

**Université de technologie de Compiègne – Thesis proposal**

<b>Part 1: Scientific sheet</b>	
Thesis proposal title	Prehistoric tool wear analysis and classification of tool use using topography multiscale analysis
PhD grant	Doctoral work contract based on a Ministry of Research Grant
Research laboratory	<p>Roberval Laboratory from Université de Technologie de Compiègne (UTC) and Histoire Naturelle de l'Homme Préhistorique (HNHP UMR 7194) from Muséum National d'Histoire Naturelle (MNHN) are members of the Sorbonne University Alliance (ASU). They offer a particularly favorable environment for teaching and research.</p> <p><a href="https://www.utc.fr/en/research/utc-research-units/mechanics-energy-and-electricity-roberval/">https://www.utc.fr/en/research/utc-research-units/mechanics-energy-and-electricity-roberval/</a></p> <p><a href="https://hnhp.mnhn.fr/fr">https://hnhp.mnhn.fr/fr</a></p>
Thesis supervisor(s)	Julie MARTEAU, UTC, Roberval Laboratory (HDR) Antony BOREL, MNHN, HNHP Laboratory (HDR)
Scientific domain(s)	Archeology Mechanics
Research work	<p>Understanding the daily lives of fossil humans involves interpreting the tools (stone, bone, antler, shell) of these past users. Archaeological research has been addressing these issues for many years. As with any object (and a fortiori stone tools, which will be the focus of the project presented here), use and exposure to different agents modify the topography of the surfaces most directly accessible to the environment. Thus, observing and characterizing the traces (topographical signatures) on the surface of tools can provide clues to the processes undergone: movements performed (scraping, sawing...), materials worked on (skin, wood...).</p> <p>To make the characterization and interpretation of stone tool surfaces alterations more robust, we propose to set up a method for multiscale characterization of the topography of altered surfaces using a corpus of experimental tools from different rocks (flint, quartzite, metarhyolite...) used (manually and with the aid of a tribometer) to saw or scrape different materials (bone, deer antler, reed...) with different numbers of cycles. This corpus will enable us to establish strategies for identifying and measuring areas of contact with the material being worked. Morphological indicators will then be set up to describe topographical signatures and thus move towards a classification of uses. The contributions of a classical statistical approach versus a deep learning approach will be assessed. The results will also be used to develop better excavation and post-excavation protocols to prevent alteration and better preserve traces of use on archaeological stonetools.</p>
Key words	Traceology, topography, prehistory, stone tools, roughness, multi-scale analysis
Requirements	Good skills in the acquisition and processing of surface topography and ideally in confocal and/or interferometric microscopy. Programming skills (R and/or Python) are required.
Starting time	October, 1st, 2024
Location	Roberval Laboratory, Compiègne, France

<b>Part 2: Job description</b>	
Duration	36 months
Additional missions available	Teaching (practical sessions)
Research laboratory	The Roberval Laboratory is a research unit of the Université de Technologie de Compiègne. This laboratory operates in the field of mechanics, energy and electricity. Roberval's activity is based on the synergy between fundamental and finalized research, to help meet some of the major challenges facing society: transport of the future; industrial renewal; energy. The scientific activity of the laboratory is organized around 5 teams with complementary skills: numerical mechanics; acoustics and vibrations; materials and surfaces; mechatronics, energy, electricity, integration; integrated systems: product / process
Material resources	Shared office, personal computer.  Confocal microscope, Scanning Electron Microscopy, large corpus of tools...
Human resources	
Financial resources	
Working conditions	Autonomous work, meeting organization...
Research project	
National collaborations	LAMIH (Université Polytechnique des Hauts de France), GDR 2077 SurfTopo, IMPMC
International collaborations	ELTE (Budapest, Hungary), ATOMKI (Debrecen, Hungary), IPHES (Tarragone, Spain)
International cosupervision (cotutelle)	
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**Please contact first the thesis supervisor** before applying online on <https://webapplis.utc.fr/admissions/doctorants/accueil.jsf>