Murder and mystery keep Dr. Sam Stout Boning up on

by Joan M. McKee

COLUMBIA POLICE suspected foul play when Ralph Davis reported his wife missing in June 1986, but they had no evidence. A big break in the case came in March 1988 when police found the missing woman's blood-splattered car in storage near Jefferson City. Yet one question remained: Could suspect Ralph Davis be convicted of murdering his wife without a body being found? Tests showed that the blood most likely belonged to the missing woman, but more proof was needed.

Embedded in the blood-stained carpet of the car, detectives found approximately 30 small fragments of bone about the size of fingernails. They called Dr. Sam Stout, professor of anthropology and director of the forensic anthropology lab at Mizzou, to see what he could discover.

After unsealing the official evidence bag, Stout began inspecting the bones. First he wanted to find out if the bones were human. Looking at the fragments under a microscope, he saw many large osteons — areas where blood vessels and nerve fibers travel through the bone. The size of the osteons showed that the bones came from a large warm-blooded animal — most likely from a human. The blood tests backed up his theory.

When asked about the bones, Davis told police that the fragments came from his wife's finger that she had cut on the car's window. But Stout disagreed. Under the microscope, he saw several holes for small blood vessels in the curved pieces of fragments and concluded that the bones must have come from the skull, a bone with numerous blood vessels. When seen through a microscope, the structure of the bone fragments showed a disorganized pattern normally associated with the skull.

Stout's investigation also discovered traces of the antibiotic tetracycline on a number of the bone's surfaces. Since the antibiotic was seen near the surface, rather than embedded within the bone, Stout knew the medicine was used within about three months before death. The police found a druggist who testified that he filled a prescription for tetracycline for Susan Davis just before she disappeared.

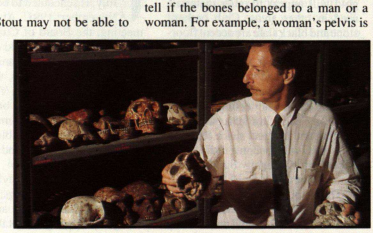
Stout also noticed dark smudges around the edges of the bone fragments. After a closer look under a scanning electron microscope, he discovered the smudges were lead. He concluded that the bones were human skull bones that were struck by lead, possibly from a bullet, and that the person had been taking tetracycline.

The body still has not been found, but with research by scientists such as Stout, in April 1989 Davis was given the death sentence for his wife's murder. The conviction, which is the first in Missouri where the body was not found, is currently under appeal.

Although the Davis case resulted in a conviction, some mysteries remain hidden for years in the bones Stout keeps in a locked cabinet in his lab. The cabinet holds bones that are currently under police investigation.

Even though Stout may not be able to tell to whom the bones belonged, he can give police many clues. To unlock these clues, Stout prefers to have several bones to work with. "The skull and pelvis are the best," Stout says.

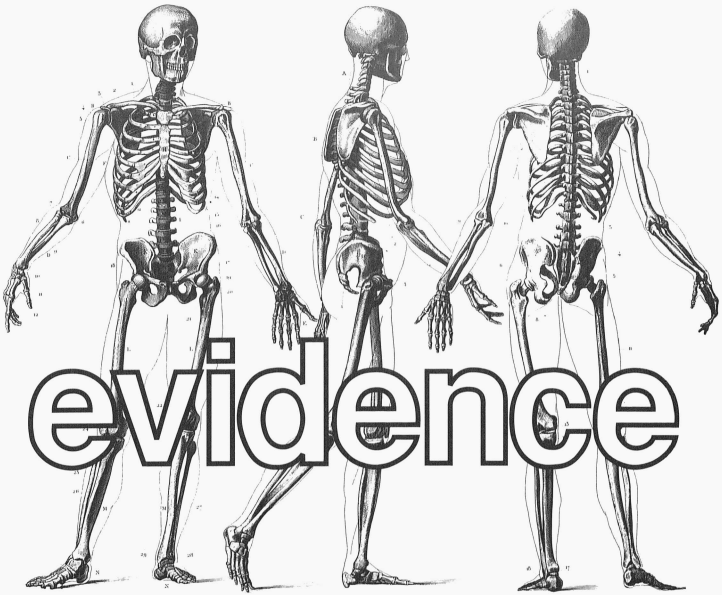
By examining the pelvis, Stout can often tell if the bones belonged to a man or a woman. For example, a woman's pelvis is



Although forensic anthropology students often study real human remains, Dr. Sam Stout also uses plaster casts of skulls like these in his classroom.

Jeff Adams photo

Reprinted from
MIZZOU MAGIC
the magazine published by MU for students in Missouri's middle schools and junior highs to support science education.



delicate and broad, while a man's pelvis is narrower and heavier. There also is a notch found in the pelvis bone that is wider in women and narrower in men. The skull also can be helpful to determine sex. For instance, a man's chin is often more square than a woman's.

Stout stresses that it is often difficult to make positive identifications. "There are so many missing people," Stout says. "Many times we just eliminate a person from consideration."

SKELETAL REMAINS can help forensic anthropologists, scientists who study bones to investigate crimes, find the age of the individual when death occurred. Since teeth grow at a predictable rate, they can be extemely helpful.

During childhood, bones continue to grow. Bones stop growing at around age 20, but they constantly repair themselves. Some cells bore out holes in the bone, and other cells fill them in. This continual action leaves marks inside the bones. By looking at thin cross-sections under a microscope, Stout can tell approximately how old bones were when a person over the age of 20 dies.

Since the changes in bones differ according to the size of the bone — for example, bones in the hand are smaller than bones in the leg — they change at different rates. Stout wants to study the changes of each type of bone. "So far, we have developed ways to determine age by using the clavical (the collarbone) and rib," Stout says.

Another reason to study different bones is because criminals are becoming more clever, Stout says. "Criminals know how people can be identified so they cut off the arms, legs, torso and head and bury them in different places," he says. His latest study is of bones in the feet.

"Feet are often the best preserved parts of the skeleton," Stout says, "because the shoes and socks protect them." The idea to study these bones began when a fisherman found a shoe in a tree. When he took it down, he discovered a foot in it. The identity of the foot, which is kept in the freezer in Stout's lab, remains a mystery, but Stout hopes he and his students can use it to learn more about determining the age of skeletal remains and to someday discover its identity.

Finding ethnic origin is another key to identifying the remains. "It is the most difficult," Stout says, "because there are no pure races." In general, bones in the lower face protrude more in blacks, while whites have prominent bones around the nose.

Blacks usually have wide-set eyes, while whites look like their eyes have been pinched together, Stout says.

"I never use just one indicator for race," Stout says, "because one could be wrong. Humans are variable. Some look like a mosaic." Another indicator of race is to look at the femur or thigh bone. In blacks, the bone usually is straight. The bone curves slightly in whites.

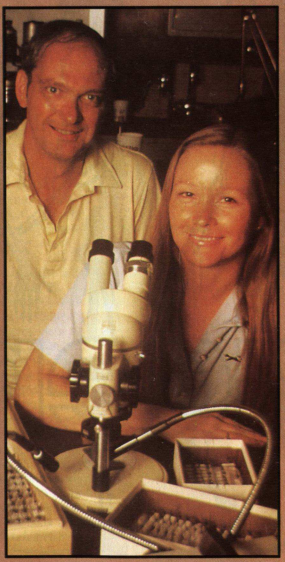
ANOTHER MYSTERY locked inside Stout's cabinet is the identity of a skull found in the Missouri River. Although a large portion of the skull was missing, Stout knew the injury wasn't the cause of death. Around the edges of the wound, he saw bone growth that indicated healing. "This part of the skull must have been missing while the individual was still alive," Stout concludes. He also found a metal staple near the hole, which indicates that a protective plate might have been surgically placed in the head. What appears to be a bullet hole on the other side of the skull may have caused the wound that was surgically repaired. So far no one has been reported missing who fits this description.

But sometimes Stout's research helps police match up skeletal remains with a missing person. In 1982, police in Rolla gave Stout a skull to identify. He discovered that the bottom of the skull had been chopped up by a blunt object. The skull also had a fractured cheek bone that had healed before death occurred. Stout also observed that the individual had lost teeth before death.

Last year a man confessed to killing his son and chopping off his head with a shovel. The son had been in several fights and had at one time fractured his cheek. He also had worn a partial dental plate that fit perfectly into the skull. The case was solved.

Not all the bones Stout examines are from violent crimes. He has worked with the U.S. Army Central Identification Laboratory in Hawaii to identify soldiers who were missing in action. In one case, the family contested the identity, but Stout examined a section of the femur and determined the age to be about 37 years old. He also saw traces of antibiotics, both of which fit with the description of the soldier.

While Stout researches more ways to unlock the secrets of skeletal remains, law enforcement officers continue to bring unidentified bones to his lab. Some may remain a secret, like the bones found in an unburied antique coffin in a closet in Hermann, Mo. But Stout and his students hope to be the keys to unlocking these mysteries of skeletal remains



Entomologist Dr. Robert Hall and research specialist Kathy Doisy study insects like blow flies to help police investigate mysterious deaths.
Jeff Adams photo

Tales told by maggots

Although the sign on the laboratory probably will never say "Maggot PI," some species of flies are helping detectives solve crimes.

Dr. Robert Hall, professor of entomology, is an expert in using insects to verify information about people who die mysteriously. This field of study is called forensic entomology.

"Almost as soon as a person dies, nature tries to recycle the body," Hall says. To help discover how long a body has been dead, law enforcement investigators send insects they find on the body to Hall. Blow flies are his favorite indicator. The bright green and blue flies have an excellent sense of smell, and some can sense decomposing tissue seconds after death. They are different from house flies, which are attracted mainly by decomposing vegetable matter. "If you have ever seen a dead animal on the side of the road, you have probably seen blow flies buzzing around," Hall says.

A corpse doesn't have to have a wound for the blow flies to begin their work. They prefer to lay eggs around the mouth, nose and eyes of the corpse, where moisture can be found. The eggs hatch into larvae also known as maggots. The maggots go through four stages and eventually emerge from a puparium — or hard shell that looks like a small brown capsule — as an adult fly. This life cycle of the blow fly lasts between 10 days to four weeks and depends upon the species of blow flies and the weather. The maggots change into adult flies quickly in hot weather and much more slowly in winter.

Hall and research specialist Kathy Doisy carefully examine the maggots found in the corpses. By observing the stage of the blow fly and comparing it with the temperatures of the location where the body was found, they can help police verify the time of death.

Sometimes clever criminals will move a corpse to try to confuse police. But since different species of blow flies live in different areas, Hall sometimes can tell if a body has been moved by the type of insects he observes.

Although evidence discovered from observing insects in decomposing corpses often can't give an exact time of death, the clues can help law enforcement agents narrow down the time and often can be used to back up other information.