

Otto Renz and the Microfossil Heritage of Ambrogio Soldani

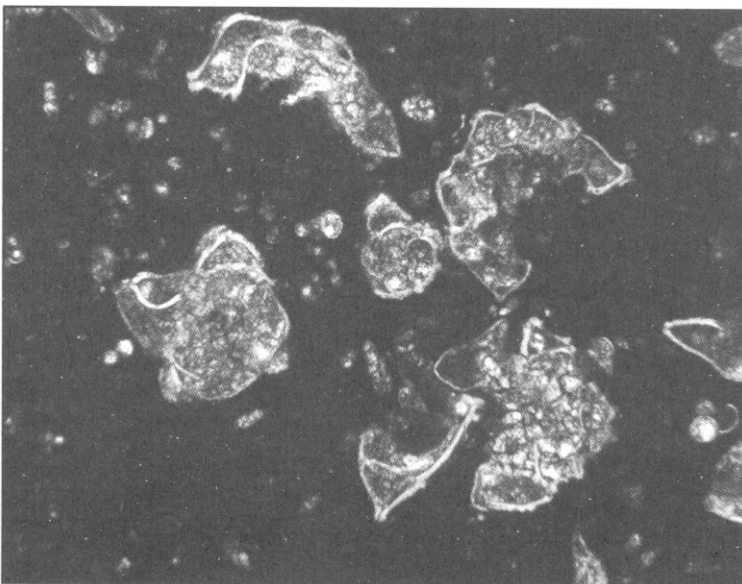
Ambrogio Soldani's pioneering work on microfossils at Siena in the late eighteenth century had to wait more than a hundred years before its potential was finally realized. But at last, at the beginning of the twentieth century, geologists began to make serious use of microfossils, and especially of the Foraminifera. With petroleum companies drilling wells all over the world in the search for oil, the tiny and often very abundant forams emerged as the ideal tool for determining the ages of marine sedimentary rocks.

As Soldani had done, specialists called micropaleontologists would wash away the soft matrix of clay and silt, clean off the forams, and study them under the microscope. Micropaleontologists named the genera and species of forams, worked out their evolutionary family tree, and tied that family tree into the standard geological timescale. Forams offered a wonderful new tool for dating rocks.

The *Scaglia* limestones of the Apennines are full of forams. Even Brother Elias must have seen them, as tiny specks, in the limestone from the Assisi quarries that he used to build the Basilica of Saint Francis.

But they were frustrating to micropaleontologists, because the *Scaglia* is so solid and hard that it is impossible to get the forams out whole. When you hit a piece of *Scaglia* with a hammer, it breaks right across the forams, so you cannot see the surface details of the little shell that were needed to identify the species.

The breakthrough came in the early 1930s. A young Swiss geology student named Otto Renz was studying at the University of Bologna, where he was encouraged to investigate the *Scaglia*. Italian geologists suspected that some of the Apennine rocks were much younger than Bonarelli had thought in 1901, and the problem needed a careful, detailed study. Otto Renz accepted the challenge, and from 1932 to 1934 he roamed through the Umbria-Marche Apennines on a bicycle, mapping the geology, measuring stratigraphic sections of the *Scaglia*, and collecting samples¹.



Foram shells seen with a microscope, in a thin section of the Scaglia limestone. The foram in the upper right happens to be cut in a profile that makes it easy to identify, but the other cuts are not diagnostic.

The best exposures Renz found were in the Bottaccione Gorge at Gubbio. He measured the beds, drew diagrams, and collected samples, just as we were to do forty years later. Back to the lab, he made thin sections of the *Scaglia*. This is a standard geological technique for studying rocks. You cut the rock with a diamond saw, polish the surface flat, glue it to a glass slide, and grind it down so thin that you can see through it. Then you can identify the minerals and study all the fine details under a microscope.

Otto Renz did something new with his thin sections – he used them to identify the forams in the *Scaglia*! It was tricky because micropaleontologists were used to determining the species of whole, cleaned-off specimens, as Soldani had done, while all Renz could see was random cuts through the forams. Most of the cuts were useless, but occasionally he would see a profile that was diagnostic, as when you see a recognizable silhouette of a person's head.

It was not easy, but it was enough. Renz was able to identify the forams in thin section well enough to recognize their basic evolutionary changes. Most important, he recognized that all the forams of the genus *Globotruncana* became extinct partway up through the *Scaglia*. This, he knew, marked the end of the Cretaceous, and it had two important consequences.

First it meant that Bonarelli in 1901 had been wrong in thinking that all of the *Scaglia*, up to the *Scaglia cinerea*, was Cretaceous in age. In fact the upper part of the *Scaglia rossa* is Paleocene and Eocene, and the *Scaglia cinerea* is Oligocene. The tiny microfossils made it possible to correct an error of more than 40 million years.

Second, when Renz recognized the extinction of the genus *Globotruncana* in the *Scaglia rossa*, he set in motion the chain of events that would lead, almost fifty years later, to the recognition of the impact in Mexico that caused the extinction of the dinosaurs.

As Otto Renz was finishing his study of the forams in the *Scaglia*, he returned to the Apennines on a field excursion, and he tells of the great pleasure he had in visiting the *Scaglia* outcrops at Gubbio with Guido Bonarelli, then in his sixtiesⁱⁱ. It must also have been a pleasure for Bonarelli to see how this young Swiss geologist could now use tiny fossils to date those hard limestones that had frustrated him when *he* was a young geologist.

ⁱ This account is based on Renz's own introduction to his PhD thesis (Renz, O., 1951, Ricerche stratigrafiche e micropaleontologiche sulla Scaglia (Cretaceo Superiore-Terziario) dell'Appennino centrale [Italian translation of the thesis in German, 1936]: Memorie Descrittive della Carta Geologica d'Italia, v. 29, p. 11-12), and on an obituary in Spanish written in Venezuela, where Renz worked for many years (www.pdvsa.com/lexico/pioneros/renz.htm).

ⁱⁱ Renz, O., 1951, op. cit., p. 12.