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EEMIAN NEANDERTHAL RELOADED: RESSON CALCAREOUS TUFA SEQUENCE (AUBE, FRANCE) AND THE REDISCOVERY OF EEMIAN HUMAN SETTLEMENT IN NORTHWEST EUROPE

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IN THE LATE 1980s, C. GAMBLE [1] INITIATED A DEBATE ON THE CAPACITY OF EARLY HOMININS TO COLONISE THE NORTHERN LATITUDES OF EUROPE DURING THE MIDDLE AND LATE PLEISTOCENE INTERGLACIAL PERIODS. AT THAT TIME, THE LAST INTERGLACIAL (EEMIAN; MIS 5e) WAS CHARACTERISED BY A TOTAL ABSENCE OF HUMAN OCCUPATION IN NORTHERN FRANCE, BELGIUM, NETHERLANDS, GERMANY AND GREAT BRITAIN. SINCE THE 1990s, A FEW SITES WITH EVIDENCE OF HUMAN OCCUPATION ATTRIBUTED TO THE EEMIAN HAVE BEEN RE-EVALUATED, DISCOVERED AND EXCAVATED IN CENTRAL AND MIDDLE EUROPE, PARTICULARLY IN GERMANY. SUBSEQUENT TO THESE DISCOVERIES, A NUMBER OF AUTHORS, INCLUDING ROEBROEKS ET AL. [2], HAVE REJECTED GAMBLE'S MODEL. IN 2006, A SERIES OF MIDDLE PALAEOOLITHIC LEVELS WERE UNEARTHED AT THE BASE OF THE CAOURS EEMIAN TUFA (SOMME BASIN) IN NORTHERN FRANCE [3]. THIS INITIAL DOCUMENTATION OF HUMAN PRESENCE DURING THE LAST INTERGLACIAL IN NORTHWESTERN EUROPE INAUGURATES A NOVEL RESEARCH PARADIGM, CENTRING ON THE CAPACITY OF NEANDERTHAL COMMUNITIES TO INHABIT THE DENSE FOREST ECOSYSTEMS OF THE EEMIAN PERIOD. IN 2013, A NEW EEMIAN SEQUENCE WITH HUMAN OCCUPATIONS WAS DISCOVERED IN WAZIERS (NORTH, FRANCE) [4]. FIVE ARCHAEOLOGICAL LAYERS WERE IDENTIFIED IN FLUVIAL DEPOSITS AND PEAT LAYERS, WHICH EXHIBITED A CORRELATION EXTENDING FROM THE TERMINATION OF MIS 6 THROUGH TO THE FIRST HALF OF MIS 5e.

IN 2020, A NEW RESEARCH PROGRAMME WAS INITIATED WITH THE OBJECTIVE OF REVISITING THE RESSON SITE, SHOWING A SEQUENCE OF CALCAREOUS TUFA THAT WE SUPPOSED TO BE COEVAL WITH EEMIAN PERIOD [5]. THIS SUBSTANTIAL TUFA MASSIF (>10 m THICK), WHICH IS LOCATED IN THE GEOGRAPHICAL CONFINES OF AUBE (FRANCE), WERE PREVIOUSLY DESCRIBED ON SPORADIC OCCASIONS, BY I.E. LEYMERIE (1846) OR FLICHE (1883). LEYMERIE REPORTED THE PRESENCE OF LEAF IMPRESSIONS AND FAUNAL REMAINS TYPICAL OF INTERGLACIAL PERIODS, AND FLICHE DESCRIBED FAUNAL REMAINS WITH ANTHROPIC TRACES (CUTTING MARKS) ASSOCIATED WITH A FLINT LE MOUSTIER-TYPE SPEAR AND MENTIONED THE PRESENCE OF NEANDERTHAL REMAIN FRAGMENTS. IT IS UNFORTUNATE THAT THESE ELEMENTS DO NOT HAVE PRECISE GEOGRAPHICAL AND STRATIGRAPHIC LOCALISATIONS. WE REOPENED AN ABANDONED TUFA QUARRY OF THE MASSIF IN 2020, ANOTHER ABANDONED QUARRY IN 2022 AND CARRIED OUT 7 DEEP TEST PITS THROUGH THE TWO QUARRIES COUPLED WITH GEOPHYSICAL PROSPECTION. A TEST EXCAVATION WAS CARRIED OUT IN THE SECOND QUARRY IN 2024. THE TUFACEOUS SEQUENCE WAS ANALYSED USING A MULTI-PROXY APPROACH, CONFIRMING ITS ATTRIBUTION TO THE EEMIAN INTERGLACIAL. THE PLEISTOCENE SEQUENCE OF MORE THAN 10 METERS IN THE FIRST QUARRY BEGINS AT THE END OF MIS 6 AND ENDS AFTER THE EEMIAN OPTIMUM (LOCATED AT A HEIGHT OF NEARLY 8 m). AT LEAST THREE ARCHAEOLOGICAL LEVELS HAVE BEEN IDENTIFIED IN THE FIRST QUARRY AND FOUR IN THE SECOND. LOCAL FLINT WAS USED TO PRODUCE FLAKES AND POINTS, THANKS TO THE LEVALLOIS AND DISCOID CONCEPTS. SOME OF THEM SHOW TRACES OF ANTHROPIC ACTIVITY. AFTER 5 YEARS, THE RECENT RESEARCH PROGRAMME HAS ALLOWED TO APPROVE THE ARCHAEOLOGICAL STATUS OF THE RESSON SITE AND TO DOCUMENT A REFERENCE SEQUENCE FOR THE EEMIAN IN NORTH-WEST EUROPE.

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RESSON, A SITE ALREADY IDENTIFIED IN THE 19TH CENTURY

THE RESSON SITE HAS BEEN KNOWN TO PALAEOANTHROPOLOGISTS SINCE THE MID-19TH CENTURY, WHEN THE PRESENCE OF ANIMAL REMAINS AND LEAF IMPRESSIONS IN THE TUFA WAS FIRST MENTIONED BY LEYMERIE. IN 1869, THE PRESENCE OF ARCHAEOLOGICAL REMAINS WAS ALSO REPORTED BY BELGRAND. IN 1883, FLICHE PRESENTED A SUMMARY OF THE PALAEOANTHROPOLOGICAL AND ARCHAEOLOGICAL REMAINS FOUND AT RESSON.

HE COMPLETED A LIST OF 35 PLANT TAXA, 8 SPECIES OF MOLLUSCS AND 6 VERTEBRATES (BIRDS AND MAMMALS). SOME OF THE LEAF IMPRESSION COLLECTIONS HE DESCRIBED WERE FOUND AT THE TROYES MUSEUM (FIG. 1) AND HAVE RECENTLY BEEN COMPLETELY RE-EXAMINED. THE IDENTIFIED PLANT TAXA SUGGEST AN AQUATIC ENVIRONMENT BORDERED BY RIPARIAN FOREST WITHIN A DECIDUOUS FOREST, WHICH IS CHARACTERISTIC OF PLEISTOCENE INTERGLACIAL PERIODS (FIG. 2).

FLICHE ALSO DESCRIBES CUT MARKS ON THE BONES OF LARGE MAMMALS, AS WELL AS TWO INTENTIONALLY SHARPENED DEER ANTLERS ASSOCIATED WITH A FLINT TOOL THAT HE DEFINES AS A 'MOUSTIER-TYPE SPEAR' (FIG. 3). HE ALSO MENTIONS FRAGMENTS OF A HUMAN SKULL.

HOWEVER, THE ARCHAEOLOGICAL REMAINS UNEARTHED IN THE 19TH CENTURY HAVE NOT BEEN FOUND TO DATE AND THEREFORE COULD NOT BE REANALYSED. HOWEVER, IT IS REPORTED THAT GABRIEL DE MORTILLET SAW THE 'MOUSTIER-TYPE SPEARS' ALONGSIDE OTHER MOUSTIER-TYPE FLINT TOOLS AT THE 1878 UNIVERSAL EXHIBITION IN PARIS, WHERE ITEMS FROM THE RESSON TUFA WERE DISPLAYED IN THE PREHISTORIC ANTHROPOLOGY SECTION (FIGS. 4 AND 5).

IN 2020, A NEW RESEARCH PROGRAMME WAS INITIATED WITH THE OBJECTIVE OF REVISITING THE RESSON SITE, SHOWING A SEQUENCE OF CALCAREOUS TUFA THAT WE SUPPOSED TO BE COEVAL WITH EEMIAN PERIOD [5]. THIS SUBSTANTIAL TUFA MASSIF (>10 m THICK), WHICH IS LOCATED IN THE GEOGRAPHICAL CONFINES OF AUBE (FRANCE), WERE PREVIOUSLY DESCRIBED ON SPORADIC OCCASIONS, BY I.E. LEYMERIE (1846) OR FLICHE (1883). LEYMERIE REPORTED THE PRESENCE OF LEAF IMPRESSIONS AND FAUNAL REMAINS TYPICAL OF INTERGLACIAL PERIODS, AND FLICHE DESCRIBED FAUNAL REMAINS WITH ANTHROPIC TRACES (CUTTING MARKS) ASSOCIATED WITH A FLINT LE MOUSTIER-TYPE SPEAR AND MENTIONED THE PRESENCE OF NEANDERTHAL REMAIN FRAGMENTS. IT IS UNFORTUNATE THAT THESE ELEMENTS DO NOT HAVE PRECISE GEOGRAPHICAL AND STRATIGRAPHIC LOCALISATIONS. WE REOPENED AN ABANDONED TUFA QUARRY OF THE MASSIF IN 2020, ANOTHER ABANDONED QUARRY IN 2022 AND CARRIED OUT 7 DEEP TEST PITS THROUGH THE TWO QUARRIES COUPLED WITH GEOPHYSICAL PROSPECTION. A TEST EXCAVATION WAS CARRIED OUT IN THE SECOND QUARRY IN 2024. THE TUFACEOUS SEQUENCE WAS ANALYSED USING A MULTI-PROXY APPROACH, CONFIRMING ITS ATTRIBUTION TO THE EEMIAN INTERGLACIAL. THE PLEISTOCENE SEQUENCE OF MORE THAN 10 METERS IN THE FIRST QUARRY BEGINS AT THE END OF MIS 6 AND ENDS AFTER THE EEMIAN OPTIMUM (LOCATED AT A HEIGHT OF NEARLY 8 m). AT LEAST THREE ARCHAEOLOGICAL LEVELS HAVE BEEN IDENTIFIED IN THE FIRST QUARRY AND FOUR IN THE SECOND. LOCAL FLINT WAS USED TO PRODUCE FLAKES AND POINTS, THANKS TO THE LEVALLOIS AND DISCOID CONCEPTS. SOME OF THEM SHOW TRACES OF ANTHROPIC ACTIVITY. AFTER 5 YEARS, THE RECENT RESEARCH PROGRAMME HAS ALLOWED TO APPROVE THE ARCHAEOLOGICAL STATUS OF THE RESSON SITE AND TO DOCUMENT A REFERENCE SEQUENCE FOR THE EEMIAN IN NORTH-WEST EUROPE.

AN EXCEPTIONALLY LARGE CALCAREOUS TUFA FROM THE LAST INTERGLACIAL PERIOD

CALCAREOUS TUFAS ARE OPEN-AIR CARBONATE FORMATIONS THAT FORM NEAR SPRINGS OR IN WATERCOURSES. WHILE THEY ARE RELATIVELY WIDESPREAD IN REGIONS WITH LIMESTONE BEDROCK, SUCH AS THE PARIS BASIN, ANCIENT TUFAS PRESERVED TO A THICKNESS OF SEVERAL METRES ARE RARE. THE RESSON TUFA EXTENDS ACROSS THE SMALL VALLEY OF THE SAME NAME, COVERING NEARLY A KILOMETRE IN LENGTH AND SEVERAL HUNDRED METRES IN WIDTH. THIS IS WHY IT IS MARKED ON THE GEOLOGICAL MAP OF THE AREA (FIG. 1).

WHEN RESEARCH ON THE SITE RESTARTED IN 2020, AN ANCIENT QUARRY FACE SEVERAL METRES THICK WAS CLEANED, DOCUMENTED AND SAMPLED (SEE FIGURES 1 AND 3). THIS REVEALED A TUFA DEPOT AROUND 10 METRES THICK, RESTING ON COLLUVIAL DEPOSITS THAT HAD BEEN NETWORKED BY FLUVIAL PROCESSES. THIS GEOMORPHOLOGICAL EVIDENCE, TOGETHER WITH THE FIRST U¹⁴C DATING ON CALCITE, CONFIRMS THAT THE RESSON TUFA DATES FROM THE EEMIAN INTERGLACIAL PERIOD, BETWEEN 130,000 AND 115,000 YEARS AGO.

PROFILE 1 SHOWS THE MOST WELL-DEVELOPED TUFA SEQUENCE (FIG. 2 AND 3), CONSISTING OF A SUCCESSION OF GRANULAR FACIES COMPRISING ENCRUSTED PLANT DEBRIS, FOLLOWED BY FINER AND EVEN SILTY FACIES IN THE UPPER PART, WHICH IS TYPICAL OF FLUVIAL-MARSH TUFA.

FIGURE 1: EXTRACT FROM THE 1:50,000 GEOLOGICAL MAP OF THE PARIS BASIN (MODIFIED FROM LACOT, 1967).

FIGURE 2: STRATIGRAPHIC CORRELATION OF PROFILE 1 OF THE 2020 LARGE QUARRY (GAD P. ANTOINE AND J. DABKOWSKI).

FIGURE 3: PANORAMIC VIEW OF THE 2020 LARGE QUARRY FROM THE POSITIONS OF VARIOUS PROFILES AND SAMPLES (PHOTO AND CAD: J. DABKOWSKI).

THE CLIMATE AND ENVIRONMENT OF THE EEMIAN PERIOD (130,000-115,000 YEARS AGO, MIS 5e) AT RESSON

SEDIMENTARY ARCHIVES FROM THE EEMIAN INTERGLACIAL PERIOD ARE RARE IN NORTH-WESTERN EUROPE. THE AIM OF THE CLIMATE AND PALAEOENVIRONMENT RECONSTRUCTION AT RESSON IS TO ADDRESS THE LACK OF KNOWLEDGE ABOUT THIS PERIOD AND TO PROVIDE CONTEXT FOR THE ARCHAEOLOGICAL LEVELS UNEARTHED ON THE SITE.

AN APPROACH COMBINING ISOTOPE GEOCHEMISTRY AND MALACOLOGY, WHICH HAS ALREADY PROVEN EFFECTIVE ON OTHER PLEISTOCENE CALCAREOUS TUFA SEQUENCES (I.E. LA CELLE, CAOURS), IS USED HERE TO RECONSTRUCT THE PALAEOENVIRONNEMENTS AND PALAEOCLIMATES.

FIGURE 1: DISTRIBUTION OF MOLLUSC SPECIES AND RECONSTRUCTION TOGETHER WITH TUFAS AND δ¹⁸O CURVES FROM THE P2 PROFILE.

FIGURE 2: MALACOLOGICAL DIAGRAM TOGETHER WITH TUFAS δ¹⁸O AND δ¹³C CURVES FROM THE P1 PROFILE.

FIGURE 3: MAP SHOWING THE POSIBLE AND CURRENT DISTRIBUTIONS OF CLIMATOLOGICAL AND PALAEOCLIMATOLOGICAL MARGINALS.

THE RESULTS OBTAINED AT RESSON CONFIRM:

- A UNIQUE RECORD OF THE INITIAL PHASE OF THE EEMIAN, DATED ON ALMOST 7 m, BY THE GRADUAL APPEARANCE OF FOREST SPECIES (FIGS. 1 AND 2).
- THE IDENTIFICATION OF A MAXIMUM IN FOREST DEVELOPMENT CONTEMPORANEOUS WITH THE CLIMATIC OPTIMUM AT THE TOP OF THE SEQUENCE (FIG. 2).
- THE CHRONOLOGICAL ATTRIBUTION OF THE SITE TO THE EEMIAN, INDICATED BY THE PRESENCE OF *DALDERBARDA RUPEA* OUTSIDE ITS CURRENT RANGE (FIG. 3).

RESSON, DEFINITELY AN ARCHAEOLOGICAL SITE

THE RESSON SITE WAS FIRST RECOGNISED IN THE 19TH CENTURY BY LEYMERIE FOR THE REMAINS OF FAUNA AND LEAF IMPRESSIONS FOUND IN THE TUFA. THEN, AS EARLY AS 1869, ARCHAEOLOGICAL REMAINS WERE IDENTIFIED, OF WHICH ONLY THE DESCRIPTION OF A FLINT SPEAR OF THE MOUSTIER TYPE HAS COME DOWN TO US. THE ARCHAEOLOGICAL STATUS OF THE RESSON TUFA DEPOSIT WAS THEREFORE UNCERTAIN UNTIL OUR RETURN TO THE SITE.

DURING THE FIRST CLEANING OPERATION OF THE SECTIONS IN 2020, FLINT KNAPPED FLAKES (FIG. 1) WERE UNCOVERED, ALONG WITH BONE REMAINS SHOWING SIGNS OF HUMAN INTERVENTION.

IN 2022 AND THEN 2024, EXCAVATIONS CARRIED OUT IN THE FORMER QUARRY OF THE CURRENT GREEN WASTE DISPOSAL SITE UNCOVERED FOUR ARCHAEOLOGICAL LAYERS AT THE BASE OF THE STRATIGRAPHIC SEQUENCE (FIG. 2), CORRESPONDING TO THE BEGINNING OF THE EEMIAN PERIOD BETWEEN 140 AND 130,000 YEARS. THESE LEVELS YIELDED NUMEROUS FLAKES, EVIDENCE OF CUTTING ACTIVITIES CARRIED OUT ON SITE USING LOCAL FLINT. THE FLAKES ARE MOSTLY SMALL IN SIZE AND WERE PRODUCED USING LEVALLOIS (FIG. 2) AND DISCOID SCHEMES.

FIGURE 1: LEVALLOIS COPIES AND FLAKES IDENTIFIED IN LAYERS 1-4 AT RESSON IN 2022, DATED TO APPROXIMATELY 130,000 TO 115,000 YEARS (OBTAINING IN ARMEDESQUERRE).

FIGURE 2: STRATIGRAPHIC CORRELATION OF THE 2022-2024 EXCAVATION AT RESSON, SHOWING THE FOUR ARCHAEOLOGICAL LAYERS UNCOVERED (CAD P. ANTOINE).

THE FAUNA RECENTLY UNCOVERED IN THE RESSON TUFA CORRESPONDS TO THE EXPECTED INTERGLACIAL SPECTRUM AMONG THE SPECIES PRESENT ARE AUROCHS (*BOS PRAGIENSIS*), FALLOW DEER (*DAMA DAMA*), HORSES (*EQUUS SP.*), STEEPER RHINOS (*STEPHANORHINUS HEMITECHUS*) AND MEGACERBS (*MEGALOCEROS GIOVANNI*). JUST UNDER 20% OF THE FAUNA REMAINS SHOW SIGNS OF HUMAN INTERVENTION, INDICATING THAT THE PRESERVED FAUNA REMAINS WERE ACCUMULATED BY HUMANS.

FIGURE 3: LEFT: TRAYS OF ANIMALS WITH IDENTIFIED AND POSSIBLE RELATIONS (FRAGMENTS LEFT). LOWER RIGHT: METEORITE OF WAZIERS (METEORITE). MEDICAL FRAGMENTED LEFT: TRAYS OF FALLOW DEER (BOTTOM RIGHT).

RECENT FIELDWORK HAS DEFINITELY ESTABLISHED THE ARCHAEOLOGICAL STATUS OF THE RESSON TUFA MASSIF. BY PROVIDING EVIDENCE OF RECURRENT OCCUPATION BY NEANDERTHALS IN THIS VALLEY BED, RESSON JOINS THE SHORT LIST OF RARE SITES CORRELATED WITH THE EEMIAN, ALLOWING US TO DOCUMENT THIS LITTLE-KNOWN PERIOD BETWEEN 140,000 AND 115,000 YEARS AGO.

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