Slicing through time

As an organizing principle, evolution is routinely referenced throughout the training of biology students. However, the scope of “deep time,” while often considered in the context of phylogenetic studies, is not a standard subject. For example, biology students usually would not be familiar with the geologic periods, their length or order. On the other hand, geologists, who are required to have a thorough familiarity with the geologic time scale, are not normally fully conversant with many key biological concepts. Paleontology stands at the interface between these disciplines. An optimally trained paleontologist needs to know both a lot of biology and a lot of geology. The limitations of the fossil record place many constraints on the utility of fossils when trying to trace evolutionary changes with direct evidence (as opposed to basing phylogenies only on extant organisms), but fortunately, certain biomolecules are highly resistant to decay. One such compound is sporopollenin, the biopolymer that surrounds the dispersal bodies (pollen and spores) of land plants and some algae. This compound, under the right conditions, can survive the rigors of fossilization for over a billion years, and records taxonomic as well as developmental information that can be gathered in various ways. One of these is transmission electron microscopy (TEM). This presentation will survey 35 years of research on the sporopollenin walls of fossil pollen and spores from a variety of groups using ultramicrotomy, which involves cutting these fossils into thin slices (called sections) for viewing in the TEM.