

Biological anthropologists evaluate the health of indigenous Amazonian populations to measure the impacts of socio-ecological changes.



H. P. SILVA

BEYOND BONES



Darwin200

would soon transform the field. First came the theory of evolution in 1859, providing a compelling mechanism and context in the form of natural selection. Then came the modern synthesis, which married evolutionary theory to the theory of genetics. Suddenly this embryonic field had new forms of biological data to mine.

Today, bioanthropology is a hybrid of life and social science that probes human anatomy through the lenses of culture, behaviour and evolution. It addresses “what it means to be human”, says Hilton Silva, a bioanthropologist at the Federal University of Pará, Brazil. Career opportunities are as multifaceted as the discipline itself.

Biological anthropology is commonly classified as one of the ‘four fields’ of anthropology, the others being socio-cultural, linguistic and archaeological. It evolved from physical to biological science to embrace evidence other than bones, such as DNA sequences and behaviour. But the subdivisions are fading. “The four-fields approach emphasizes disciplinary boundaries that we are breaking down,” says Robert Barton, head of the anthropology department at Durham University, UK. However, many bioanthropologists specialize in a particular area or skill, such as primatology, imaging, sequencing ancient DNA or virtual reconstruction of body parts.

The bioanthropology community is small — about 3,000 show up at international meetings, says David Strait, associate professor of anthropology at the University at Albany, New York, who is planning trips to Zambia and Bulgaria. “But because of the subject matter, we have a reasonably high profile,” he says. The media and the public are fascinated by how insights from our

Ricki Lewis reports on biological anthropologists’ branching out into crime forensics and science policy.

ancestors reveal the roots of modern behaviours. “All stripes of people are interested in anthropology. They want the basic Darwinian perspective: why do we do what we do?” says Helen Fisher, a visiting anthropology research professor at Rutgers University in New Jersey.

Career diversity

Most bioanthropologists work in academia, with at least two months of field research a year. “Part of the job description is to travel,” says Strait. Bioanthropologists also teach anatomy at medical schools, he adds. Environments range from tiny departments to large, focused programmes, such as Leipzig School of Human Origins in Germany, run jointly by the Max Planck Institute for Evolutionary Anthropology and the University of Leipzig. “Part of the richness of our institute is the interaction between specialists from very diverse fields to address fundamental questions in evolutionary anthropology,” says director Jean-Jacques Hublin.

That richness is also quite apparent in government and museum bioanthropologist positions, where repatriation is often the aim. Christopher Dudar, lab manager of osteology at the Smithsonian Institution in Washington, DC, for example, tests Native Americans’ remains stored at the museum and helps return them to the tribes staking a claim — which can be challenging when there is more than one claim. “We look for biological markers on the skeleton. Horseback riders would be plains Indians, versus pueblo Indians who were more sedentary horticulturalists,” Dudar says. “We would not expect their skeletons to show signs of horseback riding.”

Required skills are technical and physical. “Some bioanthropologists are experts on field methods, others on computer modelling, and yet others on laboratory techniques such as morphometrics, hormonal assays and isotope analysis,” says Barton.

Research can be gruelling. “It means working hard in the field from the early morning until late at night, living in simple dwellings and being covered by dust the



Helen Fisher.

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whole day,” says Albert Zink, head of the Institute for Mummies and the Iceman in Bolzano, Italy. For those more comfortable in front of a computer screen, virtual anthropology is an approach that models human skeletal variability. The European Virtual Anthropology Network (EVAN), based at the University of Vienna, funds young scientists to apply this technology. For example, an EVAN-supported company has developed a three-dimensional face-recognition system for use in security, based on anthropological research.

Other skills are less high-tech. Some bioanthropologists must, for example, feel comfortable with sifting through dog faeces for human bone fragments or identifying the species and developmental stage of larvae feasting on a corpse to get clues about a person's death. An intimate familiarity with the human skeleton and its response to stress is crucial, says Cassandra Kuba, chief forensic anthropologist in the Department of Justice, Law and Society at California University of Pennsylvania. And fieldwork may require learning a language, says Pancras Ngalason, executive director of the Jane Goodall Institute in Dar es Salaam, Tanzania, where understanding Swahili is necessary.

Bigger picture

The most important skill for a bioanthropologist is, perhaps, a “deep curiosity to understand our species, our evolution and our relationship to the natural world”, says Jay Stock, director of studies in archaeology and anthropology at the University of Cambridge, UK. All areas of bioanthropology also share what anthropologist Eugenie Scott, executive director of the National Center for Science Education based in Berkeley, California, calls “a holistic, systems view” of standing back and letting the stories emerge from the clues.

This holistic perspective and the necessary skill set mean bioanthropology thrives on collaborations — such as with radiologists, palaeontologists and dentists. And that presents challenges. “Directing such research teams requires a wide range of skills beyond the scientific: managerial and project management, diplomatic, financial and people skills,” says Darren Curnoe, co-director of the palaeosciences laboratory at the University of New South Wales in Sydney, Australia. His research on the spread of modern humans to east Asia during the late Pleistocene epoch requires him to have knowledge in geology, geochronology, genetics and archaeology.

These days, bioanthropologists often forge careers involving more modern detective work. Forensic anthropologists may work in academia while helping local law enforcement a few times a year. Others work for medical examiner's offices, for the government or in organizations such as Médecins Sans Frontières.

Kuba landed her dream job in forensic anthropology shortly after earning her PhD. She teaches undergraduates, local law enforcement, coroners and attorneys in the university's Institute of Criminological and Forensic Sciences, but she enjoys casework the most. Suppose a hiker comes across a decomposed skeleton in the woods. The forensic anthropologist, she explains, recovers the remains and transfers them to the lab for processing and analysis, then determines the postmortem interval, analyses trauma and burns, and probes skeletal traits that may help identification.

Christopher King, forensic anthropologist for the US Army's Mass Graves Investigation Team in Iraq, has



David Strait (top) and Eugenie Scott (above).



Jean-Jacques Hublin.



Frank Ruehl (above) analyses a mummified foot.

uncovered victims of war, plane crashes, terrorist attacks and tsunamis. Back in the 1980s, the job required only identifying and returning the remains of relatives to families. New technology allows anthropologists to analyse the trauma that the deceased experienced in far more detail. “As a result, there is an increased need for trained professionals to excavate and analyse human remains using strict scientific methods that will stand up to courtroom scrutiny,” says King. “With terrorist groups and large-scale natural disasters seemingly on the rise, this type of investigation will continue to grow.”

Some have to a study remains from a different perspective. Tal Simmons, principal lecturer in forensic anthropology and archaeology at the University of Central Lancashire in Preston, UK, specializes in taphonomy, the study of decaying organisms. She watches pigs rot, extrapolating the findings to humans. “We help the police determine how long ago a person died,” she says. Her work entails determining the subject's age, ‘race’, sex and build, the features of pathology or trauma, and consulting records of daily temperatures to calculate the stage of decomposition.

Bioanthropology, though, has reached beyond the bare-bones analysis of the lab and the dig site, providing careers linked to serious social issues. Trained as a physical anthropologist, Scott has forged a career as a leading figure in the movement to keep intelligent design and creationism out of science classrooms. “I had to learn about religion, education, the law, politics and how to run a not-for-profit,” she says. “It was never boring.”

Bioanthropologists have even moved into the realm of popular culture. In 1975, Fisher approached her anthropologist PhD mentor — “How do you do anything with anthropology in the real world?” she asked in frustration. He had no answer. Nevertheless, she found a way to successfully combine serious research on pair-bonding with projects that bring anthropology to the masses. Fisher often appears on talk shows; she also created the dating website chemistry.com and she consults for the dating website match.com, where she tries to elucidate the physiological bases for attractions among different personalities.

Whether investigating mummified remains or inquiring into the bonds of love, bioanthropologists apply their expertise to probe many aspects of the human condition. “Evolution is another way to contemplate the beauty of life and the origin of human complexity,” says Hublin.

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For more on Darwin, see www.nature.com/darwin.

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