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Virtual Anthropology and the form and function of fossil human faces

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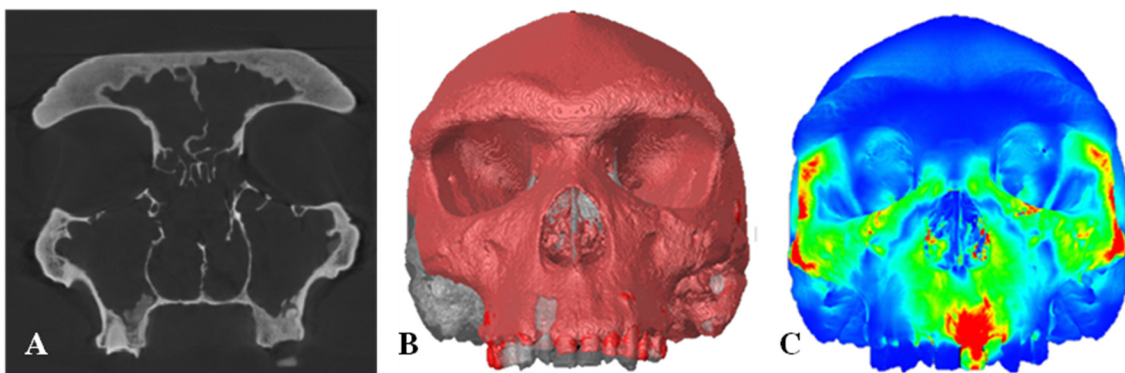


Figure 1: Stages for biting simulation (A: CT scan courtesy of the Natural History Museum of London and Robert Kruszynski).

Why do some of our fossil relatives have massive brow-ridges? Is it because large brows stiffen the face when biting? Knowing how facial bones deform (strain) during biting, would allow comparing strains between individuals with small and large brow-ridges.

But we can't map strains without damaging rare fossils, so we are performing virtual experiments, rather than using real specimens. We are using methods of statistical shape analysis and image processing to make from CT scans (A) a complete three dimensional virtual model of the skull of *Homo heidelbergensis*, one of our fossil ancestors (B). The model is then used to simulate biting using Finite Element Analysis, to estimate strains over the face (C).

This approach allows us to estimate the effects of biting on the bones of the face of our fossil ancestor. We are building other models where the brow-ridges are reduced but everything else stays the same. Our initial findings suggest that removing the brow-ridges has little effect on the stiffness of the face, so if the huge brow-ridge does not stiffen the face what is it there for? One possibility is that they are there to serve a social signaling function.

Editors

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