



### **A103 The Use of Industrial Computed Tomography (CT) in Forensic Anthropology**

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After attending this presentation, attendees will be familiar with the uses of industrial CT scanning in forensic anthropological examinations.

This presentation will impact the forensic science community by increasing awareness of alternative postmortem imaging approaches, as well as by demonstrating some of the uses of industrial CT technology in forensic anthropological casework and research.

The use of postmortem CT to examine skeletal remains is not new, but its use by forensic anthropologists is relatively rare. This may be due to limited resources for purchasing or accessing CT scanners, or unfamiliarity with CT options and their advantages. CT is used in a variety of industries, including not only medicine and dentistry, but also security, aerospace, automotive, manufacturing, and defense, among many others, and these industrial devices can be adjusted to parameters suitable for examining bone. Anthropologists may therefore be able to consider alternative technologies such as industrial CT, thereby increasing their potential access to it. Moreover, industrial CT scanners are highly versatile and offer several significant advantages over medical CT in the examination of skeletal remains.

For example, most industrial CT systems are self-contained and self-shielding, eliminating the need for specialized rooms for their operation, as well as individual shielding. Moreover, while medical CT systems are commonly limited to certain dosages (due to health concerns for living patients) or are tailored to specific diagnostic applications, industrial CT in postmortem imaging allows longer scan times and greater versatility in terms of the analytical parameters used. For example, the use of high intensity, micro-focus or nano-focus X-ray sources on industrial CT systems permit much greater magnification and resolution than a typical medical CT scanner. Industrial CT scanners are also capable of greater penetration of dense objects, such as dental fillings and surgical devices, than typical medical CT technology. If desired, most units can also be used for traditional 2D digital radiography. File formats generated from industrial CT scans are standard and compatible with most medical imaging viewers, analytical software platforms, and 3D printers.

Currently, the Federal Bureau of Investigation (FBI) Laboratory and the Forensic Anthropology Center at Texas State (FACTS) both utilize an industrial CT scanner in postmortem assessments of skeletal remains for forensic and research purposes. This unit is marketed primarily for non-medical, industrial applications but is readily adapted for use in anthropological investigations. Applications include documenting features for identification, analysis of skeletal trauma and disease, assessment and documentation of biological parameters, production of 3D printed replicas, and research on bone density and microstructure. Another significant advantage of this type of machine in a large forensic or academic laboratory is that, unlike a medical CT system, which is configured and dedicated to one or a few specific purposes, the machine has many forensic and research applications. In the FBI Laboratory, in addition to forensic anthropological applications, the device supports forensic examinations of manufactured



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products, explosive devices, electronics, and firearms. At FACTS, the system is used in forensic anthropological casework and research, as well as for imaging archaeological, paleontological, and geological specimens. This ensures a high utilization rate and more readily justifies the costs of its operation and maintenance.

CT is an extremely useful tool in postmortem forensic anthropological examinations, and the use of radiology for non-destructive documentation, examination, diagnosis, and preservation of skeletal remains is encouraged. Virtually any type of CT scanner can be adapted to effectively image skeletal material, so anthropologists are not limited to medical CT systems in their examinations. Laboratories can consider alternative CT scanners for purchase, but they may also be able to leverage resources that already exist in their community by developing relationships or partnerships with professionals in other offices or industries. The use of more versatile machines can result in greater imaging resolution and detail for skeletal examinations and may also be more cost effective for a laboratory, especially in cases in which the device can serve multiple disciplines.

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### **Forensic Anthropology, Forensic Radiology, Computed Tomography (CT)**