



Wednesday

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New frontiers in IR astronomy with arrays

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Since first entering astronomy in the 1980s, IR arrays have enabled a revolution in astrophysics. NASA's upcoming JWST and WFIRST missions were designed around them. Essentially all of the world's leading observatories employ IR arrays (and often more than one). After a high level introduction to IR arrays and how they work, we provide a snapshot of NASA's WFIRST mission. Then, we describe two advanced topics in IR array operation and calibration that are important for minimizing systematic uncertainties when using IR arrays for astrophysics. The first is Improved Reference Sampling and Subtraction (IRS²; IRS-square), a mathematical technique for making optimal use of the reference pixels in JWST NIRSpec (and other instruments that opt to implement the required readout patterns). The second concerns new insights into IR array calibration that have been gleaned from principal components analysis (PCA) of WFIRST and JWST test data and science observations by HST's WFC3. Somewhat surprisingly, the PCA revealed unexpected shortcomings in how IR arrays data are calibrated today -and importantly how to fix them. The PCA also provides quantitative insight into how the information content of astronomical scenes scales with data volume.