

**Abstract:**

The development of a predictive theory of star formation is one of the prime goals of contemporary astrophysics. The problem of star formation is a very complex one and its solution depends critically on knowledge of certain empirical data. In this colloquium I will discuss some of the key observational milestones that have recently been achieved in identifying and measuring the fundamental boundary and initial conditions that constrain this problem and that must be met by any complete theory of star formation. In particular, I will describe in some detail new results concerning the physical nature of dense molecular cores on the verge of star formation. I will indicate how these results may lead to a solution of the problem of the origin of stellar mass, perhaps the key unsolved mystery in the star formation process. I will argue that the origin of stellar mass and the IMF may be the result of the interplay of only a few very basic and measurable physical processes. This provides some optimism that a more complete and predictive theory of star formation may be within reach in the near future.