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Carved in Bone
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Meet Dr. Bill Bass

Dr. William M. "Bill" Bass is one of the most famous forensic anthropologists in the world. When he arrived at the University of Tennessee in 1971, forensic science was in its infancy. But with the founding of the Research Facility (the Body Farm) in 1972, the field grew by leaps and bounds. On three acres of land, dozens of donated human remains lie exposed to the elements, enabling Dr. Bass, other forensic scientists, graduate students, and law enforcement personnel to study postmortem change, and since, the research program began in earnest in 1981, crucial discoveries have been made in the determination of time of death and manner of death.

A Q&A with Dr. Bass

What is forensic anthropology?

Forensic anthropology is the application of the traditional tools and techniques of physical anthropology'skeletal analysis, mainly to criminal cases, especially murders. Forensic anthropologists are often called on to help identify murder victims. If the police already have a pretty good idea who the murder victim is, a forensic anthropologist might look at dental records or medical X rays and try to match them to the victim to confirm the identification; if the victim is a John or Jane Doe, we'll start by determining the victim's age, race, sex, and stature, so the police can crosscheck missing-person reports or ask the public for leads that might help identify the victim. We also detect and interpret signs of skeletal trauma ranging from gunshot wounds to bludgeoning fractures to knife marks on ribs. And these days, thanks to the research we've done at the University of Tennessee, we also play an increasingly important role in determining time since death.

What made you decide to go into forensic anthropology?

It was an accident literally. I was majoring in psychology, working on a master's degree in counseling, at the University of Kentucky. Just for fun, though, I was taking an anthropology class, too. One day my professor asked me if I wanted to go with him on a forensic case a woman had been killed and burned in a highway accident, and he'd been asked to identify her body. I went along and found it absolutely fascinating. It was like a light bulb went off above my head. That was the 'aha' that was the moment when I knew what I wanted to do for the rest of my life. I went home, talked to my wife, and changed my major to anthropology. It was the best move I ever made.

What is the "Body Farm"?

That's the nickname for the scientific facility I set up at the University of Tennessee in 1980 to study human decomposition. Officially, it's called the "Anthropology Research Facility," but thanks to a bestselling Patricia Cornwell novel that featured the facility, it's much more widely known as the "Body Farm." At the time I created it, it was the world's only facility of its kind, and although modest efforts have been made recently to start a similar facility elsewhere, the Body Farm remains unique.

What is its purpose?

Its main focus has always been to observe and understand the processes and timetable of postmortem decay, primarily to improve our ability to determine what's called "time since death" in murder cases. In recent years, though, the facility has played an increasingly important role in developing or testing new forensic technologies, and also in training law-enforcement groups like FBI agents, crime-scene technicians, and cadaver dogs and their handlers. It's a unique scientific resource you can do research there that can't be done anywhere else in the world.

Why is time since death so important?

When I'm called to a murder scene, the first question the police ask me is nearly always, "How long has this person been dead?" It's crucial to know when the crime was committed, because that can really help narrow the search for a suspect or can help rule out potential suspects who had alibis at the time the victim was killed. Now, if the body's fresh no more than a day or two old a medical examiner can generally pin down the time since death to within a matter of hours. But if the body's badly decayed for instance, if it was dumped in the woods and lay there for weeks or months before being found by hunters determining time since death requires detailed knowledge of the stages of decomposition, the role of temperature and humidity, the extent of insect activity in the corpse, and so on. Those are the kinds of variables we've spent decades researching at the Body Farm.

What kinds of research have you conducted to understand time since death?

Our early research projects were incredibly simple, because we knew almost nothing about decomposition rates. We put bodies out at the facility and watched to see when various limbs fell off. It sounds silly, but nobody knew even those rudimentary things. Gradually we got more and more specific with our research questions: How does the decomp rate compare in sunshine versus shade? In cool weather versus hot weather? In a shallow grave versus on the ground? In water? Inside a car? What effect do other variables have clothing, body weight, and so on?

What happens to the skeletons after a body has finished decomposing?

Their contribution to forensic science is far from over at that point. Once the research project is finished, we clean off the bones, measure them, and enter the skeletal data in a forensic data base created by my colleague, Dr. Richard Jantz. The data base is the heart of a computer program called "ForDisc," which is short for "Forensic Discrimination." Using the ForDisc software, which is now in use all over the world, an anthropologist who's been brought into a forensic case can enter a few skeletal measurements from an unknown crime victim or even a partial skeleton—for example, the length and diameter of a femur, or thighbone—and the computer can predict, with amazing accuracy, the race, sex, and stature of the person that femur came from. Over the years, our data bank and our skeletal collection has grown tremendously. Today, I'm proud to say, the William M. Bass Research Skeletal Collection is the world's largest collection of modern skeletal specimens, and it's a tremendous asset in helping forensic anthropologists and police pinpoint the characteristics and narrow down the possible identifies of unknown murder victims.

Where do the Body Farm's research bodies come from?

Our research bodies come from three sources. One source is Tennessee's network of medical examiners. If a body that comes through a county medical examiner's office ends up going unclaimed—either because the person is never identified or because no one ever shows up to claim the body—the ME might send it to us for decomposition research or for addition to our skeletal collection. The second source is family members of people who die—folks who know about our research and donate their loved one's remain to help advance the cause of science. The third source is people who will their bodies to us, signing donor consent forms in advance.

What's up-and-coming in forensic science? Current and recent research projects at the Body Farm:

Chemical products of decomposition: Using sophisticated analytical equipment, a research scientist from Oak Ridge National Laboratory is analyzing the hundreds of chemical compounds released as bodies decompose. To date, he has identified more than 400 individual compounds. He has also developed a prototype portable instrument that can detect airborne traces of some of the most prominent of these compounds—a step toward a handheld device that could be used to locate murder victims and mass graves in human-rights cases.

Biochemistry of adipocere formation: Adipocere—a Latin word usually translated as "grave wax"—forms when a body's fatty tissue decomposes in a moist environment: on drowning victims, for instance, or bodies buried in damp basements or hidden in caves. (Adipocere figures prominently in the murder victim whose discovery in a cave triggers the action of *Carved in Bone*.) One current research project is studying the biochemical stages and compounds involved in adipocere formation, as a step toward developing a time-since-death "clock" that could interpret specific chemical ratios in a corpse's adipocere to determine how long since death occurred.

"Divining" for corpses: Surprising as it sounds, an age-old folkloric technique for locating groundwater—called "divining," dowsing, or "water-witching"—is getting a high-tech investigation as a technique for locating buried bodies. Most people who divine for water use a forked, green stick, which—properly wielded—will purportedly twitch when it's carried over groundwater. A remarkably similar phenomenon seems to occur with angled metal wires in the proximity of decaying corpses: the wires twitch, cross, separate, or swing from side to side. One theory currently being investigated by an Oak Ridge National Laboratory research scientist is that as a body decomposes, chemical changes transform it into something akin to a giant battery, whose electromagnetic field affects the wires. Once the mechanism is understood, it—like the chemistry of decomposition gases—could be harnessed to create a sophisticated portable body detector.

Effects of taphonomy on decomposition rates: In a long-term study just completed for the FBI, Body Farm researchers placed corpses in various settings that replicate common murder scenes—inside a car, in a house, in shallow graves, submerged in water, and on the surface of the ground—to compare the decomposition rates and study specific changes in the corpses' hair. Daily weather readings and photographs provided a detailed comparative record. As the researchers expected, the corpses laid on the ground decomposed fastest, because they were most accessible to insects. Slowest to decompose were the bodies buried and immersed in water. Comparative studies like this help forensic scientists refine their estimates of "time since death" when decayed bodies are found at murder scenes.