
Where There's Fire, There's Smoke: Reconsidering Air Circulation and Hearth Location at Paleolithic Cave Sites

Yafit Kedar*¹ and Ran Barkai*^{†1}

¹Tel Aviv University – Israël

Résumé

The human use of fire in the Paleolithic period has been widely researched in recent decades due to its major implications for the understanding of human adaptation and evolution. In the Levant, it appears that by the end of the Lower Paleolithic period, ca. 400-300 kya, humans were already using fire on a regular basis, and most probably even controlled fire to some extent.

Hearths produce an intense heat that breaks up the wood polymers into smaller molecules. The smoke emitted from the combustion contains a number of oxygen-based compounds. When wood burning is inefficient, the particles contain inorganic compounds such as ash and soot, as well as compressed inorganic components. Smoke from the burning wood contains around 200 different chemical materials, mostly of a size that can be inhaled and some that are noxious and carcinogenic. These chemicals, which are transported via smoke, influence human health.

Although the use of fire also has many direct advantages, we may assume that the continuous use of a hearth in caves and rock shelters required contending with its disadvantages by carefully selecting its location and its possible influence on human health. In this study we offer a new explanation for the choice of hearth location in caves and rock shelters, based on an air-circulation model due to irritations of smoke to human. The air-circulation model is influenced by the temperature difference between the cave's interior and the external environment, based on thermodynamics laws. The model takes into account the cave structure, hearth characteristics, and seasonal temperature fluctuations. We then apply the model to a number of caves and rock shelters in order to demonstrate its validity.

Mots-Clés: fire, hearth, air, circulation, cave

*Intervenant

†Auteur correspondant: Barkaran@post.tau.ac.il