

Analysis of Italian Soil: Extraction by Organic Solvents

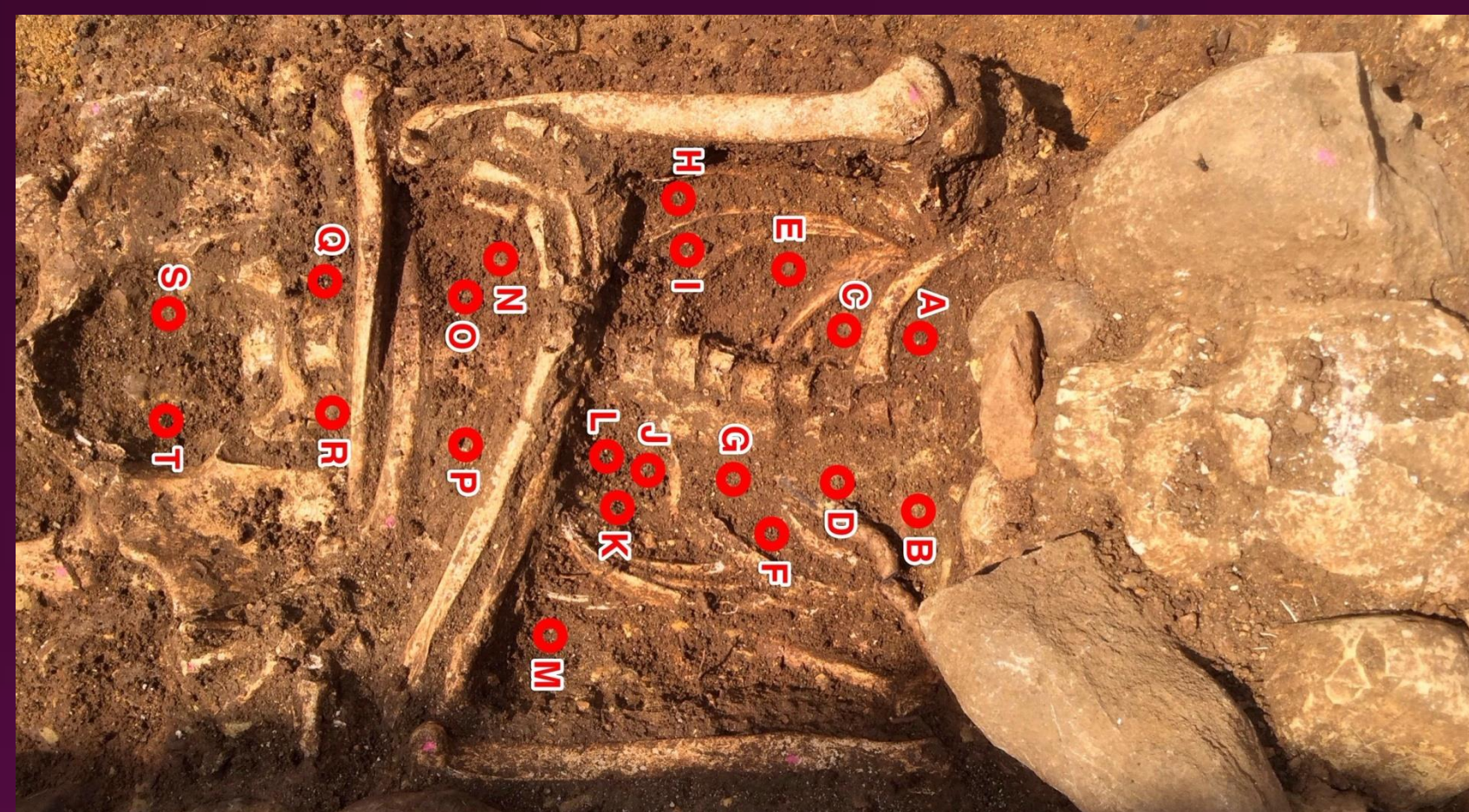
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Introduction

Skeletal remains found in an archaeological dig site were uncovered, and the soil surrounding them was used for extraction and identification of organic residues. The Soxhlet extraction method in combination with gas chromatography mass spectrometry was used to achieve this. The applications of this research can be extended to determine the use of other archaeological artifacts as well as the uses of different isolated dig sites. Organic residues were successfully extracted and identified using this experimental method.

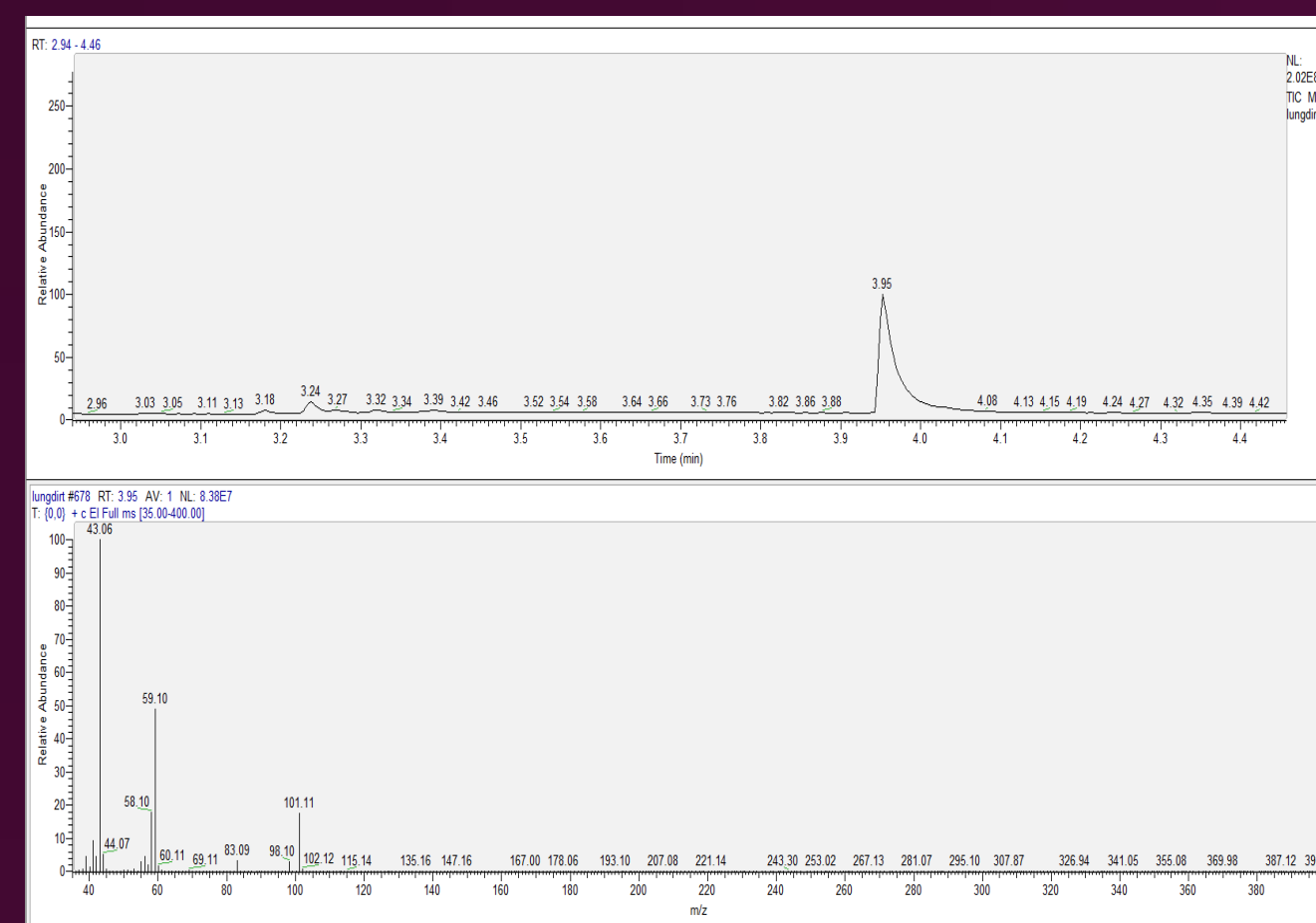


Uncovered skeletal remains; site from which soil samples were obtained

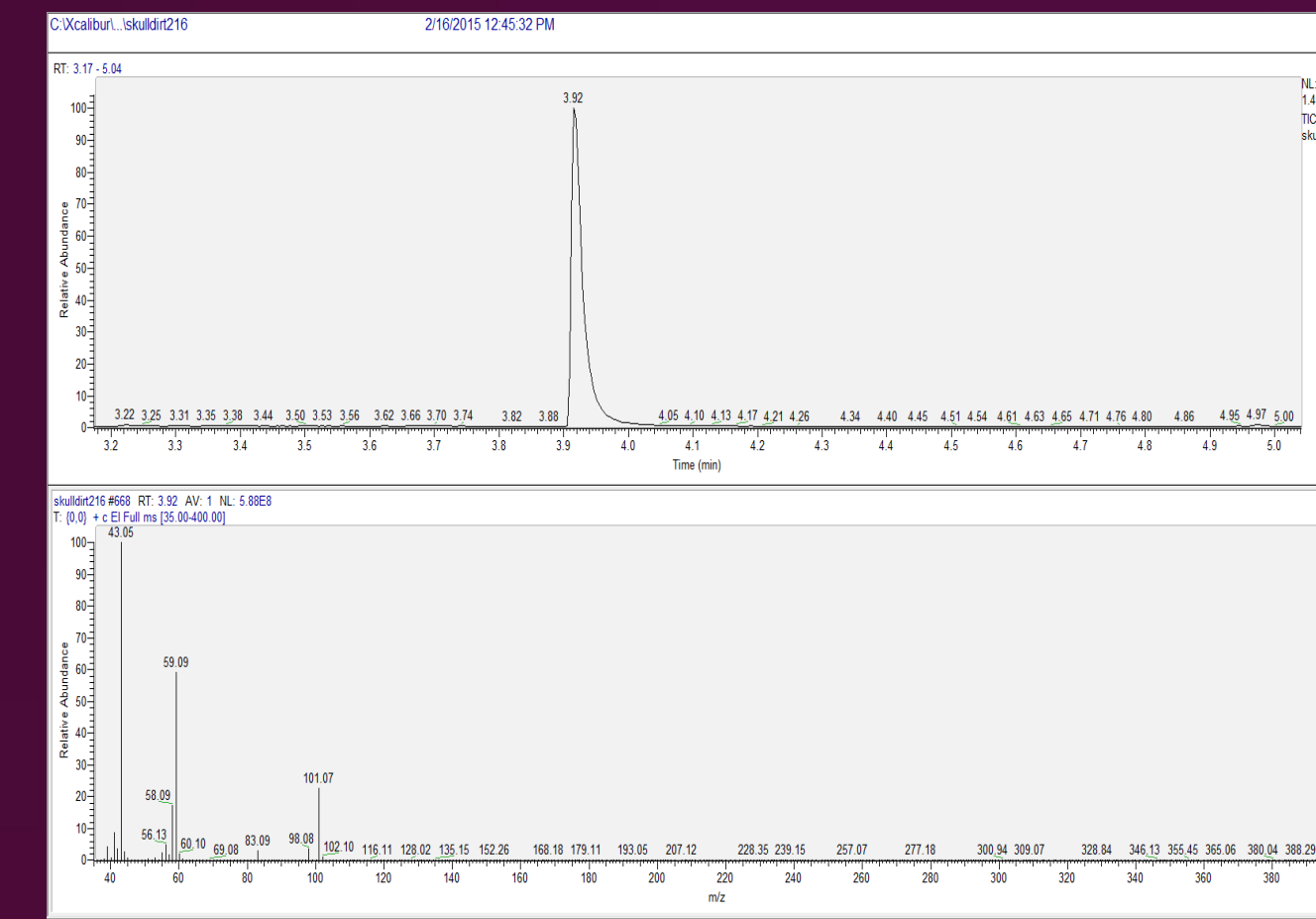
Instrumentation

- Soxhlet Extraction
- Gas Chromatography Mass Spectrometry

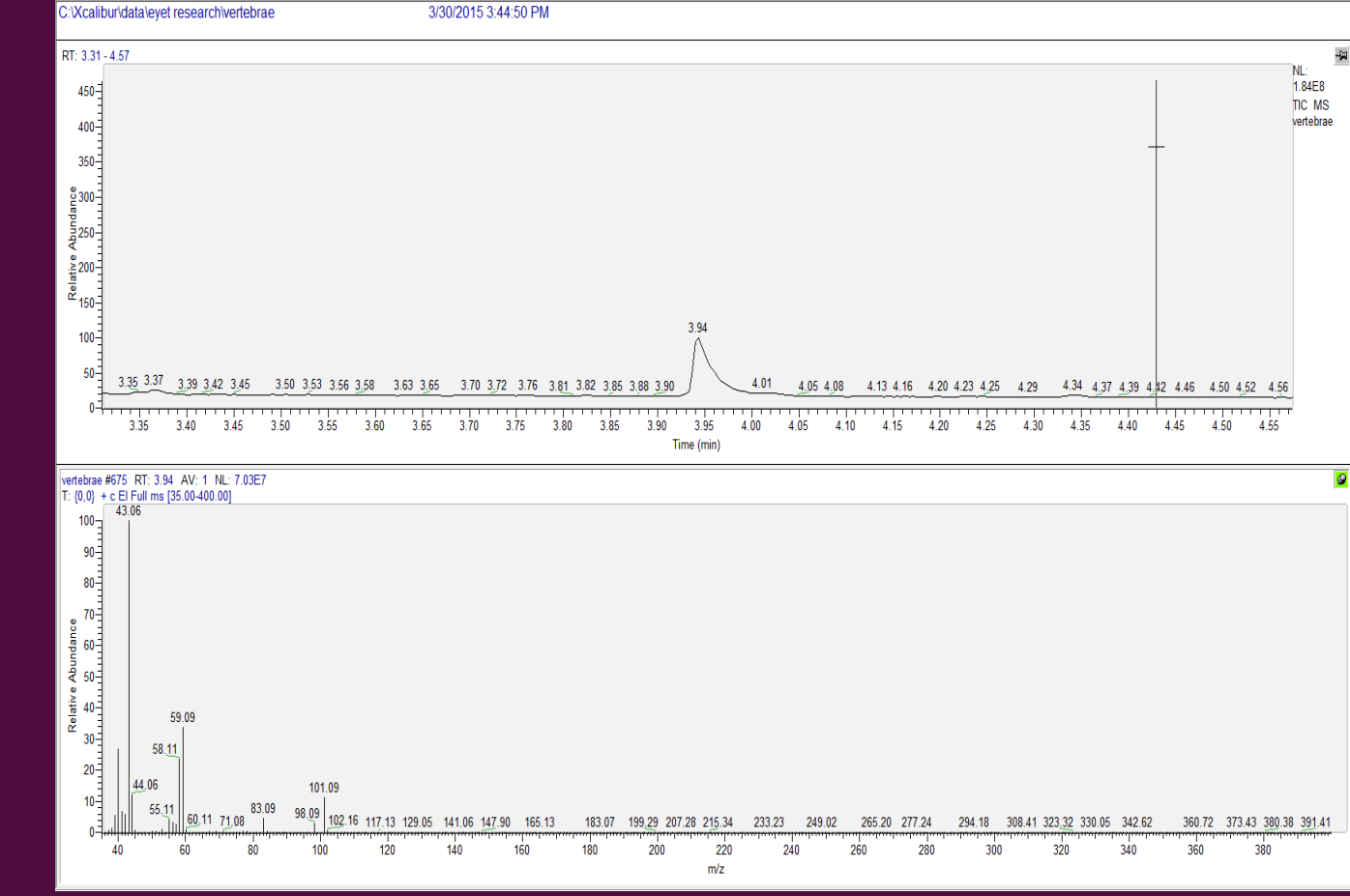
Results



Soil sample taken from the lung; 91.79% match for acetylmethylcarbinol



Soil sample taken from the skull; 91.28% match for acetylmethylcarbinol



Soil sample taken from the vertebrae; 89.56% match for acetylmethylcarbinol

Soxhlet Extraction:

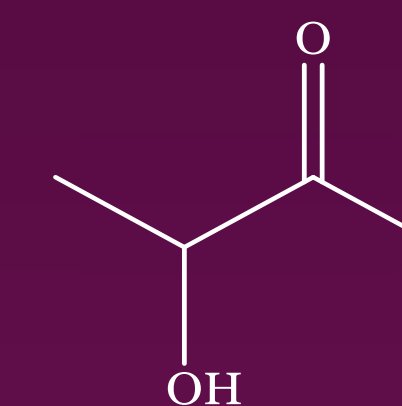
- Solid material is loaded in paper thimble, which is loaded in main chamber of extractor above solvent.
- When heated, solvent evaporates into a gas and then cools into a liquid, which leaks into sample tube
- This continues for several hours until residues are completely removed

Future Work:

- Use ion- selective electrodes to determine concentrations of nitrates and calcium ions in the soil samples
- Analyze more soil samples for organic residues using GC-MS
- Quantify extracted residues

Result Trends:

- All of the soil samples analyzed contained varying amounts of acetylmethylcarbinol (3.95 minutes):



- Used as an external energy store by numerous fermentative bacteria
- Vertebrae sample contained trace amounts of phenethylamine (10.08 minutes), a neuromodulator found in the human central nervous system. Product of microbial fermentation.
- Mouth sample was found to contain urea (3.88 minutes), which metabolizes nitrogen containing compounds in humans.
- Malonic acid (4.03 minutes) was also found, and serves as a building block to produce numerous valuable compounds in the body.

Acknowledgments:

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