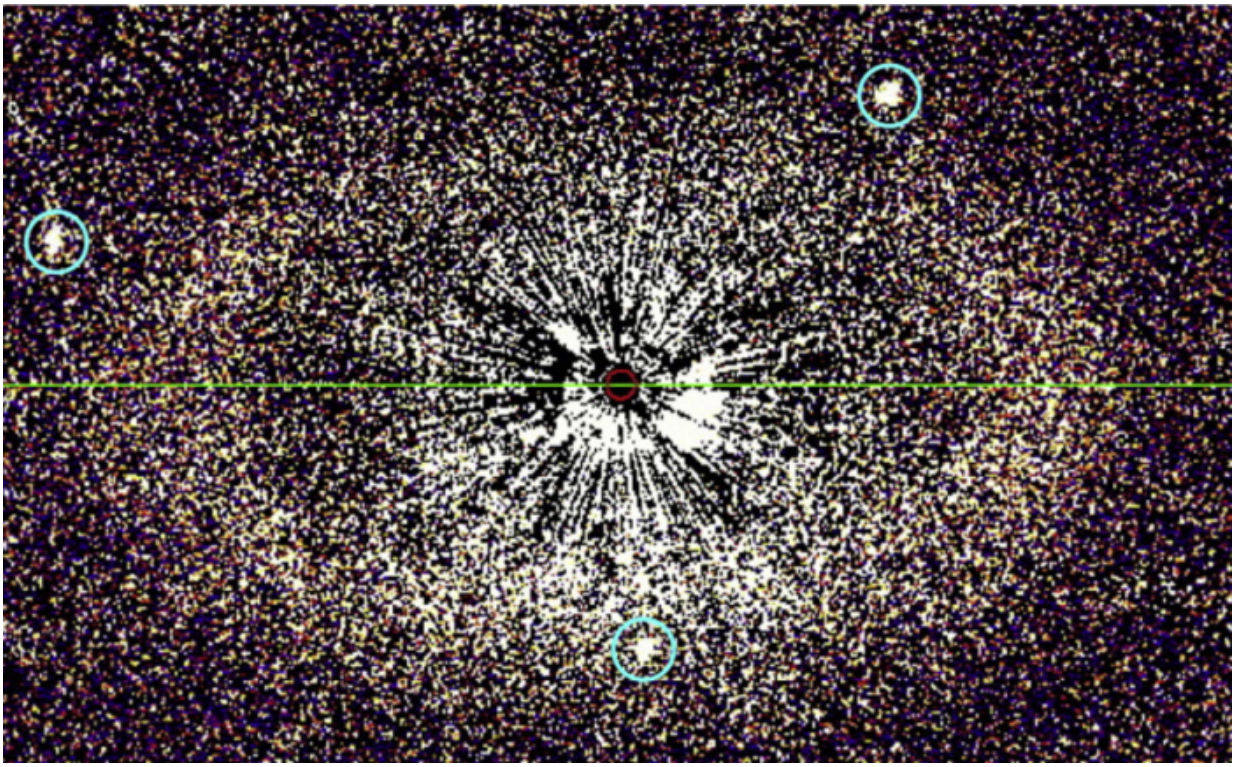
Hubble images three debris disks around G-type stars

September 14 2016, by Evan Gough



An image of the circum-stellar disk around HD 207129. The three circled objects are background objects and are not part of the disk. Credit: Hubble Space Telescope, Glenn Schneider et al 2016.

A team using the Hubble Space Telescope has imaged circumstellar disk structures (CDSs) around three stars similar to the sun. The stars are all G-type solar analogs, and the disks themselves share similarities with our

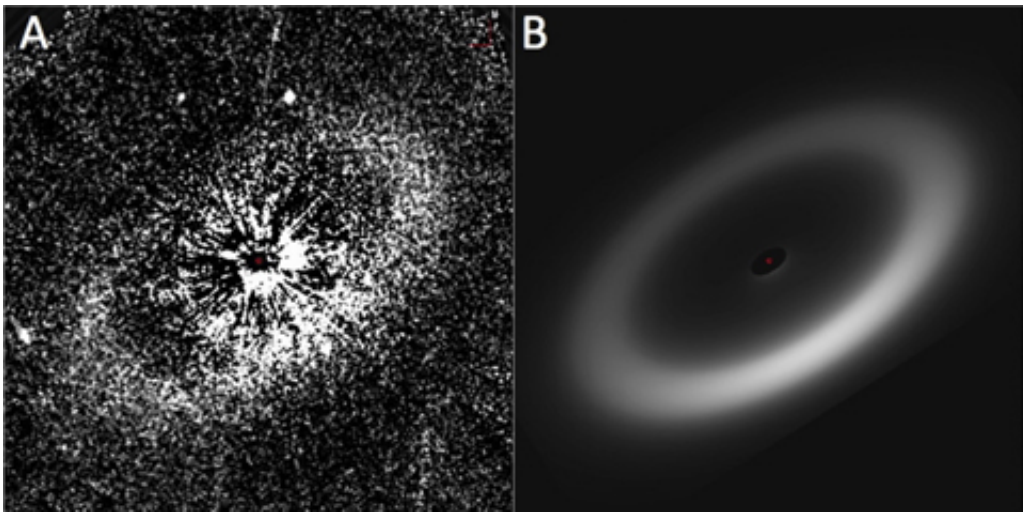
Solar System's own Kuiper Belt. Studying these CDSs will help us better understand their ring-like structure, and the formation of solar systems.

The team behind the study was led by Glenn Schneider of the Seward Observatory at the University of Arizona. They used the Hubble's Space Telescope Imaging Spectrograph to capture the images. The stars in the study are HD 207917, HD 207129, and HD 202628.

Theoretical models of circumstellar disk dynamics suggest the presence of CDSs. Direct observation confirms their presence, though not many of these disks are within observational range. These new deep images of three solar analog CDSs are important. Studying the structure of these rings should lead to a better understanding of the formation of solar systems themselves.

Debris disks like these are separate from protoplanetary disks. Protoplanetary disks are a mixture of both gas and dust which exist around younger stars. They are the source material out of which planetesimals form. Those planetesimals then become planets.

Protoplanetary disks are much shorter-lived than CDSs. Whatever material is left over after planet formation is typically expelled from the host solar system by the star's radiation pressure.



A is the observed image of HD 207917. B is the best-fit debris ring model of the same star. Credit: Hubble, G. Schneider et. al. 2016

In circumstellar debris disks like the ones imaged in this study, the solar system is older, and the planets have already formed. CDSs like these have lasted this long by replenishing themselves. Collisions between larger bodies in the solar system create more debris. The resulting debris is continually ground down to smaller sizes by repeated collisions.

This process requires gravitational perturbation, either from planets in the system, or by binary stars. In fact, the presence of a CDSs is a strong hint that the solar system contains terrestrial planets.

The three disks in this study were viewed at intermediate inclinations. They scatter starlight, and are more easily observed than edge-on disks. Each of the three circumstellar disk structures possess "ring-like components that are more massive analogs of our solar system's Edgeworth–Kuiper Belt," according to the study.

The study authors expect that the images of these three disk structures

will be studied in more detail, both by themselves and by others in future research. They also say that the James Webb Space Telescope will be a powerful tool for examining CDSs.

A circumstellar disk of debris around a mature stellar system could indicate the presence of Earth-like planets. Credit: NASA/JPL

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