

# **To the Bone**

**Uncovering mobility and migration in the  
Roman world**

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## **Abstract**

Research into migration and mobility in the Roman world has undergone almost constant change in the past decades. At the forefront of this change are new scientific methods that research human remains, a source of information that has never been studied properly in this context before the development of these methods. Most influential are the recent methodological developments in aDNA- and isotopic research. At the time of writing, these methods are not used by all scholars in the field, with some dispute about their usefulness arising. As such, there is a gap between scholars conducting research in the same discipline, contingent on their acceptance and subsequent use of scientific methods, leaving valuable information and data unresearched. This thesis seeks to bridge that gap, by providing the methodology relevant to historians wanting to use scientific methods in their research. Additionally, it addresses new challenges and ethical concerns that come with the analysis of human remains and invites further debate on the merits and challenges present in the discipline presently. As such it ties in to the current debates on ethics and research into migration and mobility in Roman history. This thesis shows that the future of the discipline is contingent on historians incorporating the new methods into their work. Working with all the sources that are now available to scholars of the discipline, the future looks bright for our understanding of ancient lives. The ball is, however, in the court of the historians.

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## Introduction

Over the last few decades, the discipline of history and those who practise it have taken a turn away from "grand narratives". Instead of looking only at processes over time and those in power who influenced them, scholars focus on uncovering the lives of "everyday people". This seems in line with a shift in public interest, which also moves towards the more "mundane" aspects of the lives of those who came before us. In the study of ancient history, sources are typically scarce, given the amount of time that sources need to survive in order to be available to us. Though many sources such as inscriptions, architecture or precious items that often form the bulk of the evidence historians use to illustrate their theories and ideas do allow us to reconstruct the lives of those with the means to create these lasting memories, those who cannot are invisible to us. This meant that historians had to rely on mostly circumstantial evidence when piecing together the lives of people in the ancient world, such as records of the sale and import of grain and pork to Rome, which has been used as an indicator for the population living in the city of Rome through time.<sup>1</sup> Since the birth of the modern discipline of historical research, the use of evidence of a circumstantial nature has been the status quo when it came to the lives of "ordinary" Romans. A lack of source material dealing with Romans who were not part of the elite meant that they were only seen through the evidence that deals first and foremost by the elite, or written for an elite audience. For that reason, the vast majority of historical works deal almost exclusively with matters of the Roman state, religion and the lives of those in power such as emperors, consuls and their families.<sup>2</sup> Looking at the lives of "normal" Romans thus usually meant that we look at them through a framework meant for analysing the lives of the Roman elite.

## Theoretical framework

This situation is slowly changing. Given the increased interest of scholars in explaining the lives of "normal" Roman people, much attention has been devoted to migration and mobility in the Roman world.<sup>3</sup> This is because mobility is such an impactful aspect on the lives of ancient people. Distances were greater, roads unsafe. Traveling, and certainly migrating with

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<sup>1</sup> For example, Dey (2021), *The Making of Medieval Rome*, makes use of Rome's pork supply to calculate its population from 400 AD onwards, in large part due to a lack of other sources. This, in turn, also gives us information about the diets of the people living in Rome.

<sup>2</sup> Mary Beard's seminal work, *SPQR*, for example, which is perhaps the most popular work dealing with Roman history, is an example of this.

<sup>3</sup> See De Ligt and Tacoma (2016) for a recent effort of international scholars to cover many aspects of migration and mobility.

all belongings was a choice not lightly made. If we can uncover how, why and where people moved, we also gain an insight into the decisions that Roman people had to make in their lives. Moreover, it tells us about the networks that were present in the Roman world. Knowledge about the mobility of people can fundamentally impact our understanding of the Roman world. For example, an inscription found in Beroia mentions two young women travelling from a location in what is now France to Roman Macedonia. Maccusa and Victoria, also known as Valerio[*I*]a, aged 22 and 14, travelled to visit their uncle.<sup>4</sup> Because of the advances in scientific methods, it is now possible to reconstruct the lives of the people that would previously have been lost using only traditional methods of writing history using previously available evidence. Migration has always been a very difficult phenomenon to study in history. Whereas the big narratives about empires, rulers and cities have benefited from a relative abundance of sources, both in written and material form, the study of ancient migration has not.

Up to the development of scientific methods, scholars were for the most part dependent on inscriptions that explicitly or implicitly indicated migration or mobility. Scholarly work on migration began in earnest with the work of Ravenstein.<sup>5</sup> It took almost a century before any work was undertaken in the study of migration that is still accepted as authoritative today. Charles Tilly wrote on migration in modern European history in 1978.<sup>6</sup> He created a rather crude but clear typology shown in a map he drew (see figure 1). His work created a great influx of scholars interested in the study of migration. As was rather common in the twentieth century, much of the research was focused on Europe. Perhaps the best example of studies into migration in the period that followed Tilly's work is *Moving Europeans*, a book by Leslie Page Moch.<sup>7</sup> With her work, she changed the ideas about migration that had existed until then. She showed that Europe, before the Industrial Revolution, was not a static society but that there was evidently much mobility between 1650 and the early 1980s, both nationally and internationally. Going into the 21st century, the scope of research on migration has widened, both geographically and temporally.<sup>8</sup> Only quite

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<sup>4</sup> *CIL* 3, 14406, An uncharacteristically implicit inscription tells us of their journey. Their uncle was a *vir perfectissimus* and *comes*, named Flavius Gemellus. Even though his status would have meant that the girls were doubtlessly escorted for (at least the majority of) their journey, it is still an example that sheds light on the possibilities of travel and for what reasons these travels were undertaken.

<sup>5</sup> Ravenstein (1885).

<sup>6</sup> Tilly (1976) was the first to create a migration typology, looking at both definitiveness <sic> and the length of migration, identifying 'mobility' as a less definitive version of migration.

<sup>7</sup> Moch (1992), with a revised edition published in 2003.

<sup>8</sup> Hoerder (2002) covers migration in world history from 1000 AD onwards for example.

recently has the field taken off in terms of numbers and attention in the study of the Roman world. David Noy's work from 2000, *Foreigners at Rome*, is to my mind the starting point of the discipline in its current form.<sup>9</sup> Around the turn of the millennium, the field of ancient history turned its attention to migration and mobility. Mobility in early-imperial Gaul studied through epigraphy,<sup>10</sup> patterns of migration and mobility in Roman North Africa<sup>11</sup> and migration to veteran colonies<sup>12</sup> are some of the specialist studies that have since been undertaken.

Of course, scholars were aware of the existence of mobility in the Roman world before this development. The founding of cities, conquest of areas, the founding of colonies in Rome's early history, slave transports and provincial Romans moving to Rome are but a few of the areas studied before attention came to the dedicated study of mobility in this period. De Ligt and Tacoma argue that this wide range of topics studied is precisely the reason it took relatively long to come to a dedicated discipline:

One explanation may be sought in definitional and organisational issues. It seems likely that ancient historians have for a long time equated migration implicitly with voluntary movement. The extent of such voluntary movement was believed to have been relatively limited and to have been confined mainly to particular groups, most notably to the elite and traders. The state-organised or enforced movements of soldiers, colonists, and slaves were not studied under the heading of migration. As the study of these latter groups formed well established research topics in their own right, the need for a different organisational concept was not felt.<sup>13</sup>

As broad topics and subjects are now studied within a single discipline, but there is a need for a standardized terminology. The simplest definition of migration was first mentioned by Moch and has since been in use as one of the less problematic definitions.<sup>14</sup> Migration can thus be of a permanent or a semi-permanent nature. An important note is that for the sake of this definition, 'migration is studied independent of agency or legal status.'<sup>15</sup> Different forms of migration, in temporal or motivational terms, were often intertwined. In the terminology,

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<sup>9</sup> Noy (2000). The work by David Noy, *Foreigners at Rome: Citizens and Strangers* is still widely considered to be one of the most extensive books about migrants and migration in the Roman world.

<sup>10</sup> Wierschowski (1995).

<sup>11</sup> Hamdoune (2006).

<sup>12</sup> Carroll (2006) 209-232.

<sup>13</sup> De Ligt and Tacoma (2017).

<sup>14</sup> Second edition of Moch (2003) 18. '(...) defining it as a change in residence beyond a municipal boundary, be it a village or a town'.

<sup>15</sup> De Ligt and Tacoma (2017) 4.

no distinction will be made between the different forms of migration.

In many publications, the present one included, mobility is often mentioned in the same sentence as migration. In the study of the ancient world, the definition of the term mobility has been shaped by the work of Peregrine Horden and Nicholas Purcell. In their influential history of the Mediterranean they used the term to describe the connectivity of people in the Mediterranean, identifying it as a structural feature in the region.<sup>16</sup> Mobility in our current discipline can mean virtually any kind of movement of people. However, the defining elements of mobility are usually that it takes place within a regional setting, as well as not having the aim of settling in another location outside of the boundaries of one's own town or city. Tilly, for example, takes a slightly different approach to the definition by writing that daily moves over short distances with minimal social breakage should be grouped under the heading 'mobility', whereas the term 'migration' should be reserved for movements over longer distances involving a significant amount of cleavage or disruption.<sup>17</sup> I would argue that the spirit of both terms is abundantly clear by these accounts, with the sidenote that mobility can also turn into migration, in some cases. Theoretically, migration is referred to as the result of 'push' and 'pull' factors. These notions should be self-explanatory, with certain circumstances pushing people away from their original homes and other circumstances pulling them to their new homes. Over the course of history, many people have been forced to migrate by many factors, such as floods, fires, expulsion or war. These are all examples of involuntary migration. Voluntary migration may have been induced by the prospect of a better (economic) future elsewhere. This was not necessarily a permanent process, but could be seasonal as well.<sup>18</sup> Economic reasons are generally identified as being one of the greatest push and pull factors for migration. With much migration for economic reasons, the conditions in cities have been the subject of some scrutiny. The theory that in cities the living conditions were so abysmal that mortality rates were higher than the number of births has culminated in the term 'urban graveyard' being coined. Because of this, migration was needed to keep up with the number of people dying, in the process of doing so creating the jobs that migrants were looking to acquire. While the theory is debated, it does show a general pull effect from the larger urban areas.<sup>19</sup>

The established methodology, that I refer to as being traditional, almost exclusively

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<sup>16</sup> Horden and Purcell (2001).

<sup>17</sup> Tilly (1976).

<sup>18</sup> Erdkamp (2017).

<sup>19</sup> Hin (2017).



relies on two types of source material. The sources that have generally been used by scholars are literary and epigraphical in nature. This work is by no means intended as an attack on the use of these sources, as they remain of great importance to the field. As I will show, there are many difficulties in discovering and proving migration and mobility in the ancient world. In recent years however, methods have been developed that can add a great degree of certainty to the work carried out in this area of study.

## **Methodology**

This thesis aims to explore the discipline of research into migration and mobility in the Roman world. There is a distinct gap in the discipline, separating scholars who employ "hard" scientific methods from those who use "soft" or more traditional methods. It will add to the debate by researching the possibilities in the field moving into the future. Specifically, it will seek to identify the different methods that scholars of ancient history can employ to look at migration and mobility, in an attempt to bridge the gap. Historically, scholars have mainly relied on evidence from both literary and archaeological sources.<sup>20</sup> I will give a brief historiography of what has been achieved in the field using these sources alone. The effectiveness of the method and also its limitations will also feature. In addition to this, two much more recently developed methods shall be explained and their possibilities shown. There is great potential in these two methods, but as of yet they are not part of mainstream scholarly inquiry. Ancient DNA analysis and stable isotope analysis have been in use for some decades, but their potential as a tool that is exceptionally useful when studying ancient migration and mobility has only quite recently been unlocked. Both methods will be discussed, with an eye to their past, present and future use in historical research. Their possibilities and limitations will be shown. The selection of these two methodologies specifically was made because of their proven results in the field. They have, however, not penetrated into the "mainstream" of historical work concerning migration. Some scholars are, for reasons that will be discussed below, opposed to the use of scientific methods in archaeology and history. This opposition, which has also found its way into publications I shall discuss below, is one of the main reasons that make this thesis necessary and relevant.

The focus of this thesis will be on research conducted on human remains for two reasons. First, it is a source of information that has been overlooked in the entire history of the discipline. Second, the use of human remains in historical research is still in its infancy

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<sup>20</sup> The evidence Noy uses is literary, but mostly epigraphy is used. In his own words: 'Quantitatively, it is the evidence of inscriptions which is most important for the study of foreigners at Rome.' Noy (2000) 5.

and there are still some ethical and methodological questions that remain unaddressed.

The study of migration in the Roman world will be specifically taken as the (sub)discipline to focus this thesis on. The reasons for this are several. First, it is a field of study that has both historically and presently received much attention. Many publications have dealt with the topic, but the number of sources available for this kind of historical research is limited. Especially textual sources such as inscriptions and literary works have been studied intensively, even exhaustively. Explicit evidence for migration and mobility is almost never found. Therefore, new and innovative methods have a real chance to prove their worth. They also deal with a source of information that has not been used widely in research into ancient history: human remains. Although archaeological projects have, of course, dealt with human remains in a more general way, their composition has not been a factor in most studies. This means that we now stand on a wealth of knowledge waiting to be uncovered. It also means that this kind of research, when conducted, must comply with an entirely different set of rules to abide by.

The study of human remains, sometimes destructive, is not something to be taken lightly. This aspect of research of this kind has received very little attention as of yet, which is why the ethics and problems that occur with human remains in historical research will also feature in this thesis. In the end, the aim of this thesis is to gain a thorough understanding of the discipline, its methodology and possibilities that have come in recent years with innovative ways of discovering migration and mobility in the Roman world. I believe that with understanding, these methods will naturally find their way into the foreground of historical works, telling the stories of those who would otherwise be lost to oblivion. This thesis will aim the answer the following question: what can new research methods performed on human remains add to the discipline of research into ancient migration and mobility in the Roman world? In order to be able to answer this question, the first chapter will focus on the history of migration and mobility in the Roman world according to literary and epigraphical sources. Then, we will look at stable isotope analysis and ancient DNA sequencing, respectively. The possibilities and limitations of each method will be discussed, showing what both methodologies can add to the current research. Both methods have received criticism in scholarly publications, which will be reviewed and addressed.<sup>21</sup> As the methods are concerned with human remains, I will also discuss the ethical and methodological implications, as they have not been addressed in scholarly literature in a satisfying manner.

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<sup>21</sup> For example, Bruun (2007).

The question of how the Roman world functioned can in a large part be answered by looking at the way in which its people moved into, out of, and within its boundaries. This thesis questions the way in which this has been done and how we can come to more accurate conclusions using scientific methods.

## Chapter 1: Historical Research

Much historical research into migration and mobility in the Roman world is based on an analysis of literary as well as epigraphical (inscriptional) sources. Major recent studies include the work of David Noy and a publication edited by Luuk de Ligt and Rens Tacoma.<sup>22</sup> Their work constitutes the current state of affairs in the field of research into mobility and migration in the Roman period. Noy's monograph, *Foreigners at Rome*, is widely seen as a pivotal work in the field. It is an extensive work that seeks to explain 'why and how foreigners came to Rome, how they were treated when they were there, how they adapted to life in the city, (and) how far they were able to or wished to retain a distinct "foreign" identity'.<sup>23</sup> The material Noy used to accomplish answering this question was largely epigraphic. Some comparative methods were also employed, such as comparing studies concerning themselves with other periods or locations as a way of lending more strength and credibility to his claims. While we will look more closely at his conclusions, a brief overview of them is of use to us here, as a means of understanding what has been studied already. His research Noy is presented in three parts. First, 'Evidence and ancient attitudes'. Here, he gives the methodological framework for his study and the definitions and theories involved. On top of this, the demographic issues of the research are highlighted. He discusses what proportion of the population consisted of foreigners and whether these foreigners were actual citizens, hence the title. Finally, he looks at the many reasons for increases in immigration in Roman history. His second part, 'Moving to Rome' looks at the individuals who would have migrated to Rome. Their reasons and motivation are central to his approach there. Additionally, he looks at the events occurring after such an individual's arrival in Rome. His final part, 'Living at Rome' focuses more on ethnicity and identity. Central to this part are the experiences that individuals had based on their ethnicity, also examining to what extent foreigners maintained their own ethnic identities. He added insights and knowledge to the field in a number of key areas, such as the motivation of migrants, the preservation of ethnicity and identity and expulsions. Often quoted is also the overview Noy provides us with of the different groups of foreigners in Rome. The epigraphic evidence is sorted per geographical region and the reasons for each of these geographically linked groups (Gauls, Greeks or Spaniards for example) are examined with an eye to the historical circumstances in

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<sup>22</sup> Noy (2000); De Ligt and Tacoma (2016).

<sup>23</sup> Noy (2000) x.

which the migration took place. In short, Noy successfully proved that there was an extensive foreign community in Rome, which was at the time a fact that had been very much underexamined.

More recently, the publication of de Ligt and Tacoma provided a new impulse to the discipline. Their publication contains a number of key articles pertaining to many aspects of migration and mobility. I will be making use of a number of them in this thesis, but as a way of introducing the topic it is useful to briefly look at the accomplishments of the edition. The focus of the different articles is varied. Much more than the work of David Noy, archaeology is used as a way of studying mobility. What resulted is a treasure of information and ideas about migration and mobility. As it was the result of a research project on migration and the labor market in Roman Italy, the focus is partly on labor mobility, forced versus voluntary mobility and female and familial mobility. As the most pertinent articles shall be discussed in this thesis I will not discuss them in depth here. Anyone interested in the study of migration and mobility from a textual an epigraphical/archaeological perspective should read the publication in its entirety, as it is fascinating from start to finish. In this chapter, I shall build upon the knowledge that scholars like Noy and the authors included in the edition by de Ligt and Tacoma, as well as point out the deficits in their knowledge and methodology and propose a solution to this problem by exploring new methods in this thesis.

The traditional method of looking at migration and mobility in the Roman period is for the most part still currently used. It is, as previously mentioned, dominated by the study of inscriptions. Epigraphic evidence is thus still very much at the forefront of historical research into migration. The reason for this is obvious. Epitaphs are the most common evidence of people who died in a certain location in antiquity. As long as the inscription is found in its original place, or *in situ*, it tells us who died there and when. Usually, some kind of additional information is specified. This information is important and gives us a lot of insight, but it has its limitations. In this chapter I will discuss the ‘traditional’ evidence and discuss its possibilities and limitations. To reach a conclusion about the additional value of new research methods it is vital to have a firm grasp of the possibilities present in the research methods as they stand right now, the status quo. When dealing with what we as modern spectators would call ‘migrants’ - with all of its modern, often negative connotations - it is important to note that this is a modern concept. The Romans themselves did not draw the line at where people originally lived or were born, but put more of an emphasis on their legal status. As David Noy puts it in his seminal work:

The people who are studied here were never neatly categorised by the Romans. Latin does not have a term to match the full range of the English 'foreigner'. Peregrinus, defined by Lewis & Short as 'a foreigner, stranger' was primarily a legal term for someone who was free but not a Roman citizen. It was sometimes used in conjunction with *advena*, a more general term meaning 'newcomer' or 'stranger'. A peregrinus/peregrina might even come from a family which had lived in Rome for generations, speak only Latin, and have no known kin outside Rome, but the lack of Roman citizenship was the crucial feature of his or her status. Conversely, a *civis Romanus/Romana* might know no Latin, never visit Rome and have no dealings with anyone who did, but was defined by a status which was inherited (or bought, or acquired by manumission). However, when Roman citizenship became almost universal among the free population after 212, the meaning of peregrinus changed, and in the fourth century it was the label used for the 'foreigners' who were periodically expelled from Rome.<sup>24</sup>

This is relevant to us in the present, as most of the most common sources available to us are, as said, epigraphic. As the Romans themselves were the ones to commission the inscriptions and were thus in control of what they said, we are inevitably dealing with Roman ideas about the status of people. There are some opportunities to catch a glimpse of the origin of certain people. For example, in some inscriptions we are told about repatriated remains of people who did not die in Rome but whose remains were returned and interred in Rome.<sup>25</sup>

Conversely, people who died in Rome and were buried there may not have intended to do so. Merchants, people traveling through Rome but dying in the process and many more examples that can be imagined are among those buried in Rome. Not all of them will have had the luxury of having a friend or a relative with the means and the will to provide their grave with an epitaph, or, in case one has been provided, much of the information about a person may be incorrect or simply missing.

Using the traditional methods and sources, we can only say something about the cases in which migration is specifically stated in an inscription, or even less likely, in literary evidence. Literary evidence about migration seems to be overwhelmingly contained to only the most elite of Romans. However, one of the most famous cases of a documented case of migration in antiquity is from the Bible.<sup>26</sup> The passage tells us of two Roman Jews, Priscilla and Aquila. It is unique because it is not about elite Romans, but rather two people of a much

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<sup>24</sup> Noy (2000) 1.

<sup>25</sup> Tybout (2017) provides an in-depth discussion of the repatriation and burial of people who did not die in the place they were buried.

<sup>26</sup> Acts 18.1-3; 18.18; 18.24-6.

lower social status. The passage shows us something about the distances migrants could travel in such an early time. Although their legal status is not mentioned, it is not a stretch to assert that they were likely peregrini. Aquila is mentioned to be a native of Pontus and, while Pricilla's native town is not named we do not know for sure where she is from, she may well have been from the same place. They were subjected to the expulsion of Jews from Rome under Claudius.<sup>27</sup> Leaving Rome for Corinth, they later met Paul there. They traveled with him to Cenchrea to Ephesus, where they converted the Jew Apollos, according to the story. Their profession, so we are told, was that they were tentmakers -as was Paul- by trade. They had already returned to Rome by the time Paul wrote Romans.<sup>28</sup> While the specific details about the story may not be completely accurate, there are some important points to be taken from it. It shows that it was possible to move around the Mediterranean over relatively great distances, even for those without means of paying for the best or safest transports.

Furthermore, it shows that it was not unheard of to return to Rome, even after an expulsion.

The question for us, researchers of migration in antiquity, is complicated because of information like this. It is impossible to deduce, from literary and epigraphic evidence alone, if a person migrated to different areas of the world in their lifetime. An epitaph might mention a cognomen like 'Syrus', indicating a connection to Roman-day Syria. In reality however, the deceased may have been the son/daughter of a migrant from Syria. Noy shows that even names with a clear topographical origin can give us no conclusive evidence as to the origin of a person.<sup>29</sup> Going even further than that, Noy asserts that even in cases where there is an even clearer connection to another location, we must take extra care not to draw any conclusions without additional evidence.<sup>30</sup> As such, we are reliant on the explicit mention of the origin of a person on their epitaph, if one exists. Except for instances of this very specific mention, other forms of epigraphic evidence cannot be conclusive on their own. Another important limitation of the material is made up of a number of key issues. First, a

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<sup>27</sup> Suet. *Claud.* 25.4

<sup>28</sup> Romans 16.3-4.

<sup>29</sup> Noy (2000) 6.

<sup>30</sup> Noy (2000) 6-7. 'If the date of death is given according to the Egyptian calendar, the deceased clearly had connections with Egypt, but was not necessarily an immigrant.' Furthermore, page 249 reads: 'It was evidently felt that a Latin epitaph required a date according to the Roman system, but that the Egyptian dating system and the Greek language went together naturally. It is not clear if the people commemorated with Egyptian dates were all immigrants from Egypt themselves, although some clearly were. While non-Egyptians might adopt the Egyptian calendar for religious reasons, the fact that the large majority of the examples given above are Christian shows that this was not usual. More probably, the inscribing of dates from their own calendar was a small statement of Egyptian identity made by Egyptians themselves and perhaps also (although this is not provable) by people of Egyptian ancestry.' I would like to add some nuance; not *provable* with the use of this epigraphical evidence *alone* with the methods employed thus far.

chronological one. As most students of Latin epigraphy will be aware, the vast majority of Roman inscriptions date from imperial times.<sup>31</sup> Moreover, there seems to have been a religious factor influencing the decision whether or not an epitaph was to be dedicated as well as how its text read. This can be explained by the different ideas Christian and Jewish people had about representation in relation to for example the afterlife, as well as the need to identify as a member of one of either groups and finally as the quantities of people of either one of those religions being buried for religious reasons, as opposed to being cremated. In a perfect world, the evidence from epitaphs would provide us with a comprehensive and average image of the population at any given time, with the only condition being that they were able to afford an epigraphic commemoration on or around their (family) grave.

In reality, we know this to be false. The epigraphic funerary evidence is only a representation of a much smaller group in Roman society. Most obvious are two things. First, there is a notable irregularity when it comes to the age groups that are represented. Second, there is a huge gender gap in the evidence. Epitaphs for men far outnumber those for women. As well as these major irregularities, there are some smaller differences in representation. Epitaphs for children, for example, outnumber those made for parents. Differences as the ones I have mentioned here make it hard to read too much into the subjects of the epitaphs in a quantitative sense. What I mean by this is that the evidence that is currently on record cannot be used as evidence for conclusions about epitaph distribution and frequency based on age, gender or an individual's place in the family, for example. Circling back to a point I have made earlier, which concerned the social and legal status of people in the Roman empire makes it remarkable that a large majority of the people commemorated in epitaphs were slaves. This, in addition to survivor bias in the material evidence makes for a very narrow focus in the evidence currently available. All of the factors that limit our understanding of migration through material evidence so far make it extremely hard for scholars to make solid claims about the numbers and origin of migrants that came to Rome.<sup>32</sup> These findings gave birth to an extensive debate in the early to mid-nineteenth century. Tenney Frank stirred up debate by asserting that the urban plebs had become 'orientalized', which was countered by an Italian scholar, Gaetano de Sanctis, who was one of the main opponents of Frank's description of the Roman population in this debate.<sup>33</sup> While this debate should be seen in its

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<sup>31</sup> For example, there are hundreds of instances of epitaphs mentioning imperial freedmen, who often came from outside Rome. See for example Taylor (1961) and Mouritsen (2004).

<sup>32</sup> Mouritsen (2015) 1-2.

<sup>33</sup> Frank (1915-1916); Frank (1920); De Sanctis (1925) and response by Calderini (1930).



context, it is important to note that these claims were based on the nature of the epigraphic evidence.<sup>34</sup>

In the city of Rome it has been estimated that at least three quarters of those commemorated in funerary inscriptions were former slaves, while most of the freeborn appear to be first generation freeborn (*ingenui*).<sup>35</sup> The imperial port of Ostia, which is regarded as, at least in a practical way, an integral part of Rome itself, a sample of funerary inscriptions suggests a very similar picture with freedmen making up 75 percent of the individuals in the material, the remaining 25 largely consisting of their immediate relatives and descendants.<sup>36</sup> The actual figures and diversity among the Roman slave population has itself been the subject of some debate. Walter Scheidel's article on human mobility in Roman Italy focusing on the slave population is today seen as the most accurate and most widely accepted take on this issue.<sup>37</sup> His research aimed to understand the composition and origin of the Roman slave population in Roman Italy. According to him: 'the age and sex distribution of the slave population of Roman Italy was a function of three factors: mortality, fertility, and migration.'<sup>38</sup> He concludes a number of things, most important to this thesis and this debate are the conclusions that there is no evidence to suggest that the slave trade was dominated by male slaves. There is no evidence, furthermore, that points to any sort of imbalance in the import of slaves. He recognizes the fact that men are over represented in the epigraphic evidence, even though we know that most male slaves had families. He bases this upon the examination of a corpus of neo-Babylonian cuneiform inscriptions referring to 45,000 names.<sup>39</sup> His solution to the problem faced by the apparent imbalance in representation is simply: 'This apparent paradox disappears once we accept that men are simply much more likely to be referred to by name than women. High sex ratios in Roman inscriptions should perhaps be explained in the same way.'<sup>40</sup> Even more important for us here are his estimates of the number of imported slaves. He estimates that for the period between 200 and 1 B.C. 1

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<sup>34</sup> The epigraphic evidence being the large number of names linked to locations outside of Rome. As this debate took place around the First World War and during the Interbellum, it took place at a time of highly politicised (social) science, usually made in the service of some goal supporting the nation. From the Italian perspective, it was not in the best interest of the state if the Italian people descended from slaves who came from elsewhere, especially not with while the Italian state itself put so much emphasis on its Roman imperial past. Tenney Frank himself is today seen as quite a contentious figure himself. At the very least, his views on race and his use of terms such as 'oriental' and 'mixed race' are no longer acceptable in scientific, or indeed any serious writing.

<sup>35</sup> Taylor (1961).

<sup>36</sup> *Idem*

<sup>37</sup> Scheidel (2015).

<sup>38</sup> Scheidel (2015) 71.

<sup>39</sup> Scheidel (2015) 73.

<sup>40</sup> *Idem*.

in 2 to 1 in 2.3 slaves in Roman Italy were imported. This would mean that in this period, between three to four million slaves were imported to Roman Italy from elsewhere in the Roman-controlled world.<sup>41</sup> This conclusion leads to far-reaching implications in terms of what we would expect to find in the material remains. Far more slaves and freedmen would have been imported from elsewhere than what is now visible through epigraphy. This is an area of research that could be exploited using scientific methods.

Turning back to the debate on representation in epigraphy, only with the publication of 'Freedmen and freeborn in the epitaphs of Imperial Rome' was it realised that there was a problem in the representation of slaves in epigraphy.<sup>42</sup> In this paper, Taylor argues that the epigraphic findings are not a faithful representation of the real composition of the Roman population. She argued something which is now mainstream in historical thinking on the subject, namely that freedmen had very particular reasons for commemorating themselves and their families.<sup>43</sup> Ramsay MacMullen, in 1982, theorized that the increase of inscriptions in the first few centuries AD was a matter of culture, transforming into a habit, the 'epigraphic habit'. He recognises that the habit was supposedly stronger in Romans than in other cultural groups such as Greeks or 'natives'.<sup>44</sup> A very telling passage in his work tells us that the explanation he gave to the rise of the epigraphic habit was the fact that epigraphy was aimed at a certain audience, which the commissioned inscription was made for:

Some clue to an explanation may lie in the contrast between statements on papyrus and on stone. What was written on the former arranged itself in more intelligible patterns because it was addressed by one person to another (occasionally to himself, as a memorandum) and because it served some material and evident utility; but what was written on stone almost always addressed nobody in particular—rather, the whole community. (...) Apparently the rise and fall of the epigraphic habit was controlled by what we can only call the sense of audience.<sup>45</sup>

Freedmen commissioned inscriptions for a variety of reasons, all rooted in their specific experiences and concerns, but it is now widely accepted that in many cases MacMullen's 'sense of audience' may have played only a minor — and rather more complex — role since

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<sup>41</sup> Scheidel (2015) 78.

<sup>42</sup> Taylor (1961).

<sup>43</sup> The argument being that, as newly freed men, they wanted to show their newly gained social status and new-found means by showing both in a funerary inscription.

<sup>44</sup> MacMullen (1982) 238.

<sup>45</sup> MacMullen (1982) 246.

the commemoration was purely private. And since epigraphic practices remained socially contingent, the overall record produced by individual acts of commemoration has little value as a demographic source on the Roman population. But precisely this aspect also allows important insights into the mentality of specific sections of the population, such as the freedmen.

For this reason we see a relative over-representation of them in the material evidence.<sup>46</sup> This was a new argument at the time, which obviously turned the debate upside down. The outcome of this was that scholars accepted that the epigraphical tradition was not something equally shared by all people within a 'class' of people, but rather an expression of individuality. The motives being different in every case and therefore no real conclusions about any one group as a whole could be made based on this evidence.<sup>47</sup> We are today very much dependent on the way that people in the past wanted to represent themselves in death and the way in which commemoration took place. Furthermore, it is dependent on the period that is studied. There is no need to convince even the stoutest supporters of a purely epigraphic approach that to study migration and mobility in the Mediterranean before the third millennium BC is a very difficult, if not impossible task when looking at the material found thus far alone. Regional differences in burial practices may, of course, give us clues as to the cultural affiliation the deceased may have felt, or wanted to propagate.

In recent decades, it has been understood that producing or commissioning the production of inscriptions in stone is the expression of a very specific cultural practice.<sup>48</sup> Some people will have embraced this way of expression while others will have rejected it completely. There has been much attention for the chronology of the 'epigraphical habit' as it has become known. The epigraphical habit had a rise and fall in popularity in the Roman period. There have been some attempts at explaining this difference in popularity over time.<sup>49</sup> Nevertheless, as the 'epigraphical habit' is a modern concept that was created in order to make sense of the epigraphical reality, it remains of importance to stay close to the material itself, so that the model does not become an end-all term to capture every aspect of the

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<sup>46</sup> This is not, in and of itself, an issue for the identification of migration and mobility. It does, however, make it impossible to reach any sort of blanket conclusions about the Roman people as a whole.

<sup>47</sup> Even though this is still subject to debate among some scholars. Mouritsen (2015) 42, makes a convincing argument against it: 'It is often assumed that because Ostia's economy was exceptional in the role played by trade and commerce, the epigraphic sources may here give a broadly realistic profile of the population. The argument overlooks the fact that the social composition found in the epigraphic material from Ostia is not exceptional but fully in line with findings from other Italian towns. We are therefore dealing with a general phenomenon which cannot be explained by specific circumstances obtaining in one particular locality.'

<sup>48</sup> MacMullen (1982).

<sup>49</sup> For example, MacMullen (1982) who coined the term 'epigraphical habit'.

epigraphical evidence.

The concept of the existence of an 'epigraphical habit' was first and foremost given in by the realization that inscriptions had strong and marked differences that were influenced by their place in time. This idea had been challenged, for example by Henrik Mouritsen.<sup>50</sup> He argues that 'the findings suggest that the notion of a single monolithic Roman 'habit' needs to be modified.'<sup>51</sup> Different classes of people in the Roman world used different epigraphic forms, at different times and for different reasons. The idea that expression through epigraphical means was a homogeneous practice connected by a common culture was the general consensus for some time, but has been disproven by work by scholars like Mouritsen. Greg Woolf, an eminent scholar and epigrapher in his own right, analyses the use of epigraphy as a means of asserting one's place in society motivated by social mobility and competition.<sup>52</sup> While he is not wrong, Mouritsen shows that there is much more to the practice of epigraphy than that. It does not, for example, explain why when the aforementioned freedmen turned to epigraphy to assert themselves and their newfound status, the elite turned away from funerary epigraphy as a place to show their status. Instead, they directed their efforts at honorific monuments that were publicly sponsored.<sup>53</sup>

What I have shown by analysing the epigraphical tradition, its merits and limitations, is the fact that as a means of looking at a complicated issue like migration, it is inadequate to uncover the complete history of migration and mobility in the ancient world, when used on its own. As I have stated above, I do however strongly believe that the archaeological sources that have played such an important role in earlier research have a very big role to play going forward. Echoing the criticism by Bruun<sup>54</sup>, which I will engage with further in this thesis, wherever it is abundantly available it should always play the "lead role" in any investigation. As has hopefully become clear by now however, that is almost never the case. New methods of investigating migration and mobility in ancient history are needed if we are to move forward and gain more insights and a better understanding of this vital aspect of human life in the past. As with any innovation, it is important to first have a firm grasp of the status quo, so a fair assessment can be made on whether the proposed innovation is, indeed, a step in the

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<sup>50</sup> Mouritsen (2005).

<sup>51</sup> Mouritsen (2005) 62.

<sup>52</sup> Woolf (1996).

<sup>53</sup> Mouritsen (2005) 63.

<sup>54</sup> Bruun (2010) will be discussed in much closer detail, but his criticism, being a respected scholar and epigrapher especially, is as interesting as it is polarizing, making for an article that is important to deal with for anyone looking at the possibilities of newer, more science-based methodologies.

right direction. As I have stressed a number of times, the study of migration and mobility is one of careful scrutiny of the sources in the hope of catching a glimpse into the lives of those people we now identify as having participated in such movements. What will follow is an extensive, but by no means complete, appreciation of what is possible in this regard, through historical methods available to scholars.

To understand the subject fully, a brief overview of the theories that are at the core of the study of mobility and migration in the Roman world is necessary. They constitute the framework through which scholars look as they delve into mobility. Among the most important ideas that require theoretical thought are the motives that ancient individuals may have had for their – often hazardous and sometimes fatal – migration. A number of reasons for mobility have been theoreticized. The theories about the motives for mobility have been subject to revision in the past years, as new insights are gained about motives that are being uncovered. For example, climate change has been posed as a factor in recent years, as climate change in history becomes ever more studied given its rising urgency in the present.<sup>55</sup> A category of motives or motivation for mobility that has been identified is mobility due to the actions of the state. There are multiple reasons that gave an incentive to move, perhaps largest among them being mobility for the army. As the Roman Empire grew in size, ever more soldiers were needed to protect its borders. The fact that soldiers were almost exclusively deployed to regions far from their own obviously had an impact on the numbers of individuals who were migrating as well as on the distances they travelled. Soldiers left home for many years, with some returning when their service had run its course, with others choosing to remain near their place of deployment and start a new life there. As well as the men who served in the army, their wives and families followed them in their migration. A further motive that can be identified as being due to the actions of the state is colonization and resettlement as mandated by the Roman state.

The movement of many army veterans took place in connection with the founding of so-called veteran colonies. This occurred mainly until the Augustan period. A number of these colonies are quite well-known.<sup>56</sup> The founding of veteran *coloniae* continued under later emperors for another century. These resettlement projects and the founding of veteran colonies constituted a massive migration of veterans and their families, if they had one. It can be assumed that this resulted in female and child mobility on a large scale as well and

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<sup>55</sup> The thought-provoking and to some very controversial monograph by Kyle Harper, *The Fate of Rome*, which came out in 2017, will no doubt have had a catalysing effect on the development of these ideas.

<sup>56</sup> Todisco (1999).

undoubtedly of women too, insofar as the soldiers had been able to form partnerships during their service. In this context we can therefore assume female migration as well. A further category can be identified as economical. Merchants made up a group of ever moving people. For obvious reasons, such mobility is precisely that, mobility. To categorize them as migrants would be illogical. However, it is extremely difficult for us in the present to distinguish a merchant as not being a migrant. Unless specifically mentioned in an epitaph, to us he is simply a person who died in a specific place at a specific time, with perhaps an indication that he did not originate there.

Other examples of migration due to economic reasons were migrants attempting to make a better life for themselves. Whether it be better work, better living conditions or other economic opportunities, people moved for these reasons for centuries. Cities attracted craftsmen who were much less in demand in the countryside or small villages. For example, the *Fabri Navales* in Ostia, a professional group (we may refer to them as a guild, although this is not a neutral term) of shipbuilders, left a list of their members.<sup>57</sup> Of them, at least seven were identified as coming from elsewhere and therefore having migrated to Rome's port. One can imagine the need for shipbuilders to move to a large port so plenty of work would be available. The final category I would identify broadly speaking as forced migration. Broadly, as slavery was one of the major contributing factors to the total of migrants in the Roman world. Strictly speaking, they can be described as commodities, shipped off to wherever they would be sold off to or could be sold for the highest price, thus perhaps better fitting economic migration. Flavius Josephus, in his account of the Jewish wars, tells us of 97,000 Jewish prisoners, who were shipped to Rome and used to build the Colosseum.<sup>58</sup> The reason for this is likely that none of them were allowed to keep their original names, rather receiving a Greek or Roman one upon arrival.<sup>59</sup> Reasons for migrating that were forcing include fleeing warfare, or in some cases environmental causes such as flooding, or volcanic activity such as the famous example of the Vesuvius eruption of 79 AD. Detecting these reasons is nigh impossible, as they are not written down in epigraphs usually.

Persecution was another reason for many migrants to move. Some famous examples include the persecutions of both Christians and Jews, attested to in literary sources. We can safely assume that migration due to persecutions usually included entire families. The factors

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<sup>57</sup> De Ligt and Tacoma (2017) 10.

<sup>58</sup> Joseph. *BJ* 6.418. Interestingly enough, only one of them has thus far ever been identified via an epigraphic source, *CIL* 10, 1971. See figure 2 for the original inscription.

<sup>59</sup> Bruun (2017) 186.

named here constitute most, if not all, reasons for mobility and migration in the Roman world. Identifying Migration Identifying individuals who migrated in the Roman world is a difficult process. Scholars historically mostly rely on inscriptions. Besides this epigraphical evidence, we have access to literary sources, like the passage in the Bible mentioned before. Only very rarely do we gain insight into the life's story of an individual through an inscription.<sup>60</sup> When we do, however, we gain an immensely insightful narrative as to the motivation and nature of migration that an individual went through in life.<sup>61</sup> In epigraphical sources, when they are not as extensive as some verse inscriptions, there are a number of ways of identifying migration:<sup>62</sup>

1. Explicit mention of migration or a foreign origin. The formulation *domo ...* is sometimes used to denote a place of origin, when the deceased found it important enough to mention this. Usually found in epitaphs of soldiers.<sup>63</sup>
2. A Greek filiation, when found in certain contexts (usually Western Roman) is a marker for migration. These were for example found on the list of shipbuilders in Ostia mentioned earlier.
3. The *tribus*, or voting tribe, which is named in addition to the *tria nomina* can indicate a *tribus* that is not the same as the place where the person is buried. If this is the case, migration can be established with a high degree of certainty. This type of clue is however quite limited, as only men could be members of a *tribus* and it is not always mentioned in an epitaph.
4. Terms that denote a previous residence elsewhere, such as *incola*, or resident, which simply meant a person was a resident in another place than the one they were born in. Cognomens that refer to a specific geographical location, such as *Africanus* or *Graecula*, usually are not very reliable testaments to a person's place of origin..<sup>64</sup>
5. The use of names which are neither Greek nor Latin, when they appear outside of their natural linguistic area, indicate migration. We are either dealing with a

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<sup>60</sup> Schmidt (2015) does show that verse inscriptions, longer inscriptions about an individual do exist, but only comprise a minute part of the entire body of epigraphic sources.

<sup>61</sup> Hamdoune (2006).

<sup>62</sup> Wierschowski (1995) 24-25 and Noy (2010) 13-28 give a more extensive overview of these criteria. My list was based upon their work as well as on that of Bruun (2017).

<sup>63</sup> Bruun (2017) 189.

<sup>64</sup> Bruun (2017) 190.

‘barbarian’ name born by a free immigrant or with slaves being allowed to keep or having been given names reflecting their origin.

6. When a person appears in multiple inscriptions found in different locations, or states clearly that he or she has ties to more than one community, logic leads us to the conclusion that that person is at home in only one of these places and a migrant in the other locality or localities.<sup>65</sup>
7. When inscriptions are written in non-local languages, it stands to reason that the individuals mentioned in them are immigrants. This is often likely when we are dealing with inscriptions in eastern languages found in the Western Mediterranean, although, of course, in some parts of Italy Greek was a local language centuries before the Romans were ever in charge and this remained so after they gained control of these areas.
8. Unusual textual elements in an inscription, such as *formulae* that are common in other geographical regions or places, or iconographic representations that point to a foreign culture, can also be important in determining whether the person is an immigrant.
9. The final way of telling whether or not we are dealing with migration is one further and, according to Bruun, 'little known'. The ‘onomastic profile’ of a place. It is a method that is employed by Olli Salomies and is a rather interesting method he employed in his survey of the population of Ostia.<sup>66</sup> While the method itself is not absolutely accurate when employed on individuals, it can give a probable indication about trends in certain locations. The ‘onomastic profile’ of a locality can be defined as the distribution of family names here, and an important role is played by the most common family names. For Ostia, the names Egrilius, Combarisius, Ostiensis, as well as some others, are particularly typical. The method thus is based upon the typical names that are found in localities, with names that are typical of one region being found in another indicating the presence of migration.

## **Discussion and Conclusions**

The study of migration and mobility in the Roman world is one that is still on the rise after several decades of developments made through analysing the evidence that is visible to the human eye. As migration and mobility in the present presents us with challenges but also

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<sup>65</sup> Gregori (2012).

<sup>66</sup> Salomies (2002) 137-140.



with many insights about the impact and consequences that may occur as a side-effect to it, we are finding out more about the nature of the phenomenon in the ancient world. Extensive behavioral studies will doubtlessly enter the discipline in the coming years, altering the field yet again, perhaps. Just like the methods that will be discussed in much greater detail in this thesis, different methodologies, originally developed in other disciplines, will have a great impact on our own. In this chapter, I have shown the possibilities and limits of what we know as historians, based on the sources that are available to us in 'traditional' historical research. It is painfully obvious that these sources are insufficient for uncovering the full scope of migration and mobility in the Roman world. The sources are almost exclusively written with an audience in mind, or as a way to represent oneself to others, making them subjective by default. In the literary evidence, we see mostly texts in which women are mentioned only on rare occasions. They are not often mentioned in honorific inscriptions and in inscriptions dedicated to public benefactors.

Scholars are more often than not forced to deduce general conclusions from very little evidence indeed. Generally speaking, there are usually only a handful of examples available with what could be called anecdotal evidence.<sup>67</sup> As well as women, children are extremely underrepresented in the material. Only on occasions where we can safely assume familial mobility – and there are not many cases in which we can say this with a high degree of certainty – can we infer some knowledge about what happened to children who were involved in moving. Slaves, among who were women and children as well for that matter, have even less representation other than what we know from literary sources. Except for funerary inscriptions that were usually dedicated by grieving parents, children are notoriously underrepresented in Roman inscriptions. When analysing the epigraphic evidence for women and children, it is of critical importance to be able to identify those individuals who have a migrational background. Although some ideas have been presented – such as the list of criteria I have shown above – they almost all rely on the use of circumstantial evidence which does not give any certain results.

My intention in showing these facts is to make it plain that there is a desperate need for more information. At this moment in time, there are only a few methods capable of providing just that. What will follow is an analysis of the methods that can bring us into the future of the discipline. There has been an increasing interest in moving beyond the literary and epigraphic evidence towards scientific methods that can aid in our understanding of the

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<sup>67</sup> Bruun (2017) 202.

past when it comes to migration and mobility. A fair warning is in order here I feel, as these methods are only scratching the surface in terms of what has been researched. Of course, part of this is because people are unaware of the methods or methodology employed, as is not unusual when innovation comes into a discipline that has relied on the same methodology in its history. 'Some exciting findings have been presented, but historians have to ask what the contribution in each case amounts to, in regard to the existing general picture.'<sup>68</sup> In general, it seems inevitable that these methods will be more effective in uncovering information about migration and mobility, as well as the life's stories of human beings. At this point in time, the amount of information we have is based on the analysis of data sets that have been created by analysis of human remains. Given the relative youth of the discipline, the amount of data sets we have at our disposal is still relatively small, especially when compared to the vast catalogue of epigraphical sources. As we progress through time, the data and information will build up, eventually – and hopefully – allowing us to see patterns and general trends that can shed more light on the phenomenon, even without direct evidence. Additionally, it may also bring new information about the evidence we already have, such as links between epigraphy and the interred that have until now gone unnoticed.<sup>69</sup>

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<sup>68</sup> Bruun (2017) 203.

<sup>69</sup> For example, the use of non-Latin names in epitaphs that until now has received much attention but also much uncertainty.

## Chapter 2: Stable Isotope Analysis

Unlike the use of DNA in archaeological/historical research, stable isotope analysis has been in use for much longer. Its applications are much more varied at this point, not in the least as this sort of analysis is not confined to human remains but rather almost all archaeological artifacts. For the purposes of this study, however, I shall limit the scope of the concepts that are discussed, for the sake of brevity and relevance. First, it is important to understand the concept of stable isotope analysis so subsequently, the possibilities and limitations of using this method are clear. Second, the relevance for studies that research migration will be explained. Finally, we will take a look at the practical implications and possible results that can be reached through this method. The method itself has been around since the late 1970s. It has been used to study larger populations<sup>70</sup> as well as smaller groups and individuals.<sup>71</sup>

The practice of using isotope analysis to uncover mobility and migration in the past is a relatively new application of this type of method. Most commonly used for this purpose are either oxygen or strontium isotopes, although nitrogen and carbon also play a significant role in uncovering more information.<sup>72</sup> The system that is picked by the researcher is usually dependent on any previous research from which a baseline value for the specific isotope can be used.<sup>73</sup> Other factors that influence this choice are for example the local and regional geography and cost of performing the analysis, as well as preserving the samples and the possible added value of the data that may be gained from the analysis. The practice of using both strontium and oxygen isotopes was started by British scholars. They started doing this kind of research in the first years of the 21st century.<sup>74</sup> By 2010, using a combination of the two isotope systems in order to better understand ancient migrants became the standard, with studies using this method multiplied and spread across the globe. The analysis of both strontium and oxygen isotope analyses is particularly useful in western Europe, making them the method of choice when dealing with Roman remains. Oxygen isotopes found in Europe can be pinpointed in an evenly spread manner from east-to-west and thus provide a broad geographical scale through which an individual can be located. Individuals local to an area should have an isotope signature characteristic of the water, soil, and rocks in the region. Nonlocal individuals will present anomalous ratios compared to the locally-defined signature.

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<sup>70</sup> Prowse et al. (2004).

<sup>71</sup> Rutgers et al. (2009).

<sup>72</sup> Prowse (2017) 210.

<sup>73</sup> If no previous data are available it can be difficult to spot migrants in the samples, as there are no indigenous data that they can be compared to.

<sup>74</sup> For example, Budd et al. (2001), Bentley et al. (2005) and Evans et al. (2006).

When looking at mobility, the questions that need answering are numerous. Why did people move? What life awaited them at their destination? Did migrants form separate communities or was there a form of integration in the local population? The fact that these questions remain tells us a lot about the textual and archaeological sources that have featured in this kind of research up to this point. Little is known about the group of people in the Roman Empire we would call migrants using modern terminology. One of the most common ways of looking at this community was through statistical analysis of factors that would indicate migration or mobility such as marriage, names or mention of a birthplace in an epitaph.<sup>75</sup> Much more common in mobility studies today is the employment of chemical analyses of human skeletal remains in the form of bones and teeth. This made a much more individualistic approach to human remains possible, without the need of a dataset on which to perform statistical analysis individuals that stood out could be identified.

Technically, precisely locating a place of origin for an individual is usually not a straightforward process. This is due to both fractionation in the human body and the homogeneous nature of so-called meteoric isotope gradients.<sup>76</sup> Strontium isotopes are more useful in this regard. They can attest more accurately to an individual's native area, by showing a more precise link to it as strontium passes into the human bodily tissues unfractionated. On top of this, the geology of an area is more often than not much more heterogeneous than its climate compared to other areas (in Europe).

Even given this difference between the uses of oxygen and strontium isotopes, in some cases the precise location of a specific range for strontium can be harder to ascertain than is the case with oxygen. Taking Italy as an example, oxygen isotopes taken from measurements of meteoric precipitation give a differentiation in longitudinal strokes of land, meaning that it is hard to differentiate samples from roughly the same location in a line from the Northwest to the Southeast of Italy (*see figures 3 and 4 for the original map and an updated version*). Put more plainly, that would mean that there is only a small difference in samples from the west coast found 200 km apart than samples found within that range located more inland (East or West). This means that based on oxygen isotope measurements alone people from areas that are in reality hundreds of kilometers away can be identified as locals. The reason for this is the specific geology of Italy. With the Alps in the North and the

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<sup>75</sup> A study often mentioned in scholarly literature as a good example of this way of looking at mobility is Stojanowski and Schillaci (2006).

<sup>76</sup> A term used for precipitation (e.g. rain, hail and snow), which is isotopically speaking more or less the same everywhere and affects samples in different geographical locations roughly equally, making the differences in original location harder to pinpoint.

Apennines running across the Italian peninsula, one of the longest coastlines in Europe, several volcanoes – some still active today – and in general a range of different types of rock such as basalt, travertine and limestone. All of them have distinct strontium values, but when we zoom out and look at the country as a whole as it is today, the ratios of strontium isotopes when measured from the geology and sources of water can be roughly plotted in a North to South pattern. The attentive reader has perhaps already spotted the resulting advantage from using both oxygen and strontium isotopes. When used in a combined manner, an almost grid-like map can be made with specific areas that correspond to a certain measurement of strontium and oxygen combined, making a much more specific location possible.

The concept of looking at mobility and migration in the Roman Empire through isotopes is, unsurprisingly, dependent on the identification of people who were distinctly different from the locals, through their skeletal remains. One of the facts that add value to this kind of research is the fact that the vast majority of Romans without extensive means of commemorating themselves after they had passed away were buried outside the city walls in simple graves. The grave goods found within such graves only very rarely indicate any ethnicity or ties with non-local areas. Because of this, the remains of Romans are more often than not the only thing left to identify them or uncover their lives in any way. This therefore necessitates a chemical analysis of the remains themselves if we are to gain any information from them. The precise methods used will be further expanded upon later, but first it is necessary to look at the methodology employed, making the concept easier to grasp and showing the processes.

The first strontium isotope analysis was carried out in 1989.<sup>77</sup> The analysis was used to ascertain whether the remains of individuals originated from the coast or rather further inland. Today, most of the strontium isotope analysis is carried out to establish a form of mobility. The methodology that enabled scientists to analyse oxygen isotope ratios was developed at a later time, starting in the early 2000s. They were soon used to establish mobility, much like strontium. The difference being that when it comes to oxygen the isotope is used to look at the ancient climate and water sources that were available to them. The breakthrough that made this possible was made much earlier, in 1984.<sup>78</sup> A further possibility in establishing mobility through isotopes comes through lead and sulphur, both of which will not be discussed here, as their use is not very common and their workings are much like the

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<sup>77</sup> Ericson (1989), and Sealy (1989).

<sup>78</sup> Longinelli (1984), proved it was possible to reconstruct the conditions in which an individual lived.

analysis of oxygen and strontium. They can be of additional value in cases where strontium and/or oxygen isotope analysis is not sufficient.<sup>79</sup>

### **Strontium Isotope Analysis**

Strontium (Sr) is an element that can be found across the globe, mostly in minerals located in bedrock. The fundamental idea behind strontium isotope analysis is that the relative presence of strontium isotopes is related to bedrock and to the geological situation of a specific area. The strontium is encapsulated in the bedrock. As it weathers due to erosion, it releases strontium into groundwater and the surrounding soil, and so strontium enters the food chain and is incorporated unfractionated into the human body during tissue formation. Chemical analysis of bone or enamel can thus indicate whether an individual moved during her lifetime and potentially whence the person emigrated, based on the presence of strontium. Strontium, as an element, exists in nature in four different isotopes. In chemistry, these are <sup>88</sup>Sr, <sup>87</sup>Sr, <sup>86</sup>Sr, and <sup>84</sup>Sr. Each of those isotopes have their specific 'abundances'. This means that in a sample one would expect to find a specific amount of each isotope. Those relative amounts then point to the specific natural circumstances from which the sample originated. Out of all of them, the relative abundance of the <sup>87</sup>Sr isotope increases with time because of the decay of <sup>87</sup>Rb (rubidium). Because <sup>87</sup>Rb is radioactive, it slowly decays into <sup>87</sup>Sr.<sup>80</sup> This decay is extremely slow, with a half-life of 47 billion years.<sup>81</sup> The effect of this is that in terms of its use in archaeology, <sup>87</sup>Sr can be treated as a stable isotope. The relative abundance is closest in <sup>87</sup>Sr when compared to <sup>86</sup>Sr (7.04% as opposed to 9.87%, respectively), which is why these two are measured for archaeological purposes. <sup>88</sup>Sr and <sup>84</sup>Sr are much further apart (0.54% and 82.58%, respectively), making any relative differences much harder to spot.

A different Strontium isotope is <sup>90</sup>Sr is an artificial radionuclide with a half-life of 28 years, which is produced by nuclear reactions. It is a man-made isotope and therefore is a very recent addition to our planet. As such, it has little relevance to archaeology, but it is of

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<sup>79</sup> Lead isotopes are similar to strontium isotopes in that they vary with respect to the geology of the region and are incorporated into the human body mainly through diet. Anthropogenic lead is a factor that makes this kind of research difficult and possibly unreliable. Certainly in the study of ancient Rome it is almost impossible to use because of the quantities of anthropogenic lead present in everyday life, such as water pipes, cutlery or sweetened wine. Sulfur analysis is also linked to geology and like carbon and nitrogen is linked to diet as well. It is, like strontium, most useful in detecting proximity to the coast. Given the geographical situation in Italy, this produces more or less the same data as strontium.

<sup>80</sup> So-called Beta-decay, in which, simply put, an atom emits particles until it reaches a more stable state, in the process changing the particle as its consistency changes.

<sup>81</sup> Pollard et al. (2007). Additionally, this half-life makes the dating of rocks possible, a method aptly named rubidium-strontium dating.

some interest to us here, as because of concerns over  $^{90}\text{Sr}$  fallout and exposure in the 1950s, coupled with its long residence time in bone initiated a bonanza of work on strontium movement through the biosphere and incorporation into human tissues.<sup>82</sup> These studies provide much of the fundamental knowledge necessary for archaeological investigations of human mobility using strontium isotopes. Consequently, despite many studies which have shown that the method works well, it is clear that much remains to be clarified and it will not work for every question or in every place. It rests on the assumption that people were sourcing their food locally and that there is a measurable strontium isotope difference between the place the person migrated from and the place they migrated to.

The possibilities for exploiting strontium isotopes to investigate environmental processes in ecosystems were first proposed by Graustein and Armstrong in 1983.<sup>83</sup> The ratio of the different strontium isotopes found in any specific rock indicates the relative amount of rubidium and strontium present when the (rock) sample in question was formed. Processes after the formation of the rock can also be shown.<sup>84</sup> The ratio between  $^{87}\text{Sr}$  and  $^{86}\text{Sr}$  is therefore related to the age of the rock as well as the isotopic composition it has. The older the rock, the more of the  $^{87}\text{Rb}$  has decayed into  $^{87}\text{Sr}$ . Likewise, younger rocks relatively have a greater amount of  $^{86}\text{Sr}$  when compared to  $^{87}\text{Sr}$ . Geologically speaking, the planet has not undergone any significant global changes since humans inhabit it. Only volcanic activity can account for some relatively young rock, giving a very anomalous ratio between  $^{87}\text{Sr}$  and  $^{86}\text{Sr}$  which is immediately apparent upon investigation.<sup>85</sup>

Practically speaking, the method for looking at isotopes has revolutionized since the implementation of Thermal Ionization Mass Spectrometers (TIMS). These spectrometers can give us a number that is accurate to the fifth decimal.<sup>86</sup> As already briefly mentioned, strontium enters the so-called biosphere (a.k.a. the flora and fauna) through the process of weathering of rocks. As water runs over and past rocks, strontium present in the rock very slowly enters its way into the water and subsequently the plants and animals. As strontium is a relatively heavy molecule, it does not fractionate in any significant way, as opposed to lighter isotopes like oxygen or carbon.<sup>87</sup> As the strontium passes through the groundwater,

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<sup>82</sup> For example Vose and Koontz (1959) and somewhat more recently Tolstykh et al (2003).

<sup>83</sup> Graustein and Armstrong (1983). Two further very influential works published about a decade later are Aberg (1995) and Capo et al. (1998).

<sup>84</sup> Montgomery (2002).

<sup>85</sup> A ratio of 0.703 as compared to 0.740 in older rock. Montgomery (2002).

<sup>86</sup> Montgomery (2002).

<sup>87</sup> The process of fractionation will be explained in more detail later.

soil and plants it finds its way into animals and humans (through diet), it does so in more or less the same consistency (or rather, ratio) as it was present in the rock it originated from. Still, we should be careful. Strontium isotope ratios are not a direct reflection of an area, rather they are a characteristic. That is to say that the ratios of strontium isotopes can be altered by the mixing of different sources.<sup>88</sup> As humans, strontium gets into our bodies almost exclusively through dietary sources. This means that the strontium entering our systems will have the strontium isotope ratios of the area our food originated from. The way it stays in our bodies is through substitution of calcium molecules. Because the chemical characteristics of strontium are quite similar, strontium can act as a substitute for calcium in minerals that are involved in the formation of teeth and bones in our bodies.<sup>89</sup> Strontium isotopes that have entered the biosphere through water and soil thus enter our bodies as it works its way up through the food chain.<sup>90</sup>

These processes that are at the basis of this specific type of isotope analysis make it possible to establish a geographical provenance of an individual based on his remains that were formed with the incorporation of minerals (so-called "hard tissues"), i.e. bones and teeth. By analysing the  $87\text{Sr}/86\text{Sr}$  ratio, humans can be linked to a specific geology, a connection that was formed by the individual's diet. The strontium concentration in these hard tissues is related to both the diet and the amount of strontium available in the geological environment, so strontium concentrations also vary geographically and with the trophic level an individual was on, as for example vegetarians would for the purposes of this research be on a relatively lower trophic level than those who eat meat. Perhaps counterintuitively, this means that vegetarians, or herbivores in general, have higher concentrations of strontium isotopes, because meat does not contain much strontium. A very one-sided diet could therefore impact the ratio of any individual's  $87\text{Sr}/86\text{Sr}$  ratio. Both the concentration of strontium and the ratio between  $87\text{Sr}$  and  $86\text{Sr}$  can be measured from the hard tissue of ancient human remains. The unfractionated nature of strontium makes it useful in the study of migration, especially in Italy with its diverse geology.

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<sup>88</sup> Montgomery (2002) 24.

<sup>89</sup> Apatite and phosphate, both involved in the formation of skeletal tissue in the human body are two examples of such minerals. See Underwood and Mertz (1977) for a more complete overview of the substituting processes.

<sup>90</sup> Montgomery (2002) 34 shows the way in which strontium is incorporated into human tissue through passive substitution for calcium in the minerals that have a role in tissue formation.



## Strontium Isotope Measuring

Across the methodology of stable isotope analysis, researchers are dependent on human remains. As all soft tissues decay within a few years of death, we are left with the hard tissues. Teeth and bones are therefore the materials that are exclusively used to obtain isotopic information from skeletal remains. If a researcher is trying to learn about an individual's place of birth, then tooth enamel is the ideal material to use, because it forms early in life and, once formed, its isotopic signal remains unchanged throughout the lifetime of an individual, as I have briefly discussed this is the consequence of the lack of fractionation of strontium when it enters the body as a replacement for calcium. This means that tooth enamel is a permanent record of the infancy and childhood of an individual, regardless of how old the individual is at his or her time of death.

Because of the biological reality of how bone forms – bone is of course formed before birth, but other than teeth it grows and develops during childhood as well as adolescence, and even continues to change and renew itself constantly through a person's life, although this rate of change slows down as people get older<sup>91</sup> – the strontium isotopes present in bone are therefore rather an average of the final decades of a person's life. This is not something that we can measure, however, due to the interaction between strontium in soil with human bone, contaminating the sample and practically homogenizing it with the soil, in terms of strontium isotope ratios.<sup>92</sup>

The methodology for strontium isotope analysis therefore is dependent on the unearthing of teeth. Every research that incorporates strontium isotope analysis therefore logically starts by identifying and selecting teeth that are suitable for this purpose. The methods I will present here are not the only ones or the final solution, but they do represent the broad consensus of best practices employed by researchers.<sup>93</sup> Criteria used for choosing which molar to extract include the identification of the molar (most often M1, as it is one of the earliest formed molars humans possess) are typically as follows:<sup>94,95</sup> First: the

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<sup>91</sup> Hedges et al. (2007).

<sup>92</sup> Prowse (2017) 208 mentions however that research published by Snoeck et al. (2015) points towards the retention of strontium ratios in bone after calcination (cremation). Therefore, that opens up the possibility of performing strontium isotope analysis on cremated bone, something that Snoeck has since done: Snoeck (2018).

<sup>93</sup> Vaiglova et al. (2022).

<sup>94</sup> Earlier forming teeth can provide information about initial life patterns such as cessation of nursing, while later forming teeth record dietary inputs in later years.

<sup>95</sup> Prowse (2007) 513: 'Formation of the M3 crown begins between 7 and 12 years and is complete between the ages of 10 and 17.5 years. The d18Oap values of these teeth thus represent a record of the water sources available during infancy (M1) and late childhood/adolescence (M3), respectively.', partially quoting from Schour and Massler (1940) and Smith (1991).

identification of the M1 molar that is the easiest to remove without damaging the alveolar bone. Second: the identification of an M1 molar that lacks 'cariou lesions', damage to the enamel or significant amounts of calculus. If necessary, the teeth are measured *in situ* using measurement standards.<sup>96</sup> After extraction the teeth are sectioned. This usually entails cutting the tooth in half with a precision saw. This is to be able to access the enamel with a precision drill.<sup>97</sup> After extraction of the enamel it is dissolved in a solution. After evaporation and redissolving it is placed into a centrifuge, which separates large pieces of enamel from the mix. After another round of evaporation and redissolving it is placed on a filament and measured with a spectrometer.<sup>98</sup> The results are then presented in a table, with for each individual their number, age and sex, with the ratio of strontium isotopes that are present. In this way, by comparing the Sr87/Sr86 ratio to the published data on environmental abundances of strontium, we can identify the approximate location where an individual grew up.

### **Oxygen Isotope Analysis**

Oxygen isotope analysis is a rather different method, although the main principles are the same. Oxygen isotope analysis has, over the years, been in use as a way of studying ancient climates, or paleoclimate studies. The application of the method in the research into the human past is slightly more recent. Its use as a marker for human mobility in the past has gained momentum in the first decades of the present century. The relevance of oxygen isotopes lies in their correlation to several climatological factors that influence the elemental composition of water. Logically following from this, the isotopic composition of the water in the human body is dependent on the isotopic composition of the water we consume and that is present in the environment.<sup>99</sup> As with strontium isotope analysis, the fundamental idea of exploiting this relation is that, when we measure the oxygen incorporated into human tissues during the development of these tissues, this will provide us with a ratio that is representative

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<sup>96</sup> Buikstra and Ubelaker (1995) 61-63, this article is an internationally accepted publication on best practices and standards for data collection from human remains.

<sup>97</sup> Vaiglova et al. (2022) 4: 'sampling produces a sequence of samples that can be used to assess sub-annual changes in isotopic inputs throughout tooth formation. The temporal resolution of these sequences varies depending on the sampling technique. Hand-drilled sequences provide attenuated values averaged over several months of tooth formation. Micro-drilling with laser-ablation mechanisms provide higher resolution time slices averaged over a few months, while targeted micro-drilling using histological maps of developmental features (i.e., daily growth lines) can approximate isotopic inputs with weekly resolution.'

<sup>98</sup> I do realize this is a highly simplified version of events as they occur in this type of research. The aim however is not to give a full chemically precise version, but rather one that is understandable to those who are not familiar with these analyses.

<sup>99</sup> Longinelli (1984).

of the area in which a person grew up in the time when these tissues were developed. As mentioned, with strontium being a relatively heavy element, it passes through the food chain unfractionated into the human body. Oxygen isotopes are a different matter. Like carbon and nitrogen, which will briefly be addressed later, it eventually enters the body fractionated, a process that will be explained further.

Oxygen occurs in nature in more than one stable isotopic form. The three isotopes present in nature are  $^{16}\text{O}$ , along with the slightly heavier  $^{17}\text{O}$  and  $^{18}\text{O}$ .  $^{16}\text{O}$  makes up almost all of the oxygen isotopes in nature, having a relative abundance of 99.76%.  $^{17}\text{O}$  and  $^{18}\text{O}$  have respective abundances of 0.04% and 0.2%.<sup>100</sup> As these isotopes are in no way radioactive, there is no decay over time, meaning that the isotopes do not change and are therefore stable isotope systems. The isotopes measured are the  $^{18}\text{O}$  and  $^{16}\text{O}$  isotopes. This ratio can be directly measured in a sample by using an isotope ratio mass spectrometer (IRMS). This ratio is then put into what is called a delta notation. An example of that is: delta notation:  $\delta^{18}\text{O}(\text{h}) = \frac{^{18}\text{O}/^{16}\text{O} \text{ sample}}{^{18}\text{O}/^{16}\text{O} \text{ standard}} - 1 \times 1000$  where the delta value is given in per mil (h) and measured with respect to a standard. The standard here is typically the Oxygen isotope ratios are typically measured with respect to the VSMOW (Vienna Standard Mean Ocean Water) standard. The delta value of  $^{18}\text{O}$  ( $\delta^{18}\text{O}$ ) of both meteoric and environmental water such as rivers, springs, lakes varies by region in relation to factors such as temperature, humidity, distance from the coast, latitude, rainfall, and elevation.<sup>101</sup>  $\delta^{18}\text{O}$  when measured can thus give us an indication of the climate in an area where the tissue studied and sampled was formed. The oxygen present in the human body can come from any (combination of) three sources: inhaled molecular oxygen water consumed through the food we eat, and drinking water. Oxygen also leaves the body in the form of perspiration, urination and breathing out. Because of this, the water present in the human body is, perhaps logically, a balance.

Longinelli, in his 1984 article, was the first to point out that the measurement of the  $^{18}\text{O}$  delta present in bodily tissues, human and mammalian alike, could be used to give us information about paleoclimatology. In his article, he shows that the isotopic composition of environmental water is one of the most important variables that influence the oxygen isotope composition of body water in humans and mammals.<sup>102</sup> He studied the isotopic composition of the water found in humans, rats and domestic pigs, demonstrating a direct correlation

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<sup>100</sup> Pollard et al. (2007).

<sup>101</sup> Craig (1961) and Gat (1996).

<sup>102</sup> Longinelli (1984) 385.

between the  $\delta$  18O of ingested water and body water. From human bone and the enamel of their teeth, the oxygen isotope ratio or signature of environmental water can be measured because of this correlation. It is measured from two sources in the human bone and tooth enamel, hydroxyapatite carbonate and phosphate.<sup>103</sup> Logically, if a person, in his or her lifetime, ingested the majority of his or her oxygen – at the time that their teeth and bones were forming – from local water sources, the  $\delta$  18O that can be measured from their 'hard tissues' is characteristic of, and has the geographical distinctive features of that environmental water. This is after taking into account the 'metabolic fractionation' between enamel and body water.<sup>104</sup> The resulting measurements, when compared to measured sources of environmental water in the area can give us an identification on those who were locals and those who immigrated, based on whether they ingested their oxygen, and thus their water, locally. This is not a straightforward process, as there are more factors that influence the retention of the different oxygen isotopes. The 18O isotope has a higher rate of retention than 16 O when it comes to processes such as evaporation, condensation and precipitation.<sup>105</sup>

When it comes to food, again, the amount of 18O can relatively be quite significantly higher than the amount that is present in environmental water. Especially for herbivores this is the case.<sup>106</sup> Nevertheless, the majority of the  $\delta$  18O value in humans comes from phosphate and carbonate signatures that are related to the water they drink. The method employed to reconstruct the  $\delta$  18O of local meteoric water is based on this linear relation of the oxygen isotopes present in phosphate or carbonate in human hard tissues and the  $\delta$  18O of local meteoric water. Using these equations, it is possible to approximate the  $\delta$  18O value of a person's drinking water from his enamel or bone.

As I have briefly mentioned above, oxygen isotopes can be measured in both the phosphate (PO<sub>4</sub>) and carbonate (CO<sub>3</sub>) components of tooth and bone. Carbonate is more susceptible to diagenetic alteration, particularly when dealing with bone, but the technique for analysing d18O values of structurally-bound carbonate in apatite (d18Oap) is much faster and

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<sup>103</sup> Longinelli (1984) and Luz et al. (1984).

<sup>104</sup> Daux et al. (2008). What is important to know about fractionation when it comes to historical research is the following: even though different isotopes of, for example, the element Oxygen have the same atomic number and are therefore in essence the same element, their atomic weights are different, depending on the isotope. Because of these slight differences in mass, particularly for lighter elements – not, as explained, for heavier elements like strontium, which is why that enters the body unfractionated – they behave slightly differently. The resulting processes in the body after the element enters it, which is what we call fractionation, cause an isotope to either increase or decrease in relative abundance. As these processes occur in the body, the isotopes we measure have to take this fractionation into account.

<sup>105</sup> Bentley and Knipper (2005).

<sup>106</sup> Daux et al. (2008) 1139.

easier to perform. Simply put, that means that after burial the carbonate that remains in the hard tissues that survive, over time suffer from 'the cumulative physical, chemical and biological environment; these processes will modify an organic object's original chemical and/or structural properties and will govern its ultimate fate, in terms of preservation or destruction'.<sup>107</sup> Dental enamel, on the other hand, is much more resistant to diagenesis post burial. Many studies have shown that dental enamel is virtually impervious to diagenesis. Even in samples that have, for example, been submerged for millennia there is no significant diagenesis to speak of.<sup>108</sup>

### **Oxygen Isotope Measuring**

The same collection method that is used for strontium is also used for oxygen isotope sample collection. The same quality standards apply, and for the same reasons the M1 molars are the preferred option. They are manually cleaned to remove any surface contamination. As the cusps of the crown of the tooth are the first to form, or 'materialize', they represent the earliest phase of the tooth and therefore the earliest phase of a person's life can be analysed. In older individuals who had extensive wear on the crowns of their teeth, samples were drilled from preserved enamel at the highest point on the crown, again to be able to look at the earliest possible part of the individual's life. As with the strontium isotope method, the enamel is drilled into to collect powder. This is where the methods diverge. The powder is soaked in a 50% standard bleach solution for 24 hours. The powder is rinsed three times with distilled water and then soaked in a dilute (0.25 M) solution of acetic acid for 5 min, followed by two water rinses.<sup>109</sup> What remains of the powder after this process is dried. The enamel powder is then reacted with 100% phosphoric acid, at a temperature of 908 degrees Celsius. This produces gas, which can be analysed by a mass spectrometer. The resulting ratios are given in the standard delta-notation described before, so that they can be compared to the precipitation map containing the values found in environmental water. Additionally, the samples are tested for diagenesis, which could invalidate the samples for use in stable isotope research. Testing for effects of diagenesis can be done by analysing multiple samples of the same type, like M1 molars or M3 molars from the same individual. If there is a difference in the  $\delta^{18}\text{O}_{\text{ap}}$  (ap

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<sup>107</sup> Wilson and Pollard (2002).

<sup>108</sup> Lee-Thorp and Sponheimer (2003) and Zazzo et al. (2004).

<sup>109</sup> Killgrove (2010) 240.

stands for apatite, the mineral in which the carbonate is bound) value between the same type of tooth for the same individual, it is safe to assume the influence of diagenesis.<sup>110</sup>

### **Ancient Diets as a Marker for Mobility**

The reconstruction of ancient diets as a marker for mobility has been a major development in the study of ancient lives. Through the analysis of nitrogen and carbon isotopes from bone collagen, the general diet of an individual can be reconstructed. The methodology involved in this process will be revisited later, but before that is discussed, it is important to discuss the concept in general first. The main goal of the analysis of nitrogen and carbon is to provide us with a reconstruction of long-term dietary habits. This is an opportunity that has never before been available to scholars and therefore a major milestone in the research of ancient lives. The analysis gives an indication of the composition of the foods that made up the ancient diet, as well as where the food itself came from. Tracy Prowse undertook such an analysis on an ancient population first.<sup>111</sup> She discovered that the diet of the individuals buried in the Isola Sacra cemetery ate a mostly plant-based diet with the addition of marine proteins (sea fish). Stable isotope analysis is able to provide us with differences in long-term diets, something that no other source can provide. Looking to the future, there are huge opportunities in uncovering differences in diet by sex, age and social class.

Even though these data are individualized and very specific, they by themselves cannot convey all aspects of diets in the Roman world. The social aspect of food, for example, is not something we can learn through isotopic data alone. In this we are reliant on the literary evidence and understanding of ancient dining culture. In contrast to this very specific and limited source of information, the possibilities of stable isotope analysis to supplement and expand our knowledge of ancient diets are numerous. Due to the different applications that cover human bone and teeth, but also inorganic objects. For the purposes of this research I will attempt to limit myself to the most applicable use of this method, which is its use on bone collagen. This method is presently used more and more as a way of establishing the diet of a deceased person. As the method gives us the means to differentiate between different types of food in a person's diet as well as look at the relative amounts of

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<sup>110</sup> Prowse (2007) 514 adds that if there is some variability in the  $\delta^{18}\text{O}_{\text{ap}}$  values of the M1 molars that is more likely due to the fact that 'these tooth crowns are forming during the period when weaning was occurring, so the range of variation seen in the tooth enamel likely represents the process of shifting from maternal breast milk to external water sources.'

<sup>111</sup> Prowse et al. (2004).

each type of food that were consumed, it is exceptionally useful as a way of looking at migration. A topic I shall return to at a later stage is the way in which this method can work together with aDNA, strengthening and complementing each other.<sup>112</sup> Stable isotope analysis can uncover evidence about diet over the lifetime of a person, giving us reliable information on a number of topics, such as the dietary habits of people throughout history, as well as geographical differences between people. This last point is also useful to determine the geographical origin of individuals (or groups, in some cases).

Stable isotope analysis performed on carbon (<sup>13</sup>C) and nitrogen (<sup>15</sup>N) isotopes is a method that has existed for some time, but it has been gaining in use and importance in recent years when it comes to its use in reconstructing ancient diets.<sup>113</sup> The stable carbon and nitrogen isotope ratios that are extracted from bone collagen can be analysed to establish the isotopic composition of the individual's diet.<sup>114</sup> The concept of this relation between the isotopes in bone collagen through carbon and nitrogen isotopes is based on the notion that there is a direct relationship between the isotope ratios found in human tissues and the ratio that is found in their diet. Because we as humans – or any species of animal or plant for that matter – occupy a certain trophic level. In other words one might say that equates to where an organism is located in the food chain. Carnivorous organisms are higher up the food chain and therefore are on a higher trophic level. Carnivores that eat other carnivores are on the top level. After that come carnivores that eat herbivores, and so on. This is what we try to uncover by using stable isotope ratios of carbon and nitrogen to reconstruct an ancient diet.

The element carbon exists naturally in two stable isotopes; <sup>12</sup>C and <sup>13</sup>C. The natural occurrence of carbon isotopes is 98.93% for <sup>12</sup>C and 1.07 for <sup>13</sup>C.<sup>115</sup> The vast majority of carbon on our planet is contained in the oceans as a non-biological form, while another vast source of carbon on our planet is the carbon in our atmosphere – the infamous carbon

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<sup>112</sup> A great example of this comes from the research by Hoole et al. (2019) 87 about the remains of a female dated to the Early Bronze Age, later dubbed 'Ava': 'The results from the strontium and oxygen stable isotopic analysis of Ava's skeleton (as reported on below) indicate that she probably grew up within the Caithness region. Therefore Ava was probably a descendent of Beaker-using migrants, rather than being an immigrant herself. The radiocarbon dates from her skeleton and from the associated cattle scapula, and the lack of any detectable British Neolithic ancestry in her overall genome, suggests that her ancestors had arrived in Britain only a few generations before she was born.' This quote needs little more elaboration, but it shows the ways in which both methods may not be able to give a complete picture, but when used together create a comprehensive and indeed an astonishing amount of information based on nothing but human remains, without even looking at context.

<sup>113</sup> DeNiro and Epstein (1981) and Schoeninger and DeNiro (1984) are the earliest examples of this type of stable isotope analysis designed to reconstruct an ancient diet albeit in mice, and a variety of animals, respectively.

<sup>114</sup> Schoeninger and Moore (1991).

<sup>115</sup> Gannes et al. (1998).

dioxide. From both these major sources of carbon, plants ensure the entry of carbon into the food chain. When plants photosynthesise, they use carbon as a fuel of sorts and it thus enters their 'body'. The importance of this is that most of the carbon used for the photosynthesis process is  $^{12}\text{C}$ , which is slightly lighter and therefore reacts faster than  $^{13}\text{C}$ . As it makes photosynthesis a quicker process for plants,  $^{12}\text{C}$  is preferred. As photosynthesis occurs, that means that inside the plant,  $^{12}\text{C}$  has a relatively high concentration compared to  $^{13}\text{C}$ . The ratio is then, logically, higher than the original source of the carbon (its natural occurrence).<sup>116</sup> As plants take their carbon mostly from carbon dioxide in the atmosphere, the  $\delta^{13}\text{C}$  (ratio of  $^{13}\text{C}/^{12}\text{C}$ ) of a plant is dependent on the  $\delta^{13}\text{C}$  of the carbon in the atmosphere, as well as the specific way in which its photosynthesis operates.<sup>117</sup> Plants can use three different types of photosynthesis, which are C3, C4 and CAM.<sup>118</sup> C3 plants are the most common plant type and have  $\delta^{13}\text{C}$  values between -20 and -34‰, with most plant species having around -26‰. C4 plants, such as maize and millet, have  $\delta^{13}\text{C}$  values between -9 and -16‰, with -12‰ being the most common value. CAM plants under hot and arid conditions appear to mainly use C4 pathways resulting in  $\delta^{13}\text{C}$  values like those of C4 plants. Animals and humans who are higher up in the food chain than plants incorporate the carbon in plants in turn. Just like in plants, the carbon is incorporated into their bodies. As was the case with photosynthesis,  $^{12}\text{C}$  is an easier isotope to react with, making for a further shift towards a higher concentration of  $^{12}\text{C}$  in comparison to  $^{13}\text{C}$  after metabolization.  $^{12}\text{C}$  is expelled again through breathing out carbon dioxide, or through other forms of excretion and body waste. This ensures that after eating, the bodies of humans and other organisms eating plants are more concentrated with  $^{13}\text{C}$ , relatively. The  $\delta^{13}\text{C}$  value is less negative because of this. As plants derive their ratios of carbon isotopes through their specific photosynthesis process, those who eat them are also influenced by this difference.

Organisms that consume diets with a significantly high amount of C3 photosynthesising plants tend to have collagen with  $\delta^{13}\text{C}$  values around -21‰, while C4 consumers tend to have values around -7‰.<sup>119</sup> Mixed diets (C3 and C4 plants) lead to values in-between these two. To complicate matters, for marine organisms, the process is slightly

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<sup>116</sup> Schoeninger and Moore (1992) 255.

<sup>117</sup> The  $\delta^{13}\text{C}$  value of carbon is nowadays -7‰ but prehistorically it is assumed to have been closer to -5 to -6‰. This has changed due to contemporary fossil fuel carbon contribution (Schoeninger and Moore, 1992) 255.

<sup>118</sup> Schoeninger and Moore (1992) 255-256 explain the difference more clearly, for use in stable isotope analysis it suffices to know the existence of different forms of photosynthesis and their influence on the  $^{13}\text{C}/^{12}\text{C}$  ratio.

<sup>119</sup> Bell et al. (2001).



different, because they use several carbon sources. For example, carbon that comes from terrestrial deposits washed into the oceans by rivers, which have  $\delta^{13}\text{C}$  values that represent a mixture of local terrestrial plants, secondly, dissolved  $\text{CO}_2$  with  $\delta^{13}\text{C}$  values of atmospheric  $\text{CO}_2$  and, thirdly, dissolved carbonic acid with  $\delta^{13}\text{C}$  values close to zero.<sup>120</sup>

The process for nitrogen isotopes is very similar. As is the case with carbon, nitrogen has two naturally occurring stable isotopes:  $^{14}\text{N}$  and  $^{15}\text{N}$ . Their natural occurrence, or abundance, is 99.64% and 0.36%, respectively. The vast majority (over 99%) of nitrogen is, like carbon, in the atmosphere as  $\text{N}_2$  and in a dissolved form in the ocean. Nitrogen enters the food chain in two ways. The first is through dead organisms. When organisms die, bacteria will break down their remains, which results in the production of nitrates. These nitrates enter the soil or the ocean and are then used by plants as a source of nutrition. This will result in a  $\delta^{15}\text{N}$  (the ratio between  $^{15}\text{N}/^{14}\text{N}$  that gives a slightly more positive (relatively more  $^{15}\text{N}$  than  $^{14}\text{N}$ ) value than the  $\text{N}_2$  in the atmosphere. In the case of the oceans, or what is often called a 'marine environment', a majority of the nitrogen that is present comes from 'bacterial denitrification'.<sup>121</sup> The second way in which nitrogen enters the food chain is through a process called fixation. Nitrogen that is present in the atmosphere is fixated, or absorbed from the atmosphere, by algae in the case of the oceans, or bacteria in the more dry parts of our planet. This process will result in a  $\delta^{15}\text{N}$  value that is more or less the same as it is in the atmosphere. In the marine environment, the largest part of nitrogen available comes from bacterial denitrification.

In marine organisms, there are relatively high differences in their  $\delta^{15}\text{N}$  values. The majority of them have a more positive ratio than is present in the atmosphere. Marine plants and vertebrates, in turn, have a significantly higher  $\delta^{15}\text{N}$  value than the natural occurrence. For humans, in who we are of course interested, this all means that for those with diets that are relatively high in marine fish, such as the Inuit people who are almost totally reliant on marine animals for their sustenance, a value of as much as 17‰ to 20‰ has been found in their bone collagen, much higher than the naturally occurring  $\delta^{15}\text{N}$ .<sup>122</sup> Nitrogen isotope analysis makes it possible to distinguish between those with a strictly terrestrial diet (agriculturalists) and those who rely on fish for their food.<sup>123</sup> Fractionation, the process in

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<sup>120</sup> Bell et al. (2001) and Schoeninger et al. (1984).

<sup>121</sup> Schoeninger and Moore (1992) 256. Bacteria use enzymes to break down nitrate and in the process produce nitrogen gas ( $\text{N}_2$ ) or nitrous oxide ( $\text{N}_2\text{O}$ ).

<sup>122</sup> Schoeninger et al. (1983) 577.

<sup>123</sup> Purely terrestrial diets show nitrogen ratios that value from 6‰ to 12‰. Diets more mixed with marine fish asses to the mix give distinctly different values that range between 14‰ to 16‰.

which the relative concentration of  $^{15}\text{N}$  in our food is heightened after ingestion because the bonds that lighter isotopes make are more easily broken than those of heavier isotopes, results in a higher  $\delta^{15}\text{N}$  value in the consumer than the consumed (animal/plant). This means that herbivores, when eating plants, get a relatively higher  $^{15}\text{N}$  value, as well as a higher  $^{13}\text{C}$  value, compared to the  $^{14}\text{N}$  and  $^{12}\text{C}$ , respectively. As a herbivore is on a higher trophic level, its ratios will be higher than the plant it ate. It logically follows from this that carnivores go through the same process when they eat herbivores. The process is the same, but the starting point is different. The general rule of thumb here is that, compared to the eaten, the *eater* has higher  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  values. The amount of enrichment in promille is still under debate.<sup>124</sup> This has led to an average number being picked for both the enrichment of  $\text{N}^{15}$  and  $\text{C}^{13}$ .<sup>125</sup>

### **Practical Outcomes and Knowledge Gained**

The first major research in the discipline of classical archaeology was conducted by Tracy Prowse.<sup>126</sup> For the study of ancient Rome, Prowse and her team have conducted an analysis of  $\delta^{18}\text{O}$ , which was performed on the tooth carbonate of 61 individuals from the Isola Sacra necropolis.<sup>127</sup> The measurements of carbonate had not, at the time of writing, – or indeed by 2022 – been undertaken by many scholars. To circumvent the lack of data to compare the results with, there is a way to convert the carbonate values to phosphate. The relationship between the two is a given constant.<sup>128</sup> Another team led by Valérie Daux refined this equation and theorized the direct linear relationship between carbonate and phosphate from human teeth enamel which is still used in the most recent work.<sup>129</sup> But even this up-to-date linear relationship does not perfectly relate the oxygen composition of an individual's enamel to the meteoric precipitation values to the precipitation values that were (most recently) published in 2016.<sup>130</sup>

To come to a final conclusion about the impact of stable isotope analysis on the study of migration and mobility in the Roman world, we will look at the practical outcomes of stable

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<sup>124</sup> Sahlstedt and Arppe (2020) 2.

<sup>125</sup> Bocherens and Drucker (2003) 48-50.

<sup>126</sup> Prowse et al. (2007).

<sup>127</sup> Prowse et al. (2007) 510.

<sup>128</sup> Bryant et al. (1996) states: 'The relationship between the carbonate and phosphate portions of mammalian (human) teeth is constant and can be accurately predicted 1) given the assumption that the enamel was formed at normal human body temperature of 37 degrees Celsius; and 2) by employing a fractionation factor ( $\alpha$ ). The conversion from carbonate to phosphate is as follows, based the equation 1:  $191 \delta^{18}\text{O}_p = 1000 + \delta^{18}\text{O}_a \alpha - 1000$  The value of  $\alpha$  has been found to be  $1.009 \pm 0.0007$  by Iacumin and colleagues (1996) and  $1.0086 \pm 0.0007$ .'

<sup>129</sup> Stark et al. (2022) 4.

<sup>130</sup> Giustini et al. (2016).

isotope analysis taken from some of the key studies that have been performed thus far. Focusing on the core conclusions of these studies, we will gain a better understanding of what stable isotope analysis has added to the discipline, as well as gain an idea about its possibilities looking to the future.

Taking Prowse and her team's groundbreaking large scale study of human remains as a starting point, it is obvious that it leads to some conclusions that would not have been reached if any other methodology had been employed. The research of the Ostian graveyard in Isola Sacra concluded that one-third of the individuals whose molars were analyzed show clear signs of being an 'outsider'.<sup>131</sup> Meaning, they were born outside of the area their bodies were buried in, indicating that they moved there at some point in their lives. The other two-thirds showed the expected local – that also correspond with the values present in modern Roman samples - values, indicating they grew up and died in the same place, or, in an area with the same isotopic signal, which can be pinpointed using the precipitation map of Longinelli and Selmo seen in figure 3. Of course, this does not cover the period in between their youths and deaths. The specific analysis of the third molar pointed towards the fact that a significant amount of the studied individuals moved to the port in their youths.<sup>132</sup> This contradicts the assumption – based upon literary and epigraphic evidence – that most migrants in the Roman world were adult males. More impressively, conclusions could be drawn about the geographical origin of the migrants to Ostia, once again based on the precipitation maps. Even at this early time in stable isotope methodology, a very limited number of geographical points of origin could be pinpointed.

More recently, Kristina Killgrove and Janet Montgomery conducted a similar research, on 105 individuals from two Roman graveyards associated with the period of the Empire.<sup>133</sup> Their analysis also revealed so-called 'outliers'. Based on statistical analysis – made possible by the data gathered by other scholars before them – as well as stable isotope analysis they could identify migrants. To highlight a few conclusions: 'The youngest possible nonlocals were found in the Older Child category<sup>134</sup>, suggesting these individuals came to Rome between the time their first molar crown finished forming (age 4) and their deaths (before age 10).'<sup>135</sup> This is the first time evidence was found of children migrating to the Roman Empire. As for their origins, for a few individuals a fairly accurate area could be

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<sup>131</sup> Prowse et al. (2007) 516.

<sup>132</sup> Prowse et al. (2007) 517.

<sup>133</sup> Killgrove and Montgomery (2016).

<sup>134</sup> In the study, this term is used to describe children in the ages between 7 and 12 years old.

<sup>135</sup> Killgrove and Montgomery (2016) 21.

identified. For example, one individual most likely came from the Apennines, while another came from northern Italy and yet another may have come from North Africa. What is to my mind even more amazing, is that conclusions could be drawn about the level of acculturation that migrants showed. As there were no grave circumstances or artefacts differentiated between locals and non-locals, no conclusions could be drawn based on the usual archaeological methods. The researchers could look at the changes in diet of individuals at different times in their lives by using carbon isotope ratios. While the article itself provides more nuance and detail than I can give here, it was noted that immigrants showed a very sudden and complete change in their diets around the time of their migration. Of course, we cannot say whether this was a voluntary change or one forced upon them by the local availability of food. The progress between these two studies dating from 2007 and 2016 is significant. Every study adds more material with which the next scholars can compare to and work with, which together with methodological and technological advances will further the research and accuracy of stable isotope analysis greatly. As the two authors put it in their article:

Modeling migration to Imperial Rome is necessary for a deeper understanding of demographics, family structure, and gender roles, and is particularly relevant for the vast majority of the Roman population that was left out of historical records. This study has generated the first concrete data of individuals who were not born at Rome, but much more research is needed into a variety of data sets to fully contextualize questions about mobility in Imperial Rome and to move forward in employing bioarchaeology in Roman migration studies.<sup>136</sup>

### **Challenges for Future Research and Conclusions**

Stable isotope analysis in its different forms that can be applied to the study of migration, being the analysis of strontium, oxygen, carbon and nitrogen isotopes, have the potential to change the way we look at the (ancient) past. I would however be remiss if I did not include a discussion of the limitations of the method as well. Isotopic analysis, as I have stressed before, is not an infallible 'truth machine'. There are some issues that need addressing, involving the material studied, the analysis itself and finally the interpretation of the results that are produced by the spectrometer.

The material that is studied is itself perhaps the biggest challenge. Suitable material

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<sup>136</sup> Killgrove and Montgomery (2016) 22.

for analysis is not always available, especially so in the case of skeletal remains that have a tendency towards degeneration and diagenesis. This is dependent on the environment it is interred in.<sup>137</sup> Although methods for the analysis of cremated remains may be forthcoming, as of yet it is not possible to conduct reliable analysis on cremated remains. The proverbial elephant in the room when it comes to isotope analysis based on diet is the question how we can prove that someone ate local food and not non-local food, which would completely distort any results. This is indeed a concern raised by Christer Bruun in his criticism of the method and on the research conducted by Prowse and her team in Isola Sacra specifically. The answer is that we can only theorize as best we can about the presence of non-local foods. By looking at trends in the entire population this risk can be mitigated, at least.

Mass spectrometry, used to measure isotope ratios, is also subject to inaccuracies in potential. While these machines in general produce reliable results, there is always the potential for error. In addition to this, the standards used are made by approximation as local conditions can influence the different values, which might make the equations used not ideal in some cases. This is however inevitable, as researchers need to be able to produce results and these standards are the best we have at the moment.

Finally, the biggest challenge faced by researchers is the need to interpret results. The final result of stable isotope analysis is a number. It is then up to the researcher to interpret and explain the significance of that number. The numbers only become meaningful if we compare them to other numbers. For example, a ratio that tells us the consistency of strontium in an individual's tooth is useless, until we know where those values are found in nature and thus by comparison we can state the provenance of the person. As the field is still very much in development, extensive studies have not been undertaken for every single location. As time goes by, these studies will fill in the gaps, hopefully eventually giving us measurements that are so precise that we can narrow down where a person grew up within a few kilometers, for example. The need for scholars to interpret will never disappear completely. While the results of isotope analysis can give us a person's diet and the place where he or she grew up, this tells us nothing about how that person conceived of themselves. How migration impacted his or her life will always be the subject of deduction by scholars using sources of all different kinds available.

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<sup>137</sup> Katzenberg (2008) 668.

## Chapter 4: Ancient DNA Analysis

Genetic information contains a record of the history of our species, and technological advances have transformed our ability to access this record. Many studies have used genome-wide data from populations today to learn about the way people spread across the globe and their subsequent adaptation to local conditions. Implicit in this sort of research is the assumption that the geographic locations of people today are informative about the geographic locations of their ancestors in the distant past. However, it is now clear that long-range migration, mixing, and population replacement subsequent to the initial "out of Africa" expansion have altered the genetic structure of most of the world's human populations. By accessing the genetic make-up of populations living at archaeologically known times and places, ancient DNA makes it possible to directly track migrations and responses to natural selection.<sup>138</sup>

The modern human as a species has expanded to every corner of the globe since we came into existence, leaving Africa in the "out of Africa" migration some 100,000 years ago. The history of our migration to all but the most inhospitable places has been studied extensively by scholars from a multitude of disciplines, such as archaeology, anthropology and linguistics. These disciplines are at their core trying to answer the same question: how did we get to where we are today? Recently, a major discipline joined these efforts. The field of genetics is more and more the most important way of discovering our shared past at this time. In the discipline of ancient history, this development is gaining momentum as a way of uncovering information that was previously unavailable to us. At the forefront of what can rightly be called a scientific revolution is ancient DNA research (aDNA).<sup>139</sup> For the purposes of tracking migration in a specific time period, which is what we are interested in, aDNA opens up a variety of sources previously unknown to us.

The first systematic application of aDNA analysis took place in 1985. Svante Pääbo was successful in the extraction and analysis of a segment of DNA from a sample taken from a mummy dated to around 2400 years ago.<sup>140</sup> In doing so, he proved the possibility and viability of DNA analysis when applied to archaeological samples. The cloning of mitochondrial DNA sequences could allow diachronic studies of genes in the Egyptian population since Neolithic times.<sup>141</sup> He took samples from 23 mummies and fragments of

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<sup>138</sup> Pickrell and Reich (2014) 1.

<sup>139</sup> *Idem*

<sup>140</sup> Pääbo (1985).

<sup>141</sup> Pickrell and Reich (2014).

tissue from mummies from the Sixth Dynasty.<sup>142</sup> Since the discoveries made by Pääbo, aDNA research on human remains has been used to establish familial relations, the nature of diseases in the past and genetic disorders in the past, to name but a few examples.

Fascinatingly, the use of aDNA is not limited to the examination of human DNA. DNA sequencing performed on the remains of fish, for example, gives us knowledge on whether the diet was sourced locally. Indeed, in a groundbreaking paper, the use of DNA sequencing in the field of history on fish remains was performed by Allan Arndt.<sup>143</sup> He set out to answer the question whether the remains of a specific subspecies of catfish (*C. gariepinus*) had been native to the excavation site in Turkey or were imported from elsewhere. To illustrate the effective use and added value of DNA research I shall briefly describe the process used and discuss the results.<sup>144</sup> Sagalassos, the town in question, had already been extensively surveyed by archaeologists over the years. It had been a local hub with evidence of pottery production activity between late Hellenistic times and the 7th century AD.<sup>145</sup> Because of this, the town was essentially a regional economic center. Faunal remains have been systematically studied since the beginning of the excavations in 1991, mainly by the archaeologists Fuller and de Cupere.<sup>146</sup> DNA research however, was new to the survey. The study was carried out specifically on the mitochondrial DNA extracted from the remains.<sup>147</sup> The analysis of the DNA, when compared to other and modern examples of *C. gariepinus* showed a divergence in populations.

With this information, a division could be made between populations originating from the Nile river in Egypt, and those that later evolved into distinctly different groups in Syria and Israel. With this information, the researchers were able to establish that the remains found in Sagalassos were in fact imported from Egypt.<sup>148</sup> The results of this reinforced the already existing belief that there was an existing trade network connecting Sagalassos with Egypt during Roman and Early Byzantine times. In this case, this new archaeological method was used to strengthen the conclusions that had been previously based on existing

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<sup>142</sup> Usually this refers to the period between 2370 to 2160 BC in Egyptology.

<sup>143</sup> Arndt (2003).

<sup>144</sup> I have chosen this research specifically, firstly because it was carried out at a very early stage of the implementation of (a)DNA research in an archaeological survey. Second, it concerns a well-documented site, which means that there is ample “traditional” evidence to corroborate or refute the evidence gained from DNA research. Third, as the DNA research was carried out on non-human remains, this paper shows the versatility of the method and the possibilities in reinforcing the existing evidence.

<sup>145</sup> Arndt (2003) 1096.

<sup>146</sup> Fuller et al. (2012).

<sup>147</sup> Straube et al. (2021).

<sup>148</sup> Arndt (2003) 1102.

archaeological evidence. This method used the evolution of a specific species of catfish to establish a link between Sagalassos and Egypt. If this is extrapolated, this method can be used to chart the entire trade network of Egyptian catfish to settlements and towns in present-day Turkey. As remains of *C. gariiepinus* have been found in other archaeological sites as well, their DNA may serve as a marker of how connected these areas were to Egypt and their surrounding lands as well. Even without any other finds that can identify trade in ancient settlements, a method like this can be enough to provide us with valuable information and to reach a conclusion about how a site was connected with the surrounding land.

In the case of migration, we mostly have to rely on the dead for our information in the case of DNA analysis. Especially their burials are a main source of information when we look at any sort of migration in the ancient world. As mentioned earlier in this thesis, most of this information comes through information recorded in an epitaph. They can give us clues as to the reasons a person migrated. Evident reasons and markers for migration are for example slavery, enlistment in the army or job opportunities. The manner of burial itself is a clue as well. In the Roman Empire, there are burial trends that can be traced back to a point of origin sometimes far away from a burial. Other times, there are burials that are quite atypical for their geographical location, thus inferring some kind of migration or at the very least a strong connection to another geographical area of the Empire.<sup>149</sup> However, without indisputable material evidence, these claims about a connection to another location cannot be made easily without criticism. Not in the least, there is the question about identity and burial which is still very much debated. There seems to be a logical and strong connection between the way in which a person was buried, as it is one of the actions that defines the ideas and thinking of a specific person and his close friends or relatives. When a burial is distinctly different from what can be described as “normal” at the time and location it took place, it seems probable to assume that the person in question had strong feelings about the way he wanted his remains to be treated. This has a lot of connotations as to the beliefs of the person (e.g. Celtic funerals in Northern Italy in the 5th century BC), which can be used to identify the buried person as a migrant. Even with new methods such as aDNA, scholars still refer to the burial context when making claims about the status of the subject as a migrant.<sup>150</sup>

The traditional way of looking at migration through burials was of course mostly through epigraphy. As the limitations of this have been addressed, I shall be brief about them

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<sup>149</sup> Pearce (2010) 79.

<sup>150</sup> Fox (2014).



here. The nature of the evidence is such that the evidence is limited to a timeframe that only starts in the first century AD and is already starting to diminish in the third century AD. Geographically, Rome is one of the only places with enough density of epigraphical material to really make any broad claims, which in other places is simply impossible due to the lack of sufficient numbers of examples. Finally, the evidence is biased towards groups who are in a way overrepresented in the material, such as freedmen, soldiers and merchants, with men in general being the vast majority of subjects in epigraphical evidence.<sup>151</sup> With aDNA evidence, it is now possible to step over these boundaries and limitations. I will seek to show that this new form of obtaining archaeological evidence can lead to a strengthening of previously drawn conclusions based on traditional evidence, but can also lead to new conclusions entirely, on its own.

### **Methodology of aDNA**

When one reads through aDNA studies, it is often readily apparent that there are different methods of obtaining and analysing DNA. Many terms and methods, alien to most historians and archaeologists, dot the analyses made by scientists, creating a huge gap between what is considered to be “historical work” and “science”. Many historians, including myself at one point, are intimidated by this. I recognize that there is a distinct difference in both terminology and methodology present in aDNA studies used for historical purposes. This is one of the issues this thesis addresses and attempts to solve. I believe that any step towards cooperation between two “different” disciplines should start with a calibration of terminology. In other words, we need to be able to translate each other’s work. An effort should be made to bridge the gap, which starts by showing what is on offer in the respective disciplines. Instead of working on separate “islands”, we should include scholarship from multiple disciplines in every extensive study into the past. I think that historians stand to gain the most from this, even if there is a lot of resistance to turning away from what we know towards more modern methods. I therefore do not propose a hard scientific turn in historical research, but rather a slight turn of the steering wheel towards the traditionally more “*Bèta*”-sciences.

To make a start in doing so myself, this paragraph shall attempt to explain some of the methodology and the input required from archaeologists and historians. The first aDNA

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<sup>151</sup> Woolf (1996).

molecules were extracted over 30 years ago.<sup>152</sup> It is only with the advent of so-called high-throughput sequencing of genomes that we were really capable of gaining anything from the material gathered. By their very nature, aDNA molecules are a difficult material to work with. As a result of their age, contamination and degradation of the material is more often a question of how much there is instead of whether there is any. The invention of NGS, or next-generation sequencing, has transformed the possibilities of using aDNA. Simply put, NGS has the ability of sequencing and analysing aDNA from millions of incomplete fragments. Before this invention, much more complete and undamaged sequences of aDNA were necessary to come to any sort of meaningful result. ‘At its most basic level, the success of NGS lies in its ability to accommodate the sequencing and analysis of millions of loci in parallel from minute amounts of ultrashort DNA fragments.’<sup>153</sup> This meant that PCR analysis was obsolete. These tests had to be carried out for each individual locus.

As every science concerning itself with the human body, whether it be still alive or not, has to deal with the ethical side of handling ethical concerns attached to dealing with humans. It is no longer acceptable to operate without addressing these concerns and giving them a great deal of thought. Therefore, I shall go over the most pertinent ethical issues and propose solutions to them. As I have already briefly mentioned, the obvious main concern is the destruction of human remains in the process of extracting and isolating the DNA. This starts when material is removed in an attempt to isolate DNA from it. As with any archaeological project concerning a site at which the work is conducted, there are a number of parties, or stakeholders, involved. All these parties have a say when it comes to what happens to any finds, especially concerning human remains. This may include (cultural/claimed) descendants, as is often the case in native American reserves. Consultation with groups like these have evolved in the past decades.<sup>154</sup> Emphasis has been put on taking extra care in informing these groups, as well as giving them information about the scientific research and the possible knowledge that is to be gained from it, to increase understanding. Of course, there are many more stakeholders, such as the excavators themselves, museums, the local community and/or religious institutions. It can be very difficult to navigate all stakeholder groups in cases where human remains are concerned. The excavation of human

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<sup>152</sup> In 1984, short DNA fragments were extracted and sequenced from the dried muscle of a museum specimen of the quagga, a species of zebra that became extinct at the beginning of the 20th century, marking the birth of aDNA research. Higuchi et al. (1984).

<sup>153</sup> Orlando et al. (2021) 4. a locus is a specific, fixed position on a chromosome where a particular gene or genetic marker is located. Each chromosome carries many genes, with each gene occupying a different position or locus. The genes located in these loci are responsible for certain biological traits (e.g. the color of one’s eyes).

<sup>154</sup> Noland and Butte (2018).

remains can provoke very strong reactions from some.<sup>155</sup> At the very least, this means that at the beginning of any archaeological project, a great deal of thought and care should go into the ethical aspect of research of this kind. This should include detailed communication of the relevance and potential outcomes of the analyses as well as possible "risks". "Risks" may include finding evidence of genetic links to certain groups while excluding others who claim to have a connection, which may have very real consequences in the real world, like providing a claim to territory to name but one example.

Second, the strategy and process of sampling should include sample documentation by using photography or surface or computed tomography.<sup>156</sup> Researchers should, as mentioned before, take care to only use destructive ways of analysing material when absolutely necessary, while at the same time avoiding taking too much material or any form of collateral damage to the remains in the process of collecting samples. Samples should be stored and transported in the proper way, in accordance with the local laws concerning the handling of human remains. The material that is not used for the analysis should be returned to the proper stakeholders (e.g. a museum that has the means to conserve the remains or in some cases to descendants for reburial).<sup>157</sup> This may include providing a restoration of the damaged or destroyed areas.<sup>158</sup> Sample material should not be completely used for analysis but at least partially conserved for future research, as the field is still in rapid evolution new methods may be developed.<sup>159</sup>

### **Sampling in aDNA**

aDNA research relies on the sampling of material that contains DNA proteins. The research process involves invasive and destructive sampling procedures. The so-called 'osseous labyrinth' inside the petrous bone has been shown to yield higher amounts of endogenous

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<sup>155</sup> For example, in the excavation of Jewish cemeteries from Late Antiquity, Ultra-Orthodox Jewish protest groups are known to protest heavily to stop the work. Colomer (2014).

<sup>156</sup> Alberti et al. (2018).

<sup>157</sup> Wagner et al. (2020) make five recommendations for establishing successful collaborations between aDNA researchers and descendant communities: consult formally with communities; address cultural and ethical considerations; engage communities and support capacity building; develop plans to report results and manage data; and develop plans for long-term responsibility and stewardship. Finally, researchers should be mindful of the language that they use in publications that may cause controversy.

<sup>158</sup> Prendergast and Sawchuk (2018).

<sup>159</sup> Something all archaeologists will be reminded of in this case, sometimes the choice is made to postpone archaeological work and leaving the artifacts *in situ* because of the same reason. In the future, new methods may provide much less invasive research and better options for conservation that reduce cost and increase efficiency and data gathered from a sample. The practice of sampling from the petrous bone by Ron Pinhasi et al. for example is such a development that decreased invasiveness while also giving better results in analysis.

DNA than any other skeletal element.<sup>160</sup> The aim, when sampling, should always be to leave as much as possible intact, not in the last place to ensure that future analyses can take place, but of course also from an ethical point of view this is the best approach. Sirak and her team have devised a new method to sample the osseous labyrinth located in the petrous bone that causes very little damage, making it at the time of writing the best and preferred method to employ.<sup>161</sup> As DNA from ancient sources is often very fragmented, significant amounts of material were needed in the past to create a full genome for a person. In the present, relatively small samples suffice, due to innovations in the methods of isolating and analysing DNA, as well as software technology that can reconstruct fragmentary strands of DNA. A serious issue however, due to the reduced size of the samples, is the contamination from endogenous DNA and minerals from the soil that may inhibit enzyme reactions that are needed to isolate the DNA.<sup>162</sup> The protocols, or guidelines, have been adapted in such a way to minimize the margin for errors to occur. The aim is to accommodate different sample types and differing quality of preservation.

Samples that have been taken are reduced to powder prior to the process of isolation begins. The powder goes through a series of buffer fluids, removing proteins, lipids and other compounds that are detrimental to a successful outcome of the analysis. To clean the samples, a treatment with bleach to oxidize and destroy contaminant DNA and other chemical substances can be performed. Conversely, the fraction that was extracted first and therefore is the most likely to contain contaminants is removed from the sample material. A combination of both methods is possible, but care should be taken that this does not result in the loss of too much material. The cleaning process is a balance between cleaning the sample and at the same time not destroying too much 'good' material that is needed for a successful study.<sup>163</sup> Because it is highly fragmented, aDNA behaves differently than high molecular weight genomic DNA from fresh samples, and it requires custom protocols for efficient recovery.<sup>164</sup>

aDNA often suffers from damage, a logical consequence of surviving for centuries underground (usually). This damage can be repaired, as is described by Höss and colleagues in an extensive article that is not relevant for discussion here.<sup>165</sup>

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<sup>160</sup> Sirak et al. (2018) 1.

<sup>161</sup> Sirak et al. (2018).

<sup>162</sup> Orlando et al. (2021) 8.

<sup>163</sup> Idem

<sup>164</sup> Dabney et al. (2013).

<sup>165</sup> Höss et al. (1996).

## Concluding Remarks and Practical Uses of aDNA

Moving from theory to application, it is important to note that large-scale aDNA studies on Roman populations are still in their infancy. The genetic makeup of Roman period populations in Italy has only been the subject of scholarly attention in earnest since 2018.<sup>166</sup> The aim of their research was to establish how the genetic diversity of South Italians in the Roman period changed over time. Through this research, answers could be formulated to the question what genetic relationships they had with people from across the Mediterranean. The various steps that had to be undertaken started with the collection of samples. Two sites were identified as suitable for the research. Botromago and Vagnaro in Southern Italy were conquered by the Romans around 300 BC.<sup>167</sup> 41 teeth from Vagnari, and 38 from Botromagno were selected. To maximize the information gained from the samples, earlier studies on those individuals, such as isotopic evidence, were taken into account. In this fashion the most complete image could be rendered from the combination of all the information available after aDNA research.

The conclusions from the study were, briefly, as follows: the research drew conclusions about the ‘population dynamics of a Roman period population at both the local and regional scales’. It concluded that the mtDNA haplogroup composition of the individuals from Vagnari was typical of western Eurasian (modern) populations. Two individuals from that group were found to belong to a different haplogroup, corresponding with eastern European population in the present. When compared to data from other parts of the world in the past, a definite link can be made with Neolithic and Armenian Iron Age populations from western and central Eurasia.<sup>168</sup> This result points towards the conclusion that there must have been a high level of migration from across the Mediterranean and European regions before and during the Roman period. Analysis of the mtDNA further suggests that the conquest of South Italy by the Romans likely changed the genetic makeup of its population. The female population of South Italy remained largely stable in spite of the conquest by the Romans and other major events like the inception of Roman colonies in the area and enslavement. On a more local level, two instances of maternal relationships were identified within the graveyard itself. While in this instance more modern as well as more ancient data were employed, it is

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<sup>166</sup> Emery et al. (2018). This recent application can be partially explained by the fact that the method is very costly, so only useful in larger projects with sufficient funding. Progress is also made towards easier and cheaper methods, hopefully granting more and more – and smaller – projects access to the possibility of conducting aDNA research.

<sup>167</sup> Emery et al. (2018) 201.

<sup>168</sup> Emery et al. (2018) 207.

simple logic that with every research undertaken more material will become available, leading to very exciting possibilities in which regional and local familial ties and genetic relations can be discovered.

The conclusions drawn by Antonia and her colleagues, among who is Ron Pinhasi, who pioneered the method of using the petrous bone as a source of aDNA, are interesting as well, and give a great insight into the possibilities of the method.<sup>169</sup> Their work documents the genetic diversity and changes through 12,000 years of history. Focusing on the Roman imperial period, the conclusion is drawn that there was a general direction of genetic material:

One possible explanation for the predominance of gene flow from the east into Rome is the higher population density in the eastern Mediterranean than the west. Historians have suggested that the large population size and the presence of megacities, such as Athens, Antioch, and Alexandria, may have driven a net flow of people from east to west during antiquity. In addition to direct immigration, eastern ancestry could also have arrived in Rome indirectly from Greek, Phoenician, and Punic diasporas that were established through colonies across the Mediterranean prior to Roman Imperial expansion.<sup>170</sup>

For the Roman world, every major conquest shows up as a slight shift and admixture of genetic material, indicating migration to the Italian peninsula from conquered areas. Individuals that were researched were highly diverse in their genetic ancestries. Influences from the Near East, Europe, and North Africa could be seen in many individuals. This continued through the history of the Roman world into imperial times and up to the disappearance of the Roman Empire as a political entity. It shows, as the title of the article gives away, the position of Rome as a “genetic crossroads”.<sup>171</sup>

What we can conclude from these practical examples is that aDNA has much to offer to the study of migration and mobility in the Roman world. It adds to our knowledge in a way that the traditional evidence – or even isotopic evidence, for that matter – cannot. On a local level, it shows familial relationships and kinship. This gives us an insight into a number of things, such as burial practices, whether individuals were buried with their families or on their own. When an “outsider” is identified we can spot the differences in their burial to locals. More important, we can see the genetic makeup of the individual and see where they

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<sup>169</sup> Antonia et al. (2019)

<sup>170</sup> Antonia et al. (2019) 6.

<sup>171</sup> Antonia et al. (2019) 6-7.

originated from. We can tell if the individual started a family locally after their migration, or brought their family with them. The study of aDNA will benefit from the quantity of studies performed like no other aspect of scholarly work on the ancient world, for every research will provide us with a new dataset to be compared with, thus creating a network of ancient genomes and connections. In time, this will enable us to see any connections between individuals studied in an archaeological context. We will be able to place finds in a social context that has been lacking for many individuals. This will, of course, take a great deal of time and funding, but is to my mind the most exciting development in the study of the (ancient) past in recent decades.

## Chapter 5: Current Debates and Future Directions

As with most innovations and new ideas, stable isotope analysis as well as aDNA as a method of historical research have been criticized by some scholars. I will elaborate on their arguments here and if possible, show how their concerns can be addressed. Our starting point will be an article written by Christer Bruun<sup>172</sup>, in which he responds to the research conducted by Tracy Prowse.<sup>173</sup> Prowse's research, originally trained as an anthropologist<sup>174</sup>, was presented in a research paper written on the topic of migration as visible in stable isotope analysis conducted on teeth and bones. The remains were located at the Isola Sacra necropolis in Ostia/Portus. The site is well-known for its wealth of material remains and funerary epigraphy, which made it one of the best suited places for research of this kind. It made a direct comparison between different sources possible, showing the strengths and limitations of each of them, both separately and combined. With that fact in mind Prowse conducted her research and wrote her paper. We will return to the actual research later, but for now we turn to Bruun's criticism, which he does not just limit to the specific article he responds to, instead taking a much broader approach to the topic.

Bruun summarizes Prowse's article as leading towards the conclusion that immigrants to Portus included not just men of working age but young people as well. It was not limited to single adult males, but was a complex phenomenon involving families.<sup>175</sup> Bruun states that the reason for writing his article is to 'examine the way in which dental material was made to yield this conclusion', as well as examine some of the broader issues at play.<sup>176</sup> Unsurprisingly, Bruun is of the opinion that there are a number of issues with using "natural science" to come to conclusions in historical work. His starting argument – and not coincidentally one of the main reasons for writing this thesis – is that, although presented quite clearly, relies for the most part on a numerical presentation, using formulae and tables. This will repel many scholars who are used to working in the humanities, who are not used to this way of presenting evidence and arguments. This is of course part of a larger debate in the humanities, becoming more urgent with the ever increasing scientific and statistical methods, such as big-data. As with all methods, some scholars will be more resistant to change than others. It is however in this case necessary to address these issues as well as those closer to the study of ancient history.

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<sup>172</sup> Bruun (2010).

<sup>173</sup> Prowse et al. (2007).

<sup>174</sup> <https://socialsciences.mcmaster.ca/people/prowse-tracy>

<sup>175</sup> Bruun (2010) 109, quoting partially from the abstract in Prowse (2007) 510.

<sup>176</sup> Bruun (2010) 109.



It is obvious that from the outset of his article, Bruun seeks to frame the traditional scholarly methods and scientific methods as two opposites.<sup>177</sup> His reasons for doing so are to my mind at least partially for aesthetic purposes, so as to make his article simpler to understand and at the same time making the reader choose between either sides, with one side being presented as the "right" choice while the other one is questioned for reasons not solely based on facts and arguments. Keeping the context of the article in mind, it is only fair to stress that in 2010 scientific methods were still relatively new – although as has been mentioned before they had been around for decades already – and therefore could not rely on years of results and experience to back them up. Bruun mentions that he feels that he should comment on the matter before 'the results published by Prowse et al. (...) will become "hard facts" that every scholar of Ostia must confront'.<sup>178</sup>

If we look at it from the other side, it can be argued that hard scientific results can be a great starting point to use as a possible explanation for the sources found in the more traditional way. It narrows the focus and limits the amount of possibilities, certainly when migration is concerned. While there may still be several different possibilities for the outcome of stable isotope analysis performed on molars, their number is reduced and more often than not it is possible for the scholar to point to one explanation as the most probable one, supported by the evidence. For example, Prowse and her team were able to establish that some of the individuals that were studied had come to Portus before their third molars had finished forming, thus giving a rather precise age of migration. This indicates the age of a person at the time of their migration. While in itself this is not conclusive evidence of anything, it certainly gives us a very big clue as to the nature of migration and mobility in the ancient world.<sup>179</sup>

Sidestepping the research itself for a moment, it is crucial to consider the terminology for a brief moment. I feel a shared terminology will eventually be the only viable option in order to bring scientific research into the discipline of historical writing. As it has become obvious while going through some of the work conducted by geneticists, the terminology employed can be quite distinctly different from that which is commonly used by historians. Case in point being the use of the word origin when referring to genetic origin and

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<sup>177</sup> For example, repeatedly stressing that Prowse and her team do not discuss some of the issues at play in the Isola Sacra cemetery as if that has a bearing on the results and conclusions from their scientific analysis. Bruun (2010) 111, 112, 114-116.

<sup>178</sup> Bruun (2010) 110.

<sup>179</sup> Prowse et al. assert that it is evidence of families migrating, but as Kristina Killgrove shows in her response to Bruun that remains to be proven. It could, however, be proven by aDNA research. Killgrove (2010) 134.

geographical origin. They are not the same when used by members of each respective discipline. For an archaeologist, the key question is where that individual came from, with in the back of their mind the follow-up of questions of finding out about the individual's identity. Genetic information acts as a cumulative and long-term archive of population history, but provides no answers regarding an individual's experienced sense of belonging. For example, a gene that a geneticist can identify as belonging to an individual of North African origin does not tell us whether the individual carrying the gene originated there, how far removed in time that origin is in this case or how the individual got to his or her final resting place. Using these labels in an archaeological context can therefore become very misinformative, as an origin in genetic terms can be an origin that is in fact far removed from the time in which the individual lived, or could have been very different to the way that person identified themselves as.

### **The Bigger Picture**

There are bigger issues at play here. One of which is the difference between what we consider to be facts and what we deduce from sources, or "hard research", and "soft research". The main difference being that "hard research" relies on experiments that can be repeated by others while getting the same result every time. A big part of the criticism about the use of scientific methods in historical research is that in humanities, the results of research depend on the thinking of an individual scholar, with the scholarship moving forward through discussion and new insights gained through different interpretation and dialogue. Scientific research would negate that in favor of absolute truths, creating a rift between what is certain and what is not.

One of the points of critique raised often is the cost of isotopic – or aDNA analysis, for that matter – research, which is quite high. Especially compared to archaeology without laboratory research it is vastly expensive and can usually only be conducted within a much larger research, with all the funding that comes with it. The argument that this prevents experiments from being repeated and therefore renders the results to less than what they would be otherwise can be easily dismissed in my opinion. Theoretically, a repetition would be possible if the need and funding is available. The absence of motivation for the repetition of analysis cannot be a reason for dismissing the outcome. The method itself is constantly improving and with innovations can likely be made more cost-efficient. With the growth of scholars employing isotope analysis and aDNA sequencing, the methods are set to become increasingly reliable. As more scholars will be aware of the theories and practice employed in

these scientific methods, the results will be scrutinized with increasing precision and attention to detail. This is the case with every new method in most disciplines. If we were to dismiss all innovative techniques on the basis that most of the scholars in a field lacked knowledge of them, there would never be any innovation at all.

The main conclusion from Bruun's article is a much more useful one. He notes that in light of all his comments, it is important to integrate the epigraphic evidence with any study of the isotopic evidence. While he is absolutely correct in saying this, his words still sound like there is a difference in the perceived value of the different methods. The isotopic evidence in this case was specifically gathered to be complementary to the already existing material evidence, in a way a test for the method and its usefulness. It seems obvious that all evidence that can be uncovered should be used in any case. I do think it is important to stress that in many cases of ancient historical work, the amount of evidence is extremely scarce, with these methods providing a huge opportunity for new avenues of research. It is, I think, also undisputed that isotopic evidence alone can never be enough to create a convincing narrative about a find, the period or the lives of those found. I would argue that in some cases it can be the deciding factor in ruling out possible explanations, where there would otherwise be uncertainty.

### **The Price of Progress - Looking to the Future**

Almost any major innovation in the humanities can certainly be shown to encounter resistance. It can be quite difficult to convince the scholarly world of the value of a certain new idea or innovation, especially when dealing with subjects that have long been studied by generations of scholars. The need for anchors in history is undisputed, and these can be paradigmatic. Only when there is an abundance of evidence pointing towards the need to reconsider what is taken to be the truth will there be a change. Even then, this is usually the subject of much controversy. I believe that the strict separation of "hard" and "soft" science to be such a paradigm waiting to be either proven to be right or wrong. Obviously, the burden of proof falls to the scholars attempting to change the current point of view. Perhaps this is overstating the case, but it is certainly true that there exists a great deal of reluctance in accepting the use of scientific analysis in historical and archaeological work.

As long as this remains the status quo, it will be difficult to truly move beyond the incidental use of aDNA and isotope methods and embrace the methods on a large scale. These methods grow in value with each further study that is done. It builds upon previous results, by way of comparison for example, as I have shown before. Our best strategy should

therefore be to employ the methods in many more instances. To name a few examples of research that would aid the discipline as a whole: because Roman cities were often using water drawn from elsewhere, more extensive strontium and oxygen isotope research of Romans who are buried in those cities can give us evidence of the way in which resources were drawn to the city and from where. Those who have the same isotope ratios in their enamel which can be matched to a water source that we have connected to a specific city can therefore provide evidence of childhoods spent in that city. To enable more specific mapping of local strontium values, animals could be analysed in areas with a difficult geological situation. Analyzing animals also resolves many of the ethical concerns that have to be navigated. Instead of looking at the same teeth in many individuals, a single individual with a complete set of teeth can be analysed in depth, to see the development of their life through their teeth, giving information about mobility in a lifetime.

aDNA, in the case of ancient humans, has been thus far most successful when reconstructing ancestry profiles of past individuals. Looking towards the future, new research may uncover patterns that transcend modern borders to gain a genetic resolution on a much bigger scale. Having said this, however, it will be necessary to move beyond just humans. The entire environment in which ancient humans lived is within our grasp. Animals and plants that were in the food chain can be analysed to establish their effects on humans, making it possible to reconstruct specific diets. Diseases, which have been studied using DNA research, can be traced to individuals from the Roman world, giving us clues about health in relation to age, diet, familial relations and even the impact of mobility if enough data are gathered. Moving into the future, the discovery of epigenetic markers will make it possible to establish a precise age at the time of death of an individual.<sup>180</sup>

On a more methodological level, because of the limited amount of material to conduct research on, emphasis should be put on developing methods that minimize destruction. Like the new method of collecting samples from the petrous bone discussed earlier, innovations such as that will ensure our access to materials in the future, when there will be even better methods and equipment available. In the same spirit, innovations in the software and methods to repair or replace damaged DNA should be pursued.

The human story should not be lost in the pursuit of innovation. It should remain the starting point and the final aim of our endeavors. As scholars of history, we have a duty to uncover and tell the stories that are as of yet lost. As we are working with human remains, the

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<sup>180</sup> Lee et al. (2020).

highest ethical standards are the lowest benchmark our work should comply with. The story we are telling is the story of humankind as a whole, which is why the results should be presented in a way that is accessible to all. If the results are presented in this spirit – one of humanity as a whole and not, as is sometimes the case, as a narrative of national history or race – this sort of research can benefit everyone and tell the story of humankind through the ages.

### **The Influence of Society through Stakeholders**

The term stakeholder has been used a number of times thus far. Interestingly enough, it is a term that lacks a clear definition when it comes to scientific research. Recently, an article was published in *Nature*, dealing with the idea of ethics and stakeholders in archaeological research, specifically looking at human remains and the information they hold through DNA analysis.<sup>181</sup> This was necessary, because the nature of archaeology has changed with the advent of methods such as DNA- and isotope analysis among other methods that deal with human remains. As research is now more often destructive, and with the benefits ever increasing, scientists are faced with a dilemma. These destructive forms of analysis are more appealing to researchers since the amount of information gained from analyses like the ones featuring in this thesis is already large and set to increase even more in the future. The amount of information gained from archaeology has greatly increased with these new methods, while at the same time adding greater implications and importance to the results. For the first time in history the destruction of human remains in archaeology is considered to be beneficial.

This new reality has brought stakeholders of all sorts to the forefront of the new practical reality for researchers involved in archaeological work. As with all aspects of life in the present, science has become ever more public and political. Whatever the opinion of the scientists involved, public involvement has become a force to be reckoned with, whether for good or bad. This reality prompted the article in *Nature*. The starting point for the article is the fact that archaeologists and scientists have a responsibility to stakeholders in their research. The destructive - and to some very personal - method can conjure up a whole range of emotions and responses from different groups who (feel that they) have a stake in the research. The definition of a stakeholder used in the *Nature* article is 'people who have a connection to a study, including descendant communities, those responsible for the

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<sup>181</sup> Alpaslan-Roodenberg et al. (2021).

stewardship of human remains, and researchers'.<sup>182</sup> As one of the reasons for writing the article, the authors name that the issue is still quite recent. There is still a lot of discussion and the authors stress that their views are not the final take on this issue. As I think there is a problem with this definition of what a stakeholder is, I would like to offer a different interpretation, opposing the one posed by the authors. Contrary to the definition I would like to use a definition more commonly used in economic papers. I think it is important to look at the outcome in an economical way, because as researchers we can sometimes have an outlook on our research as serving the world as a whole, with the knowledge gained serving all humankind. It is vital to realize that some groups of stakeholders have a, sometimes tangible, stake in research of this kind that goes beyond the idealistic "quest for knowledge". This is a slight difference, but differs in the fact that a stakeholder should have a stake in the outcome of the research. To be a stakeholder, in other words, one should have something to gain or lose based on the conclusions of the study. This definition prevents random members of the public who are opposed to the research to claim a stake in the research, unnecessarily frustrating the research process. A selection of all the stakeholders should be made before the research commences, or if that is not possible – due to time constraints or sudden finds – as soon as possible. This is again a discussion that has not been concluded yet, but a start has been made with this publication.

Discussion on this topic should be kept at the forefront of research conducted on human remains. An article in a magazine as influential as *Nature* can have the unintended result that other scholars see it as an authoritative, and perhaps even final, take on the matter. It is obvious to me, however, that strict adherence to the guidelines that have been proposed is counterproductive. While the motivation and intention of those involved is not in question, the current definitions involved in these guidelines are unworkable in practice. The final result of the article – and the conference it is based upon – were the mentioned '5 globally applicable guidelines for DNA research on human remains' (*listed as published in figure 5*). To be fair, these are guidelines to be followed under ideal conditions to my mind, with a few being no-brainers (points 1 and 3 especially). They are nevertheless important, as they provide us with a starting point from where we can work towards their application in practical situations. They can also serve as a starting point from which a set of "best practices" can be created, making a set of criteria for scrutiny by other scientists possible,

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<sup>182</sup> Alpaslan-Roodenberg et al. (2021) 42.

such as is common in medicine.<sup>183</sup>

I feel that a number of conclusions drawn may have been made with the best of intentions but forgetting the fact that the archaeologists and the general public are also among the stakeholders and have a right to assert their opinion and have a right to the results of any research, especially when it is publicly funded. As the ones carrying out the bulk of the work and simultaneously the main beneficiaries of a successful outcome of the research, we as researchers are one of the primary stakeholder groups. We feel that this is something we should underline to begin with. As a matter of best practices and personal values, we are committed to maintaining an ethical standard as researchers. Not just to satisfy our own need for ethical guidelines to make the research the best it can be, but also because of the sensitivity of aDNA research and its potential for provoking emotional reactions and opposition. Most importantly, researchers themselves must be convinced of the solidity and thoroughness of the project's ethical commitment. This is especially important when faced with opposition, either academic or in the field. I believe the first point supports the second – if researchers are confident in the ethical guidelines, they can rest assured that the work is being done with integrity – and will thus be more likely to withstand pressure from dissenting stakeholder groups.

Pressure is likely to come from groups with fundamentalist objections to research conducted on human remains, who some of the archaeologists I mentioned before have already faced both in the field and indirectly.<sup>184</sup> In those specific cases being (ultra-)Orthodox Jewish groups who are, from a religious point of view, heavily opposed to the work carried out in these projects. The opposition can, of course, also be local or driven by other factors, such as financial incentive to stop the work when the area is needed. This is a concern because most of the archaeology undertaken in urban environments is done because of building projects. Typically in these cases, the resistance comes from international organizations that send protestors to certain sites from abroad with the aim of shutting down the work and making it impossible to gain access in the future. It is exceptionally rare for the local population to be represented in these protesting groups. So far, their tactics have been twofold. First, perhaps of the most concern to us, they intimidate workers at archaeological sites they want to shut down. Second, they apply pressure to local and national governments to get *them* to shut it down for them. This is also one of the major reasons I feel that the

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<sup>183</sup> The obvious difference being the subjects of the research are deceased, but when it comes to the respect and diligence we must take with such sensitive matters, not much is different.

<sup>184</sup> Colomer (2014) and Gerstenkorn (2017).

researcher must be fully aware of all ethical aspects of their projects.

I would recommend, as a way to counteract situations where the government – under pressure from certain stakeholder groups – shuts the project down in one location, to proactively seek out the relevant authorities to raise awareness about what may happen when a project like this is carried out. Showing the ethical and methodological solidity, the reasoning behind certain decisions and the logic used to think about ethical issues (as well as religious, in situations where that situation may matter) can help the people who are in charge to withstand the outside pressure, as they know what the stakes are and who the different parties are as well. I would present a number of things to (local) governments. First is an ethical mission statement and guidelines that are part of the preparation before any research is started. The (obvious) purpose of this is to show that we are actively dealing with ethical issues and that they are at the forefront of our research. Any opposition is therefore not because of the lack of ethical standards in our project, but due to an opinion that these groups have which is in direct opposition to ours. Second, I would like to present a breakdown of stakeholder interests. As discussion and consideration of stakes will become more frequent in the future, it is important to be one step ahead of the discussion by presenting that there is a firm grasp and analysis that has been undertaken prior to the actual start of the work. show how we have dealt with all the different stakes. The primary aim of this is to prevent politicians being blindsided by these groups, preparing them for the possibility. If the first impression is the one of the Jewish Orthodox group, it will be hard to recover from there as it creates the impression that we have not taken care to research all the ethical issues. The secondary aim of this is to show that caving to only one group automatically means that they overrule the majority. To support this statement, it is beneficial if we are able to produce statements of support from various stakeholders. This approach shows that the ethical considerations are very complicated. It disallows any group from using the argument that the ethical basis of our project is unsound.

### **Stakeholders and the Ethics of Research on Human Remains**

As has become abundantly clear, a relatively new phenomenon in archaeology and in particular in research performed on human remains, is the existence of stakeholder groups. In the scholarly literature there has been no analysis of who exactly these groups are. Only vague references are made to them and the recommendation is usually made to engage with them in one way or another. I would like to add extra depth to the concept of stakeholders by analysing different groups, weighing their stakes and making recommendations on a course



of action that should be taken by scholars to engage with them. In addition to this, the ethical aspect of researching human remains will be discussed with respect to stakeholder groups as well as why there should be a difference in approach compared to other archaeology.

I believe we should start by analysing the stakeholder group that is of our most immediate concern: academics and scholars. As we are ourselves one of the most important stakeholder groups in any study, being the ones to carry out the work. The nature of our stake may be obvious, but it is important to consider our own stake as it influences our actions and thinking. For example, as scholars we are invested in the research as it directly influences our careers. A successful excavation involving human remains that proves innovative or one that yields unexpected results may end up solidifying an academic career, as well as attract funding for projects. Besides the reputational and financial incentives there may be to conduct research, there are of course the more "benign" stakes that come into play, such as the wish to further the state of the research for the discipline, gaining more knowledge about the world we live in and in cases of rescue archaeology the wish to save remains from destruction. There are, however, a number of ethical concerns that accompany this interest in the outcome of a study. The decision to conduct research on human remains is not one to be made lightly in general. As discussed, there should be an academic necessity present, with a carefully thought-through strategy. It means weighing the academic merits of an excavation objectively, while being honest about any factors that come into play, such as those discussed here. It goes without saying that the methodology should be sound and based on the most recent best practices, like those discussed in this thesis when it comes to sampling human remains for analysis. It also means being respectful of the remains and being mindful of the fact that these are not just objects to be studied, but the remains of someone's family member and a person.

This brings me to the interred themselves. It may seem odd, but they do have a stake in the research carried out on them, being the fact that they are disturbed in their final resting place. As we ourselves would not give consent to anything happening to our bodies after we die without our knowledge beforehand, the approach that should be taken is a very conscious one and should be part of the consideration. When human remains are concerned, consent is always needed to conduct a study on the remains. For obvious reasons, this is not always possible when dealing with ancient remains. As discussed by Colomer and Gerstenkorn, sometimes the decision is made to revert to consent by proxy. A supposed descendant is given the power to consent or reject any research being carried out. This creates a paradox in most, if not all, cases. For it is not self-evident that those people we, or (local) governments

appoint as descendants, are in fact that. Any familial connection can only be proven by DNA research. This can however not take place if it is rejected by those who we cannot prove are related to the deceased. It is one of the reasons an ethical and stakeholder analysis should be part of the preparation for an excavation. If the connection is not proven, as researchers we may be able to make the case about the importance of our work and the paradoxical situation that arises by proxy-consent. The interred are stakeholders themselves, because they may benefit from research performed on them. On a personal level, we may be able to determine a lot of facts about them and their life. These stories would be lost if the decision is made not to pursue any research. On a more general level, there is the concern about who should make decisions about the dead. This question of ownership is a hotly debated one.<sup>185</sup>

There are some other stakeholder groups that can be discussed more briefly. Landowners, local population and tourism are not as often present in the equation. When they are involved, they do require some careful consideration. It is advisable to make contact with them first, as a researcher. This prevents misinformation from setting the stage, as can sometimes be the case. As popular archaeology is becoming ever more popular and sometimes of added value to archaeological projects, interaction with the local population as well as tourism is an opportunity to create awareness about what we do and how we do it.

The final category is an ambiguous one. The (local) government has been named multiple times as being involved. In economic theory, the government is not considered to be a stakeholder. This is because the government itself has 'stakeholders' to accommodate. In that sense, we are dealing with an entity that has to make different considerations based on their stakeholders. They can benefit or suffer from the results of research on human remains.<sup>186</sup> They are also susceptible to pressure from other stakeholder groups. Although communication with governments on different levels is usually through institutions, it may be wise to present them with a readymade set of considerations that have been made, like a simplified plan of the project with special focus on how the human remains are treated and why. The question whether one stakeholder (group) should receive preferential treatment over the others is a difficult one. In almost all cases, the final decision rests with the people authorizing the excavation project, usually the local government. For them, too, this is an issue that has quite suddenly arisen in the past decades. The should be to show the multi-layered nature of stakeholder investment in the project's outcomes. In so doing, we prepare

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<sup>185</sup> Aronson (2017).

<sup>186</sup> The case of Kennewick Man for example.

governments for the possibility of opposition, by making them aware of the fact that many groups have a stake in the project's outcomes, not only a dissenting group. For a government to grant or deny access should therefore be predicated on a plenary analysis of stakeholder support – ceding to a lone dissenting group disables the rest from reaping the benefits of a project that they support.

A big factor in government decisions is public approval. Part of our plan should be to present governments with a public outreach action plan. Parts of which should be directed at local populations, national museums, teaching programs, etc. The overarching goal of the action plan is to encourage public investment into the project, which buttresses the government stake, giving them greater confidence to maintain their commitment to the project in the face of resistance.

Researchers should take care to take a moderate approach in their work. While bold claims about the ancestry or genetic nature of human remains may be attractive to a researcher trying to make a name for him- or herself, they give rise to a number of issues. In the twentieth century, when science slowly evolved into what we now consider to be modern science based on observations, this newly gained “concrete” evidence was used for political purposes. It is widely known that in its quest for territorial expansion, the national socialist government led by Adolf Hitler was keen to use anthropological surveys, archaeology and genetics to strengthen his racial theories about the ancestry of the German people and the Aryan race.<sup>187</sup> Sadly, even today there are those who would be more than happy to use any scientific results to base their own conclusions upon. Be it for nationalist, racial or otherwise unsavory agendas, we as historians and scientists have a duty to ensure our work does not serve such a cause. This starts with the language we use, but can also mean that in cases where we are unsure about the results this uncertainty is stressed, rather than make assumptions or draw conclusions based on partial evidence. Most importantly, it is absolutely vital that the finds are placed in their context, so as to prevent them being taken out of it.

### **Implications of Scientific Methods**

Having new methods at our disposal as historians means new skills to be obtained. While aDNA is seen by some as the biggest leap in historical research since the invention of writing, the method is not (yet) endless in its possibilities. While the question we can ask of our sources have certainly multiplied and the answers potentially have become much more

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<sup>187</sup> Arnold (2006).

interesting, we need to be aware of the current possibilities should we consider using the method in historical research.

In this section I shall discuss what is asked of historians in order to be able to use these new methods in a practical, but also an ethical manner. As well as this, a discussion about these methods will be added, because there is no consensus as of yet about its use in the world of archaeology and history. While for many people this topic may be seen as a very distant one without any real-world implications, this could not be further from the truth. As will become apparent in a later chapter, the results of DNA analysis, even aDNA, can have very real implications in the “real world”. This is also one of the challenges that must be met by archaeologists and historians engaging in DNA research. The idea of DNA being linked with race, showing whether a person was “superior” to others around him/her is, even while fundamentally wrong, still around. DNA as a marker for migration for a group of people brings with it some serious implications. Not all people will be solely interested in the academic aspects of this kind of research. A rather more “modern” application of the use of DNA research for applications in other ways than just academic or in the service of all mankind comes from its use in Native American tribal lands. In the early days of DNA research, this issue was recognized by Kimberley Tallbear.<sup>188</sup> Even though the subject of her paper was geographically and temporally far removed from the ancient Mediterranean people, some of the issues she encountered are still very pertinent today in this kind of research. Because the results of the research as well as the conclusions drawn some of the cases were very highly publicized and therefore serve as a good example of the implications DNA research can have, both in a positive and negative way.

One of the most striking issues is that to be considered part of a Native American tribe according to law, blood and, increasingly, DNA have become central to tribal political ideas and are used to help justify cultural and political authority. Such biological measures reaffirm racial definitions of the tribal nation and who rightly claims tribal citizenship. The problem is readily apparent. The question is whether we think that DNA and blood are an end-all answer to the identity of a person. If we take these two things to have a one on one relationship with one another in reality, this would be the basis for a whole new discussion. To use a Roman example, many of the emperors were adopted, some of them more famous than others. Septimius Severus, emperor from 193 to 211 AD, was born in Africa and is known to have both Roman and Punic ancestry. Purely from the DNA point of view, if his remains were to

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<sup>188</sup> Tallbear (2003).

be found in Rome and analysed, he would be categorized as being a migrant or the son of a migrant. While factually debatable, what does this actually tell us about his identity or the way in which he was treated? The information we would gather would for the most part be false if we overstep the actual facts gained. It is important to keep this in mind. Most of what we deduce from the data gathered through DNA research at this point is still very much debatable. Combined with contextual evidence through isotopic evidence and the “usual” archaeological methods there is of course a lot more that can be proven to a very high degree of certainty. The need for extensive work is therefore necessary in every case.

A highly publicized case in the case of aDNA research on Native American remains is the case of “Kennewick Man”. The case concerned remains that were determined to be approximately nine thousand years old. A lot of controversy surrounded the find after it was discovered. It was reported by the initial researcher, James Chatters that the remains were ‘caucasoid’.<sup>189</sup> Furthermore, a stone arrow point was found in the skeletal remains. This prompted Chatters to say ‘I’ve got a white guy with a stone point in him’.<sup>190</sup> As reporters understood *caucasoid* to mean the same as Caucasian, the controversy was born. As this kind of research was relatively new in 1996, the conclusions that we today would be (hopefully) very hesitant to draw so soon were quickly reached. The possible impact of DNA research has since been made infamous by this case. Because scientific research like DNA analysis is seen in the public eye as giving concrete evidence and conclusions, I would like to stress that it is important to be very reluctant in drawing conclusions, when sometimes the better method is to give an overview of the results that we are sure of and making clear what conclusions can be drawn based on them.

Before any conclusive ancestral research could be conducted, the remains were also claimed by no less than five different Native American tribes. On top of that, because of the conclusions drawn so early in the process by Chatters the remains were seen by some as being evidence of early European presence in the Americas.<sup>191</sup> Before further enquiries could be made, the tribes invoked a US law that gave them the right to rebury the remains in a traditional way as was befitting of one of their ancestors. Because of the claims made early in the research process, scientists protested this saying that the physical characteristics made it

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<sup>189</sup> James Chatters, the anthropologist who was involved in the excavation and initial analysis asserted this at a press conference about the find in 1996. In: Egan (1996). Tribe stops study of bones that challenge history. The New York Times, 30 September 2006. Available at: <http://www.nytimes.com/1996/09/30/us/tribe-stops-study-of-bones-that-challengehistory.html>

<sup>190</sup> Idem

<sup>191</sup> A narrative then and still today mostly supported by white supremacist groups who shall remain nameless.

uncertain whether these remains belonged to an ancestor of one of the Native American tribes at all. The right to study his (the remains were shown to be those of a male) remains was won in court. What followed is one of the most extensive scientific studies performed on human remains belonging to an individual, yielding a volume of some 650 pages and combining most methods of archaeological research available.<sup>192</sup> Funnily enough, DNA research was not actually included in this extensive volume but was only published the year after.<sup>193</sup> Nevertheless, the volume is a very exciting and fascinating showcase of the state of the art in 2014.<sup>194</sup>

The subsequent DNA research conducted by Morten Rasmussen and his team was conducted to resolve his ancestry and affinities with modern Native Americans. There were several prior efforts to recover genetic material from Kennewick Man, but none had been successful up to that point. The sample was collected from the third metacarpal (the bone in the middle finger closest to the arm) of the left hand. The sample taken was relatively small, and its preservation left much to be desired. Because of this, the coverage of the sequencing (i.e. how many genomes are still present and visible through analysis) was only *c.* 1x, so that ‘each genomic position relative to the reference genome was read once on average, but because we were sampling randomly from DNA extract, this means some positions were not covered and others were covered more than once.’<sup>195</sup> While there was much less coverage than many other researches, according to other studies ‘even levels of genome coverage on the order of 1–5% (or 0.01–0.05×) are sufficient to support profound historical inferences.’<sup>196</sup> This meant that even with a sample so poorly preserved, the team could draw conclusions about the genetic links and ancestry with a great degree of certainty. Kennewick Man’s mtDNA, Y chromosome and genomic DNA were recovered from the sample. Because the Y chromosome is inherited through the paternal ancestors (unchanged and completely, as with mtDNA) and mtDNA from the maternal ancestors exclusively, both of these types of DNA

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<sup>192</sup> Owsley & Jantz (2014). This volume gives an excellent overview of what different archaeological methods can add to our understanding of the life of an individual, even one from more than eight millennia ago.

<sup>193</sup> Rasmussen et al. (2015).

<sup>194</sup> A very short summary of the results show that he died at around 40 years of age. The obvious stone tip showed he had been shot, for reasons unknown. 5 or 6 of his ribs were broken, with a further depression in his skull possibly pointing to having been struck. A number of other lesions and minor traces of illness were also found. Isotopic evidence found he had a plentiful diet consisting of large quantities of salmon as well as other freshwater fish and possibly also birds. An ear condition related to spending a lot of time in cold water was also found, likely related to providing for his diet rich in fish. All his major injuries had healed, pointing to his resilience and good overall constitution. He was right-handed, broadly built and his teeth were worn down from overuse over his lifetime. As he was buried with his head elevated and parallel to the river next to which he was found, this was definitely intentional.

<sup>195</sup> Rasmussen (2015) 1488.

<sup>196</sup> Pickrell & Reich (2014) 385.

trace back a single ancestral line.<sup>197</sup>

The results of the analysis of Kennewick Man's DNA was conclusive: Kennewick Man's mitochondrial DNA as well as his Y chromosome haplogroups are typical of Native American. This indicates a genetic link between modern Native Americans and Kennewick Man, confirming their beliefs that he was indeed one of their ancestors. More haplogroups were examined, but the only one that showed a match was the haplogroup that encompasses Native Americans, making them the only proven living relatives in the present.

This directly contradicted the earlier assumptions that Kennewick Man was an early European inhabitant of the American continent.<sup>198</sup> As the remains were now proven to be Native American in heritage and ancestry, they were eventually returned in 2016 and reburied with members of the five tribes who initially claimed the remains as their own in attendance. The relevance of this case for the research into other ancient DNA sources, or any ancient remains for that matter, is that the implications of such a study can be quite far-reaching. In this case the tribes decided that further research would not be allowed, as such research is usually frowned upon in the Native American community. In addition, a proven genetic link to one specific tribe could be beneficial to them, but detrimental to the (territorial) claims of the other four.

Ancestry is also an issue in Europe. This issue touches, among other things, upon the question of who owns ancient remains. A conclusive answer to this question has not been reached, but practically speaking, that authority usually lies with the most closely related ancestors of the deceased. This can be based on rather subjective grounds, as for example in the case of Jewish cemeteries. Ancient Jewish graves are often recognizable by the iconography present on grave markers and the grave goods found in the graves themselves. Some Jewish groups take issue with the idea of disturbing the deceased in their graves, based on religious grounds. Stepping aside from the theological and philosophical debate for a moment, the question can be posed as to why we see individuals and groups of the “same” religion as the closest ancestors. While a link can certainly be seen by all as we look at customs, a shared history and based on feeling, no concrete link between the deceased and the living can be proven without aDNA research. If and when this sort of research is blocked by the assumed closest living relatives, their claim cannot be disputed and is therefore final. An example of this, albeit concerning much more “recent” graves, was written in 2017 by

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<sup>197</sup> I do realize this is a rather simplified version of this process. For a complete account please see Pickrell and Reich (2014).

<sup>198</sup> Rasmussen(2015) 1489.

Jacques Gerstenkorn.<sup>199</sup> As an archaeologist, he narrates the entire process of attempting to excavate the first Jewish cemetery in Lyon. Eventually, he runs into the problem of ownership and who has the power to decide what happens to ancient remains. Ultimately, this leads to the project having to shut down. As the issue is encountered by more than one excavator, I feel it is worth it to offer my thoughts on the matter, to add to the debate about human remains and to provide some insight on matters that need to be discussed internationally.<sup>200</sup>

As I mentioned, Gerstenkorn is not alone in having to face such resistance in Europe. In Spain during the last two decades, the archaeology of Jewish Medieval burial grounds has been a matter of dispute, sometimes even in aggressive terms, over the non-disturbance of Jewish human remains.<sup>201</sup> Ultraorthodox Jewish groups claimed that those graves are of people of Jewish faith and therefore make two further claims. Firstly, neither archaeological excavation nor any aDNA or isotope analysis research is allowed to be undertaken. Secondly, these ancient corpses need to be treated as if they were Jewish people of today, not as cultural heritage. Consequently, the options are that they should either rest in peace in the place where they lay, or be reburied in contemporary Jewish cemeteries (either in Spain or in Israel). These statements are motivated by the Halakha, the Jewish religious law, which obviously governs some Jewish religious communities today but not necessarily, as I will argue here, the management of medieval heritage both in Spain and Europe more broadly. The case of Jewish medieval burial grounds and claims regarding them is intrinsically an archaeological question. It is also an example of how archaeology can be used in the power struggles and the politics of religious (minority) communities in present-day societies. Here I argue that archaeology, like any social science today, is not free of subjectivities and particular agendas, and consequently is very much involved in the politics of cultural heritage management. Furthermore, the topic of non-disturbance of human remains by archaeologists echoes the disputes, claims, and arguments defended by indigenous communities in relation to the practice of archaeology in their sacred places, especially in countries affected by European colonialism, such as North America and Australia.<sup>202</sup> Following American indigenous communities' vindications, the archaeology of the dead has similarly become the perfect battlefield for Ultraorthodox Jewish minority groups. It advances their interests both in

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<sup>199</sup> Gerstenkorn (2017).

<sup>200</sup> Belcastro and Mariotti (2021) offer their thoughts on the matter as well, showing there needs to be more discussion on this topic, as well as that it is an international matter.

<sup>201</sup> Colomer (2014).

<sup>202</sup> Layton (2005) and also Jones & Harris (1998)



reinforcing their present political voice, and in reassuring their religious capital worldwide. However, beyond a first appearance of being a similar topic of 'indigenous ethics', the two cases show little resemblance. Here, I will argue that, in the European context, it is inappropriate to identify Jewish medieval burial grounds as uniquely 'indigenous' or 'native'. I argue that it would be inappropriate to apply religious laws to civil matters, as Ultraorthodox Jewish groups demand in the case of medieval burial grounds.

While the excavations that are dealt with in the scholarly literature are concerned with Jewish remains, the story told is the story of humanity. According to tradition, the Jews were an insular people, set apart from the rest of the nations by God. But 'insularity' far from aptly describes the diasporic experience, as the many Jewish settlements flung across Europe and Africa testify. These were not enclaves, isolated from the world around them and spurning cooperation, they were nodes of exchange, markers of mobility.

The spread of Christianity is evidence for this – of course, when the Apostle Paul traveled west to proselytize gentile nations, the Jewish culture had already gone before him. In the New Testament Epistles, we see that the existing nodes of Jewish settlement and culture act as a mediating influence between the local populations and the incoming Christian paradigm. In other words, when Paul speaks the language of Christianity to a new host, he looks and speaks in a manner already familiar to them, owing to the pre-existing Jewish influence. In a very real sense, the pre-emptive spread of Jewish culture paved the way so that Paul's message would be intelligible to those receiving it. Surely, it was an unintended impact, but Judaism's role in the spread of the world's largest religion cannot be denied or overlooked. The same can be said for the spread of Islam – another of the world's great religions, and another one that draws upon the Abrahamic tradition. Again, that the Islamic tradition 'continues' the Jewish and Christian one, means that the language and motifs that make Islam intelligible to those outside it, had gone before it as it spread across the world. As such, ancient Jewish settlements should be seen as precursors for the development and spread of today's world culture, rather than 'belonging' to their direct racial descendants. Our world would not look the way it does had not these settlements existed. Therefore, we all have a stake in knowing about their lives, history and their stories.

I would like to end by arguing that the topic under debate here is not so much the ethics of excavating human remains but how both archaeologists and heritage managers engage with stakeholder communities regarding particularly sensitive heritage involving human remains or religious identity. It is a debate about how archaeology manages the cultural-heritage values and ideologies of other stakeholders in a multi religious society. Here

the Council of Europe Frame-work Convention on the Value of Cultural Heritage for Society<sup>203</sup> has introduced useful definitions, recommendations and agreements that may help to solve this dilemma.

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<sup>203</sup> See <https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treaty-num=199> for the full text of the Faro convention.

## **Conclusion**

This research has established the past, present and possible future of the discipline of migration and mobility in the Roman world. The aim of this thesis has been to add to the debate by researching the possibilities in the field moving into the future and addressing issues that are not resolved yet in the scholarly literature such as the ethics and new challenges that come with the research of human remains. Specifically, it has sought to identify the different methods that scholars of ancient history can employ to look at migration and mobility, in an attempt to bridge the gap that is apparent in the discipline between scholars exclusively employing either "soft" or "hard" scientific methodology. In order to achieve this, it was vital that the current situation of the discipline was made clear. In order to do so, we have first looked at the historiography of the discipline, then at the methods that have been successfully but not yet widely been used to add to our knowledge of migration and mobility in the Roman world. Stable isotope analysis, employing the analysis of four different elements, and ancient DNA analysis.

What has become clear is that "soft" and "hard" scientific methods are complimentary in this discipline. Only the more traditional sources of information, such as literary and epigraphical sources, will not suffice if we seek to uncover every aspect of the lives of those who lived in the Roman world. On the other hand, only using the scientific methods will provide us with numbers without a context. Neither is ideal. As more data becomes available through the increasing number of studies, advances can also be made in epigraphic studies, for example. Patterns can be found that would not be obvious without the science to back such conclusions up. Dealing with human remains in the study of the Roman world brings a whole range of ethical challenges, which I have shown and made a start in solving. More discussion of these points is necessary, as the way we think about human remains, the rights of the dead and ownership is not a static fact but rather a dynamic and ever changing subject. To show the realities of working on human remains with scientific methods, a thorough analysis has been provided on the stakeholders. These stakeholders had been identified in the scholarly literature recently, but not in a satisfactory or very specific manner. I have provided a possible solution in this thesis.

I have intentionally tried to present the research and methods/methodologies in a way that is practical to even the most "soft" of scientists. Partly to stimulate the understanding between those who prefer a purely philological approach to history and those who employ scientific methods as a way of gathering data of ancient people, but also because I believe that what is at play here is the story of all humankind, and as such should be made available

to everyone. The innovations in our field of study promise to uncover unimaginable amounts of information and detail about the lives of people in the Roman world, but possibly also further back in time.

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Appendix

Figure 1, C. Tilly (1976) 5.

Figure 1: Four Standard Migration Patterns

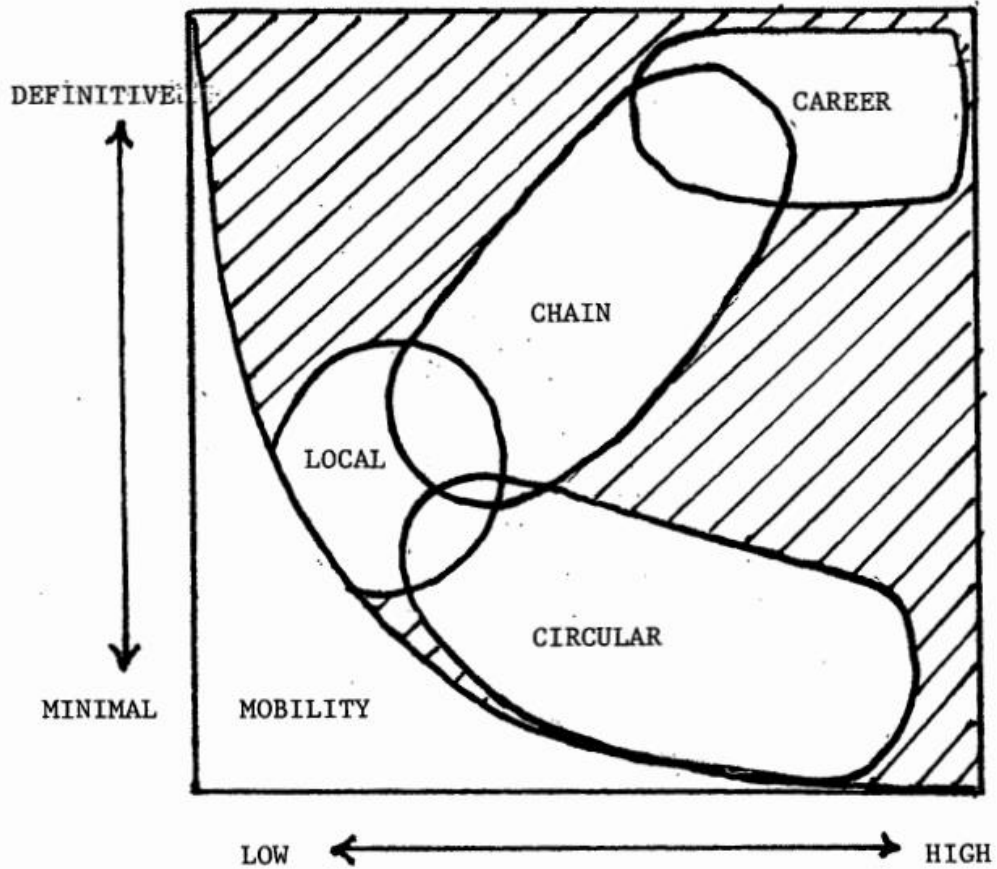
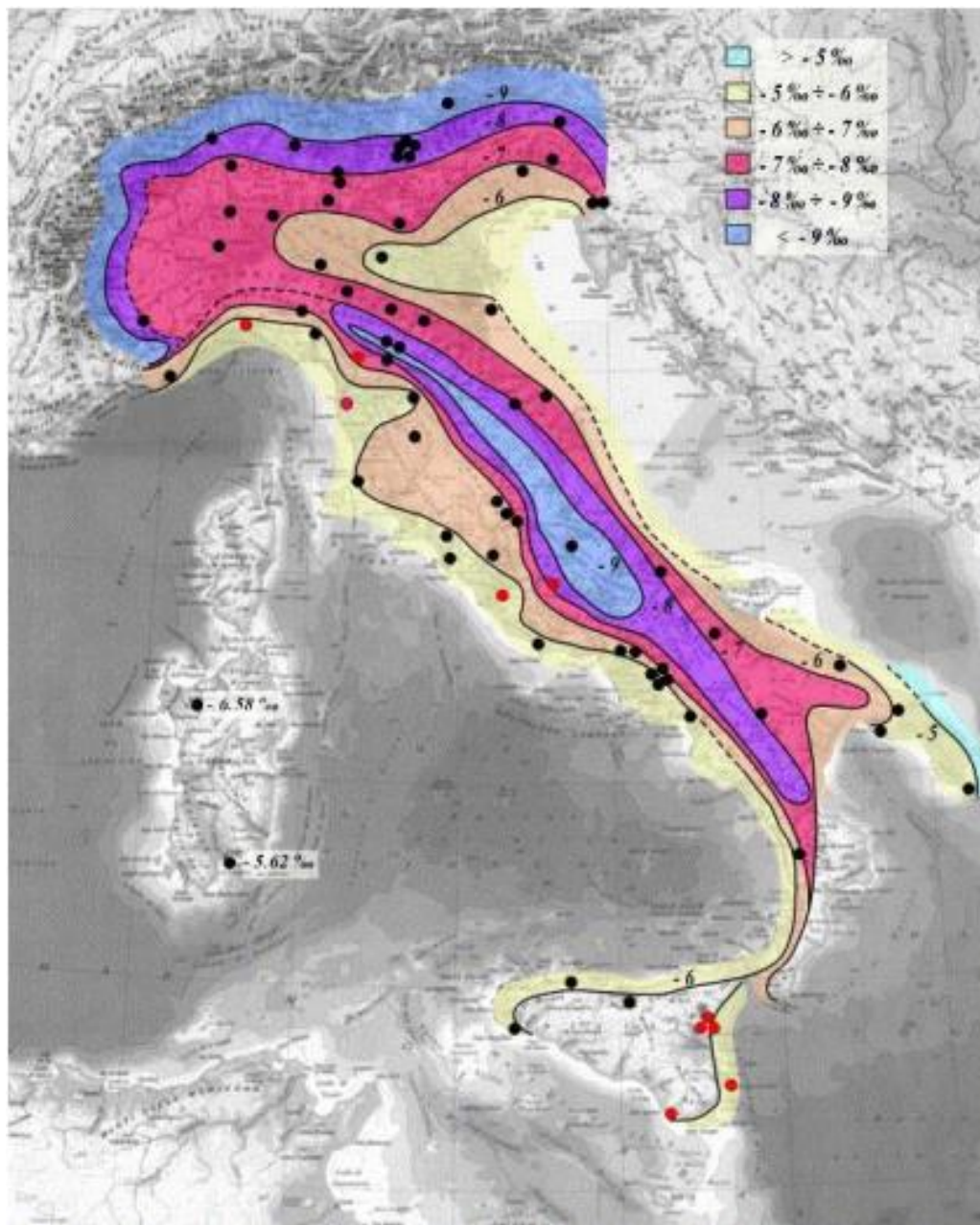


Figure 2, CIL 10, 1971 (<https://cil.bbaw.de/ace/id/KO0030279>)

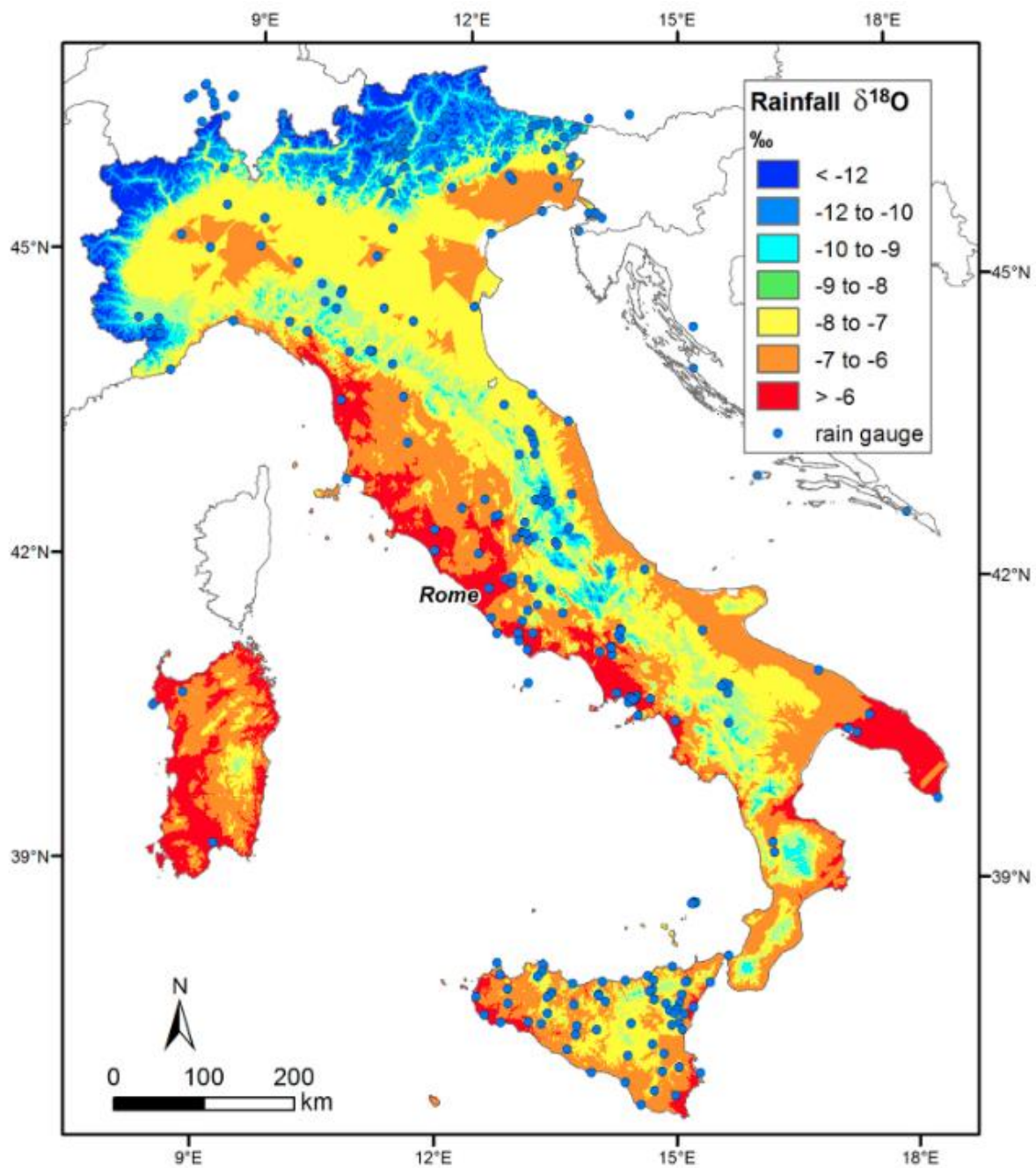


**Figure 3: Longinelli and Selmo (2003) 80:** 'Contour lines reporting the overall variability of the mean oxygen isotopic composition of precipitation in Italy. Black dots refer to the collecting stations controlled and measured by the authors; red dots refer to the 10 stations controlled and measured by other colleagues. The lack of a sufficient number of stations in Calabria, Sicily and Sardinia prevents a more detailed reconstruction of the distribution of the isotopic values in these regions.'





**Figure 4: Giustini et al. (2016) 176:** 'Map of spatial distribution of  $\delta^{18}\text{O}$  (‰) of precipitations in Italy.'



**Fig. 8.** Map of spatial distribution of  $\delta^{18}\text{O}$  (‰) of precipitations in Italy.

**Figure 5:** Alpaslan-Roodenberg et al. (2021) 42:

### **Box 1**

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## **Five globally applicable guidelines for DNA research on human remains**

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- (1) Researchers must ensure that all regulations were followed in the places where they work and from which the human remains derived.
- (2) Researchers must prepare a detailed plan prior to beginning any study.
- (3) Researchers must minimize damage to human remains.
- (4) Researchers must ensure that data are made available following publication to allow critical re-examination of scientific findings.
- (5) Researchers must engage with stakeholders from the beginning of a study and ensure respect and sensitivity to other stakeholder perspectives.