

## 24b STAR FORMATION II

Observationally, one should first see a heavily-embedded star+disk. Because the star is embedded in dusty material, most of its light at visible and shorter wavelengths will be absorbed by the material from which the star is forming. The dust, heated by the star, re-radiates that energy in the IR and millimeter wavelengths. The internal heat in the disk due to viscous dissipation also contributes to this flux. The result is a source whose flux is dominated by IR emission – a Class I source.

As the material near the star is either incorporated or dissipated, the photospheric light of the star becomes more visible, and the spectral energy distribution takes on a two-peaked appearance – a Class II source.

Finally, the light from the star is dominated by photospheric emission, but some IR emission may still be present – a Class III source.

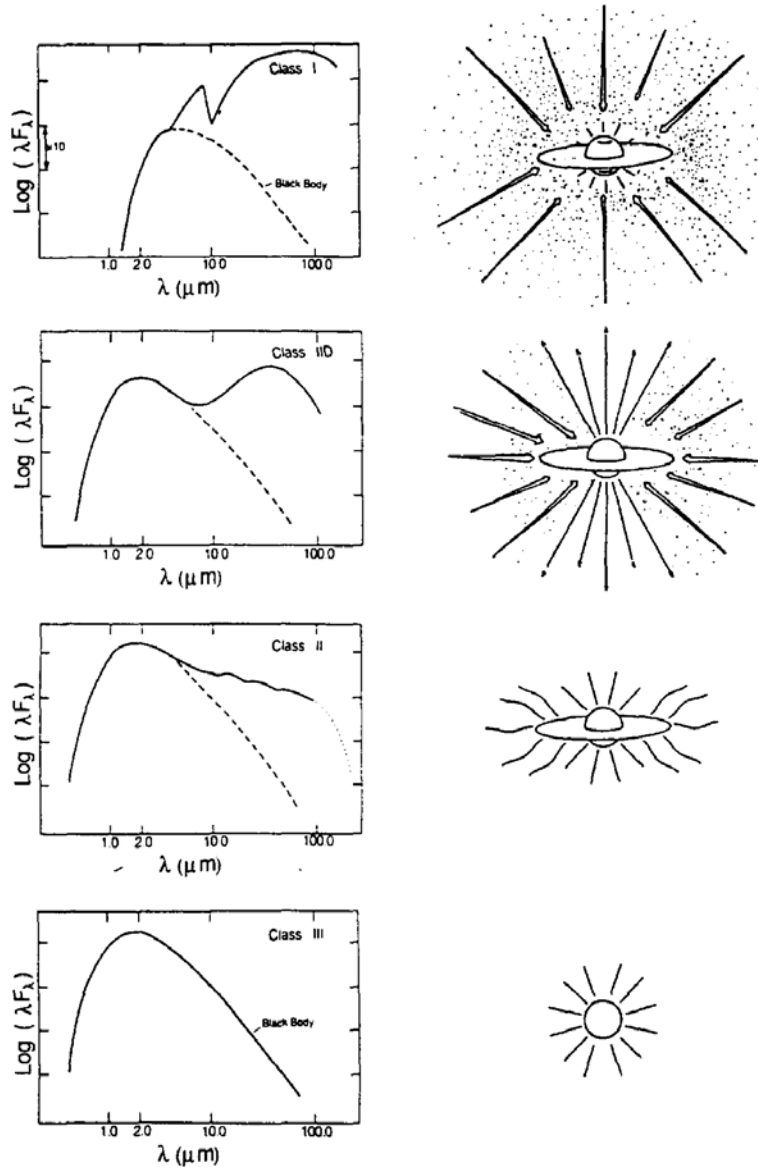


Figure 4. A schematic of the sequence of protostellar evolution, along with the accompanying evolution of the spectral energy distribution (SED). This figure, taken from Wilking (1989), illustrates the ideas described by Lada (1988a) and in the review article by Shu et al. (1987a).

The details of what is going on in the disk during this time is quite complex, but generally consistent with what we know about the formation of our own solar system.

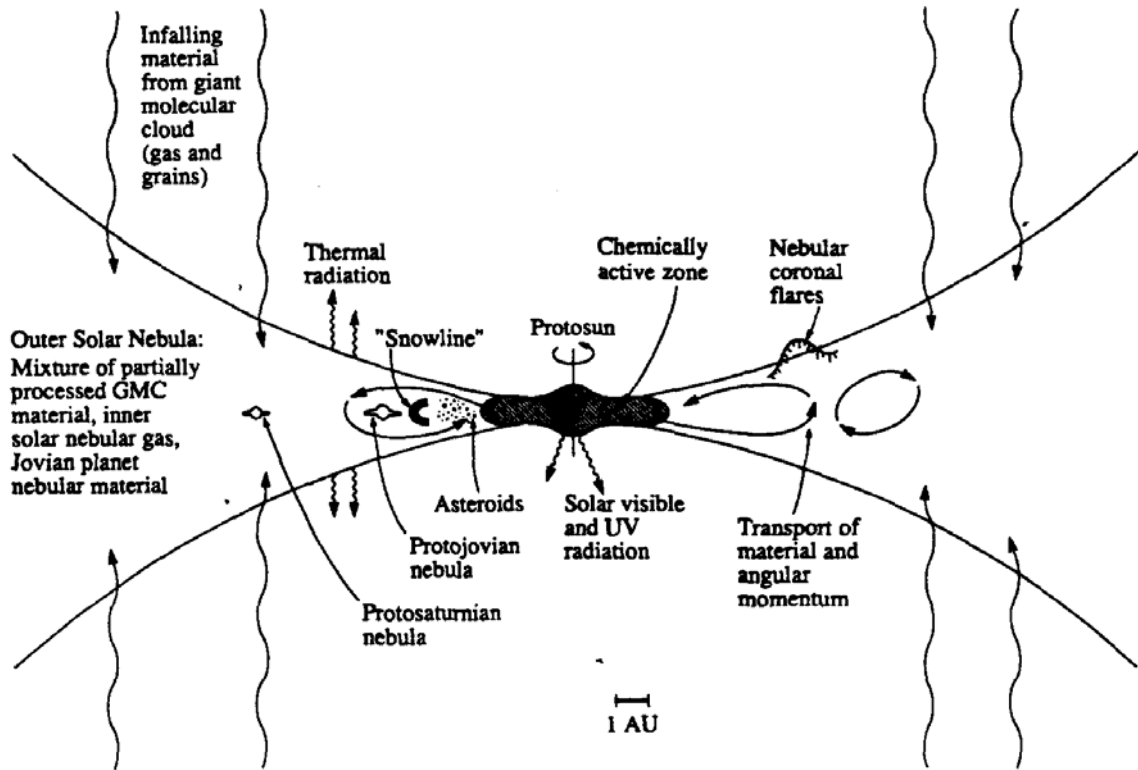
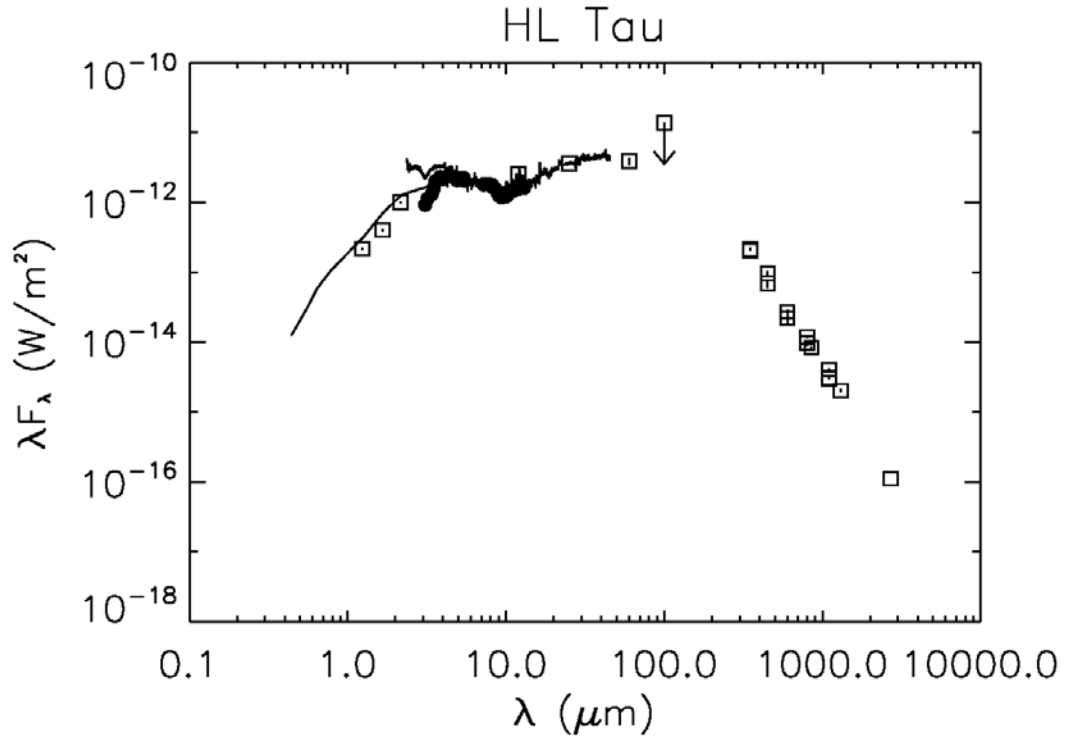
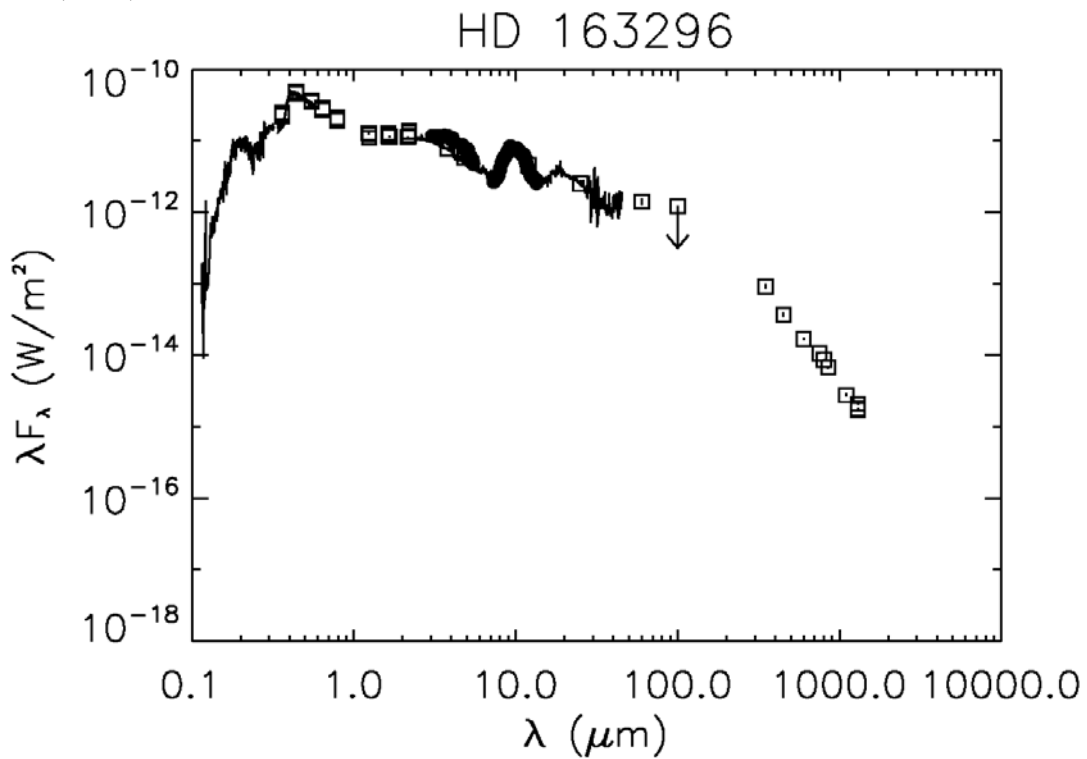


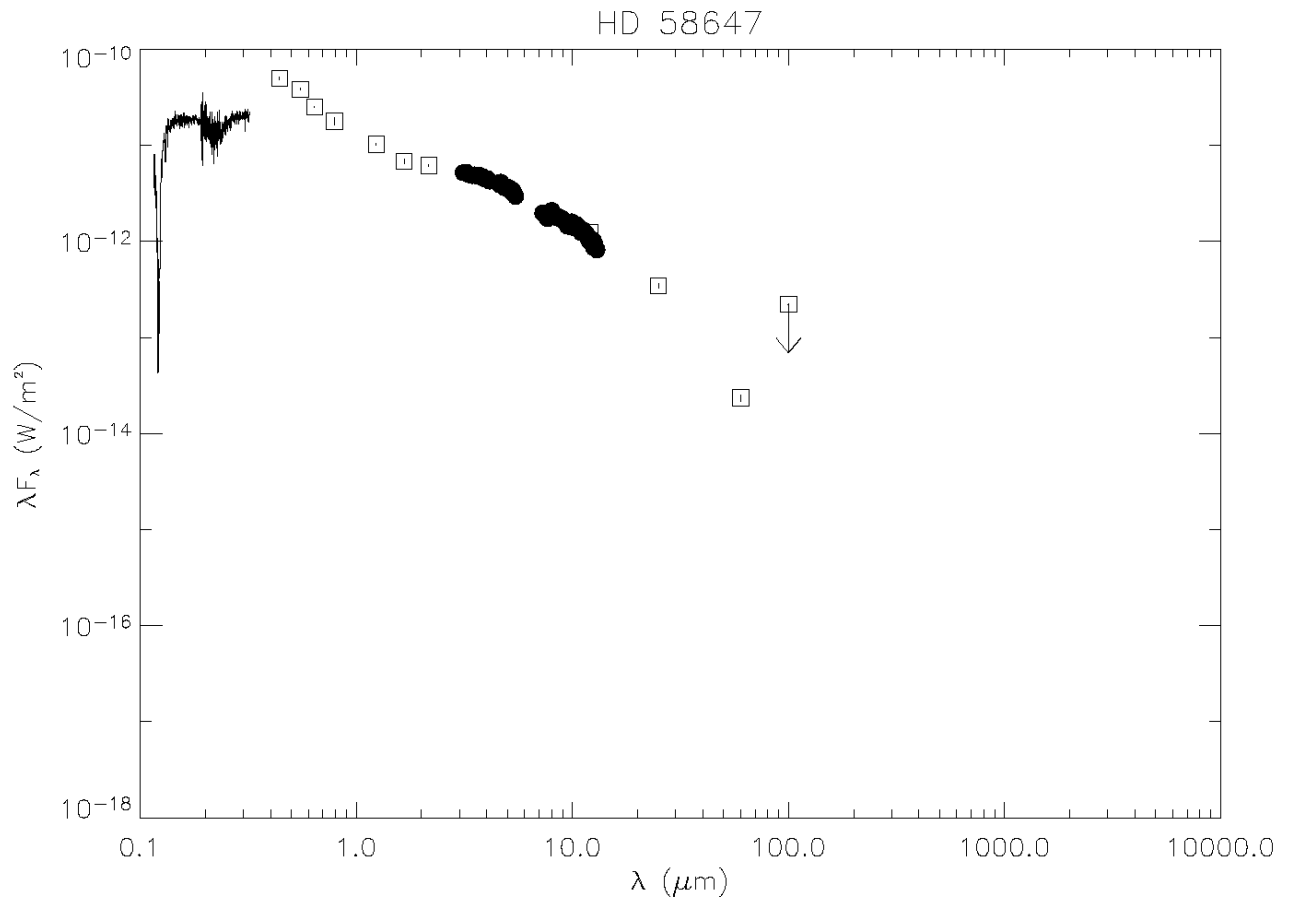
Figure 13. Schematic illustration of the physical and chemical processes in the solar nebula, illustrating the complex interplay between different parts of the nebula, between the nebula and the infalling interstellar cloud material, and between the solar nebula and sub-nebulae surrounding the giant planets. Two processes which further affect the material but which are not shown are an accretion shock, and drag heating of infalling grains (Lunine 1989c).

Today, many stars still possess disks that have been detected and are the subject of recent study. Here are the *spectral energy distributions (SEDs)* of some examples of stars in Class I – III:



Typical spectral energy distribution (SED) for Class I (*above*) and Class II (*below*) sources. From Sitko et al. (2007)





SED for a Class II-III source.

Now let's go back and look at the details of the collapse of protostars as it is believed to occur.