Stellar evolution, electron degeneracy, and theoretical discovery of brown dwarfs

(Invited review talk)

S. Kumar (The Galileo Institute)

A theoretical investigation dealing with the structure and evolution of very low mass stars carried out at the University of Michigan (1958 - 1960), Smithsonian Astrophysical Observatory (1960 - 1961), and Goddard Institute for Space Studies (1962) led me to make several predictions during the summer of 1962. Four of the theoretical predictions were:

1. The minimum mass on the H-burning main sequence for Population II stars is approximately 0.09 $M_{\odot}$.
2. The minimum mass on the H-burning main sequence for Population I stars is approximately 0.07 $M_{\odot}$.
3. As a result of electron degeneracy effects, all stars with mass below the H-burning limit keep on contracting until they become completely degenerate objects.
4. The Milky Way Galaxy is likely to contain a very large population of H-rich degenerate objects of mass less than 0.1 $M_{\odot}$.

These theoretical predictions were announced to the general scientific community in a paper that I presented at the 111th meeting of the American Astronomical Society at Yale University in August 1962.

In this talk, I'll discuss some aspects of my work dealing with the theoretical discovery of brown dwarfs during the period 1958 - 1962. I'll also make some comments on our current understanding of the origin and evolution of these objects.