Stuck in a Rut: Analysis of a Gallo-Roman Road in Burgundy, France

Senior Thesis

Presented to

The Faculty of the School of Arts and Sciences
Brandeis University

Undergraduate Program in the Department of Classical Studies
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In partial fulfillment of the requirements for the degree of Bachelor of Arts

by
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April 2016

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ACKNOWLEDGEMENTS

For anyone who has spoken to me for more than thirty seconds over the past seven months, you know that I have been excessively worried with the page length of this thesis. Despite the constant assurances by my professors, friends, and parents, it had always bothered me that my page count would pale in comparison the triple-digit works of some of my peers. This concern, however, was not based on the unfounded fear that fewer pages corresponded to a lower grade. Rather, I was concerned that a lower page count meant that I was less devoted to the project. A senior thesis was supposed to allow me to write about a topic of my own choosing, a topic that has meaning and interest to me; if I couldn’t even reach 50 pages, did that mean I’m not interested in this topic, that I didn’t care, that I had somehow failed to write a senior thesis properly? Until recently, such had been my reasoning. Now, as I apply the finishing touches, I realize that this project I have undertaken stretches far beyond the confines of the numbers shown in the top right corners of each page. In many respects, my decision to write this thesis extends as far back as the end of my time in high school, before many of my peers even knew where they would attend college. Over the years since then, I cultivated an interest in not only the subject of this paper, but more importantly in Roman history and archaeology as well, a passion that stayed with me and grew throughout my undergraduate career. In other words, this project was just as much of a journey as it was of an academic assignment, and like all journeys, there are many people whose contributions, encouragement, and assistance were invaluable to its success. I would first of all like to thank Jan McCallum-Johnston and Chris Johnston for introducing me to the road in the first place, and helping find, collect, and record much of the information that led my decision to pursue this project. I would also like to thank Madame Ginett-Monnot, as well as many of the other residents of Nolay, for providing maps, directions,
and information on the local area. I would also like to extend my gratitude to Professor Eric Poehler of the University of Massachusetts Amherst for taking the time to discuss the road with me, and for his input and opinions that have become invaluable to this thesis. I am also grateful to Melanie Harris, whose willingness to assist me with my last-minute request at the pXRF was truly a lifesaver for this paper. In addition, I am indebted to my advisor, Professor Cheryl Walker, for all of her help throughout this project and for tolerating and snapping me out of my weekly panic attacks about the progress of my work, as well as Professor Ann Olga Koloski-Ostrow, whose advice and suggestions were crucial in shaping and structuring my research. I am also extremely thankful to Mrs. Meredith Monaghan and the rest of the Provost’s Undergraduate Research Fund Committee for their generous grant that allowed me to return to Burgundy in the summer of 2015 for research. Last but not least, no amount of words can express my gratitude for my parents, whose trip to France in 2010 and in the subsequent summers allowed me to develop and research this interest, and whose patience and toleration with my antics, even when I was often undeserving of it, kept my motivation strong, and my friends, whose kindness and encouragement kept me going over the course of the past two semesters. For all of you that have been a part of my life during my studies at Brandeis University, thank you so much.
I. INTRODUCTION

During the summer of 2010, after completing a rather unsuccessful French immersion program in Aix-en-Provence, I met up with my parents in Paris to travel to the Burgundy region of France as an enjoyable vacation to end the summer, before beginning my junior year of high school. We rented a cottage in the village of Nolay, located in between the larger towns of Beaune and Autun. Over the course of our stay, we became quite fond of the region and the village, and quite friendly with many of the villagers. Ever since, my family has returned to Nolay for two to three weeks each summer to enjoy a relaxing vacation, during which we also began to learn a lot about the history of the town and the area. During our stay, in either 2011 or 2012, while discussing my interest in Roman history and archaeology with a couple with whom we had become friends, they mentioned that there were the remains of a Roman road lying about a half-hour walk north-east of the town, on the modern hiking path that runs along the edge of a plateau at the top of a steep valley. I eagerly accepted their offer for one of them to take me up to the site, and I was not disappointed in what I saw: just after coming out of a clearing in a forest, marking the end of a steep uphill hike, I could see clearly, cut into the bedrock of the ridge, what appeared to be a pair of very deep cart ruts. Despite the simplicity of the feature, I immediately became fascinated with it and how it managed to survive for over 2,000 years. As a result, during my stays in Burgundy over the next few summers, I spent much of my time researching this road, attempting to answer questions regarding its history, the path it followed, and its significance within the Gallo-Roman world. Ultimately, this interest, over time, evolved into one of an academic nature, such that it has become the subject of this thesis.

This paper focuses on the aforementioned portion of the ancient road and explores many of the questions that were raised over the course of my research. Such topics include 1) an
analysis and confirmation of the road’s presence in the Gallo-Roman period, as well as its context within the larger network of Gallo-Roman roads, and 2) a discussion of the many anomalies I discovered with respect to the road’s present-day physical characteristics. Specifically, these anomalous characteristics manifest themselves in issues such as 1) various features along this segment of the road potential archaeological value, and 2) what appear to be sudden changes in construction techniques, as well as a perpetual consideration of 3) the effects of natural erosion on the road, which is often especially problematic due to its potential to distort further our interpretation of the former two anomalies. In considering these anomalies, I hope to present some possible explanations for the road’s significance and formation. Furthermore, by carefully analyzing these anomalous characteristics, I ultimately hope to present some new insight into road construction techniques of the Roman period.
II. DESCRIPTION OF THE ROAD SEGMENT

The segment of this road lies to the north of Nolay, reaching, as it heads north, the top of a valley, above the village of Cormot-le-Petit which lies to the east, where it runs along the edge, on a modern walking path, just over a half-kilometer south from an old barn known as the “Granges d’Etagny”. I will describe the road’s characteristics as they appear, heading north to south, in order to explain more effectively these features with respect to one another. Walking south from the barn, as you approach this area on the walking path, which starts to slope downward, slight indentations in the limestone bedrock appear to form on the left- and right-hand sides of the path. Continuing down, these indentations become much more pronounced, especially on the left (east) side, to the point where they become deep enough to have been identified by previous archaeologists as ruts. The ruts are visible for most of a 150 to 200-meter stretch, after which they begin to fade away into the rock, eventually completely disappearing again. Around this point, the walking path enters into a much more forested area, and the downhill slope becomes much steeper as well. A few meters further, the path’s surface becomes more frequently covered in a layer of soil, rather than the exposed bedrock of the ridge, and shortly thereafter, you can see a patch of what appear to be smooth, cut stones, that look as if they had been intentionally placed vertically alongside one another within the soil. A similar patch of stones can also be found placed into the soil a bit further down the hill. In the vicinity of this first patch of stones, the path, on its left side, for a short period of time parallels the cliff wall that continues upward. In this area, you can find a cavity in the cliff wall that resembles a small quarry. A few meters down the path, a dilapidated wall of loose stones appears on the left-hand

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2 At this point, the path is no longer on the top of the valley; as the path begins its descent, on its left the valley continues downward, while on its right the valley slopes upward – I hope this clears up any confusion.
Figure 1: Photo of ruts on walking path.

Figure 2: Another photo of ruts on walking path (I am standing in the background for scaling).
side; on the other side, as the path begins to veer away from the cliff wall that rises above it, a similar man-made wall appears as well. These walls continue to follow the path until it reaches the bottom of the slope and emerges from the forest, after which there do not appear to be any more features of potential archaeological significance or relevance.
III. DATING OF THE ROAD SEGMENT

Although no primary sources specifically mention the existence of this road, some geographical, archaeological, and secondary evidence can help to confirm its Roman origin.

1) Geographical Evidence

Before discussing the tangible discoveries, an analysis of the local terrain on which the path lies may be helpful in determining an age. To be specific, the angle at which the road

Figure 3: In the map on the left, the walking path, marked by a dark brown line, ascends the valley, depicted against contour lines. In the map on the right, aerial photography of the same area shows the forest covering.
ascends the slope of the valley appears to be significant. While most of the features and artifacts to be presented were found towards the top of the slope (other than the walls, which are discussed in detail much later), the modern-day hiking path on which these finds lie climbs the slope in a distinctly Roman fashion. In his book, appropriately titled *Roman Roads*, Raymond Chevallier notes that typically, “when a deep valley had to be crossed, the Roman road bends sharply to take the slope at an angle, then once at the top, it resumes a straighter course.”

As depicted in Figure 3 above, this path does exactly that; just as it becomes noticeably steeper and enters a more heavily forested area (Point A on the maps in Figure 3), the path suddenly changes its direction from approximately north-northeast to approximately northwest; although during the climb, the path has a curve to it (Segment BC on the maps), it ultimately regains its northwestern direction (Point C). Then, shortly before emerging from the forest and the top of the valley (Point D), the path becomes significantly less sloped and bends more to the north, following the edge of the cliff for a few hundred meters, at which point the ruts begin to be visible.

2) **Artifactual Evidence**

The direction of the path alone cannot serve as an appropriate means to date the road, but when presented with other material finds, the possibility of its Roman origin begins to make more sense. In a brief survey of the path, for example, three iron-based artifacts were discovered. Two of them are handmade iron nails, and they were both found in the soil within or beside the ruts. While one of them was not effectively able to be dated, the other, shown in Figure 4, appears to be a hobnail that would have been used

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in the soles of *caligae*, a type of boot worn by Roman soldiers across the empire; in the northern provinces such as Gaul, caligae were used by the military as late as the end of the first century CE.\(^5\) It can be identified as such because of its relative thickness as well as the way in which it has been sharply bent. Admittedly, unlike most hobnails which have conical or pointed heads, this nail’s head is relatively flat – this, however, could possibly be attributed to erosion or the wearing away of the surface over a long period of time\(^6\), which would, if anything suggest that the hobnail can be attributed to an earlier era of production and use.

Another iron artifact, shown on the right, was found further south along the path, lying among one of the patches of seemingly purposefully placed stones. While it does not appear to resemble any particular object on its own, I posited, because of the its slight curvature, that it may be the fragment of the metal rim of the wheel of a cart; Professor Ann Olga Koloski-Ostrow independently suggested such a hypothesis as well.\(^7\)

In addition to the artifacts that I personally discovered, I was also told by some of the local residents of Nolay that other Roman artifacts have often been found near the road’s location. Apparently, for example, a metal-detecting enthusiast used to find many Roman coins at the bottom of the valley along which the road had followed\(^8\); if these claims were to be true, they would certainly help to confirm the existence of past Roman activity in the area.

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\(^7\) Ann-Olga Koloski-Ostrow, interview by the author, Brandeis University, Waltham, MA, September 1, 2015.

\(^8\) Maybe some unlucky travelers had been a bit too careless with their money while so close to such a steep drop.
3) **Ruts**

Not only are the ruts arguably one of the most diagnostically significant portions of the road, but they are also the most prominent and visible elements of this portion of road, which is likely why they caught my attention in the first place. The presence of these ruts also creates an issue in determining the construction methods of the road, but this topic will be addressed in a later section. For now, regarding the dating of the road, the ruts are important because of their widths. With the limited tools at my disposal, the crude measurements I was able to take, listed in Table 1 on the right, suggest an average width, measured from the center of one rut to the center of the other, of about 144.125 cm to 146.250 cm (accounting for error), along the portion of the road where both ruts were visible. According to various citations by Rita Compatangelo, the distance between most ruts that date to the Roman period tend to range from about 123 to 147 cm. Furthermore, one of these citations, an article by P. Sillieres, shows that the spacing of Roman ruts specifically within France seems to range from about 135 to 155 cm. Additionally, in a discussion with Professor Eric Poehler, a specialist in Roman urban systems such as roads and drainage, from the Department of Classics at the University of Massachusetts Amherst, not only was I able to confirm that the spacings I recorded fall exactly within the ranges of Roman-era spacings, I also learned that such spacings were not likely to have had a pre-Roman, namely Celtic, origin, whose rut spacings, where they existed, tended to be wider. It is also unlikely.

<table>
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<th>Distance Between Ruts from:</th>
<th>Outer Walls</th>
<th>Center</th>
<th>Inner Walls</th>
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<td>165</td>
<td>143.5</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>145</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>147</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>141</td>
<td>115</td>
<td></td>
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*Table 1: Measurements between ruts proceeding uphill (cm)*

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9 Throughout this paper, ruts will continue to be measured from center to center, or, as is written in some of the French sources I am using, “d’axe en axe”, unless stated otherwise.


12 Eric Poehler, videoconference interview by the author, Brandeis University, Waltham, MA, February 1, 2016.
that these ruts have a post-Roman origin, as Compatangelo cites a study saying that medieval rut spacings tend to have smaller widths, typically between 110 and 117.5 cm.\textsuperscript{13} Ultimately, these ruts, the layout of the road itself, and the artifacts found along it all seem to suggest that this modern hiking path lies on the remains of a pathway used during the Roman period.

4) **Context of the Road in the Gallo-Roman World**

i. **The Via Agrippa**

Having established the probability that the Romans developed a road on this path, it is now possible to study its existence and potential significance within the context of the Gallo-Roman world. It is quite likely that this road actually is an offshoot or smaller branch of the larger road network known as the *Via Agrippa*. Shortly after being given the title of *princeps* in 27 BCE, Augustus, as part of his political and military policies that would ultimately bring peace and prosperity to the Roman Empire for the next 200 years, appointed his general, Marcus Vipsanius Agrippa, to govern the new province of Gaul that had previously been conquered by Augustus’s predecessor and adoptive father, Gaius Julius Caesar. In Gaul, Agrippa was tasked with erecting a system of highways, into which, over the course of the project, he incorporated both new as well as pre-existing Gallic roads, and demonstrated many innovations in road construction. In its completion, this vast network of routes, branching out from the regional capital of Lugdunum (Lyon) reached as far as Arles in the south, Cologne in modern Germany, Saintes in the west, and even Boulogne on the coast in the north, which provided a vital and effective means of passage into Britain.\textsuperscript{14}

\textsuperscript{13} Compatangelo, *Centre de Recherches d'Histoire*, p. 118.
ii. **Connecting the Road Segment to the Via Agrippa**

Augustus’s deployment of Agrippa into Gaul, as well as the latter’s consequent projects that included the development of aqueducts and roads, first and foremost represented a military effort to solidify and stabilize the newly-acquired Gaul in order to establish an organized Roman province. The network of the Via Agrippa also undoubtedly increased the amount of trade, exchange, and transportation that had already been thriving in Gaul, thanks to its convenient geographical location as the junction of the major river basins of the Seine, Rhone, Saône, and Loire (See Figure 6).\(^{15}\) The existence of the pre-Roman and Roman site of Les Bolards near the

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\(^{15}\) Jean-Louis Voisin, "De la Via Agrippa à la nationale 6" [From the Via Agrippa to the Route Nationale 6], *Bourgogne Magazine*, November/December 2013, p. 31.
modern town of Nuit-Saint-Georges, located along the Lyon-Cologne axis of the Via Agrippa, serves to prove this point excellently\textsuperscript{16,17}, and the fact that Roman forts throughout Britain have revealed an abundance of Gallic-produced terra sigillata ceramics confirms that, after the region’s incorporation into the empire, these roads helped to facilitate goods to as far as Rome’s northernmost frontiers.\textsuperscript{18}

Thevenot does assert that this road segment that we have been studying does in fact connect with the Via Agrippa’s Lyon-Boulogne route not too far from the town of Brazey\textsuperscript{19}; the question still remains, however, as to whether our road is actually a part of the Via Agrippa – that is, the road was constructed as part of Agrippa’s plans to “Romanize” the new province – or if it was a trade route that developed from and after the establishment of the larger military artery\textsuperscript{20}. On the one hand, much evidence points to the former; hobnails, like the one that was mentioned earlier, for instance, were, as mentioned previously, used by the Roman military in their boots known as \textit{caligae}. In addition, evidence of potential quarrying activity on and along the road, (to be discussed in detail later), as well as the way in which this particular segment of the road climbs the mountain, suggests a sufficiently large and organized operation, likely beyond the labor capabilities of a small group of local residents, but well within the ability of a well-trained and prepared Roman \textit{centuria}. On the other hand, there is also some evidence that

\textsuperscript{17} Paul Stuart Middleton, \textit{Trade and Market in Roman Imperial Gaul} (Cambridge, Great Britain: Cambridge University, 1981), pp. 40-41.
\textsuperscript{19} Thevenot, \textit{Les voies romaines de la Cité des Éduens}, p. 269.
\textsuperscript{20} Admittedly, there is a third possibility – that this route actually predates Roman occupation, just as was the case of pre-Roman usage of the various Gallic rivers for trade and transport. Continued use of the road during the Roman period, as well as the placement and presence of Roman-era features on the road, however, has made it difficult to determine its earlier history.
suggests diminished military involvement in the construction of the road. As noted by Thevenot, for example, the road, like the main Lyon-Boulogne artery of the Via Agrippa, departs from the important commercial river port of Cabillonum, (Chalon-sur-Saône), but then, instead of running through Augustadunum (Autun), it actually bypasses the large urban center in order to reach Saulieu more directly.\textsuperscript{21} Although by the time it reached Saulieu it had merged with the main route, this shortcut, as can be seen in the map from Figure 6, may have allowed faster and more efficient travel to Saulieu, Sens and ultimately Boulogne, from where goods were shipped to Britain, by avoiding the detour to and distractions of the regional capital. In addition, the claims that many Roman coins have been found in the vicinity of our segment of this road might suggest a presence of economic exchange in the area. Ultimately, however, both of these can be explained with regard to or in light of the presence of military activity. First of all, while stopping at a large city like Augustadunum may have always been preferable for any legion, in order to refresh the supply of weapons, food, and even troops, it may have occurred to Agrippa, or to whomever Agrippa had tasked with overseeing the construction of roads in this region, that some military expeditions may require expediency, in which case the presence of a shortcut bypassing Autun would make sense. Secondly, the presence of coins along the route would by no means serve as a counterargument to military development; more often than not, Roman citizens became legionary soldiers as a profession in order to make money, and soldiers were bound to have coins on them in order to make personal purchases. Furthermore, as suggested previously, regardless of the origins of the road, it is very likely that this road also eventually became adopted by merchants, traders, and other travelers, who by the nature of their occupation would be carrying money with them. To put it simply, this road that branches off the Via Agrippa

\textsuperscript{21} Thevenot, \textit{Les voies romaines de la Cité des Éduens}, p. 269.
appears initially to have served a military purpose, and was likely as constructed as part of the Via Agrippa network, rather than serving more commercial purposes, although later on, it possibly, if not probably, came to serve commercial traffic as well. This functional duality, however, should come as no surprise, for many observant Romans too, were aware of blurred distinctions between the military and mercantile uses of their roads; the 1st century CE poet Statius, for instance, in an ode to the recently constructed highway of Domitian\textsuperscript{22} in Campania, encourages both “all you people beneath the oriental sky” as well as “you laurels of the East” to quickly travel down this new efficient route.\textsuperscript{23}

\textsuperscript{22} The Via Domitiana; not to be confused with the Via Domitia in southern Gaul, which will also be briefly mentioned later.

IV. **Analysis and Discussion of the Anomalous Characteristics of the Road**

While the evidence discussed above is able to attribute the use, if not creation, of the road to the early Roman Empire, many questions still remain unanswered regarding the nature of its development as well as some of the features that surround or comprise it. The presence of any one of these features – the ruts, a possible small quarry, the patches of placed stones, and walls along the path – often creates a confusing and conflicting depiction of the road’s history, on the basis of either erosion or the expected characteristics of a traditional Roman road. In addressing these anomalies, I ultimately hope to develop not only better understanding of the formation and function of the features of this specific road, but, more importantly, a better understanding of the techniques Roman road construction in general.

1) **Roman Road Construction Techniques**

Since much of this analysis focuses on the features found on the road itself, a good place to start would be a brief overview of traditional Roman road construction techniques. For this, we can again turn to the work of Chevallier, as well as that of another earlier scholar of Roman roads, Albert Grenier. According to Chevallier, normally, the first step would be to clear the area and dig a trench that is deep enough to reach either bedrock or a “sufficiently firm foundation”. Then, these trenches were repacked in layers of stones, gravel, and sand, often brought from other locations. Grenier provides a similar account of Roman road construction, but also insisted on the presence of a feature known as a “hérisson” (literally meaning “hedgehog” in English), which appears to refer to a series of upright-placed stones lined up against one another.\(^{24}\)

Although he does not use this term, Chevallier, too, mentions a rubble layer of “stones set on

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edge to aid drainage”. On top of this, a “ballast” of rocks were added according to Grenier,
and then, according to both of them, a layer of sand. These upper layers were usually
cambered, forming a convex arc, to allow drainage to run off to the sides of the road. The surface
was then often covered in paving stones, locked into place with raised curbstones running along
each side of the road. Whereas the lower layers of material often came from more distant
locations, both flagstones and paving stones were often taken from the local hillsides.
Sometimes, when paving stones were not available or practical, it seems that roads may have
been alternatively covered with an additional layer of both small stones and gravel, in a process
known as metalling.

In addition to the standard methods of road construction, Chevallier discusses the use and
presence of ruts very similar to those found on the road we have been studying:

“Ruts, both in town…and in country, may have been the result of wear and tear, but where they are deep (6-30 cm)
and with sharp edges, clearly shaped by pick and hammer, they were obviously intentional. On awkward
ground, close to a sheer drop, they served as rails, guiding the waggons, for these had front wheels higher than
the actual frames, making independent steering impossible.”

Not only are the ruts’ edges relatively sharp,
the road is located on the edge of a steep slope
as well, and furthermore, in some sections, as

25 Chevallier, Roman Roads, pp. 86-87.
27 Chevallier, Roman Roads, pp. 86-87.
29 Chevallier, Roman Roads, p. 89.
in Figure 7, the ruts exceed a depth of 20 cm; all of this would indicate that the ruts here were likely carved intentionally, although this assertion will be examined and reviewed later in the following section.

2) **Unevenness of Ruts**

   Although, as mentioned just above, the ruts on our road are typically deep enough to be visible, the depths of the ruts as you move along the road vary considerably, and what is especially confusing is the often significant difference in depth between both ruts at any given point along the path. As the path progresses downhill, the rut on the side of the road closer to the valley ledge (hereafter referred to as the “east” rut) becomes progressively deeper than the rut on the other side of the path (hereafter referred to as the “west” rut), which sometimes almost disappears entirely. The most visible example of this can be seen back in Figure 2, with Figure 7 above being the internal view of the east rut from the same area, and Figure 8 below an internal view of the corresponding west rut.

   Compared to other instances of Roman-era ruts throughout their empire, the noticeable depth difference between these ruts appears to be a unique and otherwise undocumented occurrence, but thanks to the help of Professor Poehler, I was able to develop some possible explanations for this phenomenon. Before actually tackling this issue directly however, Professor Poehler first pointed out a variety of characteristics and features about the roads and the ruts, many of which warranted their own discussion and analysis.30 One

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30 Poehler, videoconference interview by the author.
of the first things he noticed, for example, was that the west rut at various points, such as in the photos above, appeared to be significantly wider than the east rut. Additionally, compared to the smoothness of both walls of the east rut, as well as of the western wall of the west rut, the eastern wall of the west rut in this specific section is noticeably jagged. Professor Poehler has two possible explanations for this phenomena. The first hypothesis asserts that either prior to or in preparation for the formation of the road, the area was quarried, which was apparently accomplished by digging long trenches into the rock, and the desired section was then extracted by “crowbarring” into these trenches. Once the cuts had been removed, any overcut trenches would leave a scar in the bedrock resembling a rut, but with their walls noticeably uneven and jagged. Afterwards, once the area began to be used as a road, it is then possible that this scar conveniently began to serve as a cart rut, and the perpetual friction of the carts against the trench would erode their walls, making them smooth over time. If, however, the trench was wide enough to be significantly larger than a standard cart wheel (3.5-4.0 cm, according to Poehler), only one of the trench’s walls, more likely the outer one, may have been regularly subjected to this wear, which would also help to further expand the width; this theory seems to provide a reasonable explanation for what is happening in Figure 8, and may also help to explain another not as yet discussed anomalous characteristic, shown in Figures 9 and 10, where the road drops down suddenly, rather than continuing a slight decline. These dips may actually represent a perpendicular cut across the rock being quarried in order to further dislodge it from the bedrock.

This quarry theory, however, not only fails to explain the difference in depth between the ruts, but actually seems to fall apart in light of the discrepancy. Had the east rut been consistently shallower than the west rut, it would make sense to suggest that, because the west trench was

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31 Poehler, videoconference interview by the author.
already present to serve as a track for one side of each passing cart, the formation of the east rut was caused by the perpetual wear caused by the wheels on the other side of the carts. Another alternative, then, is that the presence of the east rut could be explained by the cutting of a second parallel trench as part of the quarrying process, as one of the trenches may very well have been unintentionally cut significantly deeper than the other; this, however, still presents a conflict, in that one would expect the deeper trenches to have been made wider, to accommodate the tools being used as they cut downwards. Furthermore, only by an extremely lucky coincidence would the width between the trenches turn out to be the same as the standard axle width on Roman carts; the engineers would have not likely planned for this when quarrying on a location that was to be a future roadway.

Professor Poehler’s second hypothesis about the difference in rut widths (not depth) involves the possibility that the west rut was modified sometime after the road had already been established. In the portion of the road shown in Figures 2 and 8, in addition to pointing out the width and jaggedness of the west rut, Poehler also noticed that the western wall of the west rut climbs much higher than the height of the road surface itself, because the terrain continues to incline for a little bit more as one moves to the west. On Roman carts, since the hub of the wheel sticks out beyond the wheel itself, if the outer wall of a rut was high enough to reach the center of the wheel, where the hub is located, the hub may grind against the wall, hindering movement.
and potentially even damaging the hub and wheel; Poehler thinks that as the floor of the west rut wore away due to usage, thus making the height of the western wall progressively higher with regard to the wheel travelling in it, this very process may have started to occur. If this problem became frustrating enough to the regular travelers of this road, it is possible that the west rut was intentionally widened to allow enough passing space for both the wheel and the hub, and the jaggedness of the eastern wall is evidence of the crude and hasty, yet effective means by which this was accomplished\textsuperscript{32}

This proposition, however, still fails to answer my original question of why the east rut was so much deeper than the west one. I believe that an alternative theory, essentially a combination of both of Poehler’s theories, can effectively explain the discrepancy of both the depth and width of the ruts, with far fewer anomalies than the previous two did on their own. This explanation, like Poehler’s first hypothesis, suggests that this area was intentionally quarried as part of the road-making process, but instead of the west rut being the trench used to extract the rock, it was the east rut. As opposed to the less defined characteristics of the west rut, the consistently more well-formed and straight nature of the east rut better suggests that its creation was completely intentional. In fact, its bears a striking resemblance to a trench left from a known Roman-era limestone quarry in Turkey, shown in Figure 11\textsuperscript{33}, with the exception of being much narrower and not as deep. After the quarrying process was complete, and the road began to be used, this east trench began to serve as a rut; although the

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure11.png}
\caption{Channel made by Roman pick in limestone quarry.}
\end{figure}

\textsuperscript{32} Poehler, videoconference interview by the author.
\textsuperscript{33} Tom Heldal and Elizabeth Bloxam, QuarryScapes Guide to Ancient Stone Quarry Landscapes, Work Package 9, Deliverable No. 11 (QuarryScapes, 2008), Fact Sheet 5, PDF.
resulting tilt towards the cliff edge, due to one side of the cart being lower than the other, may have made drivers nervous, the fact that at least one of their wheels was being kept on track by a rut may have been enough to make people comfortable enough to continue using the road. Over time, wear from the road’s continued use, in addition to deepening the east rut, caused the natural formation of the west rut as well. In addition, the slight variance in the axle widths of carts may explain why the west rut is regularly wider; because the wheels on one side of the cart would have been locked in place by the east rut, the erosion on the western side of the road would have been slightly more distributed. The formation and eventual deepening of this west rut then may have eventually led to the issue with the hubcap grating against the outer wall, and after my discussion with Professor Poehler, I actually made a discovery that further confirms this theory; looking at all of the photographs I took where the west rut is visible, the height of the western wall of the rut appears to be the highest along the specific section which we have been talking about, meaning that any issues of hubcaps grating against the rock would have occurred predominantly there. Furthermore, the only area where this “jaggedness” along the eastern wall of the west rut appears is in that same location, and evidently the width of the west rut is greatest at this location too. In other words, the carts were only likely encountering issues at this one location, where the distance from the floor of the west rut to the top of the outer wall had become sufficiently large enough to grate against the hubcaps. This assertion then makes the idea that the jaggedness at this location was a crude attempt to increase the rut’s width more plausible, since this alteration at just this one particular location would not have been beyond the effort and labor of one or two regular users of the road affected by the issue, users who would have likely been otherwise uninterested in the project had it been any larger in scale.
In summary, a careful analysis of the depth and width discrepancy between the two ruts reveals the improbability that both ruts were carved intentionally; rather only one of them was created intentionally, but as a quarrying trench rather than a rut. It is unknown if it was common practice for trenches such as this one to become used as ruts, as no other definitive instance of this phenomenon has been recorded; previous studies of ruts have suggested a correlation between the intentional cutting of ruts on a road and the presence of nearby quarrying activity\textsuperscript{34}, but none of these studies discuss the possibility of a secondary function of quarry trenches. Admittedly, certain phenomena, such as the differing effects of erosion on slight variations in rock type that may have been present over the width of the road, or the possibility of other unknown Gallo-Roman or post-Roman activity may provide simpler explanations of alterations made on the road. These details, however, would likely have only had a minimal impact on our perception of what remains of the road, and as such, they could only have at best served as minor forces of change.

3) \textbf{The Presence of Pitched Stones}

As discussed previously, the use of the h\'erisson technique is not uncommon in Roman roads, especially in Gaul\textsuperscript{35}, but Grenier and Chevallier both seem to believe that this layer did not appear on the surface on the roads. A well-preserved section of the Via Domitia near Ambrussum in Provence, shown in Figure 12, however, suggests the contrary. There, the layout of stones that appear to meet the definition of h\'erissons are found on the road’s surface, and the wearing of cart ruts directly into these stones


\textsuperscript{35} Grenier, "Les voies romaines en Gaule", p. 17.
suggest that there were not originally other layers of rock and soil above it. Furthermore, research in Britain has revealed similar formations on the surface of Roman roads, which English archaeologists have labelled as “pitched stones” or “stone pitching”. John Ward, for example, in his book on Roman Britain, cites the Foss Way near Ilchester, as well as a small road near the town of Pontypool, for which he provides a diagram, shown in Figure 13 to the left. The specific functions of the hérisson or pitched-stone technique will be discussed shortly.

Ultimately, these road styles quite noticeably resemble two “patches” of stones on our own road. Walking up the hill from the south (in the direction toward the lens in the earlier photos of the road), amidst rubble of other stones, smalls rocks, and dirt, I was able to identify what appear to be small groupings of pitched stones. The first one, shown in Figure 14, is relatively small and barely noticeable; I was only able to spot it was because I had already been aware of the much more extensive and visible patch further up the climb, shown in Figure 15 below. Although not as well cut, placed, or packed as the stones in the portion of the Via Domitia shown in Figure 12, their appearance still very much resembles Ward’s example, where he believes the stones were intentionally placed. Poehler, on the other hand, is skeptical as to whether these features were actually man-made, as opposed to being natural fractures in the rock. He points out that, compared to the Via Domitia, in addition to having a

somewhat more haphazard placement of stones, this road does not show any evidence of curbstones along its sides, which were important for keeping the hérisson together; admittedly, even Ward’s diagram includes curbstones. This argument, however, fails to account for the differing effects of weather and erosion on a road of vastly different characteristics, the most notable one being its much steeper incline. Furthermore, it is entirely possible, if not likely, that the curbstones have since been removed, destroyed, or have just eroded beyond recognition. Evidence of such an occurrence can be found in the presence of a rut found in one of these pitched stones, which can be seen in the center-left of Figure 15, and shown in detail in Figure 16. Unlike the deeper ruts cut into the bedrock just a few more meters of the path, this rut was more likely to have formed naturally as cart wheels wore down the stone over time. The appearance of only one rut, however, furthers my arguments against Poehler’s skepticism about the stone pitching, since the parallel rut, as well as the remainder of this rut, has not been found. This suggests that much of the road’s features, such as the curbstones, if there were any, as well as the remainder of the ruts, have been significantly altered over time, so that they are longer visible.

37 A similar effect can be seen in the much more visible Via Domitia in Figure 12.
38 It is also possible that these features simply may have just been hidden by the thick brush on either side of the path, but admittedly, in the albeit brief search for a parallel rut in the vegetation, I could not identify anything.
In addition, the fact that the artifact shown in Figures 5a and 5b was actually found in between some of the stones while cleaning and surveying the patch shown in Figure 14, if it is indeed a fragment of a Roman tire, would further suggest that these stones are indeed the remains of a hérisson formation. One last piece of evidence toward proving the intentional placement of these stones is that, while walking along the path where these stones aren’t present or visible, you can often find instead clusters of rocks that are all of approximately the same size, an example of which is shown in Figure 17. Admittedly, there is a much greater chance that these rocks are naturally formed, and that it is only my imagination that these were cut, or at least broken, intentionally, but I cannot help but consider the fact that they seem to resemble the type of work that would appear, according to specialists such as Chevallier, in lower layers of a typical Roman road.39

4) Change in Construction Methods along the Road

As we have already seen, the discovery of the rut worn into the stone has already provided some insight into the use of the stone pitching technique on our road, but its presence is arguably of the most analytically important features of this fragment of the road and can still provide much more information about the features and nature of the immediate area of the road on which it is located. First of all, the formation of the cart-rut within the stone shows that the existence of those stones in their current location, regardless of whether or not they were intentionally placed, actually predate the use of the road. More importantly, however, the presence of this rut may ultimately provide some new insight into the road construction

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39 Chevallier, Roman Roads, p. 89.
techniques of the Gallo-Romans. As suggested earlier in the discussion, the patches of pitched stones were found on the steeper, more forested portion of the walking path. As the path starts to turn more directly northward, the path reaches the top of the valley and becomes significantly flatter (see left map in Figure 3), the forest covering decreases greatly (see right map in Figure 3), and the bedrock of the valley becomes much more exposed, at which point the ruts cutting directly into this bedrock appear. It is unlikely that the occurrence of these four phenomena in the same approximate location is a coincidence. As for the relationship between the forest and the slope, for example, it is likely that the steeper terrain has always been less suitable for farming, thus allowing trees and wild plants to grow there over time; the fact that the bottom of the steep part of the path emerges from the forest right in front of a modern vineyard serves as a testament to this suggestion. The interplay between the levelling out of the slope, the disappearance of the pitched stones, and the appearance of the ruts, however, is the relationship that is more relevant to this archaeological study. Chevallier notes that on occasion, “the manner in which roads were built varied a great deal, even along the same route, according to the firmness of the subsoil and the available materials”\textsuperscript{40}, but does not provide any instances or examples of this. The changes that occur on our road do seem to provide an example of Chevallier’s notion, one that may provide us with a more technical understanding of how the use of a specific construction method correlates to the type of terrain on which the road was located. To be more specific, it appears that, as the slope of the path changed, the road adopted a different construction technique; while the path was on a steeper inclination, stone pitching was used, but once the path flattened out, they abandoned this technique, instead laying out the road directly on the bedrock.

\textsuperscript{40} Chevallier, \textit{Roman Roads}, p. 87.
As for this inclination, I should reassert that its steepness is quite noticeable, likely enough make a cart user, whether powered by animal or man, uneasy about using it. Because, however, the evidence does indicate that the road was used by carts during the Roman period, the use of stone-pitching likely represents an active attempt to make the trip up the slope safer somehow, or at least appear safer, to cart users. Both Chevallier and Grenier do mention that the purpose of these upright stones was to aid drainage on the road\textsuperscript{41}, and modern applications of this technique apparently serve a similar purpose. On modern walking paths where heavy use and sufficient natural erosion would normally deteriorate roads comprised of gravel and small rocks, stone pitching is used to provide “a solid and immovable surface that will withstand the most extreme pressures of use and water flow.”\textsuperscript{42} In addition, stone pitching is often employed on steep slopes in order to make the path more durable and stable, and apparently, compared to other techniques, it requires little maintenance and has a long life-expectancy.\textsuperscript{43} Many of the problematic characteristics on the portion of our road concerning these stone patches appear to be effectively addressed by modern applications of stone pitching, so it would not be unreasonable to believe that Roman engineers used this technique as well, having already discovered that the firm placement of stones into the ground along a steep incline would have made their road much sturdier and resistant to natural and artificial wear. Ultimately, the fact that they are still partially extant on our road serves as a testament to their durability and practicality, and frankly, it would not be too farfetched to speculate that this practice was passed down by the Romans themselves.

\textsuperscript{43} "Stone Pitching," Paths for All.
Whereas the practice of stone pitching has persisted into the twenty-first century, making information on its function more readily available, paths that happen to run over bare bedrock are, in the modern day, most often a result of the landscape and natural forces rather than human activity. Consequently, explanations for the appearance of a road cut into the bedrock, quickly replacing the stone pitching, at the conclusion of the incline along our road, are admittedly speculative, derived primarily from observations of the area’s geology and landscape. One possibility is that roads made of gravel and rock would be subject to greater amounts of natural and artificial erosion on a path with less tree covering, right along the slope of a valley; stone pitching is indeed intended to withstand erosion, but when right against a steep edge, the surrounding soil is likely much looser and prone to running off the side, thus compromising the stones’ intended firmness in the ground, making them equally susceptible to the same fate. Alternatively, a possibility exists that the top of the valley was already naturally devoid of loose soil, and consequently neither stone pitching nor any other standard construction methods, for that matter, could be employed there; if such was the case, it would have likely been impractical to import large amounts of soil and gravel to the location, so the Roman engineers may have just decided to make the road directly into the bedrock instead.

Chevallier is not alone is his assertion that the construction techniques of a Roman road may vary even along the same route due to changes in the landscape and available resources; other researchers such as Grenier and Ward have made similar remarks. The analysis of this road segment has not only provided a specific example of such an occurrence, but more importantly, has given us a more systematic understanding of how, when, and why Roman engineers decided to alter and modify their road construction techniques along a certain route.

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This one example could potentially serve as the basis for a much more in-depth study of Roman road construction techniques as they correlate to the surrounding terrain, whose results may very well provide a more accurate understanding of Roman technological and engineering knowledge and capabilities.

5) **Relevance of the Walls and the Possible Quarry**

The last section on the topic of anomalous characteristics concerns the potential “quarry” and the remains of the walls that appear on the sides of the road, which have not been discussed yet in detail. Originally, I had anticipated that a brief analysis of these features would disprove any direct connection to the Roman-era construction of the road, although their presence may help to explain the later, post-Roman history of the road, such as its deterioration or destruction. The outcome of the scientific analyses of samples taken from the road, quarry, and walls, however, were quite unexpected, and although they do not necessarily confirm outright a direct relationship between the three features, the results of these tests effectively eliminated the grounds for my initial skepticism of the possibility of such a relationship.

i. **Initial Observations**

In order to understand how I interpreted the results of the scientific analyses of the samples, an explanation is required as to how I arrived at my initial assumptions that these tests disproved. As mentioned towards the beginning of the discussion, in the vicinity of the larger patch of pitched stones, on the western side of the path behind some brush, can be seen a cavity cut directly into the rock of the rising cliff face, as shown in Figure 18. I must concede that not I, but my mother, was the one who first noticed it and suggested that it might be the remnants of a Roman quarry. At first, I was skeptical of such an assertion; while the smoothness and straightness of the cavity’s recession into the cliff is seemingly artificial, the parallel striations along its walls could have also been formed naturally – a hypothesis initially suggested by both
Poehler and myself – and consequently it is entirely possible that the cavity had happened to form by crumbling apart along such neatly aligned cracks. On the other hand, the diagonal cut running up its right wall does not appear to be a natural occurrence, but my knowledge of geology is not sufficient to confirm or deny this claim. Nevertheless, even if these cuts and striations were indicative of quarrying activity, I was not able to find evidence to attribute the activity to the Roman period. I should note that I was equally cautious with my reasoning upon my discovery of the pitched stones. At the time, I was not yet aware that stone-pitching was a modern road construction technique, as well as one used by the Romans, and consequently, I had initially believed that they were the result of more recent makeshift work to make the hiking path safer and more durable.

The remains of the walls, however, a portion of which is shown in Figure 19, are the only feature where I still hold sufficient doubts of their Gallo-Roman origin. I hypothesized that the pitched stones placed by the Romans may have been removed from the road during a later period in order to build the wall, but its haphazard construction and apparent lack of using a binding agent, such as cement, between its stones means that it would have likely been extremely

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45 Poehler, videoconference interview by the author.
susceptible to the destructive effects of erosion, especially on such a steep slope. Consequently, for portions of the wall to have survived in any capacity into the 21st century means that it was likely constructed in the past few centuries. As for the intended purpose of the wall’s construction, we can only speculate; as it runs along the path, it may have served to protect the road from wind and rain, or maybe to keep travelers from wandering off the road, potentially onto private property. Unfortunately, these speculations do not help much to elucidate the wall’s origin; on the other side of its remains, however, the dense forest and brush may be hiding some long-forgotten discoveries, and maybe a better-equipped and more-organized study of the area may reveal some features of archaeological significance that not only provide us with insight on the history of the wall, but more importantly, that of the road, once used by the Romans, that it followed.

**ii. Initial Predictions**

I collected samples from each of the aforementioned geological features, all of which were composed of limestone, hoping that studying them in greater detail would lead to some less speculative conclusions. Of these samples, one of the most perplexing was one taken from the pitched stones. As seen in Figure 20, this fragment’s external characteristics seem to only make up a crust-like layer that would have encompassed the entirety of the pitched stone, and appear to be quite different from its internal characteristics. At the time I had made these observations, I was aware that certain processes may erode or alter the physical properties of the exterior of a stone, but I was initially unable to find any examples of chemical or physical changes to limestone that would have resulted in comparable alterations to the exterior of the pitched stones. Consequently, I had figured that this “crust” was a natural occurrence and
concluded that it could not have been taken from the same limestone that was available in the quarry. Ultimately, at the time I decided to analyze these samples, I had already developed preconceived notions about what to expect in the results, which manifested themselves into essentially two more complete hypotheses: 1) the stones from the walls were extracted from the quarry, or 2) the “quarry” is actually just a natural phenomenon, and both the Roman-era pitched stones as well as the later stones from the wall were taken from entirely different locations. In other words, I had thought that it was unlikely that there was any relationship between these roadside features and the Gallo-Roman history of the road itself.

iii. Results of pXRF Analysis

The reason I ultimately decided to perform a scientific analysis of the samples was because, despite my reservations about their archaeological significance to my research, the features from which they came make up parts of the hiking path as it is today, and as such I felt obligated to investigate their presence, in the unlikely event that it would prove to fruitful. As we shall soon see, it was a good thing that I made this decision. Up until now, most of the analyses of the road have been based upon observation and research; for the study of this feature, we must now turn to a more scientific approach. Specifically, the type of analysis I used for this study is known as X-Ray Fluorescence (XRF). Having taken, while studying in London, a course on the applications of scientific analysis in archaeology, I was quite eager to have the opportunity to use Brandeis University’s portable X-Ray Fluorescence device (pXRF), in order to study the elemental compositions of some of the samples I had collected from the road.\footnote{I would like to express my gratitude to Melanie Harris for her assistance with the pXRF device.} To determine the elemental composition of samples, the pXRF emits x-ray beams at the object to be studied, causing electrons in the inner orbitals of the object’s atoms to be energized and ejected. Electrons from outer orbitals of the atom then fall to these inner orbitals, a process which releases a certain
level of energy characteristic of the atom which it orbits. The pXRF device is able to detect this release of energy and associate it with a certain element and is able to interpret this information as some portion of the object’s chemical composition as a whole. The resulting information is usually exported in measurements of parts per million (ppm).

In this study, I used pXRF to compare the chemical composition of a sample taken from this cliff cavity to fragments taken from some of the pitched stones. According to the results from these tests, the two predominant components of all of these samples were calcium and iron; the exact results are shown in Table 2. As for the quantities expressed in Table 2, it should be noted that many of the samples analyzed were not properly cleaned and were still covered in

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varying amounts of dirt, and furthermore, the amount of time that was available not only to perform the tests, but also process and interpret the results on the computer was rather limited, so the actual values shown in the table should definitely be taken with a grain of salt. That is not to say, however, that the results were uninformative; it may be significant, for instance, that both tests from Pitched Stone Sample 1 (PS1i & PS1o), which, each one from a different side of the same sample, would likely be prone to equal amounts of inaccuracy so that their results would be at least accurate relative to one another, showed relatively similar quantities of iron, and extremely similar quantities of calcium. This would suggest, contrary to my earlier assumptions, that the atomic composition of the exterior of the pitched stone is actually quite similar, if not almost identical, to that of its interior. This discovery ultimately prompted a conversation between me and Melanie Harris, who was kind enough to help me with the pXRF study, that revived the possibility that artificial processes may have caused changes to the exteriors of the stones. Because pitched stones were likely cut and smoothed before being set into the ground, this “crust”, which covered the entirety of the surface of each of these stones, may be the result of the work done upon them. It is possible that the force of the tools upon the stone would compress the compounds and elements closer together on its exterior, so that its appearance would change, but not its geological makeup.48 Furthermore, the fact that the two tests run on Pitched Stone Sample 1 suggested, as previously mentioned, very similar calcium quantities, but a higher quantity of iron on its exterior, may be evidence of the iron tools used to cut and smooth it.

As for the remainder of the samples taken from the pitched stones, as well as those taken from the quarry and wall, I am much more hesitant to trust the actual values provided by the

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48 Melanie Harris, interview by the author, Brandeis University, Waltham, MA, March 30, 2016.
pXRF; for example, WSn and WSg, two tests taken from opposite sides of the same sample of a stone from the wall, the latter side being covered in mysterious green-tinted patches, were reported as having vastly different amounts of both calcium and iron. Nevertheless, the fact that only calcium and iron, but no other elements, were visibly present in all of the samples may nevertheless lead us to important conclusions. Because the pXRF was likely reliable in reporting that all of the samples likely contained only these two elements, but was likely not reliable in reporting the accurate quantities of these elements within each of the samples, we must consider the possibility that the actual values of both iron and calcium in each sample may be similar to one another. In other words, if it turns out that the geological makeup of all of the pitched stone samples were similar enough to that of the sample taken from the cavity in the cliff, it would be entirely possible that this cavity was indeed the remains of a Roman quarry used to produce the pitched stones. At this point, I recalled my discussion with Professor Poehler regarding the potential quarrying techniques that may have formed the ruts; if the Romans used quarrying to construct one part of the road, it would make sense, already having the necessary tools and labor available, to use quarrying for another portion of the road as well. Likewise, if the sample from the wall turns out to have comparable amounts of calcium and iron, it would be possible to suggest that they too, were extracted from the same or nearby quarries; the alternative possibility, however, that the wall was constructed using repurposed pitched stones from the road can be ruled out on the grounds that none of stones from the walls exhibit this “crust” that is indicative of the level of work used to cut and smooth the stones found in the road.

I must concede that, at the last minute, I almost decided against performing the pXRF analysis, primarily due to time constraints and my assumption that the tests would not yield any useful information. I am quite glad that instead, my curiosity got the best of me. Not only did we
confirm the possibility of a quarry used by the Romans during the construction of the road, but in doing so, we were also able to learn more about the pitched stones that were used to build much of it. Ultimately, despite the often ambiguous nature of the results, the information derived from this scientific study was able to clarify many of our questions.
V. CONCLUSION

This project, which started out simply as an American tourist’s interest in the history of a nondescript hiking path in the middle of France, has in its completion developed into a comprehensive case study of Roman road construction. Indeed, while the contents of this discussion contributed much to our knowledge of the history of the specific segment of the Gallo-Roman road in question, arguably more significant were the larger implications it provided regarding road techniques across the Roman world. For example, while we have seen individual instances or documentations of the use of pitched stones, it has not to date been established or even acknowledged enough by Roman road specialists as a standard construction method used by the Romans, as are paving stones or cambering. In short, the discovery and reconfirmation of the Romans’ use of stone pitching serves as a testament to the notion that the Romans were impressively flexible with their techniques for building – a statement that is consistently agreed upon in theory but seems to be rarely considered in actual archaeological studies. Similarly, our consideration of the possible quarrying practices that may have been used to “carve out” the upper portions of the road may help to explain the development and presence of other roads cut directly into bedrock elsewhere throughout the empire. The construction of such a road would have required very different processes and techniques from the construction of those that use layers of sand, gravel, and rock, so further research into the frequency, origin, and development of these “bare” roads may contribute to a more holistic understanding of the ingenuity and skillsets of Roman engineers. Furthermore, in addition to this work of what may have shaped this road and its ruts into the rock, the discovery of the cliff-wall cavity earlier along the road further attests to the correlation between localized quarrying activities and road construction – a correlation that, again, has often been documented, but has yet to be studied in sufficient detail.
In the future, I plan to return to Burgundy to continue studying this Gallo-Roman road segment, and, now equipped with the knowledge acquired from my research, I hope to make and collect better and more comprehensive observations, as well uncover some previously overlooked information or features that may help to decipher many of the anomalies that I have presented in this paper. Such an endeavor, however, only scratches the surface of a much larger goal. The roadways that the Romans established were some of their most powerful tools in expanding their vast empire, and the commerce, transportation, and communication that these networks nurtured are what turned Rome into one of the greatest superpowers of the Mediterranean world for centuries; even today, many of the modern highways throughout Europe follow the paths of their Roman predecessors. The historical significance of these roads have not gone unnoticed, and the research by historians and archaeologists such as Chevallier, Grenier, and Poehler has added much to our knowledge of the subject. Despite their contributions, however, these roads still have much more to teach us. It would be entirely reasonable to assert that this discussion has raised more questions than answers, but these questions serve to highlight the many gaps that are still present in our understanding of the activities and practices employed by the Romans in their construction of road systems. Consequently, the results of this project, in addition any further research I may wish to pursue, on this relatively small remainder of a larger Gallo-Roman route, should be seen as seeds of a much larger quest to develop a better and more complete understanding of the roads of one of history’s most remarkable civilizations.
BIBLIOGRAPHY


Harris, Melanie. Interview by the author. Brandeis University, Waltham, MA. March 30, 2016.


Poehler, Eric E. Videoconference interview by the author. Brandeis University, Waltham, MA. February 1, 2016.


