# *h5* Mesozoic marine protists < producers >

Thomas Henry Huxley's *On a Piece of Chalk* published in Macmillan's Magazine in 1868 (based on a public lecture he gave to a class at a Mechanics Institute in 1865) begins: "If a well were sunk at our feet in the midst of the city of Norwich, the diggers would very soon find themselves at work in that white substance almost too soft to be called rock, with which we are all familiar as 'chalk.'"[1]

## Coccolithophores (plantlike protists with *calcareous* shells) [2]

Their name refers to the tiny platlets, called *coccoliths*, that comprise their shells and which usually separate and scatter when the planktonic protist dies. Coccoliths are so tiny that an electron microscope is needed to clearly image them. As today, coccolithophores were probably the main food for suspension feeders in warm waters of the Cenozoic. Coccolithophores have stayed at about one third of the 50 genera that existed in their Late Cretaceous heyday. Cretaceous chalks, made mostly of their shells and foraminifera (as *Globigerina*), are well known from spectacular exposures as the White Cliffs of Dover, England, and also the Demopolis Chalk, southwestern United States. Huxley's essay *On a Piece of Chalk*, 1868, hailed as "a masterpiece of clarity and construction," contributed to general knowledge of chalk's origin and its geologically slow accumulation, evidenced by such in it as a sea-urchin: This had died and had lost its spines. To its bared shell, a bivalve (Crania) had adhered, grown to adulthood, and died. Crania's upper valve had then drifted away. Thereafter its bare inner surface was overrun by an incrusting coralline that had spread a little onto the sea urchin, all before the smothering chalk had buried it.[1] Coccolithophores have been prolific since their Jurassic appearance. Questionable older examples are described from the Pennsylvanian.

## Diatoms (plantlike protists with *silica* shells)[3]

Their shells are so tiny that they can be clearly imaged only by high-power optical microscopes. Today, diatoms inhabit freshwater and exist in great abundance as plankton in cool marine waters. Consistently, their fossil record for the Cenozoic and Cretaceous is that they were primary planktonic producers in cool marine waters. Surprisingly, they are missing from the marine fossil record before the Cretaceous. Presumably, ancestral forms were then without easily preservable hard parts.

## Dinoflagellates (protists with *horny* shells) [4]

Their blooms cause red-tides in nutrient rich warm waters today. They have only recently become much studied (***Footnote h5.1***).[5] Their organic cysts are mostly what is preserved as their fossils. The abundance and occurrence of these show that dinoflagellates were major producers in Cenozoic and Mesozoic epeiric seas.

## Forams (Foraminerfera) (animallike protists with *calcareous*, *horny*, or *agglutinated* shells or tests) [6]

End Mesozoic extinctions of marine life have mostly involved the planktonic foraminifera. Unaffected were benthonic forams such as the alveolinids that continue, common, today and which first appeared in the Lower Cretaceous. The alveolinids resemble but, in the details of their shells, are not derived from the fusulinids. The fusulinids went extinct at the end of the Triassic. They had long been abundant in the Tethys, which persisted as a wide shelf-flooding seaway in Pangea during the Triassic when elsewhere the paucity of marine sediments is evidence of continentality. Tethyan reefs and associated marine foraminiferal calcareous sands (all mysteriously dolomitized) are dramatically exposed in the Triassic Dolomitic Alps.

Fusulinids of Upper Paleozoic age are widely distributed in shallow marine (Lower Permian and Upper Carboniferous) deposits of Spitsbergen.

Fusulinids with calcareous hyaline tests appeared in the Permian. Calcareous microgranular and porcellaneous tests had evolved in the Carboniferous. Before then, tests were agglutinated (cemented grains of fine sand).[7] The oldest, from the Cambrian, are simple agglutinated tubes. ❑