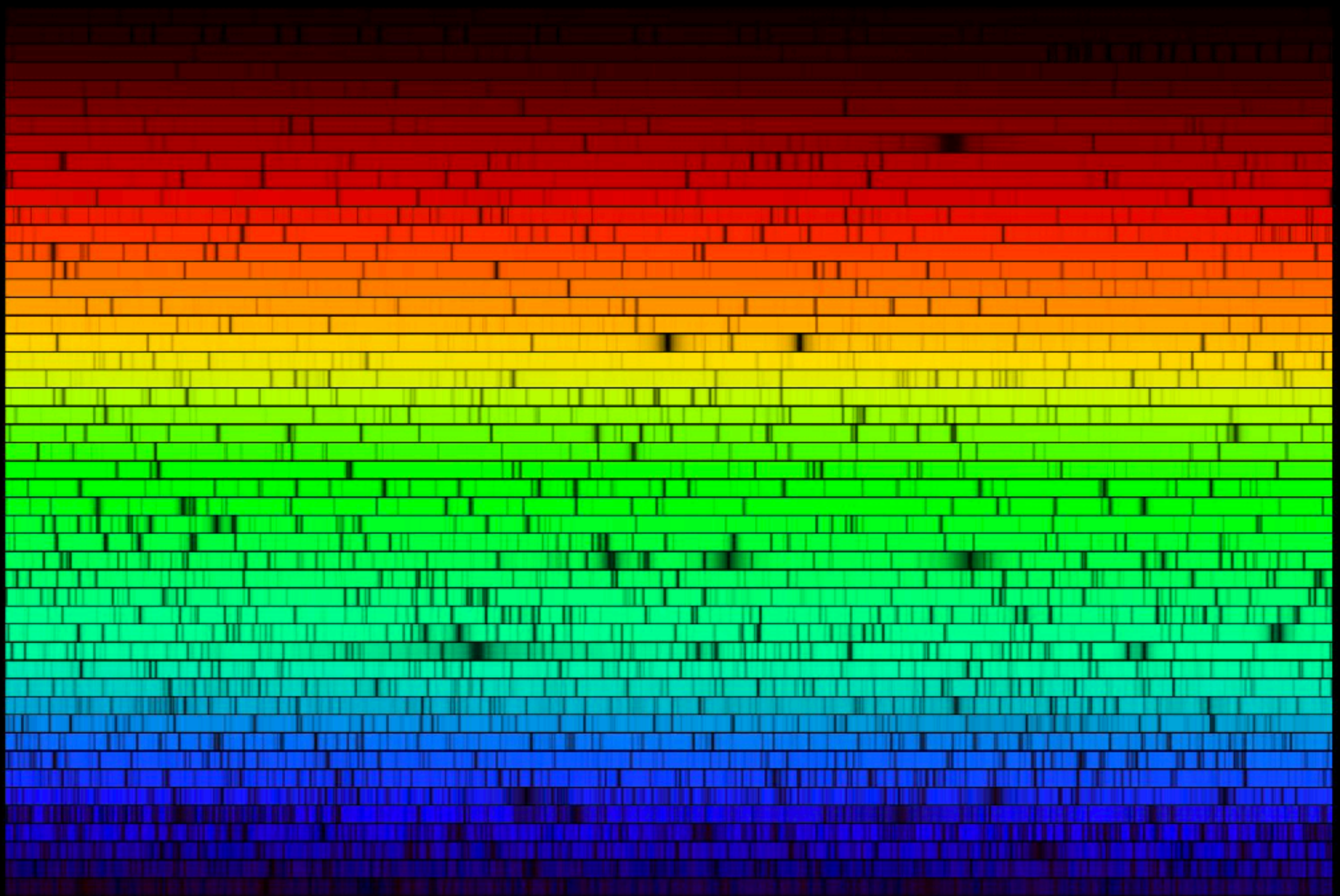
- c/10 m/s=30,000. Need much higher resolution than simple grating will usually give us.

- Solution - echelle. Coarse grating in one direction that stacks up many orders on top of each other. Fine grating in other direction to spread them out.

Arcturus



Sun



Procyon