

## A70 The Application and Implication of Radiocarbon Dating in Forensic Case Work: When Medicolegal Significance Meets Archaeological Relevance

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**Learning Overview:** After attending this presentation, attendees will appreciate the benefits as well as the implications of both traditional radiocarbon dating and bomb pulse dating when applied to skeletonized remains to estimate time since death.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by: (1) increasing knowledge of the potential applications of radiocarbon techniques to skeletal remains routinely encountered in forensic casework, (2) discussing implementation with or without contextual information, and (3) illustrating an original scientific collaboration with French archaeological authorities.

The estimation of the time frame between death and discovery of an individual is one of the essential aspects in forensic anthropology. In France, prosecution of crimes is barred after 20 years; however, determining the forensic significance of skeletonized remains in an area of high archaeological potential can be challenging. Through two complementary cases, this communication illustrates the application of radiocarbon analysis by examining their medicolegal significance.

Due to the half-life period of radiocarbon (5,730 years), dating techniques based on this radioisotope are typically relevant to material that dates from 300 to 55,000 years. Hence, traditional radiocarbon has the potential to determine whether the remains are of archaeological or forensic significance. When remains belong to a contemporaneous time frame, artificial levels of radiocarbon due to above-ground testing of nuclear weapons in the 1950s/1960s, described as “bomb peak,” can determine if remains are forensically relevant.

In 2019, adult human remains representing a single and incomplete skeleton were accidentally discovered in a flooded underground fortification built in the late 19<sup>th</sup> century near Wimereux in Northern France. Because the fort was operational during World War I, became part of the “Atlantic Wall” during World War II, and was sporadically occupied by homeless individuals, the estimated time since death may range from a couple of years to a century. Contextual information was uncertain as a result of severe flooding and site abandonment. A sample of cortical bone from the femur was submitted to radiocarbon dating after extraction of collagen fraction on the Accelerator Mass Spectrometry (AMS) facility of Saclay. Results showed elevated radiocarbon levels associated with the bomb peak and indicated two calibrated date ranges: (1) 1962 AD (37.3%), and (2) 1974/1975 AD (58.1%). Even considering acknowledged limitations of bomb pulse dating, calibrated ages are outside the limitations of the 20-year period ruled by French criminal law.

In 2017, an incomplete but well-preserved adult skull was discovered on the beach at Audresselles in Northern France without contextual information about the postmortem interval. A sample of a parietal bone was submitted for radiocarbon measurement, and low radiocarbon levels indicated no forensic relevance. Surprisingly, the radiocarbon age was  $5,387 \pm 18$  years Before Present (BP) (cal 4,232 BC at 92.5%), indicating a high archaeological relevance. Archaeological authorities were informed to ensure appropriate procedure and to contribute to the archaeological geo-referenced database implemented by the Ministry of Culture.

Reliable distinction between archaeological and forensic remains is of crucial importance. Radiocarbon is a key tool to shed light on the forensic relevance when contextual information is lost and provide a mutual benefit for forensic anthropologists and archaeologists.

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### Radiocarbon Dating, Time Since Death, Forensic Anthropology