OBSS-Science at the Bright end

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- It's hard to compete with GAIA at faint magnitudes
- Overall Mission accuracy is proportional to the number of photons collected per star:
- $\delta_X \sim FWHM_{PSF} / \sqrt{N_{\nu M}} \longrightarrow$ Need LOTS of extra ν's
- But GAIA saturates around G~12:
- It will measure G=2-12 via the diffraction wings that result from the rectangular aperture
- OR: will dump charge in drain such that final part of CCD transit is unsaturated
- Either way: Calibration is different from unsaturated stars which may cause systematic effects.
- Why do we care? Precision Astrophysics can be achieved at bright magnitudes

Astrometric Accuracy ~ Size FPA

(N. Zacharias)

- $\delta_X \sim FWHM_{PSF} / \sqrt{N_{\nu M}}$
  - For a given Mission length:
    - Longer Integration times —> fewer observations
      - Same $N_{\nu M}$ --> Same δ_X
    - 2x Larger Mirror &
    - Critical Sampling &
    - Same F-number &
    - Same (#) CCDs
      - 2^2 * Smaller Field of View ---> $1/2^2 * N_{Obs}$
        - If physical size of <u>FPA is unlimited</u>
          - Same $N_{\nu M}$ and FWHM/2 ---> $\delta_X/2$
        - If physical size of <u>FPA is identical</u> --->
          - $N_{OBS} = 2^{-3}$ ---> $\delta_X * 1$

Science @ The Bright End

- Very Accurate π's --> Luminosities
  - Double Stars
    - + Eclipsing Binaries --> Radii
    - + Spectroscopy --> Masses & [Fe/H]
    - → Mass, Radius, Luminosity
      - For two components
        - → M, R, L, log(g), He, Age
        - → For 10,000's Systems V<~ 14
      - → **Galactic Dynamics & Evolution with a sample of well-calibrated systems**

Galaxy is NOT Static
In the post- SIM&GAIA world

- Stellar mass has increased from 1% 10 Gyr ago to 100% now
- Dynamics of stars varies with time:
  - Potential changes adiabatically, Stars keep their initial energy
    - **Evolution of orbits**
- In order to understand post-SIM/GAIA Galactic Dynamics, we need approximate ages of stars

Stellar Astrophysics

- Current *Astro*physics is limited by the fact that the Sun is the only star for which wee know the fundamental parameters to sufficient accuracy
- Differences among the resulting physical parameters amount to 0.1, 0.25 dex for [Fe/H] and log(g) and 1% for T_{eff}
  - Even when using the most sophisticated models and high reolution data sets