Core-Accretion Theory of Planet Formation

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- The core-accretion theory of planet formation is the currently accepted theory of planet formation.
- The word “accretion” refers to the process of a “core” seed gathering more and more material to itself resulting in growth.

The basic idea Behind Core-Accretion Theory of Planet Formation as Follow

- A star in its early life develops a flattened disk of material that is rotating with it in the star’s mid plane. The disk is sometimes known as a debris disk because aside from abundant Hydrogen and HeliumIt contains all kinds of other material, some of which is called “dust” (of varying chemical compositions).
- The dust is initially microscopic but eventually collisions and aggregation are supposed to produce centimeter-sized grains. That this can be done is still being studied in the laboratory and theoretically. There seem to be some conditions under which it is possible.
- The dust particles are supposed to grow by further “sticking together & rduo;
- Statistically, a few bodies are supposed to grow so much that their self-gravity then overwhelms any matter in the neighborhood at which point very rapid growth is supposed to take place. This can only happen if a body reaches hundreds of kilometers in size, and at this stage it is called a planetesimal.
- Various pathways are possible after the previous stage and theoretical work is still underway to work out the details of how terrestrial planets and gas giants (for

example) are formed. The simulations are complex and involve making assumptions, and have many knobs and dials that can be tweaked.

Major problem with this Theory

- That is, the entire theory is based on a physical impossibility. It is not physically possible to go from step 3 to 4 because lumps of matter that have reached a meter or tens to hundreds of meters in size do not stick together.
- The same theory that creates them has them crashing into each other at very high speeds.
- The same theory that creates them smashes them apart before they ever reach planetesimal size.
- Their self-gravity is not enough to make them stick together even if they were not traveling at high relative speeds, and the forces that stick dust grains together don’t operate on rocks and boulders.