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Archaeological *Podocarpus* tar supports the cognitive complexity of Neanderthals

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Schmidt et al. (1) present findings of an African Middle Stone Age (MSA) method likely used to make tar adhesives from *Podocarpus* leaves. They conclude that the process shows the innovative potential and cognitive complexity of MSA humans. However, Schmidt et al. (2) suggest that birch tar produced in a nearly identical fashion by Neanderthals was a cognitively undemanding task that falls well within the mental capabilities of nonhuman great apes. It therefore does not indicate behavioural or cognitive complexity. If the latter assessment is correct, then the conclusions of Schmidt et al. (1) are highly problematic. I propose an alternative: Similarities between how and why *Podocarpus* and birch tars were recognized and utilized mean that if tar is an excellent proxy for complex cognition in the MSA, the same holds true for the European Middle Paleolithic (MP).

From Recognition to Production of Tar

Podocarpus tar can be made by burning the leaves next to a stone surface. Tar from the burning leaves condenses on the stone and can be scraped off and collected. Schmidt et al. (1) state that while *Podocarpus* tar can be discovered accidentally, it shows innovative potential, skill, and knowledge because MSA humans had to recognize and understand the transformative processes involved in its production. Like *Podocarpus* tar, birch tar can be produced by burning part of the tree (the bark rather than the leaves) near an upright stone (2). To recognize and understand the processes involved in the distillation of tar, Neanderthals must have possessed comparable innovative potential, skill, and knowledge.

Utilization Based on Material Properties

Comparisons of *Podocarpus* tar with other readily available and naturally sticky plant exudates show that it may have been preferred over other adhesives. This indicates that MSA humans had a clear understanding of the desirable material properties (1). Birch tar was also likely the most suitable stone tool hafting material available during much of the MP. It is more resistant to decay, more suited to reuse, and has a higher cohesive strength and impact resistance than pine resin, which was a widely available alternative (3, 4). Neanderthals must therefore have recognized similar properties in birch tar as MSA humans did in *Podocarpus* tar. The choice to manufacture a new and superior material, rather than simply collect naturally available resin, shows that Neanderthals, like MSA humans, fully understood the qualities and benefits of different adhesive properties.

Conclusion

Schmidt et al. (1) showcase the inherent complexity of producing tar adhesives regardless of the method used. If we accept their claim, which I hope many do, that the discovery, selection, manufacture, and use of *Podocarpus* tar is an excellent proxy for complex cognition, then we must accept that this is also the case for Neanderthals. Data from *Podocarpus* tar experiments and evidence of tar production more than 100,000 y earlier in the MP than in the MSA help to settle the debate about Neanderthal complexity.

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The author declares no competing interest.

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