High-contrast/High-resolution Scattered Light Imaging of Circumstellar Disks

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Until recently, despite decades of concerted effort applied to understanding the formation processes that gave birth to our solar system, the detailed morphology of circumstellar material that must eventually form planets has been virtually impossible to discern. IRAS provided a rich sample of stars with IR excesses, indicative of circumstellar dust, from which a ubiquity of planet-forming disks was suggested. To elucidate the physical processes and properties in potentially planet-forming circumstellar disks, and to understand the nature and evolution of their grains, a spatially resolved and photometrically reliable sample of high resolution images of such systems across the postulated epochs of planet-building is required. Following IRAS, the scattered light image of the exceptionally large and bright disk around β Pictoris, obtained with ground-based coronagraphy, gave promise of expanding this solitary example of a scattered light disk to a larger sample but remained unfulfilled until HST and its second generation instruments. The advent of high contrast coronagraphic imaging systems as implemented with the second generation instruments aboard HST, and under maturation on adaptive optics augmented ground-based telescopes, dramatically enhanced our understanding of natal planetary system formation. Even so, only a handful of evolved ($\sim$ 1 Myr and older) circumstellar disks have been imaged and spatially resolved in light scattered from their constituent grains. The current state of the observational sample, as it has arisen from the instrumental technologies and observational techniques that have thus far been employed, is reviewed and implications for future progress in the soon to be available domain of significantly higher contrast imaging systems are discussed.