

## c14 Facies < pronounced *fay.seez* or *fay.sheez* (Br.), singular and plural are the same >

*Facies non omnibus una, Nec diverse tamen, qualem decet esse sororum.* (Their faces were not all alike, nor yet unlike, but such as those of sisters ought to be.) —Ovid.<sup>1</sup>

At any moment, different environments of deposition exist. In each, different types of sediments accumulate (**Figure c14.1**).

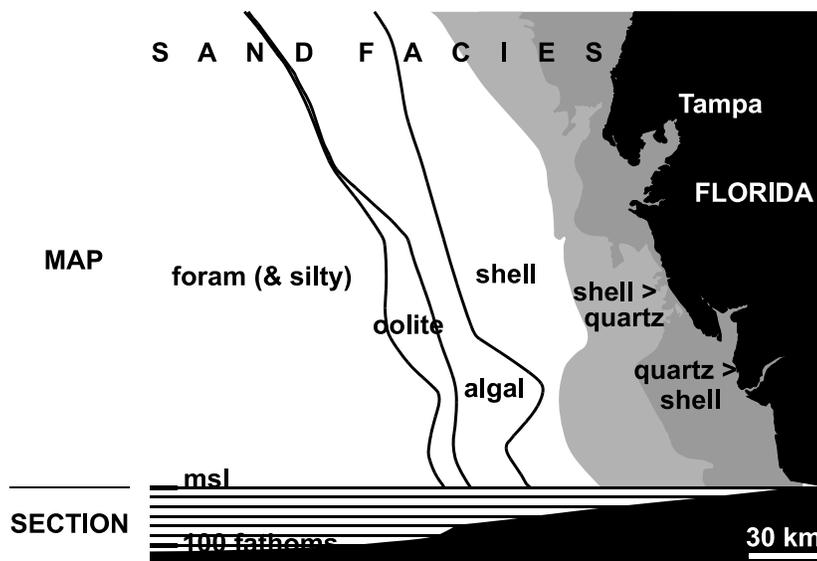
Beds record episodes of local accumulation of a sedimentary stratum that, in Smith's original conception, records a duration of geological time which is traceable globally. Smith found that when a distinctive bed is traced regionally the compositions of the successions of beds that contain it can change and the apparent order of all the beds changes as a result. However, Smith discovered that the *succession of fossils* found in a succession of beds does not change from place to place. So, fossils can be the key to correlating same-age strata. For Amans Gressly (1814-1865), that information failed him when in the 1830s he walked out distinctive strata of Jurassic age in Solothurn's Jura. He found that the composition *and* fossil content of their contained beds are different from place to place: Shale with a distinctive assemblage of fossils gradually changes laterally into a limestone with a different assemblage of fossils. However, as these grade laterally into each other they can be inferred to be of the same age.

For regional time-stratigraphic correlation, a need is to know which *different* fossil assemblages have the same age.

Sediments and fossils of the same age in different parts of a stratum are, when distinctive, called *facies*.<sup>2</sup> Gressley first used the term "facies" with this meaning in 1838.<sup>3</sup> By doing so he revealed an appreciation of the realities of sedimentation and the coming into being of strata. Originally the term had been coopted by Steno in 1669 for the entire aspect of a part of Earth's surface during successive durations of geologic time. In the interval, an understanding of facies had eluded Wernerian geologists. And afterwards, T. C. Chamberlin's influential textbook *Geology*, 1906, returned to Steno's use of the word facies to mean *successive* environmental states recorded by sediments.<sup>4</sup> In his view of cyclical geologic events (continental mountain building, river erosion to base level, marine inundation) terrestrial facies accumulated on old age landscapes and these in turn were transgressed by marine facies. Such a vertical cyclic repetition of facies would now be referred to as a *facies sequence*. Gressley's definition of facies was in place, however, when the so uninspiring

**Figure c14.1**<sup>5</sup>

Map of sand facies sediment types accumulating on the west Florida shelf (Gulf side). Depth of water at southern boundary of the map, is shown in the section.



to Chamberlin “method of colorless [Baconian] observation ” urged by Greenough in England to arrive at knowledge by induction, did reveal that extensive successive formations (**Table c14.1**), that he and others had described for the American platform, were time transgressive (**Figure c14.2**).

The boundary between facies is usually gradational but it can be abrupt (however there, adjacent facies often interdigitate which proves them to be contemporaneous). Why rocks vary laterally is best known from the study of existing sedimentary environments. This science is called *sedimentology*. A *lithofacies* is a lateral subdivision of a stratum or a formation by rock type. Why there are lateral variations in assemblages of organisms living at the same time is knowable from a study of living populations. This science is called *biogeography*. What is learned has application to the less knowable reason for aerial variations in assemblages of same-age fossils. This science is called *paleobiogeography*. A *biofacies* is a lateral subdivision of fossil assemblages by species content.



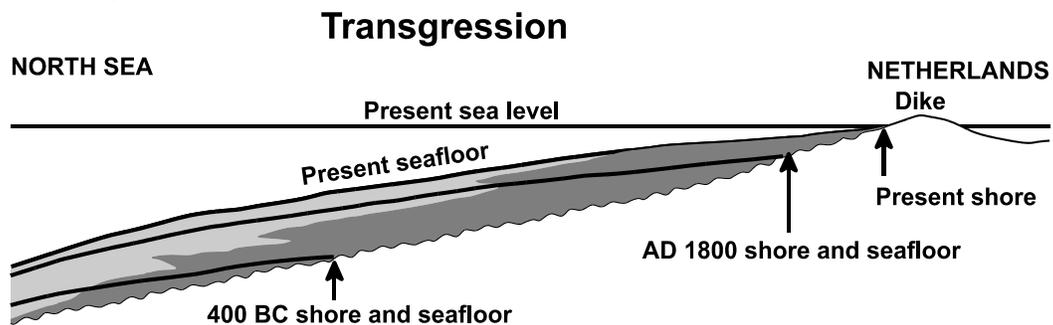
**Table c14.1**<sup>6</sup>

Lithostratigraphic units (material rock units) listed in decreasing order of rank. The formation is the fundamental unit and original, necessary, rank within this category. Other ranks are optional.

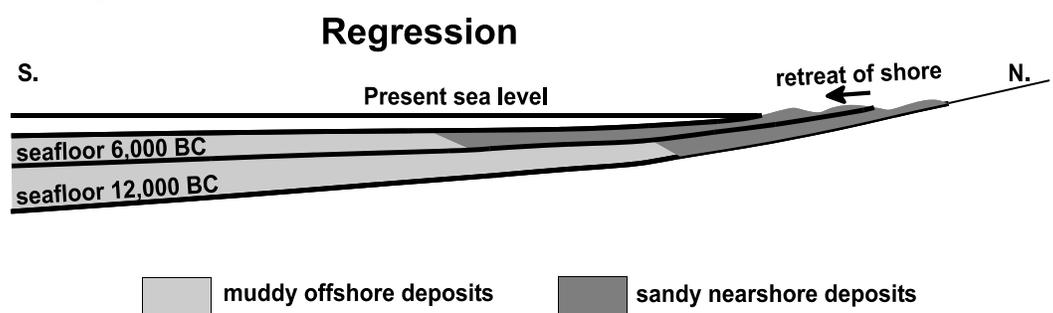
- Supergroup
  - Group
  - Subgroup \*
  - Formation
  - Member; Lens
  - Tongue
  - Bed; Flow
  - Laminae \*
- \* Recognized only in the *Guide*<sup>7</sup>

**Figure c14.2**<sup>8</sup> Two examples of historically documented facies shift:

Landward migration (onlap) of facies boundaries in time



Seaward migration (offlap) of facies boundaries in time



muddy offshore deposits      sandy nearshore deposits