
Why wasn't the ceramic arrowhead invented?

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Résumé

In biology the concept of *theoretical morphology* has been used as a heuristic device for better understanding the evolutionary trajectories of organisms. Theoretical morphology proceeds by creating and examining hypothetical specimens not actually found in nature. So instead of asking "why *does* feature X exist", a theoretical morphological approach asks "why *doesn't* feature Y exist?" Here, we use this approach to address the question of why ceramic technology did not evolve to replace stone technology with respect to hunting weapon tips (spear points, atlatl dart tips, arrowheads). In other words: why didn't the ceramic projectile point emerge? Clay is a readily available, economically efficient, and easily workable raw material. Likewise, objects made out of fired clay are extremely hard, sharp, and generally durable. We hypothesized that there was perhaps a functional constraint such that ceramic hunting weapon tips cannot perform as effectively as stone ones.

In order to test this hypothesis, projectile point test specimens were made of both stone and two grades of clay. These two materials were experimentally compared to establish parameters of how each performs under a given task. Using ballistics technology, the replicated arrowheads were subjected to performance testing to comparatively evaluate and understand each type of arrowhead's ballistic characteristics. To test the performance attributes of each point type-i.e. stone versus high-fired commercial clay versus low-fired glacial clay-the hafted points were fired into a target using a compound bow. The stone and ceramic triangle points were compared in two ways: penetrability and durability. Penetrability refers to how deeply a point can pierce a material, while durability refers to how many times a point can be shot before it breaks.

The results of this study will provide insight into past human behavior and will help archaeologists better frame questions related to understanding broad evolutionary processes. By identifying artifact types that never existed via theoretical morphology, and then positing *why* those specimens did not emerge, we can generate novel explanations for the changes that are observed over time. Such an approach may provide valuable insight to the nature of cultural evolution while elucidating new avenues for research within ballistic focused experimental archaeology.

Mots-Clés: theoretical morphology, experimental archaeology, ballistics, projectile points, ceramic, stone tools

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