AST SPECIAL TOPICS: EXOPLANETS
MISC. LECTURE NOTES: SPRING 2018

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Week 9: Protoplanetary disks and their evolution

- The observational view of protoplanetary disk structure, composition, and evolution: Mark Wyatt's (Cambridge U.) slide set on "Protoplanetary Disks" (available on Exoplanets course website):
`http://spiff.rit.edu/classes/extrasol/lectures/sf/WyattLecture5_protoplanetarydisks.pdf`
...plus multiple digressions and asides, some of them perhaps a bit snarky. (Mark, no offense intended — your slides are really great for our class!)
  - Digression, Wyatt slide 6: "There are few nearby young stars..." Not true anymore. There has been a mini-explosion in "nearby young star" identification methods and identifications over the past decade or so; that, plus the huge potential for improving knowledge of late-stage disk evolution and early planetary system evolution inherent in the study of nearby young stars, was actually the motivation for IAU Symposium 314, "Young Stars Planets Near the Sun", held in Atlanta GA in May 2015:
`http://youngstars.gsu.edu/`
  - And gee, how were the TW Hya Association (TWA) and β Pic Moving Group identified, anyway? Well, one of your instructors happens to know a bit about that story. Why, just sit right down, and I'll tell you *all* about it...perhaps more than you really wanted (let alone needed) to know...
  - Digression, Wyatt slide 8: "CTTS are strong X ray sources...but X-rays do not correlate with the presence of a disk" ...why, *au contraire*, *I beg to differ*, etc. Though perhaps it depends on what one means by "correlate." So a (short) digression here on X-rays from TW Hya and small number of similarly X-ray bright, (mostly) nearby, (mostly) "old" T Tauri stars.
  - To elaborate on the material in many Wyatt slides (e.g., 25, 27, 32, 33, 35–37), I'll describe observed properties of two well-studied disks — TW Hya & V4046 Sgr — in some detail.
- Depending on time remaining after the above, walk through Williams & Cieza's ARAA review, "Protoplanetary Disks and Their Evolution" (Williams & Cieza

2011, ARAA, 49, 67):
http://www.annualreviews.org/doi/pdf/10.1146/annurev-astro-081710-102548

- DIGRESSION: how do we determine stellar ages (not to mention masses & temperatures)? Again, depending on time left this week, will probably briefly walk through Soderblom's ARAA review, "The Ages of Stars": (Soderbolm, 2010, ARAA, 48, 581): http://www.annualreviews.org/doi/pdf/10.1146/annurev-astro-081309-130806