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## 1.1 INTRODUCTION

"Yesterday, I couldn't define colloid chemistry," said the student. This variation of an old saw could apply to many recent chemistry and engineering students as entering employment in the "real world." Two facts underlie this situation. First, colloid and surface science, although traditional parts of physical chemistry, have largely disappeared from introductory physical chemistry courses. Second, in research, technology, and manufacturing, complex problems are encountered that fall squarely within the purview of colloid and surface science. In this section we enumerate some examples that illustrate this statement. The case "vignettes" included in this chapter also illustrate the importance of colloid and surface science in a broad range of scientific and technological areas.

The paradoxical situation just described means that it is entirely possible for a science or an engineering student to have completed a course in physical chemistry and still not have any clear idea of what colloid and surface science are about. A book like this one is therefore in the curious position of being simultaneously "advanced" and "introductory." Our discussions are often advanced in the sense of building on topics from physical chemistry. At the same time, we have to describe the phenomena under consideration pretty much from scratch since they are largely unfamiliar. In keeping with this, this chapter is concerned primarily with a broad description of the scope of colloid and surface science and the kinds of variables with which they deal. In subsequent chapters different specific phenomena are developed in detail.

### 1.1a Colloid and Surface Chemistry: Some Definitions

#### 1.1a.1 Definition of Colloids

Our first task is to define what we mean by colloid science and how this is related to surface science. For our purposes, any particle that has some linear dimension between  $10^{-7}$  m (10 Å) and  $10^{-4}$  m (1 μm or 1 μ) is considered a colloid. For us, linear dimensions rather than

\*In this book SI (International System of Units) units are used fairly consistently in keeping with current practice. Some quantities are traditionally expressed in cgs units—for example, the specific area is usually measured in  $\text{cm}^2 \text{g}^{-1}$ —and we continue this practice. The older literature uses cgs (centimeter-gran-second) units almost exclusively, so the reader must be cautious in consulting other sources. Appendix B contains a list of conversion factors between SI and cgs units.