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Printed from the Charlotte Observer - www.CharlotteObserver.com

Posted: Sunday, Aug. 31, 2014

Efforts to understand human decomposition lead anthropologists to Western Carolina

By T. DeLene Beeland
PUBLISHED IN: SCIENCE & TECHNOLOGY

When people die, Cheryl Johnston's work begins. A forensic anthropologist at Western Carolina University, Johnston oversees one of our nation's six human decomposition facilities. On a mountain slope near WCU's main campus, recently deceased donors are respectfully, but intentionally, laid to rest on the sun-dappled forest floor. Over a year's time, their bodies are exposed to light, rain, humidity, heat, cold, wind and wildlife. Beneath stands of mature tulip poplar, locust, oak and walnut trees they decompose until nothing remains but bone.

Medical students routinely dissect cadavers to master human anatomy and develop skills to help the living. But people are less likely to know that forensic anthropology students, and professionals, need to study human decomposition processes to interpret and solve real-life scenarios involving recovery of human remains. From murders to mishaps, forensic anthropologists unravel how a person died and what happened to their remains after death.

"It's about giving a voice to people who can't speak for themselves," Johnston said, on a July morning while overseeing a summer field course teaching undergraduate students to excavate clandestine graves. Johnston is one of 70 board-certified forensic anthropologists in the nation.

FOReSt within a forest

Her students wield archaeological trowels and crouch intently over three mock graves in an open, sloped meadow. Only a few hundred yards away, behind a

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treeline, is the Forensic Osteological Research Station – or FOReSt. Here, the students observe how humans decompose. Behind the razor-wire-topped outer chain-link fence, and the wood lapboard inner privacy fence, 16 human bodies lie in various states of decay. Three of the bodies are buried. The 58- by 58-foot facility can hold up to 20 bodies.

About 50 people have committed to donating their bodies to FOReSt, Johnston said, but it can take years or decades until these pledges are realized. Recent donations have come from families offered the choice by funeral directors or hospital staff. Several of the bodies in FOReSt today arrived by misfortune: a car accident, a gunshot victim, a surgery patient who died on the table, a petite elderly woman who succumbed to dementia.

Weathered clothing and even exposed medical devices become enmeshed with decayed flesh on most of the corpses: from hospital gowns to morgue sheets to adult diapers, they are laid out as they arrive. Johnston's first donation was a man who loved the woods, and his family delivered him wearing his favorite jeans and plaid shirt.



“As much as possible, we honor the family or loved ones wishes,” Johnston said.

Her own feelings of how to treat the dead, while always respectful, were transformed when she lost her own father in 2012.

“I’m more sensitive now to things like how photographs of the dead are used than I was before,” she said.

After a corpse is donated and laid in FOReSt, Johnston and her students document its transition with daily photographs. After a few weeks, the documentation interval reduces to once a week. Video cameras record visitations by animals, including bobcats, black and turkey vultures, possums, raccoons, mice, birds, turtles and insects.

The videos are revelatory.

“We had one industrious possum visit the same body every night for six weeks,” Johnston said. “The literature is very clear in saying that possums only visit corpses to feed on maggots. But we have video showing possums steadily reducing the biomass.”

The research team has observed vultures feeding on the dead during a narrow spring window that may coincide with nesting, and bobcat chasing mice attracted to the bodies. The videos and photos give Johnston and her team a clear link between decomposition processes and scavenger marks left on the bones.

“The possums, for example, leave very faint markings,” she said.

They've also been able to see how roots and plants leave particular stains or marks, how gravity, rain and snow pull disarticulated bones downslope, and how animals, insects and the elements reduce flesh and move bones over time.

Eventually all that remains are bones with tattered threads of weathered connective tissue. When the skeletons are almost fully disarticulated, students collect and transfer them to WCU's Human Identification Laboratory.

Human Identification Lab

The director of WCU's forensic anthropology program, John Williams, who is also board-certified, oversees the Human Identification Laboratory. It's a simple room with a large central table covered in plastic lunchroom trays. Bones are systematically arranged on the trays: teeth here, ribs there, paired long bones. Like with like.

"As much as possible, we have the students follow the bones into the lab from FOReST, to see the process from start to end," Johnston said. "Decomposition, to collection, to cleaning, processing and cataloging."

The bones are gently cleaned using warm water, kitchen colanders and toothbrushes. The bones are then assigned a special number and incorporated into the university's collection, which totals 16 whole skeletons.

Grave school lessons

As her students excavate their mock graves, beneath large canvas sunshades, they master the basics of creating a level 1-meter grid marked with string and removing dirt systematically with a flat archaeological trowel.

"Hold your trowel more flat, like you're shaving off a curl of chocolate," Johnston guided a student.

They learn to excavate dirt along a clandestine grave wall's uneven contour, spotting small differences in soil compaction and coloration. WCU archaeologist Jane Eastman teaches the students archaeologist field techniques. They form flat excavation layers and painstakingly remove dirt, millimeters per scrape.

The students make a series of drawings each time they move 20 centimeters deeper into the mock grave until they discover a "feature." It may be plastic bone, a bear skeleton, shotgun shells or a bullet casing. All are props intended to teach.

Johnston said the N.C. Department of Natural Resources donates road-killed bear carcasses. "They're so valuable to us," she said. The meadow and road leading up to FOReST contain around 20 buried bear carcasses. In a happy coincidence, some bear bones are similar to a human's, which allows comparative teaching.

Johnston and a former student, Paul Martin, also run a twice-per-year cadaver dog training program at the FOReST site. Law enforcement professionals and civilian dog handlers from 44 states have attended. Profits from the cadaver dog program fund FOReST, which has an operating budget of \$0.

Martin, now a master's student at the University of Mississippi, returns to teach the cadaver dog programs each summer and fall, and to help Johnston teach the summer field school. His expertise is geophysical

mapping techniques such as GPS, ground penetrating radar, and programs that render three-dimensional topographical maps. Combined with the use of cadaver dogs, these methods help pinpoint suspected unmarked graves.

“Our students are exposed to mapping techniques that usually aren’t introduced until graduate school, or even until someone is working in the real world,” Martin said.

Johnston, newly appointed director of the FOReSt for the department of anthropology and sociology, hopes the field school will grow into an international destination for students overseas. Some foreign students lack access to decomposition facilities because they are illegal in some countries, she said.

“We need a field school like this, associated with a decomp facility for every region of the country,” Johnston said. “But our profession has a real problem with public perception. People need to know that we have to be able to study decomposition in order to help the dead – and their living loved ones.”



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