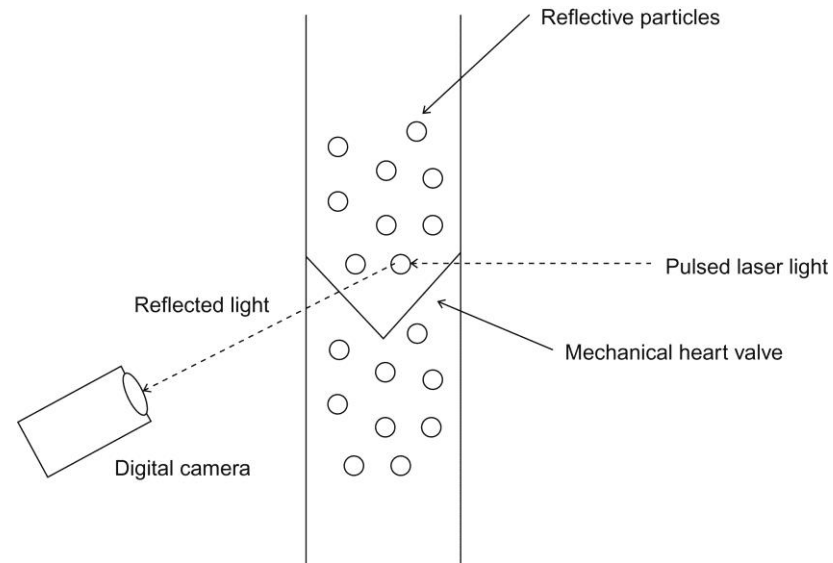
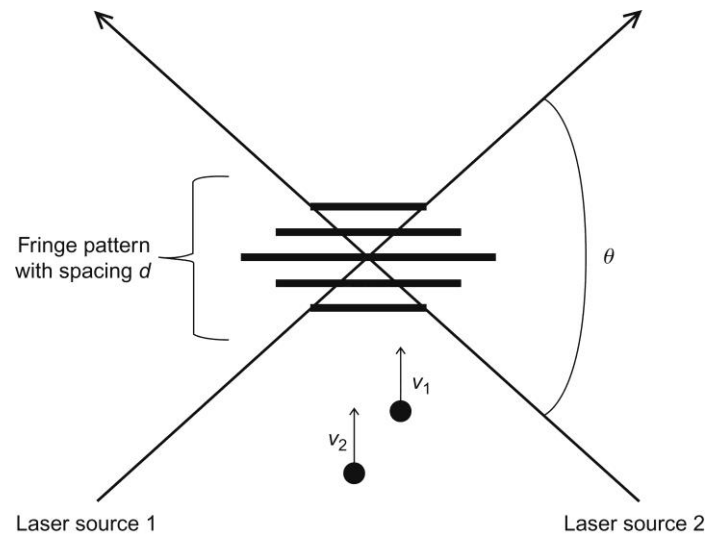


# Chapter 15

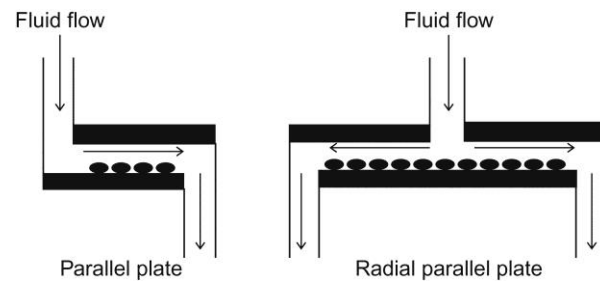
## In Vitro Biofluid Mechanics



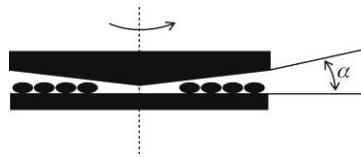
**Figure 15.1** Schematic of a typical PIV system, which consists of a flow chamber (shown with a bileaflet mechanical heart valve), a fluid seeded with reflective particles, a high-intensity laser light source, and a digital camera. Not shown is the computer system that would be coupled to both the laser and the camera to calculate particle velocities.



**Figure 15.2** Schematic of a laser Doppler system, with fringe patterns that are distorted by particles within the fluid. A digital camera (not shown) would be focused at a region that would contain the fringe patterns so that as particles distort the fringes, information can be obtained about the particle and fluid velocity.



**Figure 15.3** Schematic of a parallel plate and a radial parallel plate system. In both of these systems, cells (shown as black ovals) can be adhered to the bottom of the plate or can be seeded within the fluid. The shear stress can be modulated based on the fluid properties and the channel dimensions, and therefore, many different physiological conditions can be investigated.



**Figure 15.4** Schematic of a cone-and-plate viscometer. In these systems, cells within the fluid would be subjected to a uniform shear stress, which is only dependent on the fluid viscosity and the angular rotation of the cone. This is the case if the angle between the cone and the plate remains small, so that the velocity profile is linear.