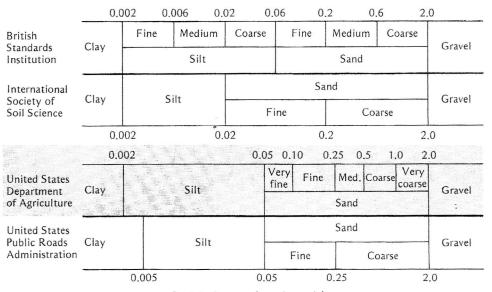
## 92 CHAPTER 4 • PHYSICAL PROPERTIES OF MINERAL SOILS



Particle diameter (mm, log scale)

## FIGURE 4.1

Classification of soil particles according to size by four systems. The U.S. Department of Agriculture system is used in this book.

To study the mineral particles of a soil, scientists separate them ir groups according to size. The groups are referred to as *separates*. T analytical procedure by which the particles are separated is called *particle-s analysis*, the determination of the particle-size distribution.

A number of different classifications have been devised. The size rang for four of these systems are shown in Figure 4.1. The classification ester lished by the U.S. Department of Agriculture is used in this text.

## PARTICLE-SIZE ANALYSIS

A particle-size analysis is done by using sieves to mechanically separate c the very fine sand and larger separates from the finer particles. Then t weight of each separate is measured. The silt and clay contents are th determined by measuring the rate of settling of these two separates frc suspension in water.

The principle involved is simple. When soil particles are suspended water, they tend to sink. Because there is little variation in the density most soil particles, their velocity (v) of settling is proportional to the squa of the radius (r) of each particle. Thus,  $v = kr^2$ , where k is a constant. The equation is referred to as Stokes's law.

With knowledge of the velocity of settling, Stokes's law can be used calculate the radius of the particles as they settle and the percentage of ea size fraction in the sample. These percentages are used to identify the s textural class, such as sand, silt, or loam.

Although stone and gravel are considered in the practical examination a: evaluation of a field soil, they do not enter into the analysis of the fir particles. Their amounts are rated separately. The organic matter, compatively small in quantity, usually is removed by oxidation before the mech nical separation.

A particle-size analysis gives a general picture of the physical properties a soil. The analysis also is the basis for assigning each soil to a textural clas This phase is considered in more detail in Section 4.5.