1.1 Gems

Let's begin with a seemingly straightforward question: What, exactly, is a gem?

That wonderful, ultimate reference book, the *Oxford English Dictionary*, defines a gem as "a precious stone of any kind, especially when cut and polished for ornament."

The reason that the OED is so wonderful and ultimate – it immodestly refers to itself as "the definitive record of the English language," after all – is that it poses more new questions with every answer. It invites you to explore.

What is a stone? What is precious? What is cutting and polishing?

Let's follow that invitation and do a little exploration…

Figure 1-1 A precious stone of any kind, especially when cut and polished for ornament…

1.1.1 Minerals, Rocks and Stones

To the everlasting disappointment of the editors at the OED, we tend to be lazy and imprecise in our language. Most people would agree that a mineral is pretty much a rock, which in turn is pretty much a stone.

Nothing could be further from the truth. In fact, these words have fairly precise meanings in the world of geology and mineralogy.

A **mineral** is a naturally occurring solid material with a specific chemical composition, regular crystal structure, and characteristic properties. Three clear requirements: **chemistry**, **structure**, and **properties**. Some experts insist that the definition should include a requirement on geological, rather than biological origin, but this remains controversial. Fans of amber and pearls can scan ahead to the definition of mineraloids for comfort. There are currently almost five thousand known minerals, with more being added each year. The website www.webmineral.com can help keep you up to date.

The **chemical** makeup of minerals ranges from pure elements to salts to extraordinarily complex molecules. Gold is an elemental mineral, while the table salt at your local diner is an ionic halide mineral. The more complex silicates constitute about 90% of the Earth's crust, and this group of minerals includes some familiar names, including garnet, zircon, topaz, and peridot. Turn to Chapter 12.2 for more on gemstone chemistry.

The regular crystal **structure** of minerals can be expressed in seven common forms: cubic, tetragonal, hexagonal, trigonal, orthorhombic, monoclinic, and triclinic. These are fancy terms for describing the arrangement of the component atoms and molecules in the larger organizational structure of the crystal, the *lattice*. Chapter 12.10 contains a great deal more information on crystal systems, including some neat 3D pictures.