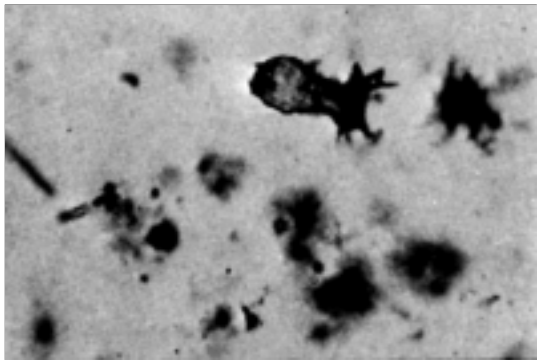

photo: Geology Dept. archive

Gunflint fossils.

Serendipity
and Stan Tyler's Precambrian Gunflint Fossils

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The possible implications for early life of John Valley's and William Peck's important paper about oxygen isotopes in the world's oldest dated zircon grain (see preceding article) reminds us of an earlier Wisconsin "first," UW Professor Stanley A. Tyler's discovery of the two-billion-year-old Gunflint microfossils in the 1950s. It seems timely to review the interesting history of his discovery of the then-oldest-known complex, non-stromatolitic organisms. The story shows us that important science is not always done the way the textbooks paint it.

Prior to 1954, the only certain Precambrian fossils were stromatolites formed by blue green algae (or cyanobacteria). These had been known for at least 75 years; they had been recognized on most continents and throughout much of the Precambrian record—even in rocks as old as 3.5 billion years. Until 1953, the search for other indications of Precambrian life had been unsuccessful, but in the summer of that year, Professor Stanley A. Tyler visited Schreiber Beach, Ontario on the north shore of Lake Superior where the 2 billion-year-old Gunflint Formation crops out on the lakeshore. Tyler had long been interested in Precambrian sediments, especially the enigmatic banded iron formations or BIF, and had just been given a grant by the then-new NSF to study BIFs. He had been tracing the Gunflint iron formation along the north side of Lake Superior, when he decided to take a Sunday off to go fishing. As he boated toward Schreiber Beach, he spied an interesting outcrop along the shore. He landed and found silicified stromatolites intimately associated with black chert beds. Typically the cherts associated with BIFs are red-colored (jasper) thanks to the presence of an iron oxide impurity. He sampled these unusual cherts and thought no more of it. Back in Madison, when he looked at thin sections made from his Schreiber Beach samples, however, he was astonished to see a variety of complex little bodies in the cherts which were composed of dark brown material that he surmised was organic matter. The apparent composition and forms suggested to him that they might be organisms. A few months later at the annual Geological Society of America meeting in Boston, Tyler showed pictures of them to paleontologist Robert R. Shrock, who had been a colleague at Madison before moving to MIT. Shrock immediately agreed that they were organic and suggested that they might be fungi like those "that cover the top of a jam jar left open too long." He urged Stan to show his thin sections to paleobotanist Elso Bargoorn at Harvard, which Tyler did while still in Boston. Thus began a fruitful collaboration between the two, which led to their first announcement of the now famous Gunflint Fossils in an April 30, 1954 article in *Science*, in which Barghoorn concluded that the fossils were unicellular plants with a remarkable variety of

photo: Geology Dept. archive

Stanley A. Tyler with his infant son at a picnic in 1942.

photos: Carl Bowser

At the Spring Banquet: far left, Bob Dott, Galen Kenoyer and Gordon Medaris, and right, Dana Geary and Rob Bleiweiss.

forms; they would have been some of the earliest phytoplankton.

Tyler returned to Madison and immediately began sectioning and photographing hundreds more of the Gunflint fossils. By 1958 he had completed a detailed description of the geology, the mineralogy, and the inferred environment of deposition for the Schreiber Beach locality. Unfortunately, due to personal problems, Barghoorn was unable to complete his contribution to what was intended to be the definitive *magnum opus* on the fossils. Then in 1963, Tyler died tragically of a heart problem at only 57 years of age. Meanwhile, a young PhD candidate named William Schopf came to Harvard to work under Barghoorn and study the Gunflint fossils for his dissertation topic. But there were further delays, and in the summer of 1964, they discovered that Preston Cloud of Minnesota had just submitted a manuscript on the Gunflint to *Science*. Cloud had ferreted out the Schreiber Beach locality, which Tyler and Barghoorn had deliberately not identified precisely in their 1954 paper. Naturally, Barghoorn was devastated! He prodded Schopf to write up descriptions and to photograph the different fossil forms immediately—by skipping classes and working all night if necessary. After two weeks of feverish work, Barghoorn called the editor and told him that he had just finished a long overdue Barghoorn-Tyler manuscript, which should be published before Cloud's because of the 1954 priority. The editor left it to Barghoorn to slug it out with Cloud, which he did with some very delicate negotiations. The Barghoorn and Tyler paper appeared first and Cloud's a few weeks later in 1965. Whew! As Schopf has recorded in his book *Cradle of Life* (1999, chapter two), the whole incident was a bit tawdry, and can be compared with Charles Darwin's distress when he received the famous letter from Alfred Wallace, which laid out a twin of his own theory of natural selection. That potential scoop was resolved in gentlemanly Victorian fashion by a short joint article prior to the appearance of Darwin's book, *On the Origin of Species* (1859).

And so it goes—not all science is neat and tidy, nor are its practitioners flawless paragons of virtue. Tyler's discovery of the Gunflint fossils in the first place was pure serendipity. He was in no way seeking to test any hypothesis about Precambrian life to be followed up systematically with coolly calculated data gathering and description. In other words, his momentous discovery owed nothing to the so-called scientific method espoused in beginning textbooks. Indeed, there is an amusing irony to the fact that it was Stanley A. Tyler who discovered those important fossils, for his interest in paleontology was minuscule. Once on a field trip, when I asked if he knew the name of a fossil specimen I had just found, Stan smiled puckishly and responded "No, Bob, that is not one of my ten fossils."

Once Tyler had shown the world where to look for Precambrian microfossils, the race was on. During the next decade, similar tiny organic remains turned up in black cherts from many continents. Meanwhile, a Russian had succeeded in separating microfossils from Precambrian shales, and the 600-700 million-year-old Ediacaran fossils, which are megascopic impressions of a variety of different soft-bodied animals, had been discovered in Australia in 1947. Soon their counterparts were also being discovered on several continents, and by the 1970s the new field of Precambrian paleontology had emerged. It soon became one of our most vigorous and exciting specialties. Schopf's 1999 book, *Cradle of Life*, records the history of this venture in a most engaging manner.

As a postscript, Tyler's untimely death prevented him from solving the riddle of banded iron formations, but he once told me emphatically that "It was not the way Pres Cloud thought." All we know is that Stan believed microbes played a key role in the precipitation of the iron; he even grew iron bacteria in a fish tank in order to learn more about what they might look like if preserved in chert. Tyler must have had a serendipitous knack, for he also discovered the oldest known coal (1.5 billion-years) in northern Michigan.