
a


b

Chapter 9

Parallel lines with tongues

The upper shell in Figure 9.1 is decorated with many fine parallel lines. This pattern suggests the same synchronous oscillations as described earlier (see Figure 3.4). However, at particular positions, the parallel lines are deformed into U- or V-shaped gaps. The pattern on the lower shell is based on the same principle; only the size and regularity of the gaps are different. On the upper shell the gaps are restricted to particular positions. On the lower shell two broad bands are nearly free of parallel lines while smaller gaps appear at more scattered positions. The shells belong to the species *Clithon oualaniensis* (in older literature also termed *Neritina* or *Theodoxus oualaniensis*). These small brackwater snails are frequent on shores around India and Sri Lanka and display an incredible richness of patterns. Grüneberg (1976) made a careful study of the polymorphism of these shells. He termed the deviation from parallel straight lines "tongues". His article contains many examples of different types of patterns, transitions from one type to another, and pattern regulation after perturbation.

What is the basis of tongue formation? Obviously, a tongue results from the temporary suspension of otherwise almost synchronous oscillations. A non-pigmented area results that is re-pigmented from neighboring regions in which oscillations survived. The V- or U-shaped oblique lines that border the tongue indicate that traveling waves move into the region of interrupted oscillation, filling the gap. After the waves meet, normal oscillation usually continues, at least for a certain interval.

9.1 Survival using a precondition pattern

An important hint in determining the underlying mechanism comes from a background pigmentation that is visible between the parallel lines on some shells (Figure 9.2a). This is most clearly visible on parts of the shell of *Conus textile*

←

Figure 9.1. Parallel lines with tongues: Patterns on *Clithon* (or *Theodoxus*) *oualaniensis*. The parallel lines indicate synchronous oscillations. These may be interrupted both in smaller (top) or larger regions (bottom). The resulting gaps, the "tongues", are slowly filled by waves that have spread from regions in which the oscillation survived.

H. Meinhardt, *The Algorithmic Beauty of Sea Shells,* 4th ed. The Virtual Laboratory,
DOI 10.1007/978-3-540-92142-4_9,