



WPI



Venice: Genesis of the City and its People

An Interactive Qualifying Project Report submitted to the Faculty of
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AUTHORSHIP PAGE

Each team member contributed equally towards the completion of this project. Without the full participation of each member and extensive teamwork the following project would not have been successful.

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ABSTRACT

Venetian law requires an archaeologist to report all objects found during municipal excavations. We designed a system to help analyze evidence from those reports. Manuscript transcriptions made by scholars at the Venice State Archive are not archived. We developed a website to promote U-Script, a manuscript transcription and search tool. Our historical data visualization system demonstrates the significance of historical evidence. Finally, we collaborated with the National Geographic-IBM Genographic Project to investigate the origins of Venetians by gathering DNA samples.

TABLE OF CONTENTS

Authorship Page.....	2
Acknowledgements.....	3
Abstract	4
List of Figures.....	7
Executive Summary.....	8
1 Introduction.....	11
2 Origins of the Venetian People.....	13
2.1 DNA Analysis as Tool for Lineage Investigation	15
2.2 Collaboration with the Genographic Project.....	16
2.3 Conclusions and Recommendations	17
3 Archaeology with ArchEasy	18
3.1 Problems with the Archaeological Process	19
3.2 Designing ArchEasy.....	21
3.3 Conclusions and Recommendations	25
4 Written History – the Importance of Manuscripts	26
4.1 Benefits of U-Script: Current State and Undeveloped Features	26
4.2 Promoting U-Script to Uncover the Origins of Venice	30
4.3 Recommendations	32
5 Visualizing the Evolution of Venice.....	33
5.1 Visualization System Design.....	33
5.2 Proof of Design Concept.....	34
5.3 Conclusion and Recommendations	35
6 Project Summary.....	36
Bibliography.....	37
Appendix A-DNA Supplement.....	41
Important Concepts-In Depth	41
Studies Incorporating DNA Analysis.....	41
Correspondence with David Comas.....	42

WPI Internal Review Board Application	53
DNA Sample Collection.....	60
Informed Consent Form—English.....	60
Informed Consent Form—Italian	63
Swabbing Instructions	66
Genographic Test Subject Information Card	67
Appendix B	69
Archaeology 20 Years ago, and Archaeology Now.....	69
Land and Water-Based Archaeology	69
Land Archaeology.....	69
Water-based Archaeology	70
Site Map.....	75
Appendix C	78
Digitalizing Manuscripts at Venice State Archive	78
Appendix D	83
Visualization System Design.....	83
Rationale for Choosing Maya	83

LIST OF FIGURES

Figure 1: A Diagram Representing Our Contribution in Finding the Origins of Venice	10
Figure 2. Path of Veneti Migration from Paphlagonia	13
Figure 3. Map of Theories of Venetian Origins.....	14
Figure 4: Examples of Forms Required to be Filled out for Different Layers of the Ground	20
Figure 5: An Example of ArchEasy Calculating the Archaeological Risk.....	21
Figure 6. Search Feature of ArchEasy	23
Figure 7: First Mockup of ArchEasy	23
Figure 8: Screenshot of ArchEasy's New Mainscreen	24
Figure 9: User Transcribing a Manuscript Using Boxed Words in the Transcription Assistant.....	27
Figure 10: User Adding His Search Results to His U-Script Project.....	28
Figure 11: Suggested Interface for the Archive Assistant	28
Figure 12: User Editing an Incorrect Transcription.....	29
Figure 13: Cross Relation Between User Credibility and Transcription Rank.....	30
Figure 14: Home Page of the U-Script Website	31
Figure 15: Screenshot of an Animation of Murano's Evolution that was Automatically Created by Our System Using Sample Input Data.....	34
Figure 16. Swabbing Instructions Included in DNA Sample Kit	66
Figure 17. DNA Sample Collection Kits	67
Figure 18. Front of Information Card.....	67
Figure 19. Back of Information Card	68
Figure 20: Foto Index Form	70
Figure 21: Layer Form and Tomb Form Index	71
Figure 22: Form Filled Out for Organic Objects	72
Figure 23: Form Filled Out for Objects Found in Tomb	73
Figure 24: Page One of Our Site Map.....	75
Figure 25: Page Two of Our Site Map.....	76
Figure 26: Page three of our site map.....	77
Figure 27: Manuscript, Written on Acid Paper, Destroyed by Mold	78
Figure 28: A Technician Scanning Manuscripts.....	82
Figure 29: Original Manuscript and Its Digital Copy.....	82

EXECUTIVE SUMMARY

Venice has transformed through centuries to evolve into the culturally rich city that it is today. Although part of the evolution is well documented in around 78km of shelves¹ of manuscripts, the information in these documents is very difficult to extract. Historians have created models to explain the evolution of Venice but have only hypothesized varying theories with inconclusive evidence. However, presently we can use the fields of archaeology, manuscript transcription and DNA analysis in completing the puzzle of the evolution of Venice and finding out the origins of its people.

Currently, archaeologists in Venice are required by the government to record information about all objects found during municipal excavations on large amounts of forms (see Appendix B). Data in these forms is difficult to search and analyze. Due to this fact, our goal was to create a system that would facilitate the process of managing and analyzing archaeological data. To accomplish this, we developed ArchEasy™, a prototype for a system that would centralize and digitalize archaeological data to increase its accessibility, as well as accelerate the analytical process. This will allow archaeologists to gather more information about the origins of Venice.

The Venice State Archive contains written records of the whole Venetian Republic dating back to around 12th century. However, these manuscripts are categorized by the type of record (such as land deeds, marriage certificates etc) and not by the place or person. In addition, the information that is gathered from manuscripts is not reusable, because the transcriptions are not archived. Fortunately, Worcester Polytechnic Institute students started a web based manuscript transcription system called U-Script. This system simplifies the research process for historians by archiving and making every transcription searchable by the public. However, lack of monetary and labor resources has prevented the complete implementation of this system. Therefore, to promote U-Script we created a website compiling all of its current features and potential capabilities.

Data-driven visualization can provide the ability to explore alternative hypotheses and visualize the impact of new information. For example, one might discover flaws or discrepancies in various data sources or gain a new and more complete understanding of the past by viewing the pattern of temporal and geographic change predicted by an accumulated set of historical evidence. Such evidence tends to fluctuate over time because of new discoveries made. Moreover, the sheer size of this data makes it impractical to visualize it manually. To tackle these issues we designed a system that would automatically visualize the evolution of Venice based on input data. Once the system is implemented it will produce an animation that will serve as a cohesive description of the origins of the Venice.

¹ Italy - Venice State Archive - Archives up to the Treaty of Campoformio, 27-06-2003 2003, 10/08 2008 <http://portal.unesco.org/ci/en/ev.php?URL_ID=7221&URL_DO=DO_TOPIC&URL_SECTION=201.html>

While the more recent history of the Venetians is known because of manuscripts and archaeology, there are gaps in the understanding of their very distant past. To address this problem we initiated collaboration with National Geographic and IBM in the Genographic Project, which aims to map the migratory paths of mankind using DNA analysis. Our team collected Venetian DNA samples to be included in the study. Once analyzed, the genetic similarities of Venetians to other regions of the world can be determined.

Our project leaves behind accomplishments, comprehensive recommendations and system designs including:

- Archaeological data management and manipulation system, ArchEasy, and its online demonstration.
- New website for promoting the manuscript transcription system, U-Script.
- Historical data visualization system as well as an animation of evolution of Venice.
- Interactive map representing various theories about the origins of Venetians.
- Collaboration with National Geographic-IBM in the Genographic project in the effort to find the true origins of Venetians.

Once these accomplishments are implemented and fully utilized we will have a better understanding of the origins of Venice and its people.

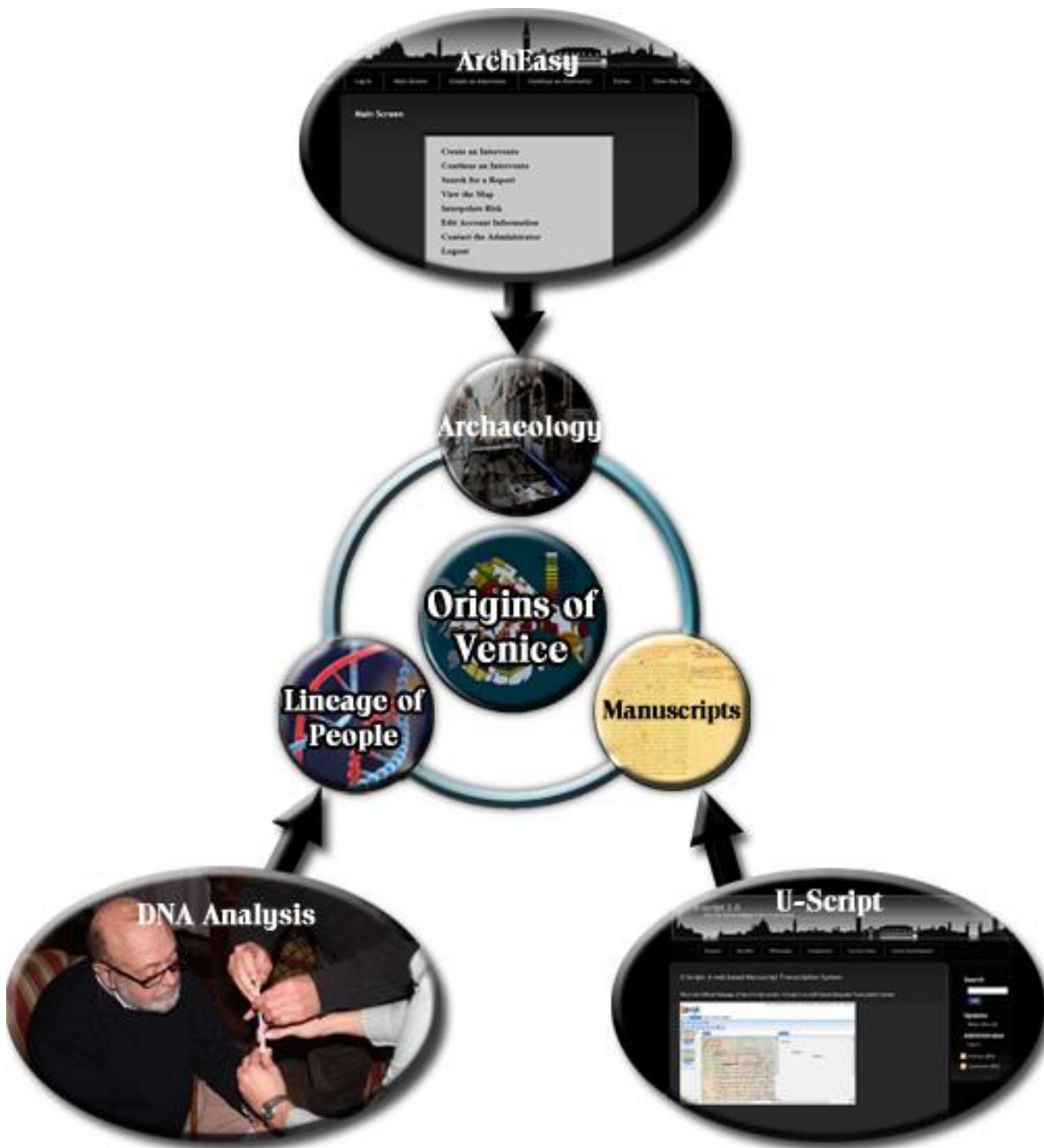


Figure 1: A Diagram Representing Our Contribution in Finding the Origins of Venice

1 INTRODUCTION

Mankind has always found intrinsic value in understanding its history. The analysis of archeological data and manuscripts has been proven important because it helps to understand the past. Along with the longing to know the history of their country, human beings also have an innate desire to know about their lineage. In fact, according to an article in “Genealogical Computing”, of the 128 million adult Americans who access the Internet, 24% report that one of their purposes is to research family history or genealogy. On any given day, some 600,000 Americans use the internet to research family history². DNA analysis is a relatively new technique that has appeased this urge to identify one’s lineage. Combining the history of a region with the origins of people who live there can open “the book” of amazing stories and give us insight into the past.

Venice is a city that contains a vast amount of history. The fact that there are many artifact-producing excavations done in Venice each year, as well as 78km of shelves³ of manuscripts held in the Venice State Archive, exemplify the wealth of information that the city possesses. With the passing of each year, clues to such mysteries as to when and how the Venetian islands formed are being partially unraveled with the help of archeological data and written documents. But as mentioned earlier, the knowledge of a city is not complete unless the origins of its inhabitants are known as well. Due to the variety of migrations that occurred throughout Europe, it is difficult to get an idea of where Venetians originated from. However, with new strides being made in DNA technology, our questions regarding the origins of Venetians are getting closer to being answered.

Efforts in fields of archaeology and manuscript transcription have brought us closer to understanding the origins of Venice. A prime example being the mandate imposed by the Venetian government that requires an archeologist be present at all municipal excavations due to the overabundance of artifacts underneath the city. Likewise, in order to make manuscripts more accessible, WPI started a web-based manuscript transcription project called U-Script, which archives and allows content searching of manuscript transcriptions. However, the program is not yet fully functional and any transcription work must be done in the Venice State Archive and re-transcribed as previous users do not leave a record of their transcribed work.

² Kory L. Meyerink, “14 Websites Preferred by Professionals”, Genealogical Computing 24.2 (2004)

<<http://www.ancestry.com/learn/library/article.aspx?article=9299>>.

³ Venice manuscript project site, April 9, 2008, Oct. 04, 2008 <<http://www.uscript.org/newhome.html>>.

Although there has been progress made towards understanding the origins of Venice, there still is no complete understanding of origins of Venice. This can be attributed to the following reasons:

1. The archaeological data present in the city has copious amounts of information that are buried under text and difficult to access. If data was centralized and easier to manipulate, analyzing the data would be less strenuous and more information could be gathered from archaeological evidence.
2. There is no system that archives manuscript transcriptions; hence people have to repeatedly transcribe the same documents. This not only wastes the time of any scholar that transcribes the same manuscript afterward, but it also prevents useful information about Venice's history from becoming public knowledge.
3. There has not been any DNA related research done specific to Venetians in order to uncover their lineage.

Each one of these fields – DNA, archaeology and manuscript transcriptions – are instrumental in discovering the origins of Venice, but unfortunately due to the factors listed above, the wealth of information each area possesses has not been utilized to its full potential.

Our Interactive Qualifying Project is focused on filling the above gaps in order to fulfill our mission. We designed a system called ArchEasy to centralize and easily manipulate the archaeological data recorded in Venice and showed its capabilities in an online demonstration. We initiated a collaboration with the National Geographic-IBM Genographic Project where we collected DNA samples of Venetian males and evaluated future project opportunities. We also worked on bringing prominence to U-Script by creating a new website to spur interest in sponsors for funding future projects that would lead to the development of this system into commercial software. Finally, we designed a system that would automatically create an animation of the evolution of Venice based on input data.

To better explain our project, the next four chapters will be divided by the topics: Origins of the Venetian People, Archaeology with ArchEasy, Written History – the Importance of Manuscripts and Visualizing the Evolution of Venice, respectively. Each chapter will contain an in-depth background section and a methodology section that explains the steps we took to achieve our goals.

2 ORIGINS OF THE VENETIAN PEOPLE

It is known that during the 5th century, the inhabitants of Roman cities such as Ravenna, Padua and Aquileia (mainland Veneto) fled the invasions of Attila the Hun, and took refuge in the Venetian Lagoon. Around a century later, the Lombard barbarians invaded, again forcing the people living in the Veneto region to take refuge in the Venetian Lagoon. However, this birth story of Venice does not answer the question of where Venetians came from. The question remains, how did they come to the Veneto region in the first place? There are many theories as to their origins and migratory paths, all based on evidence gathered from sources such as archaeological findings, written history and oral history.

The first prominent theory suggests that the Venetian people originated in Paphlagonia, a region in Northern modern-day Turkey, migrating through the Balkan region as shown in Figure 2 below. There is extensive support for this theory. Archaeologists have found similar artifacts in the Veneto region and Paphlagonia.⁴ Ancient historians such as Strabone, Tito Livio, Erodoto and Polibio make reference to the Venetians originating from the Paphlagonian region.⁵ The Veneti are connected to the Trojans as well. As per legend, the Veneti moved from the area around the ancient city of Troy (Southeastern Europe, shown in Figure 2 below) to the Veneto region under the direction of the mythical Antenor, alleged founder of Patavium (modern day Padua).⁶ Clearly there are strong suggestions that the Venetian people originated in the Paphlagonian region.



Figure 2. Path of Veneti Migration from Paphlagonia⁷

⁴ Miozzi, Eugenio. Venezia nei Secoli-La Città. Casa Editrice. Venezia. 1957. Page 29.

⁵ Miozzi, Eugenio. Venezia nei Secoli-La Città. Casa Editrice. Venezia. 1957. Page 31.

⁶ Hazlitt, C. W. "History of Venice." History of the Venetian Republic: Her Rise, Her Greatness and Her Civilization. London: Smith, Elder and Company, 1860. 1.

⁷ Miozzi, Eugenio. Venezia nei Secoli-La Città. Casa Editrice. Venezia. 1957. Page 31.

Theories are also derived from references to the Veneti people. The Veneti were an ancient group of people, living throughout Europe, having connections with the Venetian people.⁸ Julius Caesar encountered the Veneti tribe of Brittany, an area in modern day Northwest France, shown in Figure 3 below.⁹ There are also references to the “Vendi” along the rivers of the Baltic region in Northeastern Europe.¹⁰ Very similar names are scattered throughout Europe. This gives rise to the theory that the Veneti first settled in central Europe, and spread out to areas like Brittany, the Baltic and the Veneto region.¹¹

These theories are shown below in Figure 3. Either some theories are incorrect, or the Venetian's true origin story is a blend of some of them. Fortunately, in this age of technology the relatively new field of DNA analysis can be used to test these theories.

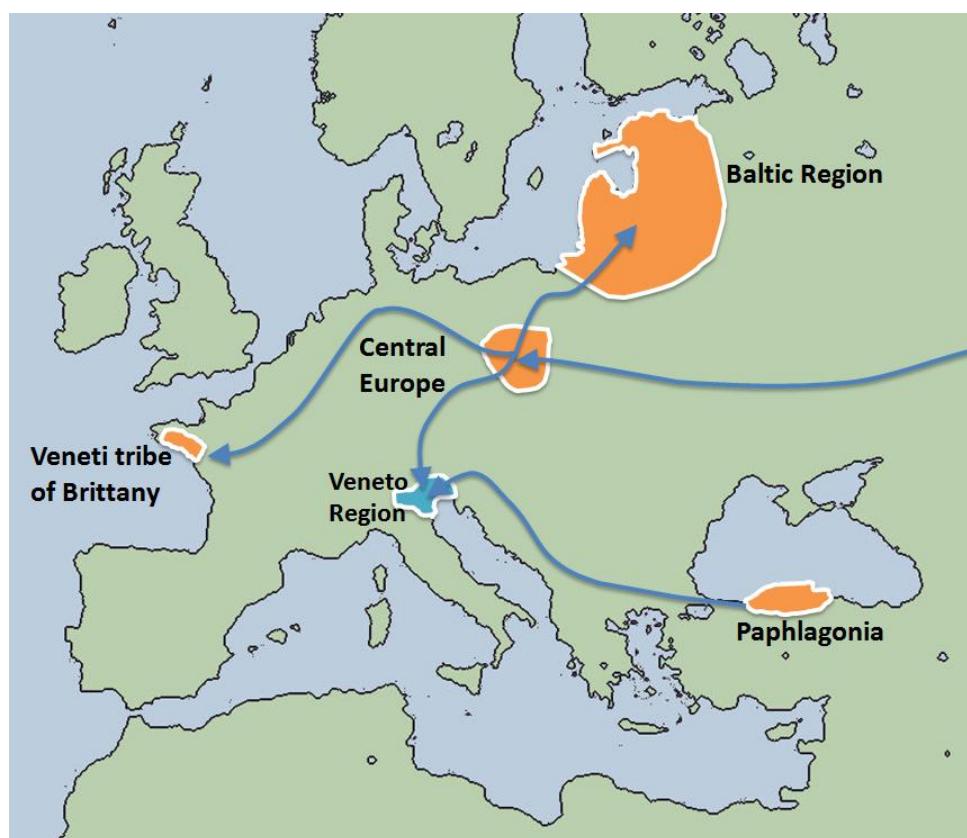


Figure 3. Map of Theories of Venetian Origins¹²

⁸ <http://www.veneti.info/en/articles/popular-scientific/39-veneti-mysterious-people>

⁹ <http://www.historynet.com/julius-caesar-in-britain.htm>

¹⁰ Burchett. A Complete History of the Most Remarkable Transactions at Sea. 1720. Page 153.

¹¹ Miozzi, Eugenio. Venezia nei Secoli-La Città. Casa Editrice. Venezia. 1957. Page 33.

¹² A similar map has been produced in Google's Click2map, which displays these theories in an interactive manner. To view the interactive version, go to the following website: http://www.click2map.com/maps/ecarlson/Venetian_DNA_investigation

2.1 DNA ANALYSIS AS TOOL FOR LINEAGE INVESTIGATION

Recent advances in DNA sequencing technology have made it possible for DNA to be used as a tool to investigate a person's lineage. DNA is found in all human cells, and defines everything about a person, from gender to hair color and height. While each person's DNA is unique, there are certain sections of DNA that are characteristic of a person's ethnic group. These sections can be used by genetic researchers to find similarities between different groups of people. The analysis cannot pinpoint a precise region and time of origin, say a specific village at a specific time, but rather tells how closely related genetically a group of people are to another group. Researchers can determine how closely related a group of people are to one another by comparing their DNA samples, thus giving a more complete understanding of the origins of those people.

DNA analysis has been a key tool in past studies investigating the origins of different ethnic groups from around the world. In 1995, Kolman, Sambuughin and Bermingham applied a type of DNA analysis to investigate the genetic link between the modern day Mongolian people and the North American Native populations, to better understand how the New World was populated.¹³ Through the analysis, researchers concluded that Mongolian populations had a significant maternal¹⁴ genetic influence on New World populations. The study did not give definite, concrete knowledge about the connection of the Mongolians to the New World population, but gave strong hints as to their influence, which greatly contributes to the understanding of how the New World was populated. Even with the limited archaeological and manuscript data available, DNA analysis allowed researchers to make better hypotheses about the migratory paths of people into the New World.

There are many more studies using DNA analysis to better understand the genetic past of a group of people. The technology has great potential to substantially expound upon the knowledge we have on the origins of the Venetians. Unfortunately, DNA analysis is very expensive because it requires sophisticated equipment and expensive chemical reagents. In order for us to find the origins of Venetians we would have to take DNA samples from Venice and other regions of the world where venetians might have migrated from, and compare them. The larger the sample size, the higher the study's accuracy. It is clearly a daunting challenge to organize a single study to find the origins of the Venetian people through DNA analysis. Fortunately, our collaboration with the Genographic Project allows us to easily apply DNA analysis to the investigation of Venetian origins.

¹³ Kolman, C. J., and N. Tuross. "Ancient DNA Analysis of Human Populations." *American Journal of Physical Anthropology* (2000).

¹⁴ Maternal DNA testing, called mitochondrial DNA (mtDNA) testing, traces DNA information passed down from mother to child, versus paternal DNA testing, called Y-chromosomal analysis which traces DNA information passed down from father to son. See Appendix A for more information.

2.2 COLLABORATION WITH THE GENOGRAPHIC PROJECT

In 2005, National Geographic and IBM began the five year, forty million dollar Genographic Project to better understand the migration story of the human race by collecting and analyzing DNA samples from ethnic groups all over the world.¹⁵ Our team established a collaboration with the Genographic Project through Professor David Comas, a Genographic Principle Investigator at the Universitat Pompeu Fabra in Barcelona, Spain. The team collected Venetian DNA samples for use in the Genographic Project with the agreement that the Venice Project Center will get the results and analysis regarding the migratory paths of Venetians.

Before sample collection could take place, consent forms were translated into Italian, information cards were created and most importantly, participants were contacted. Since this study included human subjects, an application was submitted to the WPI Internal Review Board, which was approved. Examples are shown in Appendix A. The Genographic Project's protocol required collecting cheek swab samples from males only, since they carry both maternal and paternal DNA markers, over the age of 18 whose grandparents were from the Venice region. Professor Comas has agreed to compare the Venetian DNA samples we collected to samples collected from other regions, in order to investigate the validity of the many different theories presented above. The genetic similarity of Venetians and inhabitants of the other regions will be determined, and thus the likelihood that Venetians came from that region. It is important to remember that the analysis cannot tell if the Venetians migrated from a specific region at a specific time, but rather how closely related they are to another group, and the approximate time at which they diverged genetically. From this information, better hypothesis can be formed about the migratory history of Venetians.

¹⁵ The Genographic Project, 2008, National Geographic Society. 2008
<<https://www3.nationalgeographic.com/genographic/overview.html>>.

2.3 CONCLUSIONS AND RECOMMENDATIONS

Our team collected 39 Venetian DNA samples, and completed all the necessary preparation details outlined above. One of the most difficult parts of DNA sample collection is finding suitable test subjects. To reach the needed 100 samples for the study, different methods to contact subjects could be used, such as flyers or radio. Because of the high costs associated with DNA sequencing and analysis, we recommend that the Genographic Project collaboration be pursued in full, especially since the Genographic Project group is covering the costs of the DNA sampling material, and performing all testing and analysis. It would be very expensive to establish a lab to do the same thing at WPI. We recommend completing all required DNA sampling, which could include collecting DNA samples from other areas in Europe connected to the Venetians, to help fill in any gaps of the Genographic Project sample database. DNA sampling can be completed by IQP groups, not just in Venice, but at other project sites as well. This collaboration established between the WPI Venice Project Center and the Genographic Project can give substantial weight to some of the theories, thus giving a more complete understanding of the origins of the Venetian people.

3 ARCHAEOLOGY WITH ARCHEASY

A major discipline that has helped in understanding the history of a given area is archaeology. An instance of this can be found in the work of British adventurer Sir Austen Henry Layard who discovered the lost palace of Sennacherib in 1849 along with another palace that contained the library of Ashurbanipal which harbored 22,000 inscribed clay tablets.¹⁶ According to *Nineveh – Encyclopedia II*, “the study of the archaeology of Nineveh reveals the wealth and glory of ancient Assyria under kings such as Esarhaddon and Ashurbanipal”¹⁷. (For more information about archaeology, refer to Appendix B)

In Venice, archaeology has given similar insight into the city’s past. Some of the earliest evidence suggests that the Venice Lagoon dates back to as early as 3500 BC¹⁸. In addition, one of the more interesting artifacts that has been found under the Venice Lagoon is a boat and the remains of pottery and other artifacts that date back to the 5th century AD¹⁹. According to the article “More on the origins of Venice”, “the boat was most likely built in the span of years between AD 425 and 550. This is the first boat from the late Roman world – the time when the chronicles say the history of the city began”²⁰. Crouzet-Pavan states that “It is true that a large number of Roman objects and other materials were found in the northern lagoon, in particular on Torcello...few authors have gone so far as to posit the existence of a stable Roman presence in the area”²¹. These artifacts have resulted in archaeologists obtaining a better understanding of the lives of earlier Venetians as well as given them insight into the origins of Venice.

Though archaeology has been successful in Venice, there are still issues in the archaeological process, primarily regarding data analysis. These issues limit the amount of information that can be gathered from vast amount of archaeological data collected hindering the process of discovering the origins of Venice.

¹⁶ [Nineveh: Encyclopedia II - Nineveh - Archaeology](http://www.experiencefestival.com/a/Nineveh_-Archaeology/id/1803858), 09/25 2008 <http://www.experiencefestival.com/a/Nineveh_-Archaeology/id/1803858>.

¹⁷ [Nineveh: Encyclopedia II - Nineveh - Archaeology](http://www.experiencefestival.com/a/Nineveh_-Archaeology)

¹⁸ Amerman, 501p. 7

¹⁹ Amerman, 501 p. 1

²⁰ Amerman, 501p. 3

²¹ Crouzet-Pavan, p. 3

3.1 PROBLEMS WITH THE ARCHAEOLOGICAL PROCESS

In Venice, all archaeological data is required by the Soprintendenza Archeologica²² to be recorded on eleven distinct forms (see Figure 4). The recording process is very tedious and arduous due to each form requiring a myriad of minute details. These details vary for each form but can include the height of an object, where it was found, whether another object was leaning on it, and a slew of other particulars. Furthermore, a great deal of the information from these artifacts gets buried in text, which makes it difficult to find anything specific. Additionally, this abundance of reports and buried information makes cross-referencing²³ other reports that could provide more information on a specific topic nearly impossible.

Due to the amount of details present in forms, manipulating and analyzing data they contain can be very difficult. An example of this is in calculating archaeological risk where archaeologists manually assess the likelihood that an artifact will be found in a specific area. The archaeological risk is determined by the quantity and size of artifacts found near the given area. Such risk decreases as the radius from the excavation site increases and the size of artifacts decrease. For example, finding a piece of a wall would increase the risk more than finding a broken cup. As can be imagined, calculating archaeological risk requires data about each archaeological site in a surrounding area to be collected and analyzed, so the problems listed in the previous paragraph drastically hinder analysis such as archaeological risk. This poses a problem because if the risk of a certain area is deemed low when it is high in actuality, then possibly useful artifacts could be ignored. Due to these issues, the benefits of a system that could facilitate this process of recording archaeological data cannot be understated.

²²This is the archaeological superintendant in Venice. They oversee all archaeological projects in the city.

²³The finding of similar information in different sources.

SCHEDA PER LA CLASSIFICAZIONE DI MATERIALI ORGANICI						N CATALOGO GENERALE N CATALOGO INTERNAZIONALE SOPRINTENDENZA					
MINISTERO PER I BENI E LE ATTIVITA' CULTURALI DR. MARCO BORTOLETTO Via L. Bassiotti 6/7 30172 Mestre Ve P. Iva 03073310272						LOCALITÀ ANNO AREA SETTORE QUADRATO/ QUOTE US Venezia, Murano, Fondamenta 2008 AMBIENTE 102 Marea 33					
Località:		Scheda n°:				PIANTE SEZIONI FOTO DIAPO N° FOTO		TABELLE MATERIALI			
Sigla:		Campata:	Vano:								
US:		n° reperti:	Scheda cumulativa:								
Materiale:		Epoca:									
Forma/oggetto: Classe: Tipo: Descrizione:						DEFINIZIONE Lacelli di pavimentazione in laterizi contemporanei					
						CRITERI DI DISTINZIONE Colore, manica, consistenza					
						MODO DI FORMAZIONE ANTRÓPICO COMPONENTI GEOLOGICHE COMPONENTI ORGANICHE COMPONENTI ARTIFICIALI Laterizi					
						CONSISTENZA COLORE MISURE Solido Rosso scuro 26x12,5x5,5 cm					
						STATO DI CONSERVAZIONE Medioce					
						DESCRIZIONE Lacelli di pavimentazione in laterizi contemporanei prodotti industrialmente in pessimo stato di conservazione parzialmente coperti da uno strato di malta (scarto di lavorazione di cantiere US 112)					
						OSSERVAZIONI UGUALE A SI LEGA A GLI SI APPoggIA SI APPoggIA COPERTO DA COPRE ANTERIORE_A TAGLIATO DA TAGLIA RIEMPIUTO DA RIEMPIE 101.112 103 101.112 POSTERIORE_A 103					
						INTERPRETAZIONE Parzialmente coperti da uno strato di malta (scarto di lavorazione di cantiere - US 112) da interpretarsi come il calpestio degli anni trenta della vetreria chiusa in anni recentissimi.					
						ELEMENTI DATANTI Laterizi contemporanei di produzione industriale sotto 10/12 cm dal calpestio attuale.					
n° inventario:		Foto:									
n° disegno:											
n° foto col:											
n° negativo col:											
n° foto b/n:											
n° foto b/n:											
note:											
Responsabile dello scavo:		Fotografo:									
Direzione tecnica:		Compilatore della scheda:									

Figure 4: Examples of Forms Required to be Filled out for Different Layers of the Ground

Although not Venice-specific, the most recent attempt to facilitate the process of logging archaeological data came in the form of a project called ETANA-DL. The purpose of ETANA-DL was to harvest various kinds of archaeological data into a digital library²⁴. According to “ETANA-DL: A Digital Library for Integrated Handling of Heterogeneous Archaeological Data”, “Archaeological research results in the production of vast amounts of heterogeneous data—field records, images, GIS records, VR models, etc. To handle these, most projects use some kind of information system...This makes it very difficult for archaeologists to perform collaborative research because interoperability between such systems is limited.” The architecture of ETANA-DL, involved an initial set of archaeological sites with information on the amount and type of artifacts present at the site. Although this system has not yet been implemented, the ideas presented in it provide a plethora of useful techniques. A system like this would greatly benefit Venice archaeologists.

²⁴ Unni Ravindranathan, Rao Shen, Marcos Andre Goncalves, Weigu Fan, Edward A. Fox, James W. Flanagan, "ETANA-DL: a digital library for integrated handling of heterogeneous archaeological data," (2004) . EBSCO :< <http://csdl2.computer.org/comp/proceedings/jcdl/2004/2493/00/24930076.pdf>>.

Based on our research, the primary areas that had room for improvement were the following:

- Sifting through the copious details in forms for useful information is difficult and tedious.
- The manipulation and analysis of data is very difficult due to the way the data is stored and organized.

As stated earlier, there has been an abundance of information about the past that has come from these artifacts. If there was a system to help analyze the data about these artifacts and make it easier to access, then it would uncover even more information about the origins of Venice. This is where our system comes in.

3.2 DESIGNING ARCHEASY

We have designed a system that addresses the issues above by centralizing archaeological data in a web-based application. This system, ArchEasy, accurately visualizes recorded *intervent²⁵* on a map of Venice. Along with this feature, the system has a sophisticated search function that gives archaeologists the ability to easily access their reports. The system will also be able to analyze archaeological data to do such things as increasing the accuracy of calculating archaeological risk (See Figure 5) and grouping artifacts by different characteristics to recognize commonalities.

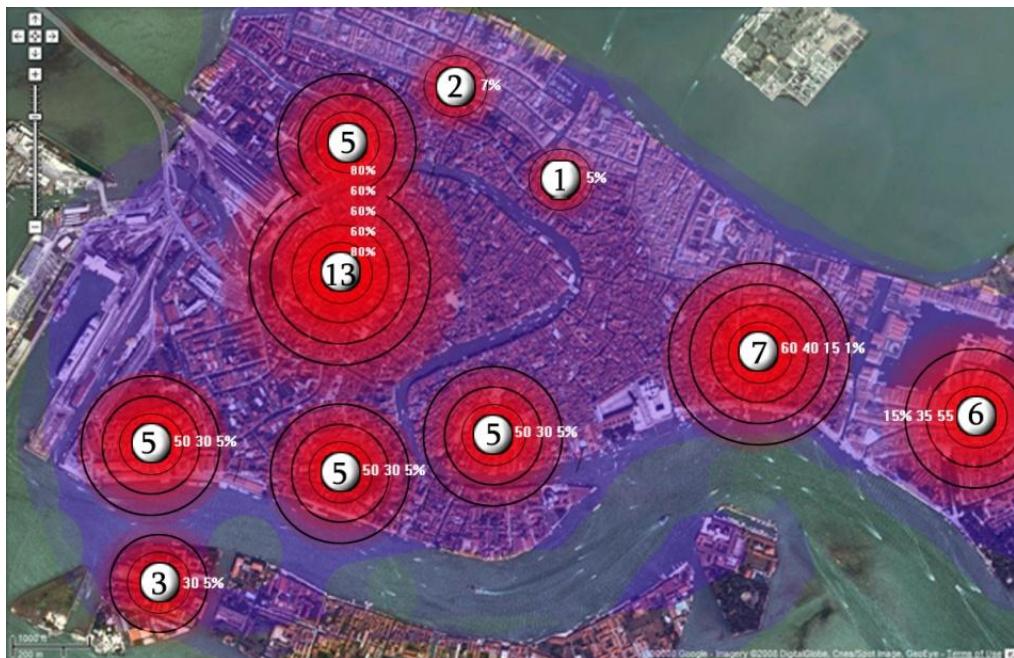


Figure 5: An Example of ArchEasy Calculating the Archaeological Risk.

²⁵ A job that an archaeologist is given where they perform excavations. Singular form: *intervento*

To first establish preliminary system requirements we created use cases²⁶ and a flowchart (refer to Appendix B) that demonstrated how the first prototype of the system would work. To further expound upon our ideas for system requirements and better tailor ArchEasy to the needs of its users, we held a series of interviews with two practicing archaeologists in Venice, Dr. Marco Bortoletto and Dr. Alberto Zandinella. We gathered the following system requirements from them:

- Ability to record excavation information into online forms.
- Ability to print separate forms as well as the entire *intervento*.
- Ability to access an *intervento* by clicking on its corresponding dot on the map. Once clicked upon, various forms that are associated with that *intervento* would be displayed.
- Final location of an *intervento* is triangulated from the GIS²⁷ coordinates of artifacts found at that *intervento*.
- Ability to search for forms by typing in search keywords and selecting kind of data to be displayed. (i.e. the object's depth, its location, its layer, and so on).
- Hierarchy of forms organized in a manner that would be most intuitive to archaeologists (See Appendix B).

The ideas that were suggested by our team and approved by the practicing archaeologists were the following:

- The ability to calculate archaeological risk of a given area.
- Ability to group artifacts by categories such as date, place found, origins, material, and the layer and depth where the object was found.
- The ability to map any search results.
- The ability to tag forms with keywords so that whenever a word that matches the tag on the form is searched for, then the form will appear in the search result.

To design some of the functionalities mentioned, we looked at other successful websites that had similar features. The feature of clicking on the map to create an *intervento*, was integrated using Click2Map's²⁸ API²⁹ because Click2Map encompasses the functionality needed for our system. The search functionality was based upon Softslate³⁰, because it allows users to choose the type of data to be returned in the search results, as seen in Figure 6 below.

²⁶ A detailed description of a system's functionality that list what will happen if a user performs a certain action

²⁷ Geographic information system, captures, stores, analyzes, manages and presents data that refers to location.

²⁸ <http://www.click2map.com>

²⁹ The application programming interface allows easy integration of functionality of provided software.

³⁰ The web-based application meant for managing ecommerce sites.

Select the type of data to be returned:

<input checked="" type="checkbox"/> Date	<input checked="" type="checkbox"/> Time	<input type="checkbox"/> Texture
<input type="checkbox"/> Location	<input type="checkbox"/> Description	<input checked="" type="checkbox"/> Color
<input type="checkbox"/> Layer	<input checked="" type="checkbox"/> Type	<input type="checkbox"/> Analysis
<input checked="" type="checkbox"/> Depth	<input type="checkbox"/> Century	<input type="checkbox"/> Form
<input type="checkbox"/> Image	<input type="checkbox"/> Site	<input type="checkbox"/> Tags

Search Keyword:

Search Results

N	Date	Time	Type	Color	Depth
1	08-12-13	13:32	Stone	Blue	2 feet
2	08-12-10	13:32	Plastic	Red	3 feet
3	08-12-12	13:32	Ceramics	Yellow	12 feet
4	08-10-12	13:32	Stone	Grey	12 feet
5	07-12-12	13:32	Glass	Green	10 feet

Figure 6. Search Feature of ArchEasy

Below are screenshots of our preliminary (Figure 7) and final prototype (Figure 8)

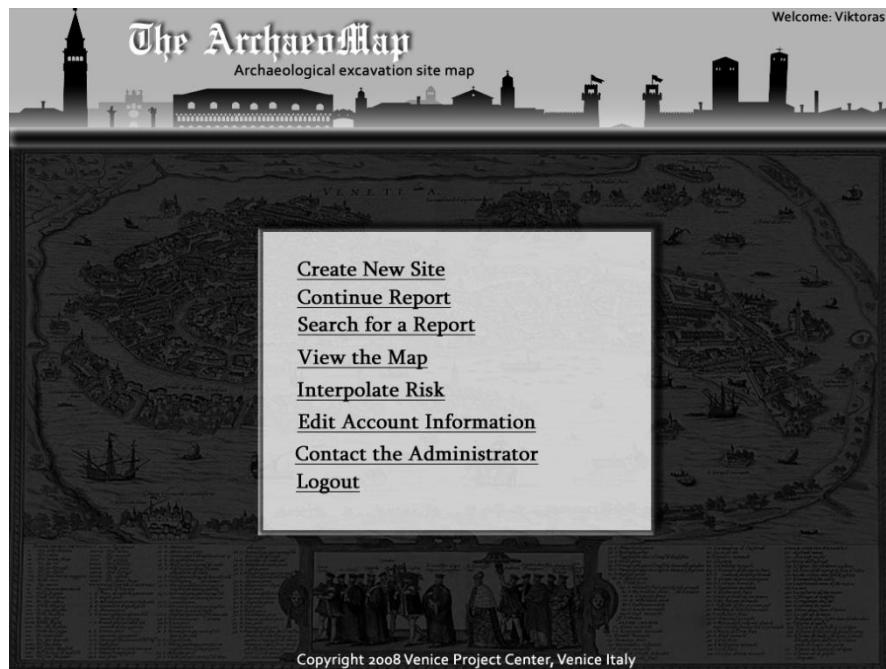


Figure 7: First Mockup of ArchEasy

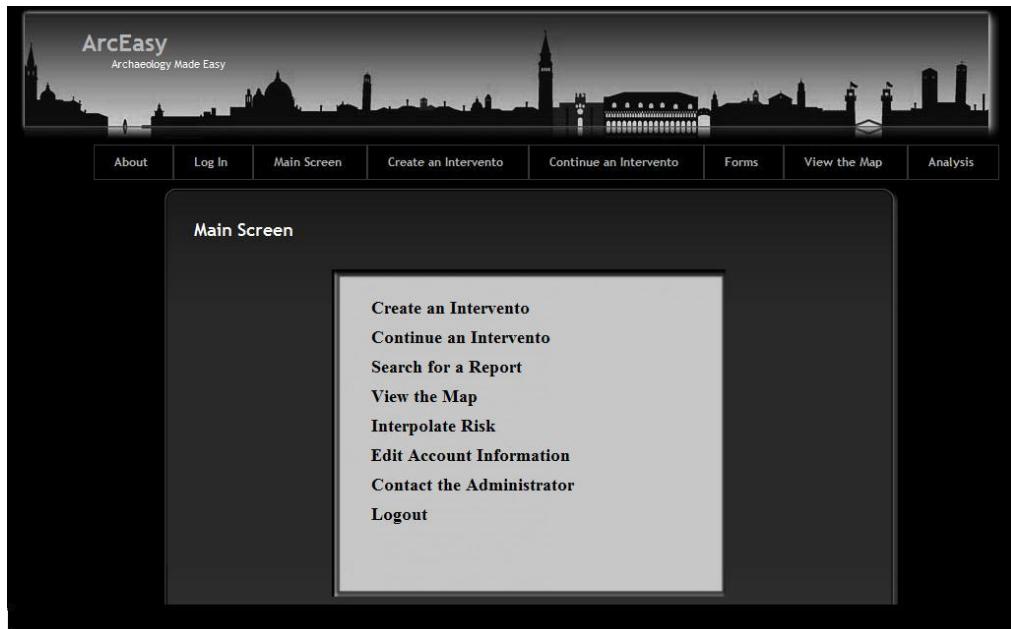


Figure 8: Screenshot of ArchEasy's New Mainscreen

With the requirements completely established, we created a demo for ArchEasy that would accurately demonstrate some of its functionalities. The primary functionalities that we wanted to highlight were the system's ability to search through forms, its ability to map *interventi*, and its ability to analyze archaeological data. We decided to display these abilities because these were the areas that most concerned the practicing archaeologists we interviewed. In order to make the most convincing deliverable, a Content Management System (CMS)³¹ was used because it allows easy website creation and management. Out of the multiple CMS choices, we agreed upon using WordPress due to its relatively easy learning curve and capabilities. The system demo is present on the website: <http://archaeology.veniceprojectcenter.org>

³¹ A CMS is a web-based application for simplified creation and management of a website.

3.3 CONCLUSIONS AND RECOMMENDATIONS

From this project, we were successful in establishing the needs of practicing archaeologists in Venice and ascertaining the capabilities that they would like to see in a system such as our own. Unfortunately, we were only able to create a design of the system, which will not be functional until implemented. This will require very adept computer science programmers because the system requirements and functionalities are very complicated. As well as adept computer programmers, the system needs to be properly promoted as well. In order for the system to reach its maximum potential, it is imperative that archaeologists throughout the city of Venice are made privy to its uses and benefits. A system like this will greatly expedite the amount of information that can be extracted from an artifact, thus providing more insight into Venice's past and bringing archaeologists a step closer to discovering the origins of Venice.

4 WRITTEN HISTORY – THE IMPORTANCE OF MANUSCRIPTS

Manuscripts are historical unpublished documents, which include correspondence notes, diaries, literary drafts, financial records, historical maps etc. The information in these documents is extremely valuable in combining clues that could lead to a better understanding of origins of a place. Unfortunately, since manuscripts are hand written documents it is difficult to extract this information, and as such, scholars must transcribe these documents.

The Venice State Archive works towards the organization and preservation of Manuscripts in Venice (see Appendix C). They preserve “the entire documentary heritage of the Venetian Republic – covering 78 kilometers of shelving.”³² For a speedier discovery of the origins of Venice we need to extract useful information from the massive collection of manuscripts at the Venice State Archive. Currently, users must search through the Archive index to find different manuscripts and the user must transcribe the document in the Venice State Archive. Once complete, the manuscript is returned, and the user takes the transcription and no copy of the transcription is stored at the Venice State Archive.

To solve the problems stated above, Worcester Polytechnic Institute students have started a project called U-Script³³. It is “an online software application to assist archivists and historians in transcribing ancient manuscripts into digital form.”³⁴ Unfortunately, this project is not refined enough for public use and it needs better promotion to gain widespread acceptance in the scholarly community of transcribers.

4.1 BENEFITS OF U-SCRIPT: CURRENT STATE AND UNDEVELOPED FEATURES

Currently, every user transcribes documents for personal use but does not leave behind a copy for the community of transcribers. Therefore, when another scholar needs to transcribe the same manuscript, he has to duplicate the effort and start from scratch. U-Script helps a user to make electronic transcriptions and saves these transcriptions for future use, thereby, reducing duplication of effort. Figure 9 shows the ‘Transcription Assistant’ interface being used to make transcriptions which are being automatically saved on the U-Script database.

³² Italy - Venice State Archive - Archives up to the Treaty of Campoformio, 27-06-2003 2003, 10/08 2008
<http://portal.unesco.org/ci/en/ev.php?URL_ID=7221&URL_DO=DO_TOPIC&URL_SECTION=201.html> .

³³ www.uscript.veniceprojectcenter.org

³⁴ www.uscript.org

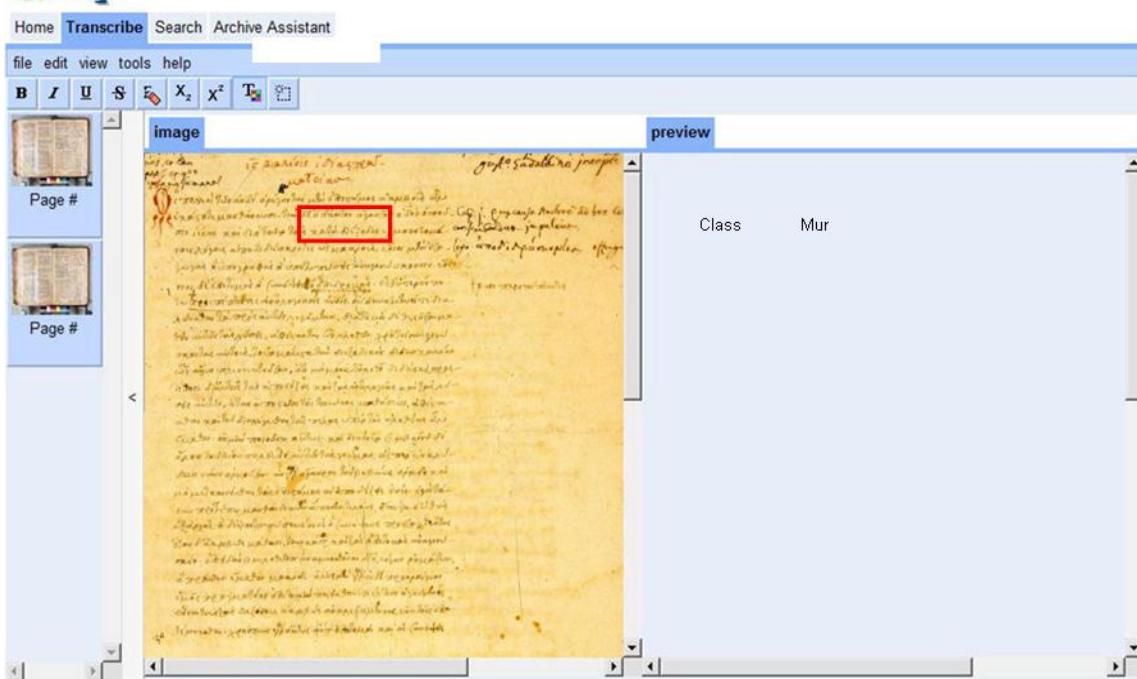


Figure 9: User Transcribing a Manuscript Using Boxed Words in the Transcription Assistant

Currently, manuscripts are organized by the type of record they contain (land deeds, marriage certificates, financial records etc.) and not by the place or person to which they pertain. Every electronic manuscript that is transcribed (as shown in Figure 9) generates searchable content and makes it possible for the user to get results that are relevant to their research subject. This feature of U-Script has not been implemented yet.

U-script provides an ‘Archive Assistant’ that lets us store manuscripts online. Storing documents electronically using U-script gives us the ability to associate descriptions to manuscripts, for example tags³⁵ to make them searchable. Figure 10 shows a scholar searching for information on ‘Murano’ and adding the manuscripts of interest to his or her U-Script project.

³⁵ Tags are keywords that are attached by users to any item of interest; a users can search for tags in the database along with words transcribed from the manuscript

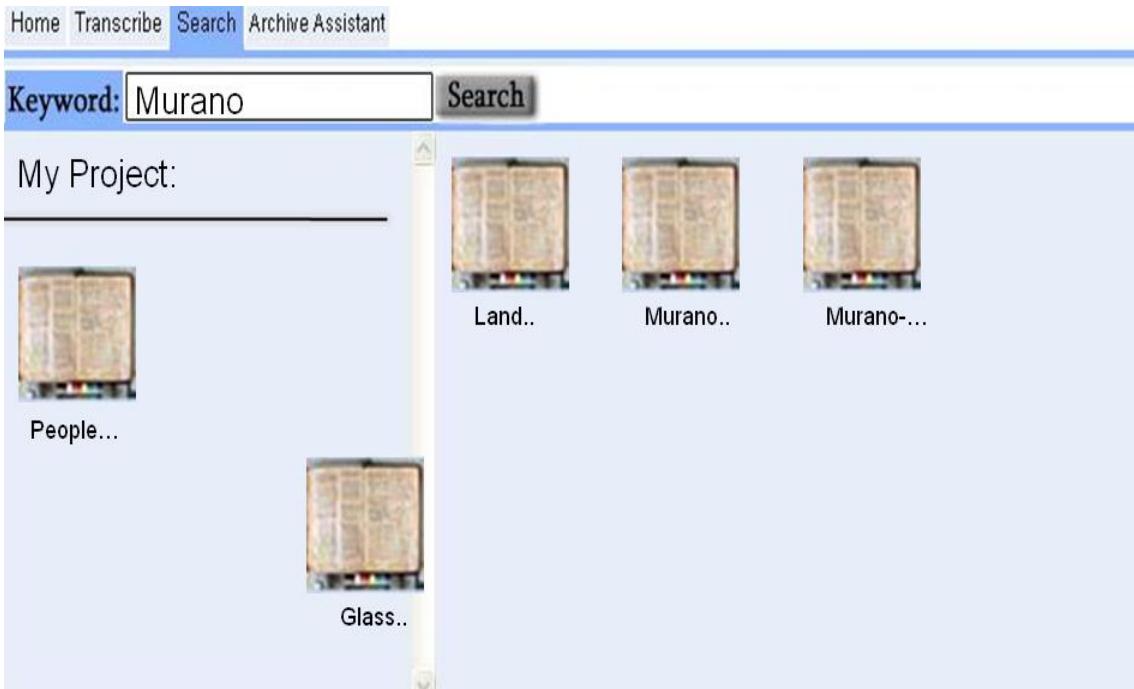


Figure 10: User Adding His Search Results to His U-Script Project

Currently, the archive assistant exists only in the form of an interface. The application has not been implemented to reflect the functionalities of the interface.

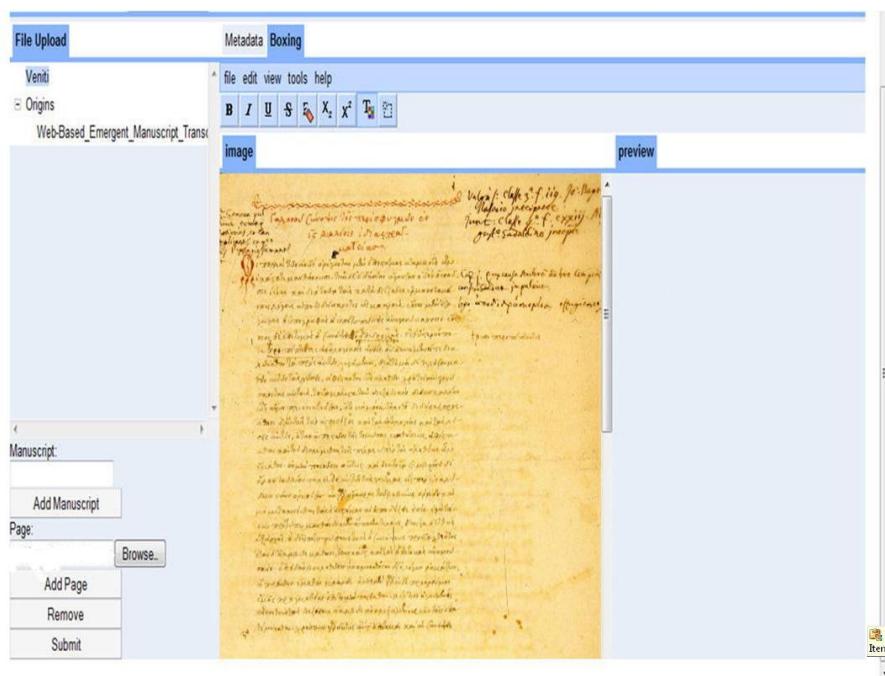


Figure 11: Suggested Interface for the Archive Assistant

U-Script also provides us with the ‘Contribution Accountant’, a tool to assign credibility to the users of the system and to the transcriptions that are stored in the system. Figure 12 shows a user correcting a previous transcription (‘Class’) to his suggested transcription (‘Glass’)

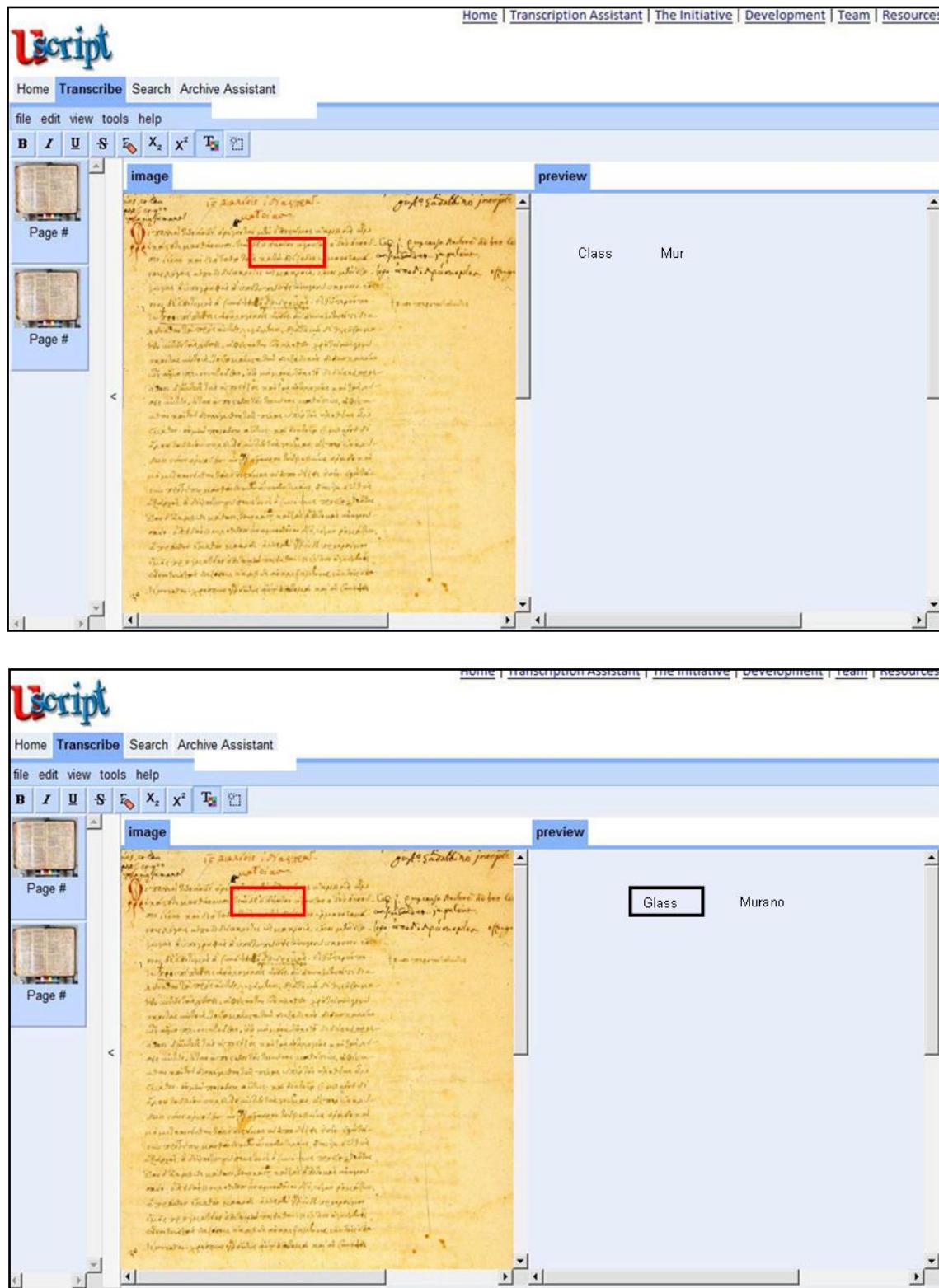


Figure 12: User Editing an Incorrect Transcription

Currently, the refinements of transcriptions are based on the number of approvals given to particular version of a transcription. Research papers have failed to mention a direct relation between the transcriber (user of the system) and the ranking of the transcription. We evaluated this as a major design flaw in a system that ranks its users and therefore suggested that credibility of user be a criterion in terms of ranking transcriptions. Figure 13 shows the relation; a ‘certified’³⁶ user’s transcription will take precedence over multiple amateur users transcriptions. This component of U-Script still remains a concept and has had no technical development.

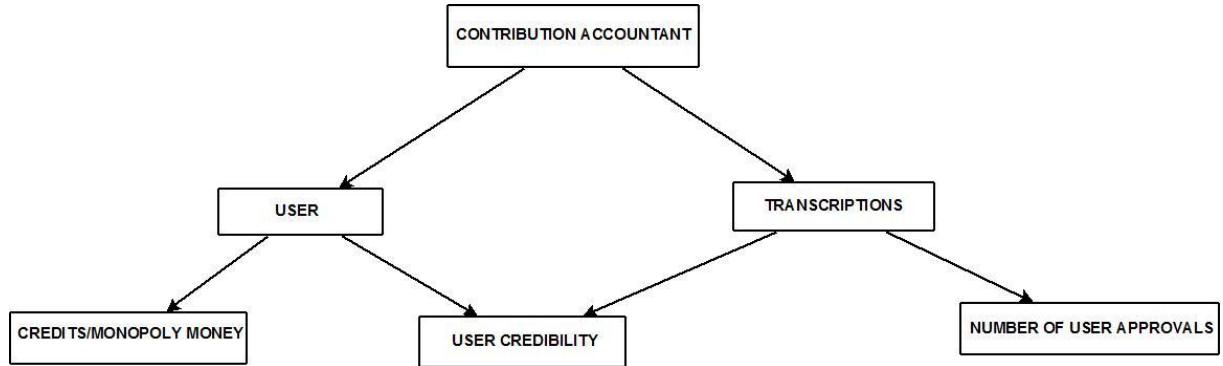


Figure 13: Cross Relation Between User Credibility and Transcription Rank

4.2 PROMOTING U-SCRIPT TO UNCOVER THE ORIGINS OF VENICE

In order to better represent this system to the public we started work on a Content Management System (CMS)³⁷ based website dedicated to U-Script. The delay in the development of U-Script can be attributed to the frequent change in the technologies that have been used to develop the project³⁸ and the lack of monetary funding for the project. Currently, effort is required in making a better user interface for the system so it can be used by historians and archivists. However, even after the initial release of the software, it will take time and effort to develop the missing concepts of U-Script, as stated previously.

³⁶ Certified user is an experienced transcriber who is deemed as a credible source by the Venice State Archive.

³⁷ See footnote 31, page 21

³⁸ U-Script: an AJAX-based Online Manuscript Transcription Service. Cafferelli, Piper and Sutman. 2008.

Currently, much of the documentation pertaining to U-Script is very technical and is suitable for readers with a background in computer science. Our website³⁹ aims to gather all the scattered resources about U-Script from the internet and offline sources to provide a comprehensive overview of the system to any interested parties. The website discusses the purpose, benefits and philosophy behind the U-Script system. It discusses the design and current state of the system and what the future development plans are. These attributes advertise our project to future sponsors, developers and to scholars who transcribe manuscripts and might want to help promote our cause. Figure 14 is a screenshot of the home page of our website, designed graphically in accordance with the Venice 2.0 theme⁴⁰.

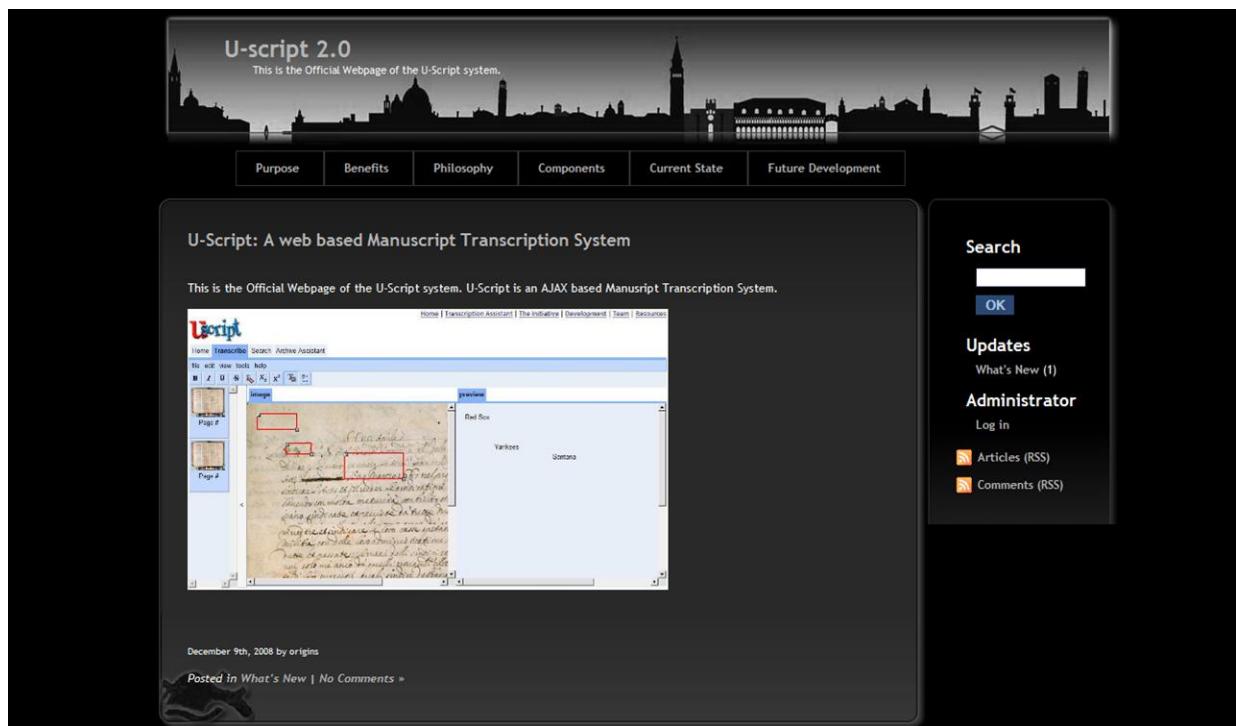


Figure 14: Home Page of the U-Script Website

A content management system based website can be maintained by users with minimal web development skills and this was the leading cause of our current web-design decision. The website serves as a forum where future developers can post latest developments regarding the U-Script system with minimal time lag. This initiative will hopefully spur interest in sponsors and developers to provide the necessary resources for the continued development of U-Script. Over time U-Script can become a fully functional open source⁴¹ system that will help speed up the analysis of manuscripts and uncover the mystery behind the origins of Venice and its people.

³⁹ U-Script website at uscript.veniceprojectcenter.org

⁴⁰ <http://www.venice2point0.org/>

⁴¹ Open source is a development methodology, which offers practical accessibility to a product's source (goods and knowledge), in our case the Software code.

4.3 RECOMMENDATIONS

Our investigation of the manuscript transcription process in Venice has led to a conclusion that we need U-script to simplify and improve the current manuscript transcription process. The system already has data, in the form of digital manuscripts and transcriptions which are being made available by the Venice State Archive (see Appendix C). At this point the majority of our efforts should focus on gathering monetary and labor resources for the development of U-Script to speed up the process of adopting electronic manuscript transcription.

5 VISUALIZING THE EVOLUTION OF VENICE

ArchEasy and the U-script systems bring data into one location and allow easy searching and some analysis. Both are important functionalities for assessing historical evidence from these data sources. However, data-driven visualization can provide the ability to explore alternative hypotheses and to visualize the impact of new information. For example, one might discover flaws or mismatches in various data sources or gain a new and more complete understanding of the past by viewing the pattern of temporal and geographic change predicted by an accumulated set of historic evidence.

5.1 VISUALIZATION SYSTEM DESIGN

As we know, historical evidence can change depending on new discoveries. Visualization should therefore be flexible enough to accept these possible changes. We designed a system that would produce a data-driven animation of the evolution of a geographical area. The primary functionalities of our system are:

- It uses automated input of data rather than inputting it manually.
- It accepts data changes easily. Every input data change is reanimated automatically.
- It recreates the evolution of a place as accurately as possible.
- It can be implemented multiple ways by choosing different visualization software suites.

Our system has two fundamental components: modeling software and input data sources. The modeling software is responsible for creating an animation of a place's evolution, by creating intermediate points (circles representing landmasses) from the input data (location and estimated date). The latter can be easily extracted from systems like ArchEasy and U-Script. To cross-validate with other sources, the system incorporates historically accepted maps of an area as checkpoints in the animation. Figure 15 displays a screenshot of the evolution of Murano where colored circles represent input data points and brown landmasses represent the look of the island based on historically approved maps. Users can compare locations and timing displayed for input data with these contemporaneous maps. More detailed explanation of the system design appears in Appendix D.

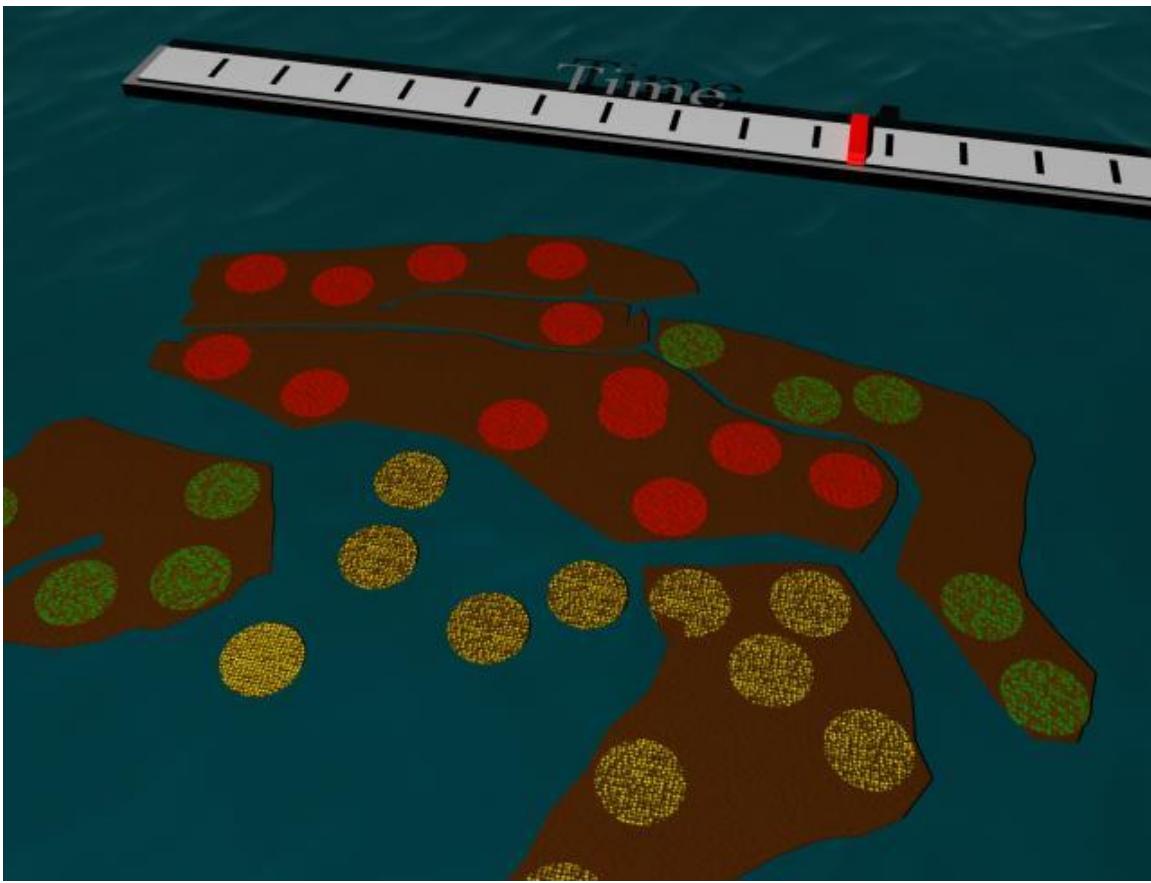


Figure 15: Screenshot of an Animation of Murano's Evolution that was Automatically Created by Our System Using Sample Input Data.

5.2 PROOF OF DESIGN CONCEPT

In order to evaluate the design feasibility, we created an example animation using our design concepts, see Figure 15 above. We decided to use Maya⁴² because it had the ability to produce required quality data-driven animations the team was already familiar with the software. See Appendix D for a more detailed explanation of this implementation choice. Furthermore, Maya has embedded Python scripting⁴³ language which permits writing scripts to automate the animation and modeling process. We wrote a script (see Appendix D) that read sample input data from a file and created an animation of the evolution of Murano, an island located just north of Venice. The animation appears at:

<http://origins.veniceprojectcenter.org/downloads/muranoEvolution.wmv>

⁴² Maya is high end three dimensional (3D) modeling software.

⁴³ Scripting language is a type of programming language that is used for developing small scale applications called scripts.

5.3 CONCLUSION AND RECOMMENDATIONS

We have produced a prototype of an animation that integrates a range of historical evidence into a useful chronological and geographical display. The next step is to combine different components of the system into one sophisticated application which will make the process of creating a data driven animation even easier. Using open-source⁴⁴ software could avoid the cost of Maya's expensive license.

Data-driven visualization provides the ability to explore alternative hypotheses, to visualize the impact of new information, and to visualize geographically what is well understood and what is not. When completed, this application will provide chronological analysis of historical information related to the evolution of a given area.

⁴⁴ Open-source software is free software.

6 PROJECT SUMMARY

Our project leaves behind comprehensive recommendations and system designs including:

- An archaeological data management and manipulation system, ArchEasy, and its online demonstration.
- A brand new website for promoting the manuscript transcription system, U-Script.
- A historical data visualization system as well as animation of evolution of Venice,
- An interactive map of multiple theories about the origins of Venetians.
- A collaboration with the National Geographic-IBM Genographic Project in an effort to find the true origins of Venetians.

Immediate work done on the ArchEasy, U-Script and historical data visualization system will improve the historical data discovery and analysis process by making it simpler. Follow up projects should utilize the collaboration between Venice Project Center and the Genographic Project to collect DNA samples and test the different theories of the migratory paths of early Venetians. Once these efforts have been implemented to their capacity, we will have a better understanding of the true origins of Venice and its people. The summary of this project can also be found at:

<http://origins.veniceprojectcenter.org>

BIBLIOGRAPHY

- Allison Gilbert, James Johnson. "Tracing Your Ancestry." 36.1 (2005): 55.
<<http://wf2dnvr6.webfeat.org:80/UEzfK123?url=http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=18094640&site=ehost-live>>.
- Ammerman, A. J., et al. Sea-Level Change and the Archaeology of Early Venice. Vol. 73., 1999.
- Ammerman, AJ,. "More on the Origins of Venice." Antiquity 69 (1995): 501.
- Behar, D. M., et al. "The Genographic Project Public Participation Mitochondrial DNA Database." Public Library of Science Genetics 3.6 (2007): e104. .
- Brambati, A., et al. "The Lagoon of Venice: Geological Setting, Evolution and Land Subsidence." Episodes 26.3 (2003): 264. .
- Brian Cafferelli, Eric Sutman, and Nate Piper. "Venice manuscript project site." April 9, 2008 2008.
<<http://www.uscript.org/newhome.html>>.
- Britt, R. R. "Identical Twins Not So Identical." Live Science. 2005.
<http://www.livescience.com/health/050708_identical_twins.html>.
- Brooks, Stephen, et al. "Multilayer Hybrid Visualizations to Support 3D GIS." Computers, Environment and Urban Systems 32.4 (2008): 278.
- Chojnacki, Stanley. Women and Men in Renaissance Venice : Twelve Essays on Patrician Society. Baltimore: Johns Hopkins University Press, 2000. WorldCat. <http://worldcat.org>.
- Clive Gamble. Archaeology: The Basics. Routledge, 2001.
<<http://site.ebrary.com/lib/wpi/Doc?id=5001608&ppg=1>>.
- COSGROVE, D. "The Myth and the Stones of Venice: An Historical Geography of a Symbolic Landscape." Journal of Historical Geography 8.2 (1982).
- Crouzet-Pavan, Elisabeth. Venice Triumphant : The Horizons of a Myth. Baltimore: Johns Hopkins University Press, 2002. WorldCat. <http://worldcat.org>.
- Eugenio Miozzi. Venezia Nei Secoli: La Città. Venezia. Vol. 1., 1957.
- Venezia Nei Secoli La Città. 1^a ed. Vol. First. Venezia, SAN MARCO: Casa Editrice "Libreccio", 1957.
- Goriski Panterji. "Il Venetico, La Lingua Del Più Antico Popolo d'Europa." : 12/4/2008. <<http://www.goriski-panterji.com/Venetscina.html>>.
- Haak, Wolfgang, et al. "Ancient DNA from the First European Farmers in 7500-Year-Old Neolithic Sites." Science 310.5750 (2005): 1016-1018.

Harrison, M. J., N. A. Burton, and I. H. Hillier. "Catalytic Mechanism of the Enzyme Papain: Predictions with a Hybrid Quantum Mechanical/Molecular Mechanical Potential." Journal of the American Chemical Society 119.50 (1997): 12285-91. .

Hazlitt, C. W. "History of Venice." History of the Venetian Republic: Her Rise, Her Greatness and Her Civilization. London: Smith, Elder and Company, 1860. 1.
<<http://books.google.com/books?id=W8JfAf3h8xgC&printsec=frontcover&dq=history+of+the+venetian+republic#PPA2,M1>>.

K. Kris Hirst. "About.com: Archaeology." About.com.
<<http://archaeology.about.com/cs/educationalresour/a/history1.htm>>.

KIVISILD, T., et al. "Ethiopian Mitochondrial DNA Heritage: Tracking Gene Flow Across and Around the Gate of Tears." American Journal of Human Genetics (Science Direct) 75.5 (2004): 752.

Kolman, C. J., N. Sambuughin, and E. Bermingham. "Mitochondrial DNA Analysis of Mongolian Populations and Implications for the Origin of New World Founders." Genetics 142.4 (1996): 1321-34. .

Kolman, C. J., and N. Tuross. "Ancient DNA Analysis of Human Populations." American Journal of Physical Anthropology (2000).

Kory L. Meyerink. " 14 Websites Preferred by Professionals ." Genealogical Computing 24.2 (2004)
<<http://www.ancestry.com/learn/library/article.aspx?article=9299>>.

Lamberg-Karlovsky, C. C. "Selected Aspects of Archaeology, 1964-1968." Annals of the American Academy of Political and Social Science 379.1 (1968): 132. . EBSCO:.

Lewis, B. R. "Julius Caesar in Britain." HistoryNet. 2008. <<http://www.historynet.com/julius-caesar-in-britain.htm>>.

Maretto, Paolo. La Casa Veneziana Nella Storia Della Città: Dalle Origini all'Ottocento., 1986.

Martin, John, and Dennis Romano . Venice Reconsidered : The History and Civilization of an Italian City-State 1297-1797. Baltimore; London: John Hopkins University Press, 2002.

Michelson, Paul E. "Mythical Venice(s)."
<[http://humweb.ucsc.edu/vja/PRIVATE/media/text/conference/MythicalVenice\(s\).PM.pdf](http://humweb.ucsc.edu/vja/PRIVATE/media/text/conference/MythicalVenice(s).PM.pdf)>.

MOGENTALE-PROFIZI, N., et al. "Mitochondrial DNA Sequence Diversity in Two Groups of Italian Veneto Speakers from Veneto." Annals of human genetics (Cambridge) 65.2 (2001): 153. . EBSCO:.

MSNBC. "Identical' twins? Not according to their DNA." LiveScience.com. Feb. 21, 2008 2008.
<<http://www.msnbc.msn.com/id/23276953/>>.

National Geographic Society. "The Genographic Project." National Geographic Society. 2008.
<<https://www3.nationalgeographic.com/genographic/overview.html>>.

"Nineveh: Encyclopedia II - Nineveh - Archaeology." <http://www.experiencefestival.com/a/Nineveh_-Archaeology/id/1803858>.

Petric, R. "Veneti-Mysterious People?" Veneti Info. <<http://www.veneti.info/en/articles/popular-scientific/39-veneti-mysterious-people>>.

Rando, J. C., et al. "Mitochondrial DNA Analysis of Northwest African Populations Reveals Genetic Exchanges with European, Near-Eastern, and Sub-Saharan Populations." . EBSCO:.

Rosand, David. "Venice." (2004) Abstract.

Shriver MD, Kittles RA. "Genetic Ancestry and the Search for Personalized Genetic Histories." Nature Reviews Genetics 5.8 (2004): 611-8.

Silke Morgenroth. "'X' Never Ever Marks the Spot: Archeology and Cultural Studies." A Companion to Cultural Studies. Blackwell Publishing, 2001. 154-15.

<http://books.google.com/books?id=HUI68Q9K6QwC&pg=PA154&lpg=PA154&dq=Morgenroth+S.+%E2%80%9CX%E2%80%9D+never+ever+marks+the+spot:+Archeology+and+Cultural+Studies&so urce=web&ots=G56rqmcPOV&sig=Gh6gMSBJExiddAs7kl4zpovmohM&hl=en&sa=X&oi=book_result &resnum=1&ct=result#PPR7,M1>.

Smolenyak, Megan, and Ann Turner . Trace Your Roots with DNA : Using Genetic Tests to Explore Your Family Tree. [Emmaus, Pa.]; [New York]: Rodale ; Distributed to the trade by Holtzbrinck Publishers, 2004.

the VENIVA consortium. "Venice State Archive." 1996. <<http://www.tridente.it/progetto/services/venice.html>>.

Torroni, A., et al. "Mitochondrial DNA Analysis in Tibet: Implications for the Origin of the Tibetan Population and its Adaptation to High Altitude." American Journal of Physical Anthropology 93.2 (1994): 189-99. . EBSCO:.

Torroni, Antonio, et al. "Harvesting the Fruit of the Human mtDNA Tree." Trends in Genetics, 22.6 (2006): 339-45. .

U.S. Department of Energy Office of Science. "History of the Human Genome Project." Wednesday, August 06, 2008 2008. <http://www.ornl.gov/sci/techresources/Human_Genome/project/hgp.shtml>.

UNESCO. "Italy - Venice State Archive - Archives up to the Treaty of Campoformio." 27-06-2003 2003. <http://portal.unesco.org/ci/en/ev.php-URL_ID=7221&URL_DO=DO_TOPIC&URL_SECTION=201.html>.

Unni Ravindranathan, Rao Shen, Marcos Andre Goncalves, Weiguo Fan, Edward A. Fox, James W. Flanagan. "ETANA-DL: A Digital Library for Integrated Handling of Heterogeneous Archaeological Data." (2004): 76-1. . EBSCO: <<http://csdl2.computer.org/comp/proceedings/jcdl/2004/2493/00/24930076.pdf>>.

"VENETI: VENETIANS." Notes and Queries s11-III (1911): 186. . EBSCO:.

Venice Project Center. Evolution of the Forma Urbis., 2004.

Wells, R. Spencer, et al. "The Eurasian Heartland: A Continental Perspective on Y-Chromosome Diversity." [Proceedings of the National Academy of Sciences of the United States of America](#) 98.18 (2001): 10244-9. .

Willey, Gordon. [Prehistoric Settlement Patterns in the Virú Valley, Perú.](#), 1953.

William Remus. "How to use DNA in Your Genealogical Research." [FEEFHS Journal](#) 13 (2004): 54-6.
<http://net.lib.byu.edu/~rdh7/wwi/%5C/users/tke8/public_html/FEEFHS/article_2005.pdf>.

Worcester Polytechnic Institute. "Uscript: Preserving History in a Digital Age." [Worcester Polytechnic Institute](#). 04/09/2008 2008. <<http://www.uscript.org/newhome.html>>.

Zalloua, Pierre A., et al. "Identifying Genetic Traces of Historical Expansions: Phoenician Footprints in the Mediterranean." [The American Journal of Human Genetics](#) 83. (2008): 633-42.

Zalloua, Pierre A., et al. "Y-Chromosomal Diversity in Lebanon is Structured by Recent Historical Events." [The American Journal of Human Genetics](#), 82.4 (2008): 873-82.

APPENDIX A-DNA SUPPLEMENT

IMPORTANT CONCEPTS-IN DEPTH

There are several important concepts to be familiar with when discussing DNA technology in application to origin investigation. All normal human cells contain deoxyribonucleic acid, or DNA. DNA strands are long chains of molecules, the sequence of which tells the cell how to function. DNA is organized into a unit called a gene. Pairs of genes are called chromosomes. The normal human cell has 46 chromosomes, organized into 23 pairs. There are 22 pairs of normal chromosomes and 1 pair of sex chromosomes. The sex chromosomes determine a person's gender. Females have two 'X' sex chromosomes, whereas males have one 'X' and one 'Y' sex chromosome. Every individual's DNA sequence is unique. However, there are specific sequences of DNA that serve as genetic markers for groups of people. These specific DNA sequences are called *haplotypes*. Specific haplotypes are characteristic of different ethnic groups, which is the basis for population DNA analysis.

Rarely, a random mutation occurs in the DNA sequence during replication. This mutation is then passed down from generation to generation, and becomes a marker for that line of people. There are two main methods for tracking these mutation markers; the first being the use of the "Y" male sex chromosome. The Y chromosome of a male is the exact same as the Y-chromosome of his father, except for random mutations, which are rare. This allows for a male line to be traced. The second technique uses mitochondrial DNA (mtDNA). Mitochondria are structures found in our cells that produce most of our body's energy. They have their own unique sets of DNA, which are stored and replicated separately from our normal DNA. Mitochondria are passed from mother to child, so they can be used to track a female lineage. For mtDNA analysis, DNA samples from both genders can be used for testing. However, since only males have Y chromosomes, Y chromosomal analysis can only be performed on males.

STUDIES INCORPORATING DNA ANALYSIS

On October 30th, 2008, Pierre A. Zalloua et al published the paper "Identifying Genetic Traces of Historical Expansions: Phoenician Footprints in the Mediterranean". The Phoenicians were an ancient trading civilization (around 1200-800 BC), centered in modern day Lebanon, on the Eastern shore of the Mediterranean. The Phoenicians were connected to the rest of the Mediterranean through extensive trading routes. Researchers investigated Phoenician male DNA traces in modern populations throughout the Mediterranean. The study investigated the expansion of the Phoenician empire using DNA analysis, and developed a method to more accurately detect genetic influences of a race. The method can identify what the paper calls a "specific historical expansion", rather than just an "overall geographical gradient".

CORRESPONDENCE WITH DAVID COMAS

Dear Erik,

Thanks for your mail.

The procedure you mention is correct. The only problem is that we do not know when the samples will be already typed since that depends on the arrival of the samples, the lab procedures and the release of the data on the web. I am afraid I cannot give you a specific date.

Concerning the consent form: there is no problem with the modifications. We would only require the scan of the last page with the signature of each of the volunteers.

No problem to analyze your own samples. Of course these samples will not be included in the Venetian pool. But feel free to send your own samples, no problem.

I will be in Barcelona from November 25th to 27th, so feel free to come to our lab. Just let me know about your plans. Please, find attached a map of the city and the address of our institute.

Please, do not hesitate to contact me if you have further questions.

Best regards,

David Comas

Unitat de Biología Evolutiva

Departament de Ciències Experimentals i de la Salut

Universitat Pompeu Fabra

Doctor Aiguader 88, 08003 Barcelona

Tel: +34 93 3160843

Fax: +34 93 3160901

E-mail: david.comas@upf.edu

-----Mensaje original-----

De: Carlson, Erik [<mailto:eCarlson@WPI.EDU>]

Enviado el: miércoles, 12 de noviembre de 2008 15:07

Para: David Comas

CC: ve08-orig@WPI.EDU; Davis, Paul W.; Carrera, Fabio

Asunto: RE: Genographics and Origins of Venice

Professor Comas,

We have a few questions for you before we begin sampling. First of all, we are making cards with individual GPID and access instructions to give to the test subjects. For instructions, we will give them the following website

(<https://www3.nationalgeographic.com/genographic/>), and instructions to type the GPID into the text box titled “Enter Your Genographic Project Kit ID”.

Is this the correct procedure, and what happens after they enter their code on this page? We would also like to let the test subject know how long they should wait before their results will be available.

We slightly modified the informed consent form, just editing out the blood sample references and adding our WPI contact and mission (see attachment). Do you need all three sheets from each participant, or just the last page where they signed? Can we simply scan and email the signed page, or would you like hard copies mailed to you?

On a different topic, could the four of us students take our own cheek samples and get them analyzed? We would obviously need to separate them from the rest of the Venetian samples. Let us know if this is possible. Also, some of the team is planning to visit Barcelona for vacation the week of November 23rd. Would you be free to meet if we came? It would be great to meet you, see the lab and get a few photos for our report. Do let us know what day/time would work best for you if you're available. We will be in Barcelona from November 25th (Tuesday) till November 27th (Thursday).

Thanks,

Erik Carlson

From: David Comas [david.comas@upf.edu]

Sent: Friday, November 07, 2008 11:03 AM

To: Carlson, Erik

Cc: ve08-orig@WPI.EDU; Davis, Paul W.; Carrera, Fabio;

jaume.bertranpetit@upf.edu; begonya.martinez@upf.edu

Subject: RE: Genographics and Origins of Venice

Dear Erik,

Thanks for your mail.

It is great to know that the kits arrived without problems.

- Unfortunately, we do not have the consents translated to Italian. It would be very nice if Professor Carrera could translate them into Italian.

- About family history: the questions are about the places where their ancestors were born. Basically, asking the volunteers where their grandparents were born.

- GPID codes. Begoña Martínez-Cruz, who is involved also in the project, will send you the codes. Sorry for the delay

- Storage and shipping. Samples can be stored at room temperature without problem. You can send the samples by FedEx and we will pay for the shipping if necessary.

When taking the samples be sure that the volunteers scrape energetically the inner part of the cheek (even both cheeks) in order to obtain enough cells to perform the DNA extraction.

Do not hesitate to contact us if you have further questions.

Best wishes,

David Comas

Unitat de Biologia Evolutiva

Departament de Ciències Experimentals i de la Salut

Universitat Pompeu Fabra

Doctor Aiguader 88, 08003 Barcelona

Tel: +34 93 3160843

Fax: +34 93 3160901

E-mail: david.comas@upf.edu

-----Mensaje original-----

De: Carlson, Erik [<mailto:ecarlson@WPI.EDU>]

Enviado el: viernes, 07 de noviembre de 2008 16:13

Para: David Comas

CC: ve08-orig@WPI.EDU; Davis, Paul W.; Carrera, Fabio;
jaume.bertranpetit@upf.edu; begonya.martinez@upf.edu
Asunto: RE: Genographics and Origins of Venice

Hello Prof. Comas,

We received the test kits in the mail yesterday. We just have a few questions before we begin:

Firstly, do you have the consent forms in Italian? Otherwise, could Professor Carrera translate the document?

Secondly, the "Procedure" section of the consent form mentions that questions about family history will be asked--What are these questions?

In the previous email, you mentioned the GPID codes, but we did not see them in the package you sent. How will those be assigned?

Finally, how will storage and shipping of the samples on our end be handled?

Thanks again, we look forward to beginning the sample collection!

Best,

Erik Carlson

WPI Origins of Venice team

ve08-orig@wpi.edu<mailto:ve08-orig@wpi.edu>

From: David Comas [david.comas@upf.edu]
Sent: Tuesday, November 04, 2008 5:05 AM
To: Carrera, Fabio
Cc: ve08-orig@WPI.EDU; Davis, Paul W.; jaume.bertranpetit@upf.edu;
begonya.martinez@upf.edu
Subject: RE: Genographics and Origins of Venice

Dear Fabio,

Thanks for your message and your interest in collaborating.

We will send you the kits to the address you suggested during this week. We will send you 300 buccal brushes and 300 tubes to collect the samples. We will also give you some codes (GPID: Genographic Project ID). These codes

can be given to the participants, and each participant could access the Genographic webpage to have his results.

December 13 is too tight for us to have the results of the samples: DNA extraction and genotyping analyses take time and I am afraid we will not able to have all the results by this date. Anyway, we will do our best.

Please, let us know if you receive the material in a proper state and if you have any further questions.

It is a pleasure to collaborate with you in this project.

Best wishes,

David Comas
Unitat de Biologia Evolutiva
Departament de Ciències Experimentals i de la Salut
Universitat Pompeu Fabra
Doctor Aiguader 88, 08003 Barcelona
Tel: +34 93 3160843
Fax: +34 93 3160901
E-mail: david.comas@upf.edu

De: Carrera, Fabio [<mailto:carrera@WPI.EDU>]

Enviado el: lunes, 03 de noviembre de 2008 1:50

Para: David Comas

CC: ve08-orig@WPI.EDU; Davis, Paul W.; jaume.bertranpetit@upf.edu;
begonya.martinez@upf.edu

Asunto: Genographics and Origins of Venice

Dear Prof. Comas:

Thank you very much for your kind offer to collaborate with us on our project regarding the Origins of Venice. We are eager to begin collecting samples in and outside of Venice immediately.

My name is Fabio Carrera. I am a Venetian and the director of the Worcester Polytechnic Institute Venice Project Center, which celebrates its 20th anniversary this fall (see

www.venice2point0.org<<http://www.venice2point0.org>>).

The student team that contacted you is only here until December 13, so it would be great if you could send the kits to the address below as soon as feasible:

Fabio Carrera
Calle Gorizia 6
S.Elena 30122
Venice, Italy

We are hoping that at least some of your analyses could be carried out before the students leave, so that they could incorporate the results in their final report, which is also due on Dec. 13.

If that isn't possible, our center can continue the collaboration beyond this semester, with another student team, so that we can achieve our goal of determining where the Veneti came from, out of all the legendary and mythological origins ascribed to them by the various historians who have ventured hypotheses about their lineage. We can send you a map of presumed locations of origin, if that can help you in focusing the analyses of our samples against the information in your databases. We will be willing to collect as many samples as you deem necessary for the purpose, way beyond the minimum 100 samples you mentioned in your email.

Once you send us a timeline for the shipping of the kits and for their subsequent analyses, we will probably want to discuss in more detail with you some of the logistics details of the process. We could probably do that by phone or skype to expedite matters.

Meanwhile, we just look forward to hearing from you and we thank you again for this tremendous opportunity.

Sincerely
Fabio Carrera

Fabio Carrera, Ph.D.
carrera@wpi.edu<mailto:carrera@wpi.edu>
<http://www.wpi.edu/~carrera>

in Venice until Dec. 15, 2008

Venice Project Center: +39 041 523-3209

Italian Cellular: +39 335 581-5292

Hello Professors,

We received this email from David Comas, a professor at a University in Barcelona, who is one of the members of the Genographic project. They are interested in working with us to actually investigate the Origins of Venetians through DNA, through the Genographic project. They would take care of all the costs (sample taking material, DNA extraction, analysis, everything) our team would collect the samples.

Instead of just doing a feasibility study, we can actually help find the origin of Venetians.

Our team would love to pursue this project, and could be a great contribution to the work done by the Venice Project Center.

-Erik

From: David Comas [david.comas@upf.edu]

Sent: Thursday, October 30, 2008 7:42 AM

To: jaume.bertranpetit@upf.edu; begonya.martinez@upf.edu

Cc: Carlson, Erik; ve08-orig@WPI.EDU

Subject: RE: Origins of Venice

Dear Erik and collaborators,

Erin Burke from Genographic headquarters has forwarded me your mail.

First of all, thanks for your interest in Genographic. My name is David Comas and I am one of the Principal Investigators involved in Western/Central European analysis for Genographic.

We will be happy to collaborate with you and help you with your project. We are interested in collecting samples all over Europe to analyze uniparental markers (mitochondrial DNA and Y-chromosome markers). The requirements for the inclusion of individuals in the sampling are the following:

- No minors (under 18 years old) will be included
- Only males should be included (since we want to analyze both maternal and paternal markers)

- Volunteers should read and sign the informed consent form (find it attached)
- Volunteers should not be related (no siblings, father-son, uncle-nephew,...): only one member of these pairs may be included in the sampling
- Volunteers' grandparents should be from the same geographical area (in order to avoid recent migrations) and their origins should be recorded.

Within this context, we will be happy to collaborate with you doing the genetic analysis of the samples you could provide. Not to mention that all costs for DNA extraction, lab managing and genetic analyses will be paid by us. We are working usually with blood as the DNA source, but it is also possible for us to work with saliva/buccal swabs. I guess that for you would be easier to get buccal swabs rather than blood since you do not need trained medical personnel.

Our proposal is the following:

During you stay in Venice, you could do the sampling and send us the samples. We will proceed with the laboratory analyses and help you in the statistical analyses of the data.

In order to do that, we can send you the material (tubes and mouth brushes) to perform the collection of the samples.

In order to have a good representation of individuals, we are dealing with a minimum of 100 male samples for geographical region analyzed. In your case, a minimum of 100 unrelated males whose ancestors came from the Veneto region will be needed. If you think you could also collect other samples from other neighboring regions (such as Friuli Venezia Giulia, Trentino Alto Adige, Lombardia, Emilia Romagna,...) for comparison to your samples, these will be also welcome.

Please, let us know what is your feeling about the proposal and if this could help to develop your project.

Yours sincerely,

David Comas
 Unitat de Biologia Evolutiva
 Departament de Ciències Experimentals i de la Salut
 Universitat Pompeu Fabra
 Doctor Aiguader 88, 08003 Barcelona

Tel: +34 93 3160843

Fax: +34 93 3160901

E-mail: david.comas@upf.edu

De: EBurke@ngs.org [<mailto:EBurke@ngs.org>] En nombre de genographic@ngs.org

Enviado el: miércoles, 29 de octubre de 2008 21:59

Para: david.comas@upf.edu; jaume.bertranpetit@upf.edu

Asunto: Fw: Origins of Venice

Dear David and Jaume,

This is an email from an organization based Massachusetts that is interested in doing work in Venice with the Genographic Project. I have told them that I am forwarding you the email and that you would follow up with them if appropriate. Thanks!

With best regards,

Erin Burke

The Genographic Project

www.nationalgeographic.com/genographic

Sign up for the Genographic Project Newsletter!

You'll receive the latest news on field research,

Genographic stories, and highlights from the Web site.

http://newsletters.nationalgeographic.com/p/National%20Geographic%20Society/Genographic_Project

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----- Forwarded by Erin Burke/HQ/NGS on 10/29/2008 04:54 PM -----

"Carlson, Erik" <ecarlson@WPI.EDU>

10/15/2008 02:16 PM

To

"genographic@ngs.org" <genographic@ngs.org>

cc

"ve08-orig@wpi.edu" <ve08-orig@WPI.EDU>

Subject

Origins of Venice

Erik Carlson

Felix Nwaobasi

Shikhar Saxena

Viktoras Truchanovicius

Interdisciplinary and Global Studies Division

100 Institute Rd.

Worcester, MA 01609

Email: ve08-orig@wpi.edu<<https://exchange.wpi.edu/owa/ve08-orig@wpi.edu>>

Oct. 15th, 2008

To whom it may concern,

We are a team of Undergraduate students from Worcester Polytechnic Institute, completing our Interactive Qualifying Project (IQP), entitled "Venice: Genesis of the City and its People". Our team consists of four third-year students: Erik Carlson – Chemical Engineering, Felix Nwaobasi – Interactive Media and Game Development, Shikhar Saxena – Computer Science, and Viktoras Truchanovicius – Computer Science.

The IQP is an opportunity for students to address problems and issues that affect communities around the globe. Students travel to project sites around the world, and we are very excited to be traveling to Venice, Italy. We will be working on-site in the "city of water" for seven weeks starting October 20th.

Our project goal is to contribute to a better understanding of the origins of Venice and its people. As part of our project, we are investigating the feasibility of using DNA to investigate

the lineage and genetic roots of the Venetian people. Understandably, we were very excited to learn about the Genographics project, and the possible opportunities it presents for our project. Feel free to visit our team webpage at the following address:

http://venipedia.org/index.php/Venipedia:Venice-B08_IQP:_Origins_Group

We would like to discuss the possibility of working with the Genographics project to investigate the genetic journey of the Venetian people. We have contact with several members of ancient Venetian families, through one of our project advisors, Dr. Fabio Carrera (carrera@wpi.edu<mailto:carrera@wpi.edu>). As we will be in Venice, we can complete any sample collection and related work.

Thank you for the consideration. We feel this would be a valuable addition to the Genographics project, as the genotype of true Venetians can be discovered and added to the knowledge of mankind's impressive journey. If you could kindly reply to this letter by sending an e-mail to ve08-orig@wpi.edu<mailto:ve08-orig@wpi.edu>, it would be greatly appreciated.

Sincerely,

Origins of Venice Team

WPI INTERNAL REVIEW BOARD APPLICATION

The following is the WPI Internal Review Board application for this portion of the project.



WORCESTER POLYTECHNIC INSTITUTE Institutional Review Board Application for Approval to Use Human Subjects in Research

WPI IRB use only
IRB # _____
Date: _____

If your project has **any** federal sponsorship (e.g. federal funding), either prime or pass-through, the WPI IRB is not authorized to perform a review. Please contact Christina DeVries in Research Administration at (508) 831-6716 for direction to an appropriate IRB. DO NOT submit an application to the WPI IRB.

This application is for: (Please check one)		<input checked="" type="checkbox"/> Expedited Review	<input type="checkbox"/> Full Review	WPI IRB use only
Principal Investigator (PI) or Project Faculty Advisor: (NOT a student or fellow; must be a WPI employee) Name: <u>Fabio Carrera</u> Tel No: <u>+39 041523-3209</u> Address: <u>carrera@wpi.edu</u> Department: <u>Interdisciplinary and Global Studies Division</u>				
Co-Investigator(s): (Co-PI(s)/non students)				
Name:	<u>David Comas</u>	Tel No:	<u>+34 93 3160843</u>	E-Mail <u>david.comas@upf.ed</u> Address: <u>u</u>
Name:		Tel No:		E-Mail Address:
Student Investigator(s):				
Name:	<u>Erik Carlson</u>	Tel No:	<u>+39 348 3343864</u>	E-Mail <u>ecarlson@wpi.edu</u> Address: <u></u>
Name:	<u>Viktoras Truchanovicius</u>	Tel No:	<u>+39 348 5250176</u>	E-Mail <u>victort@wpi.edu</u> Address: <u></u>

Check if: Undergraduate project (MQP, IQP, Suff., other) IQP
 Graduate project (M.S. Ph.D., other)

Has an IRB ever suspended or terminated a study of any investigator listed above?
No Yes (Attach a summary of the event and resolution.)

Vulnerable Populations: The proposed research will involve the following (Check all that apply):
pregnant women human fetuses neonates minors/children prisoners
students individuals with mental disabilities individuals with physical disabilities

Collaborating Institutions: (Please list all collaborating institutions.)
National Geographic and IBM--The Genographic Project

Locations of Research: (If at WPI, please indicate where on campus. If off campus, please give details of locations.)
Samples collected in Venice and surrounding area, analysis completed at Universitat Pompeu Fabra, Barcelona, Spain

Project Title: Venice: Genesis of the City and its People

Funding: (If the research is funded, please enclose one copy of the research proposal or most recent draft with your application.)

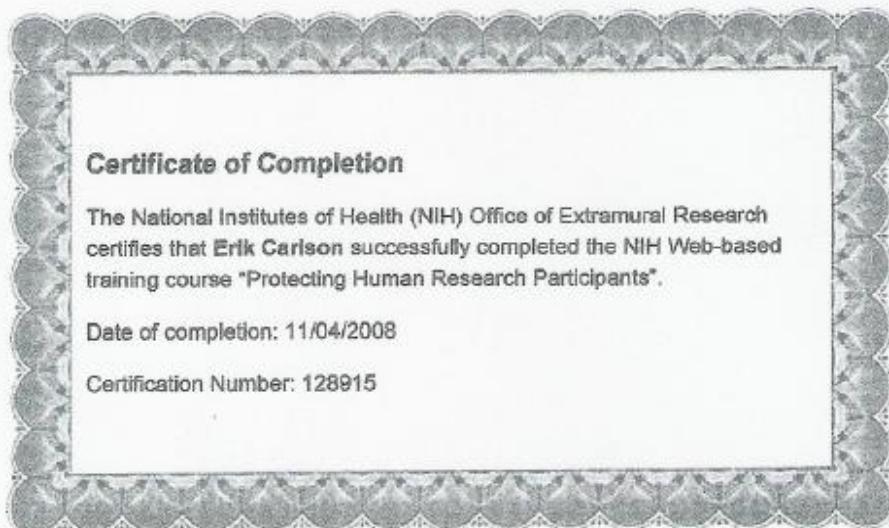
Funding Agency: National Geographic and IBM--The Genographic Project WPI Fund:

Human Subjects Research: (All study personnel having direct contact with subjects **must** take and pass a training course on human subjects research. There is a link to a web-based training course that can be accessed under the Training link on the IRB web site <http://www.wpi.edu/Admin/Research/IRB/training.html>. The IRB requires a copy of the completion certificate from the course or proof of an equivalent program.)

Anticipated Dates of Research:

Start Date: 11/17/2008 Completion Date: 12/12/2008

WPI INSTITUTIONAL REVIEW BOARD
APPLICATION FOR APPROVAL TO USE HUMAN SUBJECTS IN RESEARCH
revised 12/11/2007
1 of 6



Institutional Review Board Section 2.A

Venice: Genesis of the City and its People

The student IQP team will be performing the sample collection for the Genographic Project, which is a collaboration between National Geographic and IBM (see <https://www3.nationalgeographic.com/genographic/>). The Genographic contact is David Comas, who is one of the Principle Investigator of the Genographic Project. The Geographic Project aims to investigate the migratory history of mankind, by analyzing DNA samples from groups of people all over the world. The IQP team will be collecting cheek swab samples from Venetian males for analysis by the Genographic Project team. There are two types of genetic tests: mitochondrial DNA analysis (traces maternal lineage) and Y-chromosomal analysis (traces paternal lineage). Only male samples will be collected, since both maternal and paternal genetic tests can be performed on male DNA. Only maternal genetic tests can be performed on female DNA.

Test subjects will be contacted through Professor Fabio Carrera and the Venice Project Center. The subject will be asked if both sets of their grandparents are from the Venice region, confirming they are eligible for participation. The subject will be asked to swish their mouths with water. For sample collection, the following procedure will be used:

1. The swab brushes are individually packaged. Open the *Omni Swab* packaging at the handle end and carefully remove swab.
2. Holding the handle end of the swab, scrape the collection tip firmly against the inside of the cheek 5-6 times (about 10 seconds) being careful not to depress the plunger that ejects the tip.
3. After taking the sample, eject the tip by firmly pressing the plunger at the end of the handle into a labeled 2mL microcentrifuge tube (a small test tube)

The person administering the test will be wearing gloves. The test tube will be labeled with an identification code, and a code matching the sample will be given to the test subject. They can then go to the Genographic website and view their individual results. They can also withdraw their sample from the study/database if they choose to do so by using this code. The samples will be mailed to David Comas of the Universitat Pompeu Fabra in Barcelona, Spain.

Instructions: Answer all questions. If you are asked to provide an explanation, please do so with adequate details. If needed, attach itemized replies. Any incomplete application will be returned.

1.) Purpose of Study: (Please provide a concise statement of the background, nature and reasons for the proposed study. Insert below using non-technical language that can be understood by non-scientist members of the IRB.)

Investigate the origin and lineage of the Venetian people through DNA analysis.

2.) Study Protocol: (Please attach sufficient information for effective review by non-scientist members of the IRB. Define all abbreviations and use simple words. Unless justification is provided this part of the application must not exceed 5 pages. Attaching sections of a grant application is not an acceptable substitute.)

A.) For biomedical, engineering and related research, please provide an outline of the actual experiments to be performed. Where applicable, provide a detailed description of the experimental devices or procedures to be used, detailed information on the exact dosages of drugs or chemicals to be used, total quantity of blood samples to be used, and descriptions of special diets.

B.) For applications in the social sciences, management and other non-biomedical disciplines please provide a detailed description of your proposed study. Where applicable, include copies of any questionnaires or standardized tests you plan to incorporate into your study. If your study involves interviews please submit an outline indicating the types of questions you will include.

C.) If the study involves **investigational drugs or investigational medical devices**, and the PI is obtaining an Investigational New Drug (IND) number or Investigational Device Exemption (IDE) number from the FDA, please provide details.

D.) Please note if any **hazardous materials** are being used in this study.

E.) Please note if any **special diets** are being used in this study.

3.) Subject Information:

A.) Please provide the exact number of subjects you plan to enroll in this study and describe your subject population. (eg. WPI students, WPI staff, UMASS Medical patient; other)

Males: 200 Females: 0 Description: Venetian Males over the age of 18

B.) Will subjects who do not understand English be enrolled?

No Yes (Please insert below the language(s) that will be translated on the consent form.)

Italian

C.) Are there any circumstances under which your study population may feel coerced into participating in this study? No Yes (Please insert below a description of how you will assure your subjects do not feel coerced.)

D.) Are the subjects at risk of harm if their participation in the study becomes known?

No Yes (Please insert below a description of possible effects on your subjects.)

E.) How will subjects be recruited for participation? (Check all that apply.)

- Referral: (By whom) Fabio Carrera
 Other: (Identify) _____
 Database: (Describe how database populated)

Direct subject advertising, including: (Please provide a copy of the proposed ad. All direct subject advertising must be approved by the WPI IRB prior to use.)

- Newspaper Bulletin board
 Radio Flyers
 Television Letters
 Internet E-mail

F.) Have the subjects in the database agreed to be contacted for research projects? No Yes N/A

G.) Are the subjects being paid for participating? (Consider all types of reimbursement, ex. stipend, parking, travel.)
No Yes (Check all that apply.) Cash Check Gift certificate Other: _____

Amount of compensation _____

4.) Informed Consent:

A.) Who will discuss the study with and obtain consent of prospective subjects? (Check all that apply.)
 Principal Investigator Co-Investigator(s) Student Investigator(s)

B.) Are you aware that subjects must read and sign an Informed Consent Form prior to conducting any study-related procedures and agree that all subjects will be consented prior to initiating study related procedures?

No Yes

C.) Are you aware that you must consent subjects using only the IRB-approved Informed Consent Form?

No Yes

D.) Will subjects be consented in a private room, not in a public space?

No Yes

E.) Do you agree to spend as much time as needed to thoroughly explain and respond to any subject's questions about the study, and allow them as much time as needed to consider their decision prior to enrolling them as subjects?

No Yes

F.) Do you agree that the person obtaining consent will explain the risks of the study, the subject's right to decide not to participate, and the subject's right to withdraw from the study at any time?

No Yes

G.) Do you agree to either 1.) retain signed copies of all informed consent agreements in a secure location for at least three years or 2.) supply copies of all signed informed consent agreements in .pdf format for retention by the IRB in electronic form?

No Yes

(If you answer No to any of the questions above, please provide an explanation.)

5.) Potential Risks: (A risk is a potential harm that a reasonable person would consider important in deciding whether to participate in research. Risks can be categorized as physical, psychological, sociological, economic and legal, and include pain, stress, invasion of privacy, embarrassment or exposure of sensitive or confidential data. All potential risks and discomforts must be minimized to the greatest extent possible by using e.g. appropriate monitoring, safety devices and withdrawal of a subject if there is evidence of a specific adverse event.)

A.) What are the risks / discomforts associated with each intervention or procedure in the study?

Subject participation is just a cheek swab and short questionnaire about family history, so very minimal risk/discomfort

B.) What procedures will be in place to prevent / minimize potential risks or discomfort?

WPI INSTITUTIONAL REVIEW BOARD
APPLICATION FOR APPROVAL TO USE HUMAN SUBJECTS IN RESEARCH
revised 12/11/2007

We will assure the test subject that a buccal swab is very quick and painless

6.) Potential Benefits:

A.) What potential benefits other than payment may subjects receive from participating in the study?

Subject will get to know about their ancestry, and help contribute to a better understanding of the origins of Venetians

B.) What potential benefits can society expect from the study?

Knowledge of origins of Venetians will add to the knowledge of the migratory paths and relations of mankind

7.) Data Collection, Storage, and Confidentiality:

A.) How will data be collected?

Test subjects will be visited, informed consent will be signed, and a cheek swab will be taken with a buccal brush

B.) Will a subject's voice, face or identifiable body features (eg. tattoo, scar) be recorded by audio or videotaping?

No Yes (Explain the recording procedures you plan to follow.)

C.) Will personal identifying information be recorded? No Yes (If yes, explain how the identifying information will be protected. How will personal identifying information be coded and how will the code key be kept confidential?)

D.) Where will the data be stored and how will it be secured?

Data will be stored in the Genographic servers. Data is anonymous

E.) What will happen to the data when the study is completed?

Data and results will be released to the public once the Genographic project is completed in 2010. All data is anonymous

F.) Can data acquired in the study adversely affect a subject's relationship with other individuals? (i.e. employee-supervisor, student-teacher, family relationships)

No

G.) Do you plan to use or disclose identifiable information outside of the investigation personnel?

No Yes (Please explain.)

H.) Do you plan to use or disclose identifiable information outside of WPI including non-WPI investigators?

No Yes (Please explain.)

8.) Deception: (Investigators must not exclude information from a subject that a reasonable person would want to know in deciding whether to participate in a study.)

Will the information about the research purpose and design be withheld from the subjects?

WPI INSTITUTIONAL REVIEW BOARD
APPLICATION FOR APPROVAL TO USE HUMAN SUBJECTS IN RESEARCH
revised 12/1/2007

5 of 6

No Yes (Please explain.)

9.) **Adverse effects:** (Serious or unexpected adverse reactions or injuries must be reported to the WPI IRB within 48 hours. Other adverse events should be reported within 10 working days.)

What follow-up efforts will be made to detect any harm to subjects and how will the WPI IRB be kept informed?

None, but each participant will receive a number and access code so they can view their individual results online.

10.) **Informed consent:** (Documented informed consent must be obtained from all participants in studies that involve human subjects. You must use the templates available on the WPI IRB web-site to prepare these forms. Informed consent forms must be included with this application. Under certain circumstances the WPI IRB may waive the requirement for informed consent.)

Investigator's Assurance:

I certify the information provided in this application is complete and correct.

I understand that I have ultimate responsibility for the conduct of the study, the ethical performance of the project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the WPI IRB.

I agree to comply with all WPI policies, as well all federal, state and local laws on the protection of human subjects in research, including:

- ensuring the satisfactory completion of human subjects training.
- performing the study in accordance with the WPI IRB approved protocol.
- implementing study changes only after WPI IRB approval.
- obtaining informed consent from subjects using only the WPI IRB approved consent form.
- promptly reporting significant adverse effects to the WPI IRB.

Signature of Principal Investigator



Date

11/7/08

Print Full Name and Title

Dr. Fabio Carrera

Please return a signed hard copy of this application to the WPI IRB c/o Research Administration.
If you have any questions, please call (508) 831-6716.

WPI INSTITUTIONAL REVIEW BOARD
APPLICATION FOR APPROVAL TO USE HUMAN SUBJECTS IN RESEARCH
revised 12/11/2007

6 of 6

DNA SAMPLE COLLECTION

The following are the procedural details of our Genographic Project collaboration.

INFORMED CONSENT FORM—ENGLISH

National Geographic Society in Collaboration with Worcester Polytechnic Institute

Title of Research Project: “*The Genographic Project: Molecular Genetic Analyses of Western/Central European populations*”

National Geographic Principal Investigators: Dr. Jaume Bertranpetti and David Comas, Unitat de Biologia Evolutiva, Universitat Pompeu Fabra. Doctor Aiguader 80 ,08003 Barcelona, Spain.

WPI Venice Project Center Project Title: “*Venice: Genesis of the City and its People*”

Overall Project Principal Investigator: Dr. Spencer Wells, Mission Programs, National Geographic Society, 1145 17th Street, N.W., Washington, D.C. 20036, 202-828-5465, SpWells@ngs.org

WPI Principle Investigator: Dr. Fabio Carrera, Worcester Polytechnic Institute, 100 Institute Rd, Worcester, MA 01609 USA. Email: carrera@wpi.edu Telephone: +39 041 523-3209

INFORMED CONSENT (Western/Central Europe)

Invitation to Participate: You are invited to participate in a project that studies the various human populations of Western/Central Europe through their inherited genetic properties. This project is sponsored by the National Geographic Society. The project team will talk to you about the study and how it might affect you. They will explain what you will have to do if you decide to participate. You can choose whether or not to participate. If you decide not to participate, no one will take any position of any kind against you.

Please read this consent form carefully. If you do not understand something, please ask the researcher to explain it. If you prefer, someone will read this to you. If you decide to participate, please sign the last page of this form. We will give you a copy to keep.

Purpose: This project is a major international effort to collect population genetic data from over 100,000 individuals around the world. Our sampling will target native human populations living preferably in their geographic region of origin and who ideally had minimal mixing with the surrounding populations. Our goal is to find out the relationships between genetic, linguistic, cultural and historical data. No data or information on your medical history will be collected from you, and thus the saliva sample collected with the buccal brush will never be used for any medically-related inquiry. To better understand the history of the native people from your region and around the world, the investigators will survey segments of your genetic fingerprint. Changes or variations in your genetic fingerprint may be considered as markers that can be used for comparison among populations. These changes are interesting for the study of origin and behavior of humans because many of them are found to group in descendants of a common ancestor

within human populations. Because of the specific way of maternal and paternal inheritance, we can trace these genetic variations through human families from the present to the distant past with a relatively high degree of accuracy. Therefore, by following the spread of the descendants of a specific ancestry, we can also genetically retrace the patterns of human movement through geographic areas.

The WPI Venice Project Center team is focusing on investigating the genetic heritage of the Venetian people in order to contribute to a better understanding of the origins of Venice. The data collected in the study will be used to help confirm/disprove different theories about the origins of the Venetian people.

Length of the Project: Your participation in the project will require one single visit taking 20 minutes of your time but the entire project will last 5 years. You will be one of many thousands of people in your region who give samples of blood or saliva.

Procedure: If you decide to participate, we will collect a cheek cell sample using a cotton brush. The saliva sample will be used to look for markers in your genetic fingerprint. These markers will be compared to those of ancient native populations. We will also ask questions about your family history.

Storage of Sample: Your saliva sample will be stored indefinitely at the Evolutionary Unit of the Universitat Pompeu Fabra (UPF), where it may be used for further study to better understand human origins and the histories of your people. The saliva sample cannot and will not be used for any medically related study. Furthermore, you may at any point in the future choose to have your sample removed from the project. You can do this by simply contacting our regional center (UPF, Doctor Aiguader 88, Tel. +34 93-3160843) and explaining your desire to have your sample removed. Your sample will then be immediately destroyed at the laboratory and all records and associated data from your sample will be eliminated. Instructions on how to do this are explained below.

Risks: You will spend about 20 minutes on the project. There is almost no risk associated with a cheek swab. Participation is voluntary and we cannot guarantee any results to you.

Benefits: The only benefits to you from participating in this project will be to learn more about your family origins and your relationships to other people around the world.

Costs: You do not have to pay anything to be in the project. You will not be paid for being in this project. If you have to travel to the collecting site, we may pay for your reasonable travel costs. We will not pay for your travel costs, *unless* you arrange for them to be paid for before you provide a blood sample.

Participation: The choice is yours. You may choose either to be in the project, or not to be in the project. Your participation is voluntary. There will be no penalty if you choose not to participate, or if you agree to be in the project but later change your mind. You may withdraw from the project at any time by calling or writing Dr. Jaume Bertranpetti or Dr. David Comas (+34 93-3160843) at the Unitat de

Biologia Evolutiva, Universitat Pompeu Fabra, Doctor Aiguader 88, 08003 Barcelona, Spain, jaume.bertranpetit@upf.edu or david.comas@upf.edu. You may also withdraw from the project through the website at www.nationalgeographic.com/genographic. To withdraw from the project, you must provide your name and assigned code number. Also, the investigators may decide to discontinue your participation in this study without your permission.

Confidentiality: We will protect carefully the information that you tell us about yourself and your family. What we learn from your sample will be described only in a way that does not identify you. You will be given a code number for your sample and instructions how to use the code number to obtain the results of your sample. To protect your privacy, samples will be recorded with a secret code. Your name only will be recorded on the consent form. The secret code assigned to your sample will be kept in a locked file at the site where you participate in the project and carefully protected. No information related to your medical history will be included. Your sample will be stored at the regional site unless you ask to have your sample destroyed after the project. Your records will be monitored and may be audited without violating confidentiality.

SUBJECT STATEMENT OF CONSENT

I have read and understood the above description of this research study. All of my questions have been answered to my satisfaction. I know that my taking part in this research study is voluntary. I know that I may refuse to take part in or quit this research study at any time. A copy of this signed consent form will be given to me.

Signature of Subject

Date

Signature of Witness

Date

I attest that I have fully and appropriately informed the subject of the nature of the above research study and have offered to answer any question that he/she may have.

Signature of Principal Investigator/Designate

Date

Ricerca internazionale sulle origini degli Antichi Veneti attraverso lo studio del DNA

Una collaborazione tra Worcester Polytechnic Institute (WPI) e National Geographic Society

Nell'ambito del progetto internazionale: “*The Genographic Project: Molecular Genetic Analyses of Western/Central European populations*”

Direttore generale del progetto Genographic: Dr. Spencer Wells, Mission Programs, National Geographic Society, 1145 17th Street, N.W., Washington, D.C. 20036, 202-828-5465, SpWells@ngs.org

Ricercatore Principale di National Geographic: Dr. Jaume Bertranpetti and David Comas, Unitat de Biologia Evolutiva, Universitat Pompeu Fabra. Doctor Aiguader 80 ,08003 Barcelona, Spain.

Titolo della tesi WPI attualmente in corso: “*Venice: Genesis of the City and its People*”

Direttore del progetto WPI: Dr. Fabio Carrera, Worcester Polytechnic Institute, 100 Institute Rd, Worcester, MA 01609 USA. Email: carrera@wpi.edu Tel: +39 041 523-3209

INFORMAZIONI SULLA PRIVACY PER IL CONSENSO ALLA PARTECIPAZIONE

Invito a Partecipare: La invitiamo a partecipare ad un progetto che studia le diverse popolazioni umane dell'Europa Occidentale/Centrale tramite le loro caratteristiche genetiche. Questo studio è sponsorizzato dalla “National Geographic Society”. Il gruppo di studenti che si occupa del progetto Le parlerà dello studio e di come potrebbe toccarLa. Può decidere liberamente se partecipare o meno al progetto e, qualora decidesse di non partecipare, ciò non comporterà alcuna conseguenza nei Suoi confronti. Nel caso in cui decidesse di partecipare, Le verrà spiegato dettagliatamente che cosa deve fare.

Per favore, legga attentamente questo documento. Se non dovesse comprenderne il contenuto o avesse delle domande al riguardo, chieda liberamente al ricercatore che sarà lieto di offrirLe qualsiasi spiegazione. Se preferisce, qualcuno potrà leggerLe questo modulo. Se decidesse di partecipare, per favore firmi l'ultima pagina di questo documento. Le sarà fornita una copia da tenere per sé.

Descrizione dello Studio: Questo studio fa parte di un grande progetto internazionale che si prefigge di raccogliere dati genetici da oltre 100.000 individui in tutto il mondo. I nostri campioni si concentrano su popolazioni indigene che vivono preferibilmente ancora nelle loro terre di origine e che preferibilmente si sono mescolate poco con altre popolazioni locali. Il nostro obiettivo è di scoprire le relazioni tra dati genetici, linguistici, culturali e storici. Non le verrà chiesto alcun dato medico né informazioni sulla sua salute e quindi il campione genetico che le verrà prelevato non sarà assolutamente mai utilizzato per analisi igienico-sanitarie. I nostri ricercatori analizzeranno segmenti del suo DNA per comprendere meglio la storia delle popolazioni indigene della sua regione e del resto del mondo. Cambiamenti o variazioni nella sua impronta genetica verranno considerati come indicatori da utilizzare per confronti con altre popolazioni. Queste variazioni sono interessanti per lo studio delle origini e dei comportamenti delle stirpi umane dato che permettono di raggruppare popolazioni che discendono da antenati comuni. Grazie ai meccanismi di ereditarietà sia dal lato materno che paterno, possiamo ricostruire con discreta precisione queste variazioni genetiche attraverso stirpi umane dal

presente fino alla più remota antichità. Quindi, seguendo la distribuzione dei discendenti di una specifica stirpe, possiamo ricostruire i percorsi migratori seguiti dalle varie popolazioni attraverso varie aree geografiche.

Lo studio specificamente condotto dal Venice Project Center del Worcester Polytechnic Institute nel contesto del più ampio progetto *Genographic*, si concentra esclusivamente sul patrimonio genetico dei Veneti in generale e dei Veneziani in particolare, con l'intento di contribuire ad una migliore comprensione delle origini di Venezia. I dati raccolti da questo studio serviranno a confermare o smentire diverse teorie sulle origini geografiche dei Veneti, sulla loro diffusione nel continente europeo e soprattutto sul loro insediamento nelle lagune dove oggi sorge Venezia.

Durata dello Studio: La partecipazione allo studio comporterà un solo incontro con un addetto della durata di circa 20 minuti, mentre l'intero progetto avrà una durata totale di 5 anni. Lei sarà uno delle migliaia di persone della sua stessa regione a donare un campione di sangue o saliva.

Procedura: Qualora decidesse di partecipare, Le chiederemo di raccogliere un campione di saliva prelevandolo da sè dall'interno della guancia utilizzando uno strumento simile ad un piccolo spazzolino da denti con l'estremità tipo cotonfioc. Il campione verrà poi utilizzato per identificare alcuni marcatori specifici nella sua impronta genetica. Gli indicatori genetici così raccolti saranno comparati con quelli delle popolazioni native della regione. Le verranno inoltre richieste alcune brevi informazioni riguardanti la storia della Sua famiglia.

Stoccaggio del campione: Il Suo campione di saliva sarà preservato indefinitamente dall'Unità Evoluzionaria dell'Università Pompeu Fabra (UPF) di Barcellona, dove potrebbe essere utilizzato per ulteriori studi per la comprensione delle origini storiche delle popolazioni mondiali. Ciononostante, sarà Sua facoltà di decidere di rimuovere il Suo campione dal progetto in qualsiasi momento futuro. Per far questo, basterà contattare il nostro centro regionale (UPF, Doctor Aiguader 88, Tel. +34 93-3160843) esprimendo il Suo desiderio di rimuovere il Suo campione dallo studio. Il Suo campione verrà allora immediatamente distrutto nel laboratorio e tutti i dati ad esso associati verranno anch'essi eliminati. Istruzioni dettagliate su questa procedura sono illustrate in calce.

Rischi, Inconvenienti e Disagi: La Sua partecipazione comporterà un impegno di tempo totale di circa 20 minuti. Al momento non si conoscono rischi per la salute nell'eseguire un prelievo di un campione di DNA. La partecipazione è volontaria e non ci è possibile garantirLe la buona riuscita del test genetico.

Benefici: L'unico reale beneficio derivante dalla partecipazione a questo studio sarà quello di avere maggiori informazioni riguardanti le origini della Sua famiglia e le relazioni tra questa e altre persone nel mondo.

Costi: Nessun costo è dovuto per la partecipazione al progetto. Non c'è alcuna ricompensa per la partecipazione.

Partecipazione: La Partecipazione a questo studio è volontaria. Puoi scegliere di non partecipare. Hai il diritto di ritirarti in qualsiasi momento e decidere se il tuo campione biologico, le informazioni genetiche o la genealogia già raccolti restino a far parte di questo studio o vengano distrutti.

Puoi decidere di ritirarti dal progetto in qualsiasi momento chiamando o scrivendo a Dr. Jaume Bertranpetti or Dr. David Comas (+34 93-3160843) alla Unitat de Biologia Evolutiva, Universitat Pompeu Fabra, Doctor Aiguader 88, 08003 di Barcellona, Spagna, jaume.bertranpetit@upf.edu oppure a david.comas@upf.edu. Può ritirarsi dal progetto anche attraverso il sito web

www.nationalgeographic.com/genographic. Qualora desiderasse ritirarsi dal progetto, dovrà comunicarci il suo nome e codice segreto identificativo assegnatoLe. Inoltre, i ricercatori del progetto potrebbero decidere di escludere il Suo campione dallo studio senza la Sua esplicita autorizzazione.

Riservatezza: La Sua identità, unica e personale, è considerata strettamente riservata e privata. La Sua identità, unica e personale, non sarà rivelata in alcuna pubblicazione generica o scientifica di dati. Campioni e documenti contenenti le Sue informazioni saranno tenuti in un luogo sicuro (vedere il paragraforelativo allo stoccaggio del campione). Le uniche persone ad avere accesso ai codici e alle informazioni genealogiche saranno l'investigatore principale e le altre persone specificamente autorizzate dall'investigatore principale. La Sua identità unica e l'identità dei Suoi antenati recenti non sono collegate direttamente alle informazioni contenute nel database pubblico.

Le sarà assegnato un codice numerico e le istruzioni di utilizzo del codice stesso per poter accedere ai risultati relativi al Suo campione. A protezione della Sua privacy, il campione sarà quindi schedato con un codice segreto. Il Suo nome sarà registrato solo all'interno del presente Modulo di Consenso. Il codice segreto assegnato al Suo campione verrà attentamente custodito sotto chiave, all'interno di uno schedario appositamente protetto da intrusioni, presso la sede centrale del progetto. Nessuna informazione relativamente alla Sua situazione medica sarà inclusa. Il suo campione sarà custodito all'interno del sito locale relativo alla sua regione a meno che Lei non richieda esplicitamente la sua distruzione al termine dello studio. I suoi dati saranno sorvegliati ed occasionalmente visionati da addetti ai lavori senza che questo comporti la violazione della Sua privacy.

CONSENTO

Se è d'accordo a partecipare a questo studio, riceverà una copia firmata e datata di questo Modulo di Consenso per Suo uso personale.

Ho letto le informazioni su questo Modulo di Consenso. Ho ricevuto tutte le risposte alle mie domande in relazione allo studio e alla mia partecipazione. Sono consapevole che la mia partecipazione in questo studio di ricerca è frutto della mia volontà. Sono consapevole di avere il diritto di rifiutare di partecipare e anche di ritirarmi da questo studio in qualsiasi momento. Mi sarà fornita una copia di questo consenso firmato.

Firma del Soggetto

Data

Firma del Testimone

Data

Attesto di avere completamente informato il soggetto circa la natura di questa ricerca e mi sono reso disponibile a rispondere a qualunque domanda che il soggetto avesse al riguardo.

Firma del Capo Ricercatore o del suo Delegato

Data

SWABBING INSTRUCTIONS

Whatman Sterile Omni Swab Instructions For Use

The Whatman Sterile **Omni Swab** is designed for collection of buccal cell samples for DNA testing. To obtain a buccal cell sample, the tip end of the **Omni Swab** is rubbed against the inside of the cheek. Unlike cotton-tipped swabs, the **Omni Swab** is made of absorbent material specifically designed for the collection of buccal cells. The single use swab has a unique removable collection tip to assist in processing the sample. While collecting a buccal sample is quick, easy and painless, it needs to be done correctly.

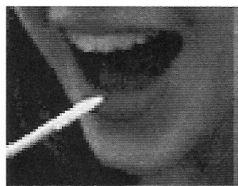
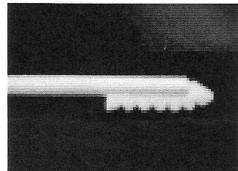
Suggested Directions for Use

The following directions are provided to illustrate an acceptable collection protocol. Each facility should establish a sample collection protocol that meets the objectives of collection and testing facilities.

Sample collection:

The person providing the buccal cell samples should not eat or drink immediately prior to giving the sample. If food or drink has been recently taken, it is suggested that the mouth be rinsed with water prior to sampling. The person taking the samples should wear biohazard-barrier gloves and avoid contact with the *Omni Swab* collection tip.

1. Open the *Omni Swab* packaging at the handle end and carefully remove swab. Do not touch the collection tip of the swab.
2. Holding the handle end of the *Omni Swab*, scrape the collection tip firmly against the inside of the cheek 5-6 times (about 10 seconds) being careful not to depress the plunger that ejects the tip.
3. After taking the sample, eject the tip by firmly pressing the plunger at the end of the handle into a labeled 2 mL microcentrifuge tube.
4. If desired, repeat sampling procedure with a second swab using the other cheek. Eject tip into a different labeled 2 mL microcentrifuge tube.



Storage:

After sample collection, tip can be kept at room temperature when processed immediately. If storage is necessary, freeze tips at -20°C.

DNA Extraction:

DNA can be extracted from the tip using standard laboratory procedures. DNA yields of 500-2,000 ng DNA are typical. Actual DNA yield will vary depending on the original DNA concentration, collection efficiency and extraction procedure.

Caution: Read instructions prior to use.
Single use only. Do not use if package has been previously opened or damaged. Federal law (USA) restricts this device to sale by or on the order of a physician.

To obtain Whatman® Sterile *Omni Swabs*, Catalog #WB10-0004:
Contact Whatman® toll free at 1-866-787-3362.

Whatman®
www.whatman.com

Figure 16. Swabbing Instructions Included in DNA Sample Kit



Figure 17. DNA Sample Collection Kits

GENOGRAPHIC TEST SUBJECT INFORMATION CARD

<p>WPI-Venice Project Center National Geographic</p> <p>Ricostruzione delle Origini dei Veneziani attraverso L'Analisi del DNA</p> <p>Per Ulteriori Informazioni Contattare Venice Project Center: Tel: +39 041 523-3209 Email: carrera@wpi.edu</p>	<p> WPI  THE GENOGRAPHIC PROJECT</p> <p>Per accedere ai risultati delle sue analisi genetiche vedere istruzioni a tergo</p> <p><i>I risultati sono protetti da un codice segreto personale per garantire la massima riservatezza</i></p>
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Figure 18. Front of Information Card

Per Accedere ai Risultati delle sue Analisi

- 1. Accedere al sito web:**
<https://www3.nationalgeographic.com/genographic>
- 2. Dopo la scritta “Enter Your Genographic Project Kit ID”, inserire il codice secreto personale:**
- 3. Poi premere “Invio”**
- 4. I suoi risultati appariranno sullo schermo**
- 5. Qualora i risultati non siano ancora pronti riprovare alcuni giorni dopo. I risultati saranno consultabili dopo circa due mesi dalla data del prelievo.**

Figure 19. Back of Information Card

APPENDIX B

ARCHAEOLOGY 20 YEARS AGO, AND ARCHAEOLOGY NOW

The current state of archaeology has improved vastly in the last 20 years. For instance, in the early 1990's, archaeology in Venice was a field that lacked profitability. According to the 1990 IQP done on Venetian archaeology, work done near the lagoon was not a profitable business, and one of the main causes for this was the weather. Another reason for the lack of profitability is the fact that most organizations couldn't handle more than two jobs per year; even though that's the amount they needed to stay in business. Combine this with the fact that many of these organizations lacked necessary funding and that many of the islands where the sites are located do not provide water or electricity made it very difficult to gather archaeological data in Venice.

Today, archaeology is a very admired and respected field and a livelihood for many people. The field is considered extremely important in preserving and better understanding the city. Hence, Venice requires that an archaeologist be present at any city maintenance work. The reasoning behind this is the presence of an abundance of important historical artifacts that need to be catalogued.

LAND AND WATER-BASED ARCHAEOLOGY

LAND ARCHAEOLOGY

There are three major processes used in modern land-related archaeological excavations. These processes are: the survey, the excavation, and the analysis. Surveying, the first process, revolves around surveying the land that needs to be excavated. This is a relatively new practice that was not used widely until 1949, when Gordon Willey introduced the technique prior to doing an excavation in the Virú Valley of Peru.⁴⁵ The next process, excavation, is the actual dig or search for artifacts. A specific technique that is used in Venice during excavations is pumping. In Venice, archeologists dig into the ground until they hit water, use pumps to dry up this current layer, and continue digging. If artifacts are found at a specific layer, then the layer that they were found at is recorded. The reason why it is recorded is because a certain object's depth underground can determine its age. After excavations, the analysis is performed. Analysis entails retrieving and analyzing artifacts in order to see if any useful information can be extracted from them. Carbon-dating has proven very helpful in determining the age of Carbon based artifacts. Combined, these three major aspects of land-based archaeology have helped uncover many indispensable artifacts.

⁴⁵ Gordon Willey, Prehistoric Settlement Patterns in the Virú Valley, Perú, 1953).

WATER-BASED ARCHAEOLOGY

There are a few differences between Land and Water based archaeology. For example, one of the main techniques used in water-based archaeology is measuring the sea-level around a plot of land. When searching for artifacts underwater, archaeologists use scuba equipment and search the lagoon. During this process, archaeologists are forced to feel around in the water due to the terrible visibility in the lagoon. Although the movement of objects underwater makes it more difficult to be precise, archaeologists get a general idea about an objects age based on how deep it is below sea level.

Dott. ALBERTO ZANDINELLA	Scavo: MUR CSC 8	Pag. 1		
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P.IVA 3714710278	ASA/ISO	200		
				
N° FOTO	DATA	SOGGETTO	NOTE	FLASH
1	22/07/08	Ambientazione		no
2	22/07/08	Ambientazione		no
3	22/07/08	Ambientazione		no
4	22/07/08	Scavo preesistente vasca		no
5	22/07/08	Scavo preesistente vasca		no
6	22/07/08	Scavo preesistente vasca		no
7	22/07/08	Scavo preesistente vasca		no
8	22/07/08	Scavo		no
9	22/07/08	Scavo		no
10	22/07/08	Scavo		no
11	23/07/08	Scavo		no
12	23/07/08	Scavo		no
13	23/07/08	Scavo		no
14	23/07/08	Scavo con l'ausilio di pompa		no
15	24/07/08	Rilievo		no
16	24/07/08	Rilievo		no
17	24/07/08	Rilievo		no
18	24/07/08	Rilievo		no
19	24/07/08	Rilievo		no
20	24/07/08	Rilievo		no
21	24/07/08	Rilievo		no

Figure 20: Foto Index Form

ELENCO US-USM		Sigla	MUR FDM 33		Anno	2008	p.	elenco	1	
US	Descrizione	Posizione	coperto da	tagliato da	riempito da	gli si appoggia	copre	taglia	riempie	si appog- gia a
100							101			
101			100				102,104,112			
102			101,112				103			
103			102				104			
104			101,103				105			
105			104				106			
106			105				107			
107			106				108			
108			107				109			
109			108				110			
110			109				111			
111			110							
112			101				102			

Figure 21: Layer Form and Tomb Form Index

SCHEDA PER LA CLASSIFICAZIONE DI MATERIALI ORGANICI																																																																																														
MINISTERO PER I BENI E LE ATTIVITA' CULTURALI			DR. MARCO BORTOLETTO Via L.Bissolati 6/7 30172 Mestre Ve P. Iva 03073310272																																																																																											
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Figure 22: Form Filled Out for Organic Objects

scheda dello scheletro

numero di elemento della tomba

in sarcofago?

reparti con lo scheletro?

in connessione?

completo?

disturbato?

posizione di:

cranio

braccia

gamba

osservazioni

condizioni delle ossa

ossa presenti

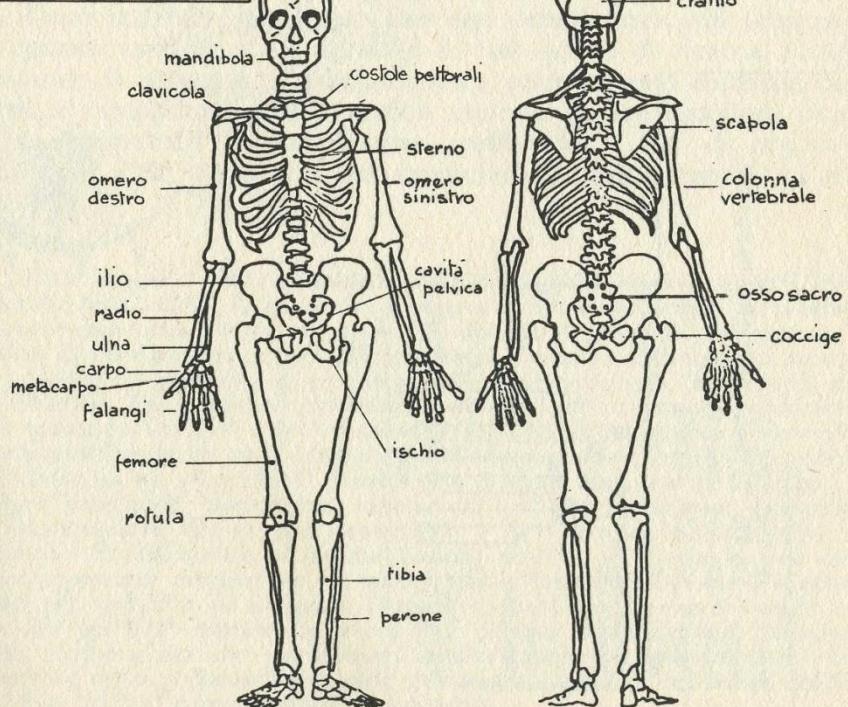


Figure 23: Form Filled Out for Objects Found in Tomb

User related use cases:

UC#	Name	Description
01	Security	Each user account is password protected
02	User log in	User log in is done in splash screen
03	User Log out	User must be able to log out at any time
04	New account request	Link to an account request page should be in splash screen
05	Forgotten Password	Link to forgotten password page should be in splash screen
06	Information required for new account	Full name, title, valid email address, archaeological company employed by, company's contact number, users contact number.
07		

Administrator use cases: (Administrator is just another user but with more permissions)

UC#	Name	Description
08	Account set up	Only the administrator can create new users and set their permissions
09	New account request	The Administrator receives an email when an account creation request is submitted
10	User removal	The administrator has the ability to remove user accounts
11	Global data access	The administrator can view all the data in the system.
12	Activate/Deactivate reports	The administrator can deactivate any reports.
13	Global User notification	The administrator can send emails to all/selected members.
14	Report Access	The administrator has the ability to give form access to other users.

System use cases:

UC#	Name	Description
15	Form and form field requirements	None of the forms or form fields is required to be filled out right away or in order to activate a report.
16	Progress bar	There should be a progress bar visible at all times while filling out forms.
17	Search (regular)	There should be a search field in every page.
18	Search (advanced)	There has to be an option for advanced search.
19	Advanced search options	Option to search different forms
20	Boolean searching	Ability to do boolean searching using AND, OR, NOT
21	Site mapping	Each excavation site should be mapped and public
22	Report mapping	Each report should be under only one site and user.
23	Multiple reports	The system should accept multiple reports for each site.
24	Information access	Normal user can only access his/her data
25	Save and Continue	User must be able to save and continue working on a report at any time.
26	Activating & Deactivating reports	User must be able to activate/deactivate a report of an archaeological site whenever needed.
27	Data sharing by users	A user can grant access to any of his forms to another user for any period of time.
28	Map of Venice	There should be a map of Venice showing all the excavations sites.
29	Viewing archaeological sites	When the site is clicked on the map information extra information should be displayed. It should have the list of all excavations with the name, contact information of the reporter and the number of artifacts found.
30	Adding new site	A user should be able to add new excavation by clicking the location on the map
31	Adding new excavation to existing site	A user should be able to add a new report to an existing excavations site by clicking on the map.

SITE MAP

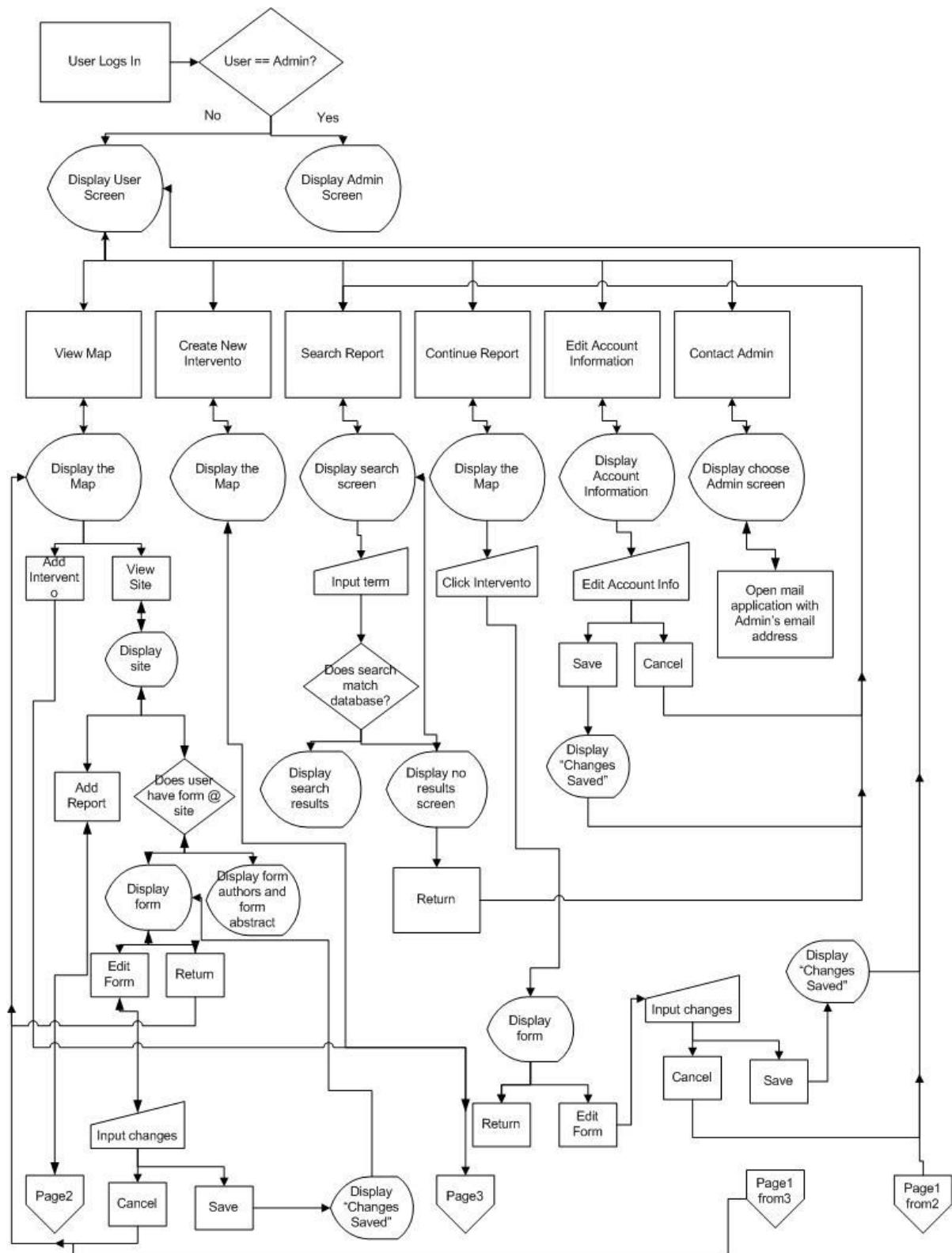


Figure 24: Page One of Our Site Map

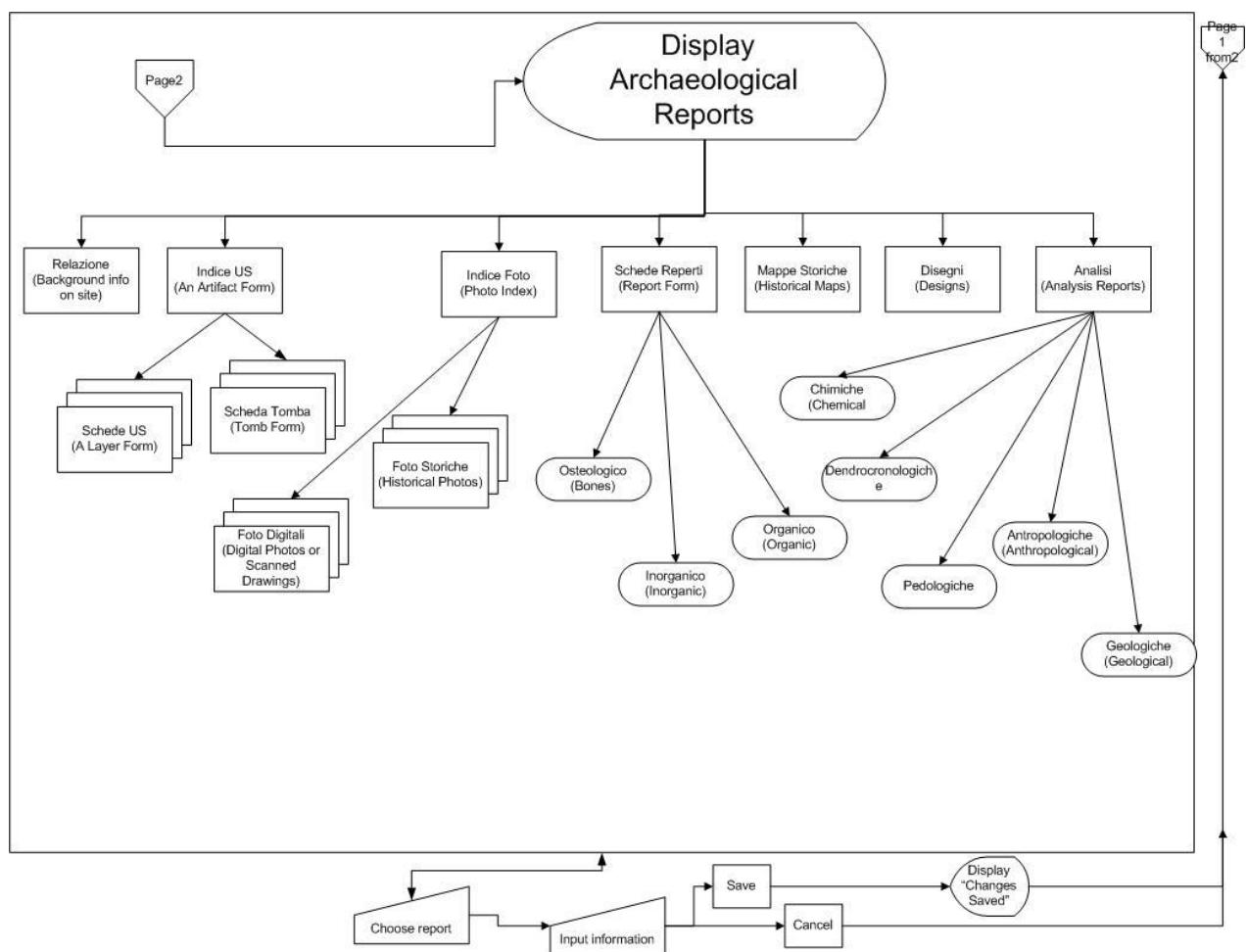


Figure 25: Page Two of Our Site Map

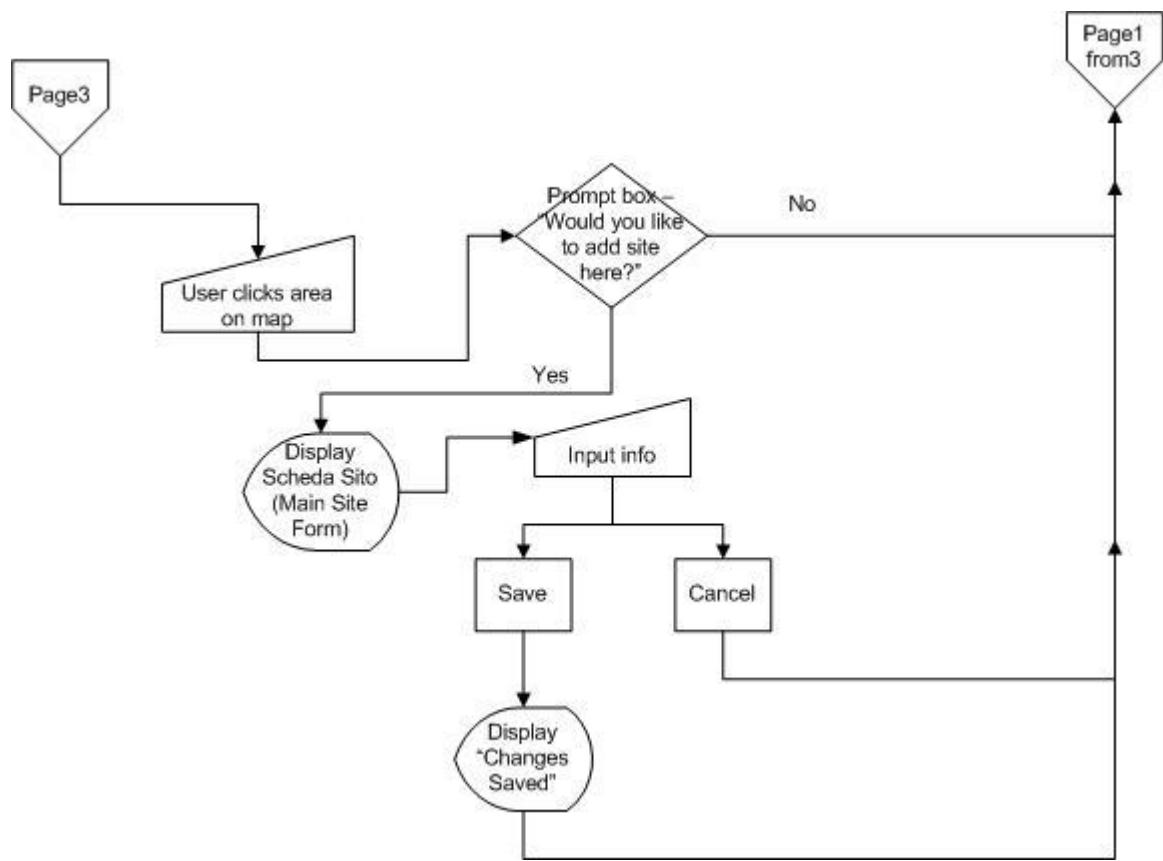


Figure 26: Page three of our site map

APPENDIX C

DIGITALIZING MANUSCRIPTS AT VENICE STATE ARCHIVE

The Venice State Archive has started creating digital copies of the Manuscripts that it stores. Priority is given to the manuscripts that have become nearly illegible. Figure 27 shows a manuscript which is rendered illegible because of Mold damage.

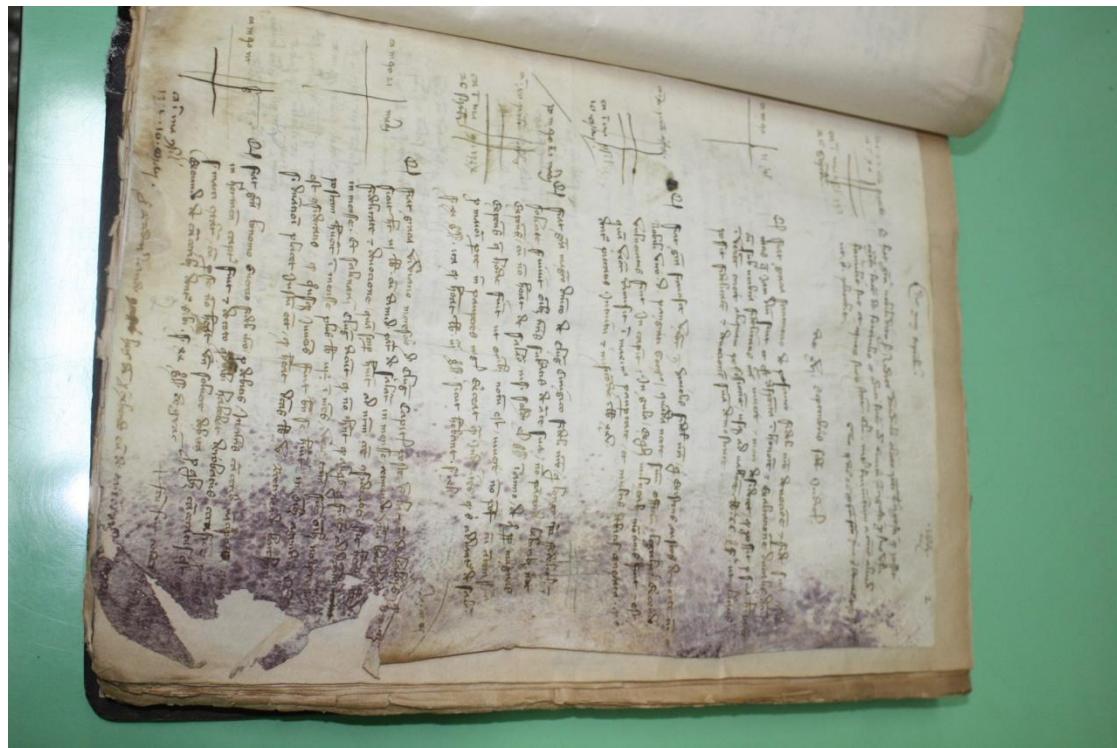


Figure 27: Manuscript, Written on Acid Paper, Destroyed by Mold

The Archive houses state of the art scanning equipments to scan these manuscripts. Figure 28 shows a technician scanning a manuscript at the Venice State Archive.



Figure 28: A Technician Scanning Manuscripts

Once these manuscripts are scanned, the images are stored on a CD Rom and it is supplied with a unique number which is indexed in a spreadsheet. Figure 29 shows a digital copy of a manuscript placed on the original document.

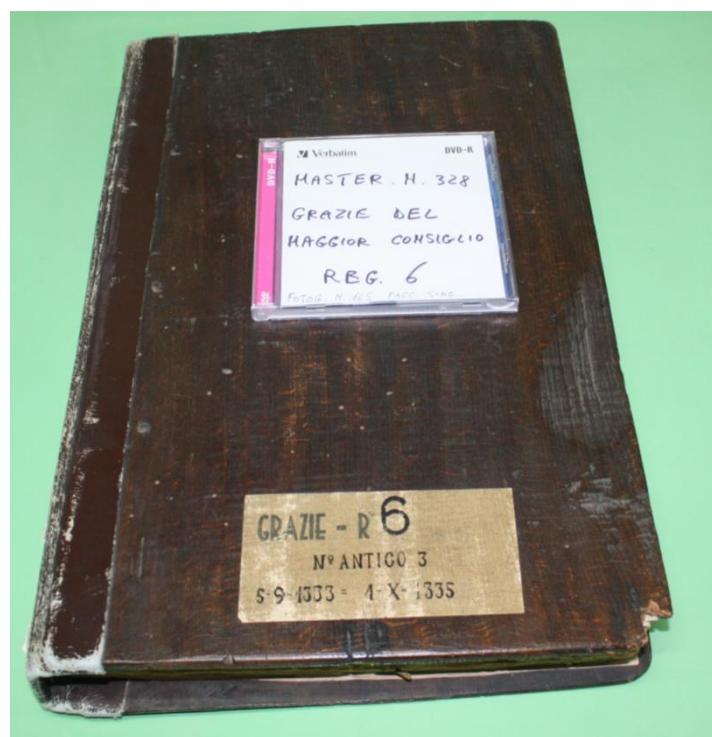


Figure 29: Original Manuscript and Its Digital Copy

APPENDIX D

VISUALIZATION SYSTEM DESIGN

The island formation between approved maps is recreated using Intermediate State Units (ISU). Specific information regarding each ISU comes from the input table. This table has four columns representing the following information: 1 – Name of the unit, 2 – Date of the unit, 3 – X coordinate, 4 – Y coordinate. Each entry in the table represents one ISU, which is a circle of set radius drawn on the map at specific location defined by XY coordinates. The application script reads the input table, creates the ISUs, and animates them and the historical maps chronologically according to input data. Each ISU and map will rise above water when the date on the timeline equals its date in the input table. This type of animation is called “keyframed animation”⁴⁶ and the process of setting up keys is called “keyframing.” Once keyframing process completes, the script renders the animation. The historical accuracy of the animation depends on the amount of input data. The number of Intermediate State Units produced increases when more input data is provided, thus, increasing the accuracy with which the evolution of Venice is visualized. Our design allows flexible implementations of this system. There are many ways one could implement this design using various open-source three dimensional applications.

RATIONALE FOR CHOOSING MAYA

Before we decided to use Maya the team evaluated Blender, another 3D modeling software, but the learning curve did not allow us to create a data driven animation given the duration of our project. Another software application we considered was Processing⁴⁷, but it also had quite a large learning curve. Using MX Flash, 2D animation software, was one more way we could have completed this task but Flash does not produce 3-dimensional animations which makes it an inferior choice to Maya.

⁴⁶ Keyframed animation describes an animation where only some frames are definite and everything in between is computer generated.

⁴⁷ Processing is an open source programming language and environment for people who want to program images, animation, and interactions.

Python Script

```
import maya.cmds as cmds
import re

f = open("input_data.csv")

#defining lists
buildings = []
dates = []
zCoords = []
xCoords = []
isIsland = []
count = 0

try:
    for line in f:
        strings = re.split(',',line)
        #populating lists of buildings and dates
        buildings.append(strings[0])
        dates.append(int(strings[1]))
        xCoords.append(float(strings[2]))
        zCoords.append(float(strings[3]))
        isIsland.append(strings[4])

finally:
    f.close()
for elements in buildings:
    if isIsland[count] == 'n':
        print "this is an ISU, create it!"
        #print 'Creating cylinder with name: ' + buildings[count] + ', Date: ' + dates[count] + ','
        xy: ' + xCoords[count] + 'x' + zCoords[count]
        cmds.polyCylinder(height=0.8, name=buildings[count], radius=0.8, subdivisionsX=30,
        subdivisionsY=1, subdivisionsZ=1)
        cmds.move(xCoords[count], 0, zCoords[count])
        cmds.setKeyframe()
        cmds.setKeyframe(buildings[count], attribute='translateY', v=0, t=[dates[count] - 20])
        cmds.setKeyframe(buildings[count], attribute='translateY', v=1.606, t=[dates[count],
        2010])
    else:
        print "this is a map, animate it differently"
        cmds.select(buildings[count])
        cmds.setKeyframe()
        cmds.setKeyframe(buildings[count], attribute='translateY', v=0 , t=[dates[count] - 20])
        cmds.setKeyframe(buildings[count], attribute='translateY', v=0.15 , t=[dates[count],
        2010])
    count = count + 1
```