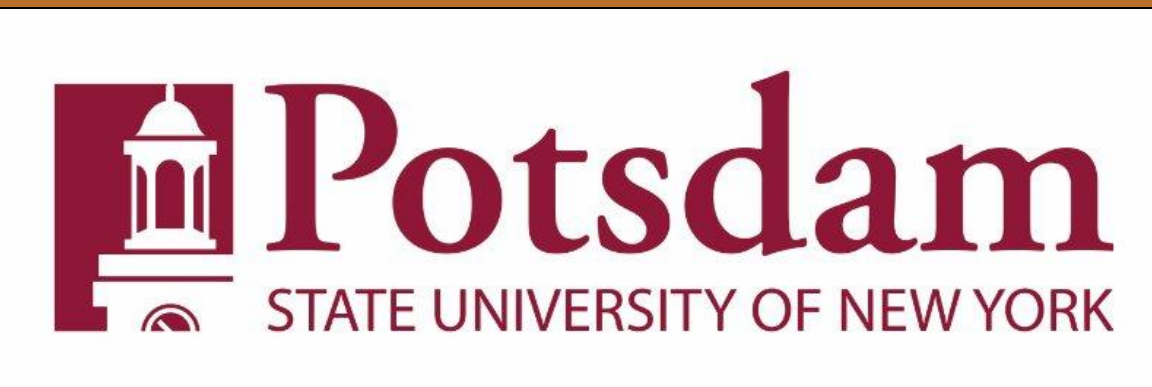


Unearthing Cooking: the study of subterranean hearths from around the world



Kathryn Nelson, Department of Anthropology, nelsonk206@potdam.edu

Introduction

All over the world people have created earthen ovens, or pit hearths, to be able to cook. The earliest evidence coming from 32,000 years ago during the Upper Paleolithic period. Since that time, people have developed many different styles of pit hearth and while they are all slightly different, they are often consistent in their use of hot rocks as a heating agent. In fact, these thermally altered stones are so ubiquitous that archaeologists often immediately interpret their function as related to cooking. This interpretation, however, may not always be an accurate assessment. For example, in Ireland, ancient peoples seemingly used hot rocks to heat *fulacht fiadh*- water filled pit hearts- but whether these features were used for cooking remains a mystery.

Methods and Research Objectives

This research seeks to further our archaeological understanding of fulacht fiadh and other potential hot rock cooking features.

To do so, the following methods were used:

1. Survey the literature to ascertain the range of pit hearth types around the world and through time.
2. Set up experimental pit hearths using hot rocks to cook acorn squash and sweet potatoes.

Testing

Pit #1: A fire was placed directly on-top of 21 fist sized cobbles. After an hour the rocks reached a temperature of 800 degrees. The tubers and squash were wrapped in wet canvas and placed on-top of the rocks



Fig. 1: pit 1 filled with 21 unheated rocks



Fig. 2: pit 1 with fire started on the rocks



Fig. 3: pit 1 with three vegetables wrapped in wet burlap cooking over the fire



Fig. 4: fire cracked rock from pit one from the next day

Pit #2: Approximately 12 softball sized cobbles of mixed lithology were first heated in a fire. After ~1 hour and 40 minutes, six of the rocks were transferred into the pit. The tubers and squash were then wrapped in wet canvas and placed on the rocks. The remaining six rocks then capped the canvas and the hole was covered with earth.



Fig. 5: heating the rocks in a separate fireplace



Fig. 6: transferring the hot rocks into the pit hearth



Fig. 7: one acorn squash and one sweet potato surrounded by the hot rocks



Fig. 8: the pit hearth filled with the backfill to cook overnight

Pit #3: 19 rocks were placed in a pit with a fire on top on the beach of Camp Cronin in Rhode Island for ~1 hour and a half. Two acorn squash and two potatoes (one sweet potato) were wrapped in foil and placed on top of the hot coals and rocks and covered with the sand to be uncovered the next morning.



Fig. 9: digging the pit hearth on the beach



Fig. 10: starting the fire in the pit hearth



Fig. 11: sand falling into the sides of the pit hearth



Fig. 12: digging to find our cooked vegetables the next day

Findings

Pit #	Date	Weather	Location	# of rocks	Fire in vs. out of pit
1	Wednesday, April 09, 2025	sunny, windy, snowy, 36° F	east side of hearth	21	in
2	Monday, April 14, 2025	partly cloudy, slightly windy, 61° F	east side of hearth	12	out
3	Thursday, April 17, 2025	sunny, windy, 51° F	Camp Cronin, RI	19	in

Pit #	Time of fire burning	Time of food heating	Covered or uncovered	Vegetables cooked?	# of FCR
1	1 hour 4 minutes	1 hour 11 minutes	uncovered	no	1
2	1 hour 40 minutes	17 hours 14 minutes	covered	yes	9
3	1 hour 32 minutes	15 hours 49 minutes	covered	yes	1

Pit #1: After an hour, the temperature of the rocks dropped ~430 degrees. At this time the canvas was opened exposing under cooked (nearly raw) vegetables.

Pit #2: This oven was left buried for over 17 hours. The earth on top was a few degrees warmer than the surrounding ground surface. When opened there was still warmth within the oven. In unwrapping the canvas, researchers learned that the food had thoroughly cooked the vegetables.

Pit #3: the pit on the beach was difficult to dig and keep the fire going. However, once the fire was burning, it created very hot coals underneath. Unfortunately, the combination of the wind and the heat from the fire was pulling the sand in from the sides and covered up many of the rocks. Despite this setback, the coals and some rocks were hot enough to cook the vegetables.



Fig. 13 + 14: the cooked acorn squash and sweet potato from pit #2. These were slightly charred and had a syrup-like liquid covering the outside of the vegetables



Fig. 15 the cooked vegetables after pulling them out of pit #3

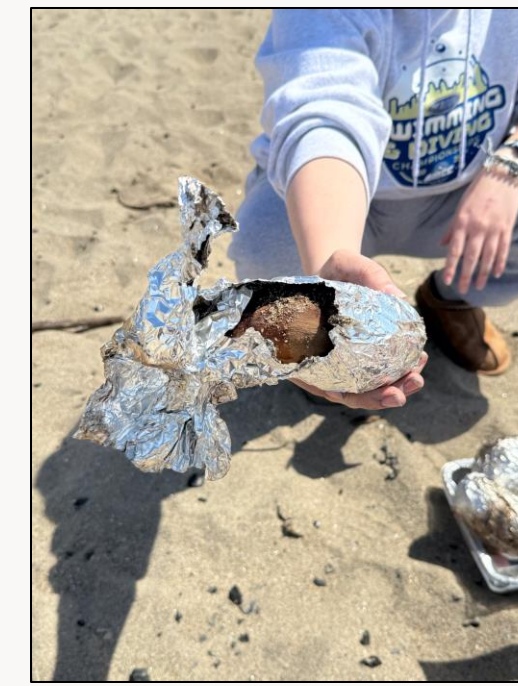


Fig. 16 the cooked sweet potato after pulling it out of pit #3. The foil was burned through.

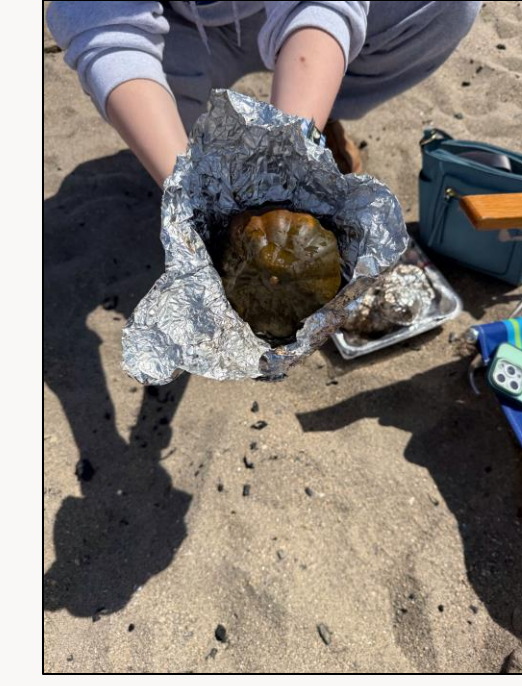


Fig. 15 the cooked acorn squash after pulling it out of pit #3

- In total there were 52 rocks used between all three pits. Of these, 11 (21.15%) of them broke as a result of thermal stress. The breakage patterns all seem recognizable— angular and jagged. Furthermore, many of these cobbles now appear slightly reddened.
- The average cooking time was 11 hours and 25 minutes, with two of the pits being cooked overnight.
- Pit #1 and Pit #3 also had charcoal incorporated into the pit. This addition would help archaeologists determine that these features were used for cooking. Since the rocks used in Pit #2 were heated away from the pit, little, if any, charcoal was present.



Fig. 18: the fire cracked rock from pit hearth #1. This was the only rock that cracked all the way through



Fig. 19: nine fire cracked rocks from pit hearth #3. This was the bottom left next to the buckets. The cooked squash and potato are in the foil and the un-cracked rocks are on the top right



Fig. 20: the fire cracked rock from pit hearth #3. This was the only rock that cracked, however, it did not crack all the way through.

Conclusion

Findings from this research show that people from all around the world and through time were able to sustain themselves through hot rock pit cooking. However, the archaeological evidence only provides so much information, including fire cracked rocks that are left behind after use, and the layer of charcoal if a fire was built in the pit. This research offers insight into the mystery of the fulacht fiadh. These trough shaped holes which are often filled with water are surrounded by a mound of earth and fire cracked rock. The hot rocks used in this study were all capable of cooking a variety of vegetables. Therefore, the thermally altered stones in Ireland possibly were used for pit cooking. However the water filled hole complicates things rather dramatically. Perhaps people used the hot rocks to stone boil in these pits? Alternatively, the water table may have risen over time. In which case the hot rocks may have been used in a similar fashion to test Pit #2

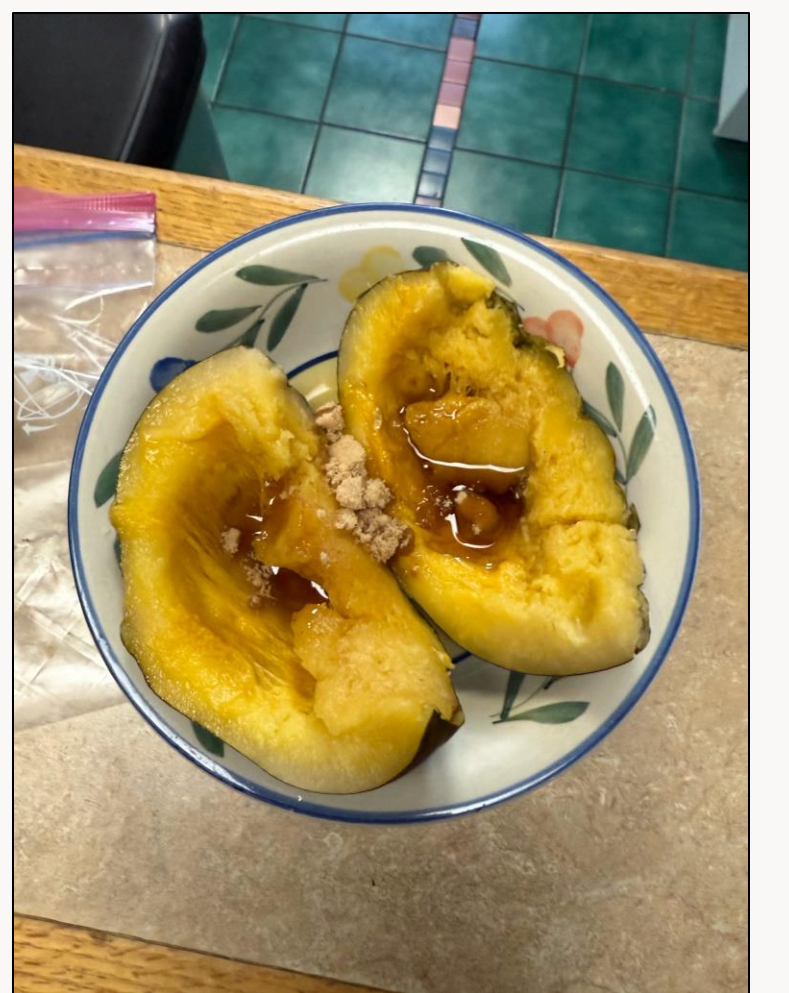
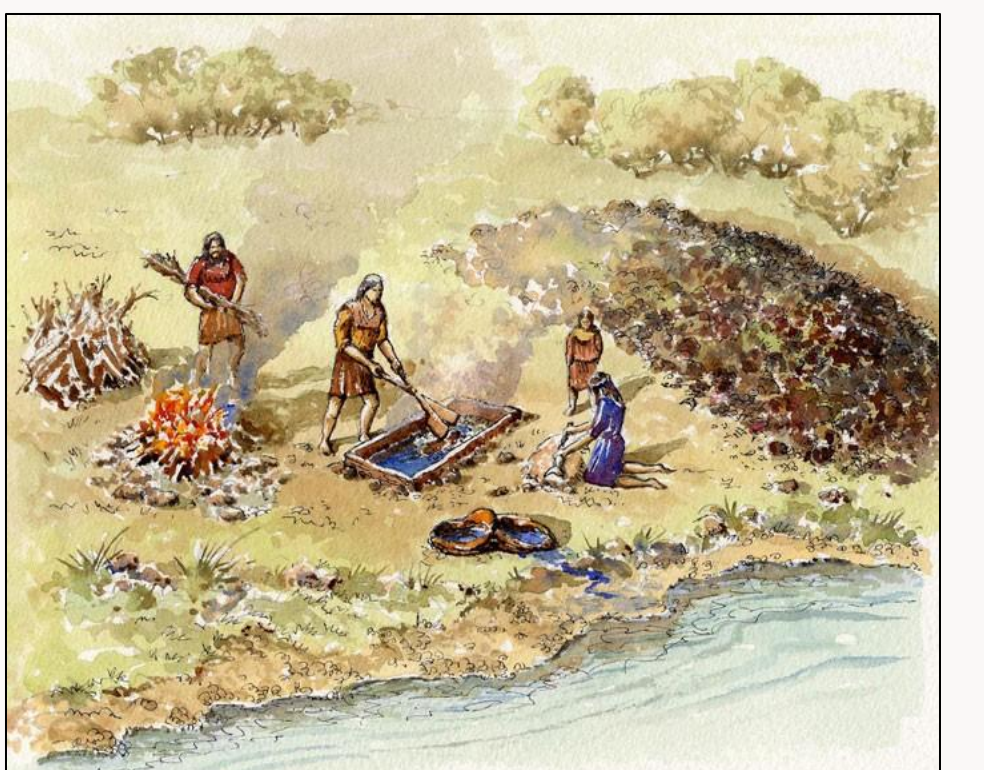


Fig. 21: the cooked acorn squash after pulling it out of pit #3. We reheated it with maple syrup, brown sugar, and cinnamon.

What next?

In Ireland, there is a feature named the fullacht fiadh which is a trough of water in the ground surrounded by a mound of earth and fire cracked rock. Little is known about these and what they were used for. To continue this research, I could take what I have learned about earthen ovens and compare to the archaeological evidence. I can learn from this comparison and attempt to cook using the fulacht fiadh by creating my own.



References

- Burreneco, and Admin. "Fulacht FIA?" *Visit the Burren*, 21 Oct. 2016, burren.ie/fulacht-fia/.
- Hogan, Leslie. 2021. "How to Prepare a Real New England Clambake" Hogan Associates. April 21, 2025. <https://hoganblog.com/2021/07/01/how-to-prepare-a-real-new-england-clambake/>
- Isacksen, Kyle. 2024. "Build an Earthen Pizza Oven: Beginner builders can be baking in cob after a few days' work and less than \$300." *The Mother earth news*. 2024-08 (325). p.36. https://suny-pot.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_infotracmisc_A822778614&context=PC&vid=01SUNY_POT:01SUNY_POT&lang=en&search_scope=MyInst_and_CI&adaptor=Primo%20Central&tab=Everything&query=any,contains,build%20an%20earthen%20pizza%20oven&offset=0
- Leierer, Lucia, Angel Alonso Carrancho, Leopoldo Perez, Angela Lagunilla Herrejon, Antonio V. Herrera Herrera, Margarita Jambrina-Enriquez, Cristo M. Hernandez Gomez, Bertila Galvan, Carolina Mallol. 2020. "It's getting hot in here— Microcontextual study of a potential pit hearth at the Middle Paleolithic site of El Salt, Spain." *Journal of archaeological science*. Vol. 123, p105237. https://suny-pot.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_crossref_primary_10_1016_j_jas_2020_105237&context=PC&vid=01SUNY_POT:01SUNY_POT&lang=en&search_scope=MyInst_and_CI&adaptor=Primo%20Central&tab=Everything&query=any,contains,its%20getting%20hot%20in%20here&offset=0
- Mullaly, Erin. 2012. "Mystery of the Fulacht Fiadh." *Archaeology*. 2012-01. Vol. 65 (1), p.55-58. https://suny-pot.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_proquest_miscellaneous_920364275&context=PC&vid=01SUNY_POT:01SUNY_PO&lang=en&search_scope=MyInst_and_CI&adaptor=Primo%20Central&tab=Everything&query=any,contains,mystery%20of%20the%20fulacht%20fiadh&offset=0
- Polo-Diaz, Ana, Jose R. Rabunal, Guillaume Gerin, Javier F.L. de Pablo. 2023. "Mesolithic heart-pits and formation processes: a geoarchaeological investigation of sediments from El Arenal de la Virgen site (SE Iberia)." *Springer*. 15(7): 104 <https://pmc.ncbi.nlm.nih.gov/articles/PMC10287818/>
- Thoms, Alston V. 2008. "The fire stones carry: Ethnographic records and archaeological expectations for hot-rock cookery in western North America." *Journal of Anthropological Archaeology*. 27(2008): 4443-460 <https://potdam-illiad-oclc-org.potsdam.idm.oclc.org/illiad/illiad.dll?Action=10&Form=75&Value=268969>
- Thoms, Alston V. 2018. "Ethnographies and Actualistic Cooking Experiments: Ethnoarchaeological Pathways toward Understanding Earth-Oven Variability in Archaeological Records." *Journal of Archaeological, Ethnographic and Experimental Studies* Vol. 10 (2): 76-98. <https://www.tandfonline.com/doi/full/10.1080/19442890.2018.1510125?needAccess=true>
- Valdez, Lidio M., Bettcher, Katrina J. 2021. "Pachamanka: Inka Earthen Ovens from Tambo Viejo, Peru." *Latin American antiquity* 2021-12, Vol. 32 (4), p. 858-864. https://suny-pot.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_proquest_journals_2608413387&context=PC&vid=01SUNY_POT:01SUNY_POT&lang=en&search_scope=MyInst_and_CI&adaptor=Primo%20Central&tab=Everything&query=any,contains,pachamanka:%20inka%20earthen%20ovens&mode=Basic

Acknowledgements

Thank you to Dr. Tim Messner for all the help through the research and providing resources for testing. Thank you to the other Hearth interns and my family for helping me build and test the pit hearths.