Due to the work by Erik Flügel, who passed away far too early in 2004, microfacies investigations of carbonate rocks have a long tradition in our institute in Erlangen (Germany). He stimulated several generations of geologists in the field of carbonate sedimentology, and it is a great honor for me to provide a small additional chapter to the present book. The chapter presents examples from a variety of depositional environments and ages. The thin sections have been prepared for the international microfacies courses held in Erlangen regularly since 1974. The chapter has two goals. On one side, thin sections have been chosen which complement the previous chapters, and provide some additional information, on the other, this chapter is intended as some sort of self-test. Before reading the figure captions you might try to study the pictures and build your own interpretation.

After reading the book many of the features visible in the following pictures are ‘old friends’, but some are new documenting that carbonate microfacies analysis is a fascinating, living scientific field, and each thin section tells its own story.

Fig. 20.1. The cold-water origin of this modern carbonate sediment (with some siliciclastic SI and carbonate rock fragments CR) is dominated by various types of herbivorous gastropods from the Fucus-Ascophyllum belt (common intertidal brown seaweed species - SW). Remnants of other epifaunal organisms (e.g. balanids - B, serpulids - S) are also typical for this environment. The rock fragments have been derived from the rocky shore. The black, mostly porous components represent remnants of the brown seaweed, which in diagenetically mature carbonate rocks are not preserved. Please note that carbonate deposits from sublittoral kelp forests (Laminaria) have a different appearance. These large seaweed plants use phenolic compounds as chemical defense against herbivores, and as a result, sediments from these environments usually lack herbivorous gastropods. Thin section of a recent beach deposit near Galway, Ireland.

B - Balanids, CR - Carbonate rock fragment, SC - Light-gray siliciclastic component, SP - Serpulids, SW - Seaweed

Fig. 20.2. Thin section of a recent warm-temperate carbonate sediment deposited on a volcanic seamount (Gettysburg Seamount, Atlantic Ocean, W of Gibraltar, 86 m water depth). This highly diverse sample contains fragments of herbivorous gastropods, bryozoans (mainly cheilostome bryozoans), sessile benthonic foraminifera (*Miniacia miniacea*), serpulids, bivalves, echinoids, coralline algae, and volcanic rocks. The coralline alga indicates that at least part of sediment was formed within the photic zone.

BI - Bivalves, BR - Bryozoans, CA - Coralline red algae, ECH - Echinoid spine, FOR - Foraminifera (*Miniacia*), GA - Gastropods, SERP - Serpulids, SI - Siliciclastic debris

Fig. 20.3. Thin section of a recent beach deposit near Tromsø (N-Norway), rich in fragments of coralline algae (*Lithothamnium glaciale*), balanid plates, bivalves, gastropods, echinoderms (sea urchins), serpulids, bryozoans, and siliciclastic rock fragments. Beach deposits very often represent a mixture of different littoral environments. High abundance of organisms needing a hard substrate for their metamorphosis and growth (balanids, coralline algae) is typical for rocky shores as e.g. in northern Norway.

BI - Bivalves, BA - Balanids, BR - Bryozoans, CA Coralline red algae (upper corner: bored), ECH - Echinoid spines, GA - Gastropods, SI - Siliciclastic grains