16.1: Stratification and Cross Stratification

I will probably be insulting your intelligence by pointing out that the term texture is commonly used in geology to apply to features of a sediment or a rock on the scale of individual particles, whereas the term structure is used for geometrical features on a scale much larger than particles. Stratification is one kind of sedimentary structure. A succinct way of defining stratification is layering by sediment deposition.

The nature and features of stratification in sedimentary rocks vary widely. This course focuses on aspects and features of stratification that are produced by physical processes. Chemical and biological processes are important for stratification as well, but they are outside the scope of this course.

You probably also know well that any individual layer in a sediment or a sedimentary rock that is produced by deposition is called a stratum (plural: strata). In terms of official terminology, a stratum that is less than one centimeter thick is called a lamina (plural: laminae), and a stratum that is greater than one centimeter thick is called a bed (plural: beds). Correspondingly, stratification is termed either lamination or bedding.

Stratification is manifested as differences in the nature of the deposit from stratum to stratum, in texture, and/or in composition, and/or even in sedimentary structures. Some features of stratification are immediately obvious—stratification is one of the most visible and striking features of sedimentary rocks—but some stratification is subtle, and requires care in observation. Lamination, in particular, is often subtle and delicate. Commonly, lamination is virtually invisible on fresh surfaces of sedimentary rocks but become apparent upon slight to moderate weathering of the surface. Likewise, lamination in well-sorted non-consolidated sands does not show up well on a cut and trimmed surface through the deposit until drying by the wind has etched some laminae more than others.
The focus of this part of the course is on physical stratification in the interior of strata. Transitions between successive strata in a succession of strata, when they are sharp, are usually caused by erosion, or at least nondeposition, before deposition of the overlying stratum. Such bounding surfaces have great significance in interpreting depositional conditions, but they are not considered in a systematic way in these course notes.

It is natural to think in terms of two kinds of physical stratification features within strata: planar stratification and cross stratification. Both are common features of sediments and sedimentary rocks. The present chapter deals with cross stratification; planar stratification is the topic of the following chapter.

The term cross stratification (often written with a hyphen: cross-stratification) is applied to any arrangement of strata that are locally inclined at some angle to the overall planar orientation of the stratification. That definition leaves some uncertainty about what is meant by the scales of “local” and “overall”, but that is usually not a problem in most instances of cross stratification. Cross stratification is commonly manifested as lamination, within a much thicker stratum, that is at least in some places at an angle to the bounding surface of the given thicker stratum. Corresponding to the official division of strata into beds and laminae, cross stratification can be classified as either cross bedding or cross lamination.