

Astro 121, Fall 2005
Research Techniques in Observational Astronomy

Week 1 (August 31, 2005): On-line tools

Snacks: I'll provide food for seminar break this week, and during class we'll make up a schedule for the rest of the semester.

Resources and reading:

- We don't have much time before our first seminar meeting of the semester, so there won't be much assigned reading. The main goal this week is to become familiar with some on-line tools that we will use throughout the semester. You can find the relevant web sites just by Googling. In addition to exploring these sites on your own just to see what they can do, please complete the tasks below as well in order to stretch your knowledge a bit.
- Bradt, *Astronomy Methods*, Chapter 3. That said, it will be useful to read a bit. While we'll deal with coordinate systems (one of the main topics of this chapter) in more depth for next week, read through the coordinate system material as it's necessary to have a basic understanding of coordinates systems in order to do searches in Simbad, and to understand some of the naming schemes for celestial objects.

Important concepts:

Understanding how to use the following on-line tools:

- ADS, NASA's Astrophysics Data System
- The SIMBAD database
- NED, the NASA Extragalactic Database
- Skyview, a tool for viewing/plotting many astronomical datasets
- In addition, during seminar we'll discuss the basics of the (sometimes confusing) system of astronomical nomenclature.

Problems

1. ADS: Below are some types of searches one might want to do in the astronomical literature. The first few searches should be relatively easy, and you can probably figure out to do them without reading any documentation. But as you go down the list, you'll be pushing a bit farther into the more advanced capabilities of ADS, so you will probably need to read some of the documentation on-line. For each search, note how many papers you find (once you actually figure out how to do the right search), and also note what you had to do to create that search.
 - a) A colleague mentions "That paper on HK Tau by Stapelfeldt et al." Find it.
 - b) How many papers mentioning the star 51 Peg were published in refereed journals in the years 1984–1994, inclusive? How many in the years 1995–2005? (Why are these numbers so different?)
 - c) Find papers by me (Eric L. N. Jensen or Eric L. Jensen) but not by all the other E. Jensens of the astronomy world. (Papers that are listed only under "E. Jensen" in ADS with no middle initial are by someone else; all of mine have one or more of my middle initials in the

record.) Note: it *is* possible to do this search in ADS rather than doing it by hand. That is, you shouldn't compile the list by combing through a longer list returned by ADS and manually picking out the right papers. The goal here is to make ADS return *only* what you want; you may have to dig through the documentation (or just poke around the site) somewhat to figure out how to do this.

- d) Find only papers on which John Gaustad (or another astronomer of your choice) is the *first* author, and which appeared in refereed journals. (As above, the goal is to make ADS return only this set of papers in a single search, not to pick through a longer list by hand.)

2. Skyview: I'd recommend using the "Advanced" interface.

- a) Create and print out images of the galaxy Cygnus A in the optical (you might try both the red and blue bands of 2nd Digitized Sky Survey), the near-infrared (2MASS), and the radio (the NVSS survey at a frequency of 1.4 GHz). Make the scale about 0.1 degree on a side, and use a black and white colormap. Can you explain why the images look so different? (Browse around on the web to find some spectacular images of this galaxy.)
- b) Create and print out a color-composite image, 20" on a side, of the 2MASS survey near-infrared emission from L1689SNO2 that shows J-band in blue, H-band in green, and K-band in red. (Hint: this system is discussed in Haisch et al. 2002, AJ 124, 2841). Given that all infrared light is invisible to the human eye, why did I choose that particular mapping of colors to photometric filters (i.e. to wavelengths)?

3. Simbad:

- a) What is the distance to the star HIP 33455?
- b) What is the radial velocity of the star HD 155555?
- c) What well-known celestial object is located near the equatorial coordinates 14 29 40 -62 40 50 (J2000)?
- d) What is the HD number of θ^1 Ori C (one of the O stars that forms the Trapezium in the Orion Nebula)?
- e) What is the source of the name "DoAr 21"?

4. NED: I'll freely admit that I'm less familiar with NED than with the other tools, since I don't do extragalactic research. Thus, these questions won't push the capabilities of NED quite as much as some of the other tools.

- a) Plot the spectral energy distribution (SED) for Cygnus A. (Bonus question: can you explain its overall trend with wavelength?)
- b) What is the redshift of 3C 273?

5. Last but not least, here are a couple of questions for which you may need to use more than one of the above tools. As with many problems we'll tackle this semester, both of these are things I actually had to figure out for my own research.

- a) What is the relationship between/among the objects YLW 60, SR 20, and BKL T J162832–242246? (Tools that you might use to figure this out include looking at the objects' coordinates; and looking at images of the field, both in optical and infrared wavelengths.)
- b) What is the equivalent width of the H-alpha line in the spectrum of the star HIP 75187? (*Equivalent width* is a measure of the strength of a spectral line, and is generally given in wavelength units, e.g. Ångstroms.) Is the line seen in emission or absorption?