Figure 10.1. Trophon shell. Inspiration for this sculpture-like view came from shell photographs by Andreas Feininger (see Feininger and Emerson, 1972)

Chapter 10

Shell models in three dimensions

Przemyslaw Prusinkiewicz and Deborah R. Fowler†

Department of Computer Science
The University of Calgary

†now at Hi Tech Toons

Inspired by the models of pigmentation patterns developed by Dr. Meinhardt, we pursued a further goal — to create a comprehensive model of seashells that would incorporate these patterns into three-dimensional shell shapes. Our motivation was twofold. On the one hand, in the absence of a formal measure of what makes two forms and patterns look alike, it is often necessary to rely on visual inspection when comparing models with nature (Prusinkiewicz, 1994). Realistic presentation adds credibility to such comparisons by removing potentially misleading artifacts. On the other hand, we consider visual simulations a celebration of nature's beauty similar to painting, sculpture, or photography (Figure 10.1). Our results are described here according to the paper (Fowler *et al.*, 1992).

10.1 Mathematical descriptions of shell shape: a brief history

The essence of shell shape is captured by the logarithmic spiral, characterised mathematically by Descartes in 1638 (see Thompson, 1952, page 754) and first applied to describe shell coiling by Moseley (1838). By the beginning of the twentieth century, the logarithmic spiral was observed in many artificial and organic forms (Cook, 1914). Thompson (1952) presented careful measurements of a wide variety of taxonomic and functional shell types, and showed their conformity with the logarithmic model.

H. Meinhardt, *The Algorithmic Beauty of Sea Shells,* 4th ed. The Virtual Laboratory,
DOI 10.1007/978-3-540-92142-4_10,