

Of Ancient Cats and Collagens

When mass spectrometrists Sonja Hess was asked if she'd like to analyze prehistoric fossils recovered from the famed La Brea Tar Pits in Los Angeles, she enthusiastically agreed to help. In 2011, Hess, the director of the Proteome Exploration Laboratory (PEL) at Caltech, began a collaboration with the Tar Pits' George C. Page Museum to study one ancient predator in particular: the saber-toothed cat, or *Smilodon fatalis*. Smilodon has long been extinct, last roaming the California wilderness more than 11,000 years ago. Researchers at the museum are interested in discovering how these cats are evolutionarily related to today's tiger species, whose "family trees" are still somewhat of a mystery. The museum's paleontologists were able to



excavate the fossils and anatomically compare them to modern tigers, but techniques at Caltech's PEL have allowed the investigators to dig even deeper—into the ancient cat's protein makeup.

Although researchers have difficulty finding intact DNA samples from fossilized prehistoric animals, Smilodon's collagen proteins are extremely stable and easy to access. Researchers at the PEL have been able to extract the collagens from fossilized bones and analyze them with mass spectrometry, a technique used to discern the molecular makeup of materials. Combining these techniques with other types of data analysis, Hess and her colleagues hope to reconstruct the entire protein sequences of Smilodon collagens. With this information, the museum should be able to gain molecular insights into the evolutionary lineage of modern tigers—and Caltech researchers hope to develop new methods for extrapolating information from proteins when DNA sequences are not available.

"We are always excited about unique samples and what we can learn from them," Hess says. "Who would *not* be excited about the first look at a 10,000-plus-year-old sample?" —JSC