BECOMING STONE – DEATH AND TRANSFIGURATION



Stevns Klint, Denmark.

Connie Svabo and I are visiting this extraordinary geological site that achieved World Heritage status in 2014. She was part of the team that developed the concept for the superb new visitor center [Link].

Here is a vitalist and hylozoic commentary.

Exposed limestone and chalk geology.



Højerup old church.

The beds of stone are massive cemeteries of prehistoric marine life.

Limestone – the sedimentary rock composed chiefly of calcium carbonate, mostly the accumulated and cemented skeletal debris of marine life.

Chalk – the soft, pure, highly porous white limestone formed almost entirely from the microscopic calcite plates of plankton-algae, deposited in the warm shelf seas of the Late Cretaceous.

In the chalk, horizons of **flint** – the hard, isotropic microcrystalline quartz, so suitable for tool making, that formed not by deposition but by silica skeletons of dead creatures dissolving and then precipitating out into voids in the chalk, often the old burrows of marine creatures.



And then there’s the Fiskeler (fish clay) – the fine layer in the middle of this section of stone.

At Stevns Klint, the Fiskeler is the thin dark pyritic marl that marks the boundary between the geological eras of the Cretaceous and the Palaeogene (the K–Pg boundary). It was created by the impact of the asteroid that crashed into the earth 66 million years ago – the Chicxulub event. The dust in the atmosphere and darkness brought the extinction of three-quarters of living species on earth, including all the non-avian dinosaurs, pterosaurs, mosasaurs, plesiosaurs.

The layer is itself the trace of what killed everything, the death event. The white calcareous plankton stopped raining down to the bottom of the sea because it all died, leaving the ordinary dark background sediment suddenly visible.



Chalk dust — the corpses of millions of prehistoric sea creatures. Flint — mineralized burrow voids left by marine creatures.





Death and transfiguration – close up of the K-Pg boundary Fiskeler.

NB Some fascinating detail.

Limestone is any sedimentary rock made mostly of calcium carbonate ($CaCO_3$), which in practice means the mineral calcite.

Seawater carries dissolved calcium and bicarbonate. Marine organisms extract these to build hard parts – coral, bryozoans, molluscs, echinoderms, brachiopods, foraminifera, calcareous algae. When they die, the skeletal debris settles. Some carbonate also precipitates inorganically, in warm shallow water saturated to the point where it comes out of solution on its own (this makes ooids, and, on land, travertine and tufa).

The sediment then lithifies: buried, compacted, and cemented as pore waters precipitate calcite in the spaces between grains. Limestones are diagenetically restless in a way sandstones aren't – carbonate dissolves and reprecipitates readily, so the rock keeps being remade after deposition.

Chalk is a limestone made almost entirely of coccoliths: microscopic calcite plates, a few thousandths of a millimetre across, that armor single-celled planktonic algae called coccolithophores. They live in the sunlit surface of the open sea. They die by the billion, and the plates rain down.

Flint nodules. Some marine organisms build their skeletons from silica rather than carbonate – sponges above all (spicules), plus radiolarians and diatoms. Their silica is opal-A, an amorphous hydrated form that is chemically unstable. Once buried, it dissolves.

The dissolved silica migrates through the pore water of the chalk and reprecipitates a short distance below the seafloor, wherever conditions favour it – often around burrow systems made by marine creatures, which is why flint nodules so often have a lumpy, branching, gut-like form. Over time the silica converts to microcrystalline quartz.