



PHYSICS AND ASTRONOMY COLLOQUIUM

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“Observational Planet Formation I: Introducing the New Field”

Abstract

Nearly every single Sun-like star in our galaxy hosts a planetary system. How planets form in gaseous protoplanetary disks surrounding newborn stars is among the most exciting and fastest growing fields in all of astrophysics. The best way to learn how planets form from observations, is to directly watch them forming in disks. By definition, this is the most direct way for us to quantitatively constrain the timescale, the location, the local environment, and the statistics of planet formation. In the past, due to the difficulties in detecting planets forming in disks, planet formation was largely a subject of theoretical astrophysics. Now, thanks to a fleet of new instruments with unprecedented resolving power that have come online in the past few years, we have just started to unveil structures in resolve images of protoplanetary disks, such as gaps and spiral arms, that are most likely induced by embedded (unseen) planets. By comparing observations with theoretical models of planet-disk interactions, the locations and masses of these still forming planets can be constrained. This marks the beginning of a brand new field — observational planet formation.

I will introduce this new field in my colloquium on Thursday. We will start by reviewing the latest advances in resolved observations of protoplanetary disks driven by a few key telescopes. We will then address a few basic questions at the center of this new field: How to associate observed structures in disks to forming planets that are often too difficult to see? What can we learn about these "invisible" planets by studying their induced structures in disks? How unique are our planet-based interpretations of disk observations? Is there a way to directly detect the predicted feature-producing young planets? If so, how do we use these planets to constrain theoretical models of planet formation? At the end I will leave you with the big picture of the field, and the general direction of where it is going.

Thursday, February 2, 2017

3:30 p.m.

Engineering Computer Science

Room 104