

# introduction



What are the main physical processes which determine the structure of stars?

Stars are held together by the force of gravitation, the attraction exerted on each part of the star by all other parts. This gravitational force is resisted by an internal pressure gradient due to the thermal motion of the particles which make up the stellar material. These two forces, gravitational attraction and thermal pressure, play the principal role in determining the structure of stars. They must be almost in balance if the stars are not to change their properties more rapidly than is observed. In addition to these forces, we must also consider the thermal properties of stars. The stars are continually radiating energy into space. If stars are not to change their thermal properties more rapidly than is observed, energy must be continually supplied to make good this loss. The origin of this energy and the way it is transported to the surface of the star must be incorporated into any theories of stellar structure.

In this section we will use our knowledge of the physical processes described above to formulate the equations of stellar structure. In doing so, we will make two fundamental assumptions about the structure of stars. First, we will assume that, although stars do evolve, their properties change so slowly that it is a good approximation to neglect the rate of change of these properties with time. Second, we will assume that all stars are spherical and symmetric about their centres. If these two assumptions are made, the structure of a star is governed by a set of equations in which all the physical quantities depend on the distance from the centre of the star alone. We will start by making these two assumptions and later consider how valid they are.