Evaluating the dietary micro-remain record in dental calculus and its application in deciphering hominin diets in Palaeolithic Eurasia

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Preface

Since William King first described Neanderthals as a distinct species in 1864, this hominin has provoked discussion, insight, and debate. This event in taxonomic history was a breakthrough in understanding human origins. Since this milestone, we have learned much more about Neanderthals and their relationship to ourselves. The application of ecological perspectives to this topic has addressed more comprehensively than ever before the subsistence, behavioural ability, and the ultimate fate of this extinct hominin. This doctoral thesis aims to continue the spirit of these advances by examining how frequently plants featured in Neanderthal dietary regimes and assessing what this means for the apparent distinctiveness of Neanderthal diets. It does this by developing dental calculus analysis as an archaeobotanical technique and exploring how it can reveal Neanderthal plant use. The scope of this thesis encompasses the development of high-resolution approaches for reconstructing food choice using dental calculus, and the use of these advances to revaluate Neanderthal diets in the context of Pleistocene ecological conditions. This thesis is comprised of six chapters, of which the middle three are stand-alone papers, two of which are published and one submitted for publication:

a) Introduction: The evolutionary context of Neanderthal dietary ecology (Chapter 2).

b) Assessing use and suitability of scanning electron microscopy in the analysis of microremains in dental calculus (Chapter 3). Published as Power RC et al., J Archaeol Sci 49:160–169. 2014.

c) Dental calculus evidence of Taï Forest Chimpanzee plant consumption and life history transitions (Chapter 4). Published as Power RC et al., Sci. Rep 5. 2015.

d) Dental calculus indicates widespread plant use within the Neanderthal dietary niche (Chapter 5). Submitted as Power RC et al. to the J Hum Evol.

e) Discussion: a pathway for reconstructing Neanderthal dietary ecology (Chapter 6).

My thesis initially contextualises the significance of the Neanderthal diet within the broader evolution of hominin diets. The importance of Neanderthal diets for understanding this Pleistocene hominin and explaining its fate are examined. It also discusses how dental calculus can assist dietary studies of this hominin. The first paper examines the shortfalls of conventional analytical dental calculus approaches, and develops a high–resolution workflow for optimising extractable dietary data from dental calculus. The second paper explores the representativeness of the dental calculus dietary record. It quantifies its resolution with dental calculus samples from chimpanzees with a documented dietary history. The third and last paper examines if the Neanderthal dental calculus dietary record from a variety of sites situated across their range in time and space suggest flexible or rigid diets. I use these results to place their diet within the current knowledge of hominin plant use, hominin dietary breadth, and the evolution of hominin diets.