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Experimental bone taphonomy: A novel approach to long-term and monitored analysis of post-mortem changes to bone

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The long term aim of my research program is to study the effects of exposure duration on the decomposition of bone in ground-surface terrestrial environments, relative to variations in seasonality and annual variations in the environment, over a long period of time, as a result of physical and chemical agents, such as temperature or humidity. This program will establish a permanent outdoors research facility dedicated to the study of changes that occur in bone after the death of an individual that is unique in Canada. In this facility over the course of five years, I will examine the sequence of changes to bone that occur after and the relationship between the sequence and rate of bone change with the environmental variables known to affect bone decomposition. The experiments will take place in a fenced facility located at Simon Fraser University, Burnaby campus, B.C., where the bones samples will be left to decompose on the ground surface of an open treeless area for a minimum of three and a half years and employing two different research designs. The area

can be considered representative of the Coastal Western Hemlock biogeoclimatic zone of British Columbia.

To date, no controlled field experiment has investigated changes in the micro- and macro-structure of bone tissue over a period of several years with such detail and depth. The proposed research integrates careful control and monitoring of environmental variables, and utilizes a novel design that allows the study to continue for as long as desired. This research will considerably expand the current knowledge base relating to decomposition of bone in ground-surface terrestrial environments and the processes that influence the rate of bone change over time, such as size of the bone or the microbial environment. Data generated by this research program will allow for a better understanding of which seasons contribute the most for decomposition and at which level (macro, micro, molecular, chemical), as well as an more detailed understanding of which environmental factors (temperature, humidity/water, UV radiation, soil chemistry, soil pH, soil microbiology) have the greatest impact in the sequence and rate of changes. By using pig bones to simulate human bone degradation patterns, the research outcomes have the potential to support the use of bone decomposition as an indicator of ancient environments in ecological studies of the past and of time elapsed since death in forensic investigations. This research program will also contribute to the distinction between fractures, that occur around the time of death or sometime after, which are crucial in the interpretations of human behaviour from evidence of butchering in the fossil record or in the determinations of cause and manner of death in a forensic investigation. In addition it will aid in the identification of changes to bone that occur after and that are associated with certain human burial practices in the past, and to the diagnosis of pathologies from fossil, archaeological or forensic bone.

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